

Interim Report
YardSale
The Open Source Point of Sale Solution

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Contents

| | | |
|----------|--|-----------|
| 1 | Requirements Definition | 3 |
| 1.1 | Introduction | 3 |
| 1.2 | Functional Requirements | 3 |
| 1.2.1 | Database Management | 4 |
| 1.2.2 | Transactions | 4 |
| 1.2.3 | Logging | 4 |
| 1.2.4 | Reporting | 5 |
| 1.2.5 | User Level Access Rights | 5 |
| 1.3 | Non Functional Requirements | 6 |
| 1.3.1 | Cross Platform | 6 |
| 1.3.2 | Cross Architecture | 6 |
| 1.4 | External Dependencies and Interfaces | 6 |
| 1.5 | Preliminary Design | 7 |
| 1.5.1 | Major Modules | 7 |
| 1.5.2 | System Architecture | 7 |
| 1.6 | Preliminary Project Task Plan | 8 |
| 1.6.1 | Milestones | 8 |
| 1.6.2 | Team Member Roles and Responsibilities | 9 |
| 2 | Design | 10 |
| 2.1 | YardSale Database Design | 10 |
| 2.1.1 | Customer Management | 12 |
| 2.1.2 | Inventory Management | 13 |
| 2.1.3 | Transaction Handling | 14 |
| 2.1.4 | Employee Management | 16 |
| 2.2 | YardSale Client Application Design | 19 |
| 3 | Implementation | 22 |
| 3.1 | Database Level Implementation | 22 |
| 3.2 | Application Level Implementation | 22 |
| 3.2.1 | YardCalc | 22 |
| 3.2.2 | YardDatabase | 22 |
| 3.2.3 | YardDBType | 22 |
| 3.2.4 | YardEmployee | 22 |
| 3.2.5 | YardInventory | 22 |
| 3.2.6 | YardException | 22 |
| 3.2.7 | YardLog | 22 |
| 3.2.8 | YardLogin | 22 |
| 3.2.9 | YardMain | 22 |

| | | |
|----------|------------------|-----------|
| 3.2.10 | YardSale | 22 |
| 3.2.11 | YardSaleScreen | 22 |
| 3.2.12 | YardSplash | 22 |
| 4 | Test Plan | 23 |

Chapter 1

Requirements Definition

1.1 Introduction

YardSale is an open source Point of Sale system that is being designed by A.S Logic Systems to revolutionize the way Point of Sale systems are implemented in today's market. Current implementations of Point of Sale systems are fraught with a number of issues; including often being extremely overpriced, difficult to administer, dated in their functionality, and lacking necessary operations. YardSale was designed to alleviate these problems and allow for extensibility as the market of retail sale expands in the future.

Being that YardSale is an open source project with little funding, the initial niche market will target small, locally owned retail stores. This type of market will allow for extensive on-site research, as many of these businesses should be willing to work with us to improve on the functionality of their existing POS system. In addition, because A.S. Logic has decided to take the open source route, the software itself will be freely available to all who wish to use it, the only expense that will come into play is if the company wishes to enlist our services in setup, troubleshooting, support, expansion, or customization.

1.2 Functional Requirements

This section entails all of the minimal requirements set by the AS Logic Systems development team for the OpenPOS hereafter referred to as YardSale.

Minimum functionality of YardSale should accomplish the following:

- Manage Inventory Data
- Manage Customer Data
- Manage Employee Data
- Perform Transactions
- Provide Logging Facilities
- Report on Data
- User Level Access Rights

Each of these tasks is described in depth in their corresponding sub sections. There is planned functionality above and beyond this basic featureset, although without these functions other functionality can not be added.

1.2.1 Database Management

The goal of the database management tasks are to add, modify, and delete information in the database. The database backend will run on a MySQL server and all relevant data will be stored in its own table or set of tables. More information on the database design can be found in the database design document.

Inventory Management

The inventory management system will have an interface for the stock employees to enter new shipments. It will also have an interface for the management employees to define new items for sale. The most common use of the inventory management system will be integrated into the checkout system. When customers are checking out, inventory will be populated to the checkout screen from the database, and then decremented on purchase from their quantity in the database.

Customer Management

The customer management system will work in a similar fashion to the inventory management system. It will have only one level of functionality though, the ability to define and update new customer data. There will also be a small interface with the database during the checkout of a customer which will allow for the selection of a customer from the customer table.

Employee Management

The employee management system here again will also function similarly to the previous two in that it has hooks into the database for employees. It will allow an authorized user the ability to add and modify employee information as well as disable employee accounts.

Among the more specific functionality of each of these sections will be to allow the user to retrieve any item stored in either inventory, customer, or employee tables given a search criteria.

1.2.2 Transactions

Transactions in YardSale are basically a 4 step process. The first step in the process is to select a customer to do business with or select a cash "quick" customer. After the customer is selected their basic information will be displayed on the main checkout screen. The user will then either select items from the inventory from a hierarchy, scan them in with the barcode scanner, or manually type in their information in lookup fields to checkout a customer. A running total will be kept as well as tax calculations for the sale. After all items are accounted for a checkout screen will be called. This will allow the user to select the customer's preferred method of payment and also provide the user with the ability to calculate the correct amount of change.

All transactions will be maintained with a table in the database that will link related elements of the transaction together for later reporting.

1.2.3 Logging

Many program logging features will be provided inherently due to the database backend. Among the logging facilities will be the following items:

- Employee Time Tracking
- Transaction Logging
- Shipment Logs

- SQL String Execution Logging

Employee time tracking will be logged based on when the login to their first client and when the logout of their last client. An entry in the Login table will track this for each instance of a session. The transaction logging as was discussed earlier will be maintained in a table of its own tracking related items, customers, and employees with transactions. The shipment logs will be an offshoot of a transaction in that some will be shipped. If so a log of the shipping information will be available as it relates to the customer and the carrier. As a debugging feature a SQL String Execution Log facility will also be included. For every SQL string used on the database, there will be a stored procedure that adds it to the log table for later searching and debug use. This feature will likely be disabled in the final deliverable.

1.2.4 Reporting

There will be a wide variety of reporting features available also as a result of the database backend. The following basic reporting functionality will be available in the first iteration of YardSale.

- Payroll for Employees
- Top Sales for Inventory Items
- Top Sales for Employees
- Top Sales for Customer
- Revenue Reporting given any time frame
- Hourly Employee Log Reporting

All of the reports will be output to a pdf via L^AT_EXtype setting. This will provide ease of portability and a wide range of flexibility in reporting.

1.2.5 User Level Access Rights

YardSale has three different levels of user interactivity. There are Managers, Sales Associates, and Administrative users.

Sales Associate Functionality

Sales associates are likely going to be the primary users of the YardSale system. However they will have a limited set of functionality when they login. Their privileges will be limited to basic customer management and transaction processing. They have no real need for full inventory capabilities nor do they need the ability to manage or browse employee information.

When a sales associate logs into YardSale they will see the following options:

- Transaction Processing
- Customer Management

Manager Functionality

The managers primary function in YardSale is to make sure that all of the inventory items, customers, and employees are correctly maintained. They are also the only primary user on the system allowed to run reporting functions.

When a manager logs in to YardSale they will have a full set of functionality available to them from the main screen inclusive of the following:

- Inventory Management
- Transaction Processing
- Customer Management
- Employee Management
- Reporting

Administrative Functionality

The administrative user is basically a built in manager user. This user will have full rights to the system and the password will be able to unlock other accounts in the system that are locked due to loss of password. The administrative user will likely never be used in day to day use of YardSale, however it is provided as a safety to always allow the access of encrypted data in case of total loss of management capability.

1.3 Non Functional Requirements

1.3.1 Cross Platform

The YardSale software is to be developed using the wxWindows libraries for C++, which creates GUIs (Graphical User Interfaces) that are platform independent. The YardSale software will be able to run on any major operating system on today's market.

1.3.2 Cross Architecture

The main purpose of the YardSale software is to be very independent of all architectural aspects of the system, using minimal system resources. The idea is to be able to use any system to run the software appropriately.

1.4 External Dependencies and Interfaces

Cash Drawers

The cash drawers used for the system are a serial interface, which must be supported by each client system. The drawers must open automatically when a transaction is completed; and manually by managers and authorized users.

Magnetic Card Scanners

The magnetic card scanners serve multiple purposes, but all with similar functionality. The scanners are a serial interface, which must be supported by each client system. They must read the information stored on the card and relay it to the system. The system will use this interface for both credit card transactions and user access.

Barcode Scanners

The barcode scanners are a USB (Universal Serial Bus) interface, which must be supported by each client system. They must read the barcode scanned and relay the information about the product to the system.

Receipt Printers

The receipt printers are a printer (parallel) interface, which must be supported by each client system. The printers will print specified information at the conclusion of each transaction; and will also be able to print daily user reports.

TouchScreen Monitor

Touch screen monitors will be used at every sales location. The monitors use a USB interface, which must be supported by each client system. The touch screens will act as both the monitor and mouse of the system for easy accessibility. The monitors must correctly read the commands given and relay them to the system.

1.5 Preliminary Design

1.5.1 Major Modules

Database

The Database module works as the translator between the user interface and the database. It converts calls made by the GUI into SQL queries to be sent to the database. When the query results are returned from the database, the Database converts these items to a Database Type (discussed in next section) to be read by the GUI. OTL Libraries will be used in conjunction with ODBC to provide database connectivity with the user interface. OTL is a cross platform library for ODBC.

Database Types

The Database Types module is the superclass for all information that may be sent to the GUI from the database. It contains function calls for each of the following types:

Inventory Type: contains variables for all possible inventory management items stored in the database. Coordinates with the Inventory Management view in the GUI, which is also used by Transactions.

Customer Type: contains variables for all possible customer management items stored in the database. Coordinates with the Customer view in the GUI, which is also used by Transactions.

Employee Type contains variables for all possible employee management items stored in the database. Coordinates with the Employee Management view in the GUI.

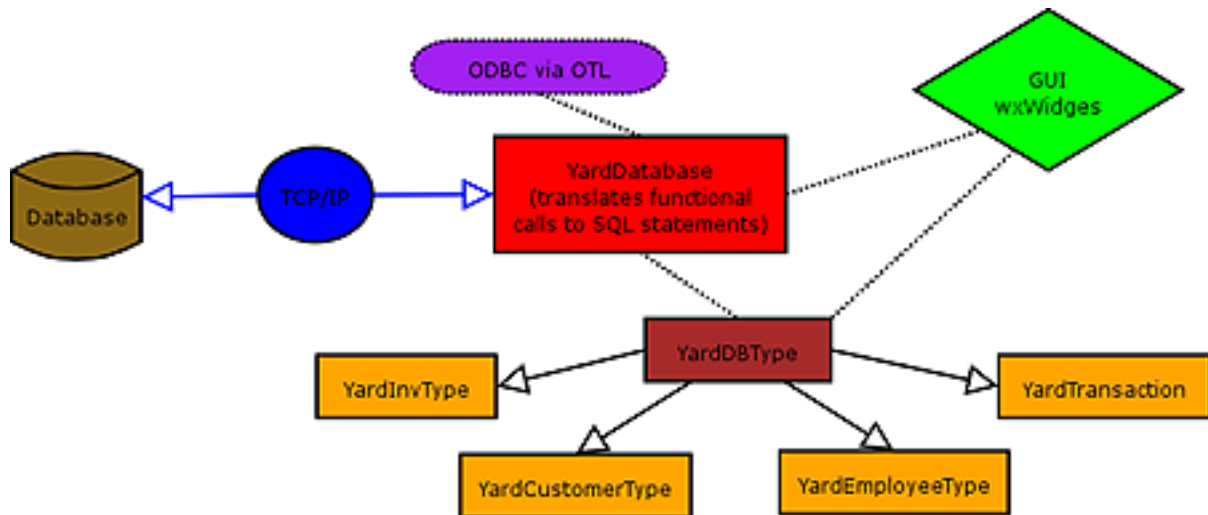
Yard Transaction contains variables for all possible transaction items stored in the database. Coordinates with the Transaction view in the GUI.

GUI wxWindows

The GUI wxWindows module defines all interfaces used by the GUI. It contains functions derived from the wxWindows libraries for C++. It also interacts with the Database module to display information sent from the database.

1.5.2 System Architecture

Figure XXX (shown below) outlines the class dependencies and hierarchy of the modules described in section 1.5.1.



1.6 Preliminary Project Task Plan

1.6.1 Milestones

2004-03-05 FEATURE FREEZE - deadline for adding functional features to the design of the POS.

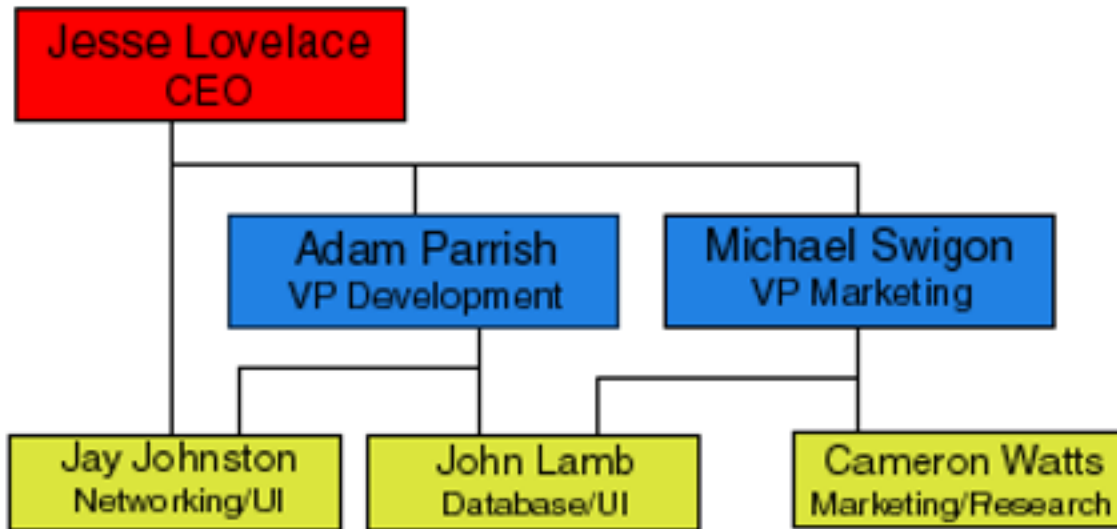
2004-03-07 ITERATION 1 - all requirements for first iteration to be completed and documented in the interim report.

2004-04-01 ITERATION 2 - all secondary requirements to be completed for the second iteration.

2004-04-17 CODE FREEZE - deadline for beginning the coding of features; those not already implemented will be removed; testing only beyond this point

2004-04-27 FINAL DELIVERABLE - completion of prototype for presentation to the CSC department at the Posters and Pies event.

1.6.2 Team Member Roles and Responsibilities



The team roles are defined as follows:

Jesse Lovelace As the CEO of A.S. Logic Systems, Jesse is in charge of all aspects of the project. Though he works very closely with both VPs, Jesse is the ultimate decision maker for the team. In addition to his roles as CEO, Jesse is also in charge of the design and implementation of the User Interface and all security aspects.

Adam Parrish Adam is the Vice President in charge of Development at A.S. Logic Systems. He works closely with both the CEO and VP of Marketing to see that YardSale's implementation is both correct and timely. In addition to these company roles, Adam is also the lead Database Programmer; seeing to it that the database is functioning properly and creating the SQL scripts for populating and querying the database.

Mike Swigon Mike is the Vice President of Marketing at A.S. Logic Systems. He works closely with both Adam and Jesse to both design the entire system and to insure that its implementation is correct. In addition to these responsibilities, Mike works with Adam in database setup and creation of SQL scripts for populating and querying the database.

John Lamb John's responsibilities fall primarily in interfacing with the database. He works closely with Jesse to develop a UI that can correctly and securely communicate information to and from the database; also implementing the SQL statements developed by Mike and Adam.

Jay Johnston Jay's responsibilities fall primarily in creation of the UI and networking the system during setup. He works closely with Jesse to develop modules for required functionality of the interface.

Cameron Watts Cameron's responsibilities fall primarily on marketing and system research. He works closely with the design group to ensure YardSale's functionality is top-of-the-line and user friendly.

Chapter 2

Design

The following sections are related to the design of YardSale in regards to the database level design as well as the client application level design. The first section provides a high level explanation of the database architecture using UML diagrams. The following section explains design related issues of the YardSale client program.

2.1 YardSale Database Design

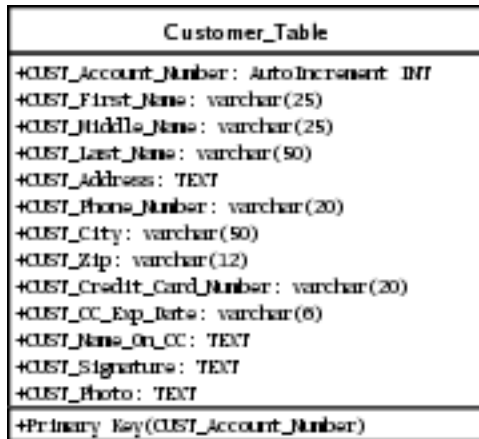
The YardSale database was designed with security and efficiency in mind. The goal was, as it is in any database, to separate unrelated data and key similar items together with table relations. The global database model is seen in the diagram on the following page. Although it is not necessarily easy to read the table relations can be seen, and table specifics like field values, indexes, and foreign and primary keys can be seen in the following table diagrams.

YardSale Global Database Diagram

2.1.1 Customer Management

Since customer management is basically a simple task it is maintained in only one table. There is no real need to have their data stored accross many different tables since all of the information is just personal data.

Customer Table



The above UML diagram shows the layout of the customer table. The object of this table is to manage customer personal information for later reference in transactions. By allowing this associativity YardSale will later be able to formulate reports on how much each of its customers spend for example. It also provides a rather in depth directory of all of a business's clients for use in any form they see fit.

The data stored begins with the customer account number which is just an arbitrarily assigned number that is managed by the database management system. It is also the primary key for the table and is therefore unique. First, Middle, and Last names are all stored in seperate fields of their own, as is the Address information. Credit information can also be stored about users but is optional, and is also planned to be stored in the field as an encrypted string of data so that underprivileged users can not access it. Two interesting features about this table is the ability to store a link to a photograph and signature for each customer. That way it will aid in positively identifying a customer when they are checking out with check or credit.

2.1.2 Inventory Management

YardSale's Inventory Management scheme spans over three tables. The main table that stores actual inventory description information is the Inventory Table itself. The other two tables are used to support the main table. They are the Tax table and the Vendor Table. The tax table is basically a storage area for different tax types, and the Vendor Table is a storage table for Vendor information or Inventory Supplier information.

Inventory Table

| Inventory_Table |
|---|
| +INV_SKU_Number: AutoIncrement INT |
| +INV_Bar_Code_Number: varchar(30) |
| +INV_Item_Description: TEXT |
| +INV_Item_Department: varchar(30) |
| +INV_Quantity_On_Hand: INT |
| +INV_Quantity_On_Order: INT |
| +INV_Reorder_Level: INT |
| +INV_Reorder_Quantity: INT |
| +INV_Item_Type: varchar(20) |
| +INV_Item_Weight: FLOAT |
| +INV_Tax_Type: REFERENCES TAX_Tax_ID FLOAT |
| +INV_REF_Vendor_ID: REFERENCES Vendor_Table.Vendor_ID INT |
| +INV_Retail_Price: MONEY |
| +INV_Wholesale_Price: MONEY |
| +INV_Bulk_Price: TEXT |
| +INV_Date_Last_Received: DATETIME |
| +INV_Weight_Pounds: WEIGHT |
| +INV_Oversized_Flag: Boolean |
| +INV_Ship_By_Freight: Boolean |
| +PrimaryKey(INV_SKU_Number) |

This table being the main Inventory storage structure contains all information needed about any inventory item. The record primary key is the SKU number which is a user defined number or character string. These are often used in small businesses to internally key their inventory. Manufacturers will often have a bar code associated with each item the produce as well so their is a field available for that as well. Each item can be briefly described, and associated with a department for further subcatagorizing. The number of any particular item is maintained as well as how many of the item are on order. There is a field for storing the number at which an item should be reordered, and also how many to reorder at that time. There are varying description fields such as item type and weight as well. Three pricing fields are supplied. The first two are statically maintained as retail and wholesale price. The third price type varies on the number of items being purchased. This field is maintained in XML format so that as many different pricing levels as are needed can be defined. When an item is received it updates the field corresponding to last received. Some items are oddly shaped or are overly heavy, either of these two options could cause the oversized flag to be set, and if the oversized flag is set a ship by freight option would also be set, but they are mutually exclusive and the ship by freight can be set without the oversized flag being set.

Tax Table

| Tax_Table |
|----------------------------|
| +Tax_ID: INT Autoincrement |
| +TAX_Name: varchar(20) |
| +TAX_Percent: FLOAT |
| +PrimaryKey(Tax_ID) |

The tax table is just a support table for the inventory items. It is referenced by ID depending on the desired taxing an item should have. Using a table allows for user definable tax types, and allows the database to be flexible to tax changes. All that the table needs is a Tax Name and a percentage for taxing items. The ID field is managed internally by the database management system and is also the primary key for the table.

Vendor Table

| Vendor_Table |
|----------------------------------|
| +VND_ID: AutoIncrement INT |
| +VND_Name: varchar(255) |
| +VND_Address: TEXT |
| +VND_City: varchar(50) |
| +VND_State: varchar(50) |
| +VND_Zip_Code: varchar(12) |
| +VND_Phone_Number: varchar(20) |
| +VND_Sales_Representative: TEXT |
| +VND_Specialty: TEXT |
| +VND_Email_Address: varchar(255) |
| +VND_Home_Page: TEXT |
| +PrimaryKey(VND_ID) |

The Vendor Table is used also as a supporting table for the inventory. This information pertains to the supplier of the items being sold. When an item reaches its reorder level in the Inventory Table, the information in this table would be used to make the order to resupply. The table is keyed by a unique ID that is managed by the database management system. The company name, address, and pertinent contact information is maintained along with a sales representative's name. There are optional fields for company specialty, email address, and homepage as well.

2.1.3 Transaction Handling

Transaction Handling is a process that has data spanning two tables with two more supporting tables. Transaction handling is split into two sections. The first section being the actual day to day transaction, and then the added functionality of packaging the items sold during the transaction.

Transaction Table

| Transaction_Log_Table |
|--|
| +TRANS_Ref_EMP_ID_Number: INT +TRANS_Ref_Item_SKU_Number: varchar(10) +TRANS_Ref_Cust_Account_Number: INT +TRANS_Item_Sale_Price: DECIMAL(10,2) +TRANS_ID: INT NOT NULL +TRANS_Quantity: INT +TRANS_Comment: TEXT |
| +Primary Key(Ref_Emp_ID_Number, Ref_Item_SKU_Number, Ref_Cust_Account_Number, Item_Sale_Price, ID, Quantity) +INDEX trans_id(TRANS_ID) +INDEX emp_id(TRANS_REF_EMP_ID_Number) +INDEX sku_num(TRANS_REF_INV_SKU_Number) +INDEX cust_acct(TRANS_REF_CUST_Account_Number) +FOREIGN KEY(TRANS_REF_EMP_ID_Number): REFERENCES Employee_Table(EMP_ID_Number) +FOREIGN KEY(TRANS_REF_INV_SKU_Number): REFERENCES Inventory_Table(INV_SKU_Number) +FOREIGN KEY(TRANS_REF_CUST_Account_Number): REFERENCES Customer_Table(CUST_Account_Number) |

The Transaction Log Table is used to store information that links Customers, Employees, and inventory items. Each entry in the transaction table represents an item sold during a transaction. Since the key is not a single ID number it is the combination of the Customer, Employee, Item, Quantity and Price, the ID can be used to represent the overall transaction. Any row that contains an equivalent ID belongs to the same transaction.

Package Table

| Package_Table |
|---|
| +PKG_ID_Number: AutoIncrement INT +PKG_Ref_Trans_ID: INT +PKG_Ref_Cust_Account_Number: INT +PKG_Ref_Carrier_ID: INT +PKG_Tracking_Number: varchar(50) +PKG_Shipping_Type |
| +Primary Key(PKG_ID_Number) +INDEX trans_id(PKG_REF_TRANS_ID) +INDEX cust_acct(PKG_REF_CUST_Account_Number) +INDEX carr_id(PKG_REF_CRR_ID_number) +INDEX shp_type(PKG_REF_SHP_Shipping_Type) +FOREIGN KEY(PKG_REF_TRANS_ID): REFERENCES Transaction_Log_Table(TRANS_ID) +FOREIGN KEY(PKG_REF_CUST_Account_Number): REFERENCES Customer_Table(CUST_Account_Number) +FOREIGN KEY (PKG_REF_CRR_ID_Number): REFERENCES Carrier_Table(CRR_ID) +FOREIGN KEY(PKG_REF_SHP_Shipping_Type): REFERENCES Shipping_Table(SHP_Type) |

The Package Table is used to store information about a package. There is a link to a transaction ID so that items can be associated with a package. There is also a link to a customer from the package table. The reason there is a link from the package table is because one customer may wish to buy something for another so the customer who made the transaction will not necessarily be the same as the one who will receive the package. There is also a reference to a carrier and a shipping type. A tracking number field is provided for when the tracking number is issued by the Carrier.

Carrier Table

| Carrier_Table |
|----------------------------|
| +CRR_ID: AutoIncrement INT |
| +CRR_Name: varchar(50) |
| +CRR_Pickup_Location: TEXT |
| +CRR_Phone_Number |
| +PrimaryKey(CRR_ID) |

The Carrier table is a support table for the Package table. It provides information about the different shipping services. The information maintained here is just what is necessary to get a package shipped. There is a phone number, pickup location and an ID associated with each entry.

Shipping Table

The Shipping Table is also a support table for the Package Table. This table is a list of all of the different methods of shipping available associated with the Carrier Table. Since each Carrier can have multiple shipping methods they can all be easily added and deleted if they ever change via this table. The table just contains the name for the type of shipping, the carrier, and how much it costs.

| Shipping_Table |
|--|
| +SHP_Type: varchar(30) |
| +SHP_Ref_Carrier_ID: INT |
| +SHP_Cost: DECIMAL(7,2) |
| +PrimaryKey(SHP_Type, SHP_Ref_Carrier_ID) |
| +INDEX crr_id(SHP_REF_CRR_ID) |
| +INDEX shp_type(SHP_Type) |
| +FOREIGN KEY(SHP_REF_CRR_ID): REFERENCES Carrier_Table(CRR_ID) |

2.1.4 Employee Management

The Employee Management section is actually two sections. There is the Employee portion which spans two tables, the Employee Table for employee information, and the Login Table which keeps track of the hours an employee works between logging in and out of the clients. The other section is the security aspect of the program as it relates to employees. It also spans two tables; the ACL Table and the Key Table.

Employee Table

| Employee_Table |
|---|
| +EMP_Social_Security_Number: varchar(13) +EMP_ID_Number: AutoIncrement INT +EMP_First_Name: varchar(25) +EMP_Middle_Name: varchar(25) +EMP_Last_Name: varchar(50) +EMP_Address: TEXT +EMP_Phone_Number: varchar(20) +EMP_City: varchar(50) +EMP_Zip: varchar(12) +EMP_Picture: TEXT +EMP_Signature: TEXT +EMP_Access_Control_Level |
| +Primary Key(EMP_Social_Security_Number) +UNIQUE INDEX(EMP_ID_Number) +INDEX acl_type(EMP_REF_ACL_Type) +FOREIGN KEY(EMP_REF_CUST_Account_Number): REFERENCES Customer_Table (CUST_Account_Number) |

The Employee Table keeps track of all pertinent information about employees that would be needed by an employer. Basic personal information such as First, Middle, and Last name as well as Contact information are maintained here. Each employee in the table has a unique employee identification number associated with them to avoid having to use the Social Security Number as a key. This also allows data such as the Social Security number to be encrypted to alleviate underprivileged users from seeing it. Each employee also has a field for a picture link and signature link to help with positive identification. The other field in this table is the password field which is used to store a users password to allow a user to login, and which is also used to decrypt the keys from the key table. Each user is also associated with a ACL entry in the ACL Table.

Login Table

| Login_Table |
|--|
| +Ref_Emp_ID: INT +Log_Count: INT +LOG_In_Time: DATETIME +LOG_Out_Time: DATETIME |
| +PrimaryKey(Ref_Emp_ID, Log_Time, Log_Flag) |

The Login Table tracks the amount of time an employee has been logged in based on when they logged into their first client to when they logout of their last client. The structure is very simple. It references an employee ID and has a Count field. When the count is greater than zero the user is logged in and upon first entry a value will be inserted into the Log In Time field. When the value of Count reaches zero again a value will be inserted into the Log Out Time field.

Security

Access Control List Table

| ACL_Table |
|------------------------|
| +ACL_Type: varchar(30) |
| +ACL_Description: TEXT |
| +Primary Key(ACL_Type) |

The ACL table which is short for Access Control List Table manages which user types have access to different levels of program use. All this table contains is a Name of a user type and a description of their functionality. Currently we foresee only four user types and will likely not have an interface to manage this table.

Key Table

| Key_Table |
|--|
| +KEY_ID: INT AutoIncrement |
| +KEY_UserEmp_ID |
| +KEY_Keyin: TEXT |
| +INDEX (KEY_KeyID_KeyID_Number) |
| +FOREIGN KEY (KEY_KeyID_KeyID_Number) : FK03030303 Employee_Table(EMP_ID_Number) |

The Key Table is used to manage the keys used to unencrypt the data stored in the database. The entry in this table will reference a valid user in the Employee Table and the text field will contain encrypted data that the user's password was used to encrypt. When the password is used to decrypt this data the user can obtain the keys used to encrypt global database data. A few example fields that are going to be stored as encrypted data are Credit Card Numbers and Expiration Date pairs as well as Social Security Numbers. This will add a level of database security that will prevent or deter malicious users from stealing valuable information from the database.

2.2 YardSale Client Application Design

The YardSale client is modular structure designed to be flexible enough to accomodate any style of business.

Main Menu



The main menu is designed to allow a user to quickly access any part of the YardSale client. The buttons are enlarged to allow touchscreen access.

Sales Screen

The sales screen design allows the products to branch out in a tree. This area is the lower left area and can group inventory items in a logical manner.

Inventory Screen

Inventory screen.

Employee Management Screen



Employee Management

Chapter 3

Implementation

3.1 Database Level Implementation

3.2 Application Level Implementation

3.2.1 YardCalc

3.2.2 YardDatabase

3.2.3 YardDBType

YardEmployeeType

YardInvType

3.2.4 YardEmployee

3.2.5 YardInventory

3.2.6 YardException

3.2.7 YardLog

3.2.8 YardLogin

3.2.9 YardMain

3.2.10 YardSale

3.2.11 YardSaleScreen

3.2.12 YardSplash

Chapter 4

Test Plan