To: P. Lin, G. Steffen

From: Jeremiah Bauer

Date: 2/24/2014

Re: Web Based Point of Sale System Design Project Report

Report Outline

- Report Summary
- Problems and Corrections
- Status of the System
- Timeline for Completion
- Programming and Development Environment
- Hardware Information
- Project Costs
- Supporting Information
 - Top Level System Diagram
 - Cashier Use Case
 - Object Controller UML Diagram
 - o Object Model UML Diagram
 - Find Item Operation Sequence
 - Complete Order Sequence Diagram
 - o Database Schema Diagram
 - Sales Page UI Design
 - o Completed Item Maintenance Page Example
 - Configuration Page Example
 - o Gantt Chart

Report Summary

In this report you will find problems and corrections, status of the system, a description of the programming and development environment, hardware information, and project costs. The design and construction of the system is moving along smoothly if not a little behind schedule due to being employed full time. I have every confidence that I will be able to finish the system by the presentation deadline.

Problems and Corrections

There has only been one major issue encountered during development. I am able to generate barcodes for items both inside and outside of the application. However, I am unable to get them to show up in the web browser, this is simply a case of me not reading and comprehending the documentation behind sending binary data to the browser with Ruby on Rails.

After discussing with Dan's Pies it was determined that users do not need to log in. Therefore the "Create User Login Page" and "Create User Administration Pages" tasks where dropped. This simplified the database schema and simplified the "Sales Page". This functionality could be added at a later date if requested.

Status of the System

The system is currently under active development. The development is progressing slightly behind schedule due to my full time employment and other course load as can be seen in the Gantt Chart in Table 7. I fully expect to catch up on development and be ahead of schedule by the end of spring break. The objects for the ORM model have been designed and can be seen in Figure 4. These objects allow the application to store data in the PostgreSQL database schema seen in Figure 7. The controller objects have also been created which provide URL access to the ORM objects. These objects can be seen in Figure 3.

The item maintenance page has been completed as seen in Figure 9. The only functionality missing is displaying the barcode to the user when the "Show Barcode" link is clicked, currently when this link is clicked an exception is thrown and displayed to the user. This exception is due to not understanding completely how to pass dynamically generated binary data to the web browser with Ruby on Rails. This functionality will be completed with a few more hours of development time.

The sales screen has been designed and is described in Figure 8 and the sequence of operations required to find an item and add it to the order has been developed. This sequence is described in Figure 5. After all the items have been added to the order the user will click the "Complete Order" button and the operations described in Figure 6 will be executed. This page will be the next page to be finished.

The store configuration page has been completed and can be viewed in Figure 10 below. This screen allows the business to change values that will be used throughout the application.

Programming and Development Environment

The programming language that is being used for server side development is Ruby. Ruby is an interpreted, dynamically typed, scripting language that combines the best from Python and Perl. A web framework called Ruby on Rails is being used to speed up development. The database being used to store information is called PostgreSQL an open source relational database. The webpages generated by Ruby on Rails will use HTML, CSS, and JavaScript. The webserver that will be used for deployment is the Apache Webserver with the Phusion Passenger (mod_rails) plugin.

The development environment is hosted on a CentOS 6.5 virtual machine. CentOS is a Linux distribution based on Red Hat Enterprise Linux. The editor being used is vim with the rails plugin. All software is open source and free to distribute and use.

Software Name	Major Version	Purpose
Vim	7.2	Text Editor
Rails.vim	5.0	Vim rails integration
Ruby	2.0	Server Side Scripting
Ruby on Rails	4.0	Server Side Web Framework
PostgreSQL Database Server	9.3	Relational Database Server
Apache HTTPD Webserver	2.4	Web server

Table 1 Summary of Software and Versions

Phusion Passenger (mod_rails)	4.0	HTTPD ruby plugin
CentOS	6.5	Host OS

Ruby gems are third party software that provide extra functionality to the Ruby programming language. Below is a list of these gems that are required for the application to function. All of these gems are licensed as open source software and are free to distribute.

Gem Name	Version	Purpose
Rails	4.0.2	Web Application Framework
sass-rails	4.0.1	Style sheet generator
uglifier	1.3.0	JavaScript compressor
coffee-rails	4.0.0	Coffeescript compiler (JavaScript minilanguage)
jquery-rails	3.0.4	Provides the jQuery Javascript framework to the application
turbolinks	2.1.0	Web link library
jbuilder	1.5.3	JSON parser
therubyracer	0.12.0	Server side JavaScript engine
Barby	0.5.1	Barcode generator
chunky_png	1.30	PNG graphic library
sdoc	0.3.20	Generates documentation from rdoc comments
Pg	0.17.1	Provides connectivity to PostgreSQL
Postgres	0.8.1	Provides connectivity to PostreSQL

Table 2 Summary of Gems and Versions

Hardware Information

The client PC being used is a net-top computer that is powered by an Intel Atom D510 processor and 2 gigabytes of RAM. This is enough processing power to host the barcode scanner and receipt printer. The server is powered by an Intel Core 2 Duo processor and 8 gigabytes of RAM. The barcode scanner is a generic brand USB barcode scanner purchased online. The receipt printer is a USB Epson ReadyPrint T20 Direct Thermal Printer. This printer was chosen because a Linux driver is available from Epson.

Table 3 Hardware Summary

Hardware Name	Function
Intel Atom D510 Net-top	Client PC
Intel Core 2 Duo Server	Webserver and Database Server
Generic USB Barcode Scanner	Scan product barcodes
Epson ReadyPrint T20 Direct Thermal Printer	Print receipts

Project Costs

Table 4 Project Material Costs

Material Costs	
Description	Cost
Receipt Printer	\$144.98
Total	\$144.98

All hardware has been ordered and will be received by 2/28/2014.

Table 6 Labor Costs To Date

Labor Costs			
		Estimated	Actual
Resource	Description	Hours	Hours
Jeremiah Bauer	Determine Final Requirements	5	2
Jeremiah Bauer	Document System Architecture	5	2
Jeremiah Bauer	Document Unit Tests	5	2
Jeremiah Bauer	Model Database	5	6
Jeremiah Bauer	ORM Development	5	2
Jeremiah Bauer	Design User Interface Theme	3	3
Jeremiah Bauer	Main Sales Page Development	20	1
Jeremiah Bauer	Product Administration Page Development	5	3
Jeremiah Bauer	Barcode Generation Development	5	3
Jeremiah Bauer	Barcode Reading Development	5	1
Jeremiah Bauer	Receipt Printing Development	3	
Jeremiah Bauer	Final Code Development	2	
Jeremiah Bauer	Unit Test Development	10	
Jeremiah Bauer	Setup Test System	10	
Jeremiah Bauer	Deploy Code to Test Server	2	
Jeremiah Bauer	Preliminary Functional Testing	8	
Jeremiah Bauer	Write Verification Testing Plans	15	
Jeremiah Bauer	Verification Testing	5	
Jeremiah Bauer	Install Required Server Software At Dan's Pies	5	
Jeremiah Bauer	Setup New Users on System	5	
Jeremiah Bauer	Train Users On New System	10	
Jeremiah Bauer	Construct Power Point	5	
Jeremiah Bauer	Build and Insert Diagrams	1	
Jeremiah Bauer	Review Presentation Requirements	1	
Jeremiah Bauer	Make Final Power Point	1	
Jeremiah Bauer	Write rough draft	10	
Jeremiah Bauer	Proof-read and edit rough draft	1	
Jeremiah Bauer	Write final report	1	
Dan Bauer	User Acceptance Testing	10	
	Total:	168	25

Supporting Information

The information below is to further clarify the design and behavior of the system.





Figure 1. Top Level System Diagram of a LAN-based Point of Sales System

Figure 2. Cashier Use Case



Figure 3. Object Controller UML Diagram



Figure 4. Object Model UML Diagram



Figure 5. Find_Item() Operation Sequence



Figure 6. Complete Order Sequence



Figure 7. Database Schema

ltem		Order
PK item_id: serial		—O< PK order_id: serial
name: character varying		order_date: timestamp with timezone default
description: character varying		now()
price: numeric		OrderDetail
tax rate: numeric		PK order_detail_id
upcCode: integer		FK: order_id: integer
PosConfig		FK: payment_type_id: integer
PK pos_config_id: serial		item_name: character varying
name: character varying		item_description: character varying
value: character varying		item_price: character varying
PaymentType		item_quantity: charact varying
PK payment_type_id >]	item_tax_rate: numeri
name: character varying		

Figure 8 Sales Page UI Design

Sales Pa	age						
	Item Search Box						SubTotal: \$33.00
	Item Description	Quantity	Unit Price	Tax Rate	ItemTotal]	
	Cherry Pie	1	\$7.50	7.0%	8.03		Tax: 2.32
	Арріе Ріе	3	\$8.50	7.0%	27.29		Order Total: 35.32
							Amount Tendered:35.31 Change Due: 0.00
]	Cash 🗸
							Complete Sale

Figure 9 Completed Item Maintenance Page

Dan's Pies	Home	Sales 🔻	Reporting -	Administration -
------------	------	---------	-------------	------------------

Listing items

Name	Description	Quantity	Price	Taxrate	Upccode			
Cherry Pie	Cherry Pie		7.5	7.0		Show Barcode	Edit Item	Remove Item

New Item

Figure 10 Configuration Page

D I D'			-	
Dan's Pies	Home	Sales 🔻	Reporting -	Administration 👻

Dan's Pies Point of Sale Configuration

Name	Value	
StoreName	Dan's Pies	Edit
StoreAddress	9266 E Backwater Road	Edit
StoreAddress2		Edit
StoreState	IN	Edit
StoreZip	46555	Edit

Table 7 Gantt Chart

D		TaskName	Diration	Start	Finish	Berlenessons				L			h			1						
	•		Calcana	. and		THERE	ary			February			March			Apri				May		
			0 45 5	0=4544	0 = 4644		1/5	V12 V19	1/26	22	29	216 22	3 32	39 3	716 3	23 330	46	4713	4/20 4/2	7 54	1 5	71
		Phase II Start	Udaje	301116714	SULIVITA																	
2		System Design Complete	0 days	Fii 1/10/14	Fri 1/10/14	11FF	-	1710		1												
з		Detailed Design Complete	0 days	Mm 3/24/14	Min 3/24/14	16FF							-			3/24						
4		Functional Prototype Complete	Odays	Mn 3/24/14	Man 3/24/14	34FF									*	3/24						
5		Verification Testing Condete	Odas	Fii 4/11/1 4	Fii 4/11/1 4	42 11	-			1							•	411				
6	-	Derbanant	Ortas	Thu 54/44	Tbu 5/1/14	/HE	-													a 51		
		Certagenet Colorities	Outaya	0-54444		-611														* (6944
	_	Hina Report Submied	Udays	SUBTIN	50131774	4011										ļ					-	
8		Resentation Delivered	0 days	Sun 5/11/14	9un 5/11/14	58FF				1						<u> </u>					+	3711
9		End of Semester	Odays	Sin 5/11/14	Sin 5/11/14																•	5 11
10		Prototype Development	84 days	Mon 146/14	Thu <i>51</i> /14		-			-		1	1							Ŧ		
11	 Image: A second s	System Design Phase	5 days	Mon 1/6/14	Fti 1/10/14			4		1		1	1			1						
12	1	Determine Final Requirements	5das	Man 1/6/14	Fri 1/10/14		-	7														
13	1	Doument SystemArchitecture	5045	Mm 1/6/14	Fri 1/10/14													-				
14	× ,		Edage																			
194	v		Juays					4400										_				
тэ	~	Hnal System Lesign Complete	Udays	H1 1/10/14	H1 1/10/14	12,13,14										ļ						
16		Detailed Design Phase	51 days	Mon 1/13/14	Man 3/24/14	11		•		1			1		÷	1						
17		Software Design Phase	51 days	Mon 1/13/14	Man 3/24/14																	
18	\checkmark	Model Database	5days	Man 1/13/14	Fri 1/17/14			-1					1									
19	1	OFMDevelopment	5days	Man 1/20/14	Fri 1/24/14	18			⊷ 7	1			1									
æ	1	Design User Interface There	5das	Mm 1/27/14	Fri 1/31/14	19			-	4								-				
21	v	Decimal loor Interface Parace	Zdas	Marc 20714	Tip 911/14	20				<u></u>												
		Min Olon Drug Do element	Zdays	Max 20044	Tro 2014/44	2					_											
~~~		Main Sales Fage Level phen	70.895	MU123 14			_															
23	<ul> <li></li> </ul>	Hould Admisizion Fage Levelophen	/ days	M012/3714	102/11/14																	
24		Barcode Generation Development	5dajs	Vied 2112114	Tue 2/18/14	21				-		1	į									
25	$\checkmark$	Barcode Reading Development	1 day	Ved 2/19/14	Wed 2/19/14	24				<u>.</u>		1	l.									
26		Receipt Rinting Development	5 days	Thu 2220/14	Web 2/26/14	25						i)	1									
27		First Code Release	Odays	Ved 226/14	Wed 2/26/14	26				-			226									
28		Final Code Development	15days	Tue 3/4/14	Man 3/24/14	3395+3days,27	·			1		1										
29		Systemintegration Prese	51 days	Mon 1/13/14	Man 3/24/14	11		-		!												
30	1	Unit Test Development	28da/s	Man 1/13/14	Web 2/19/14																	
31	1	Setup Test System	5das	Thu 2027/14	Vid 3/5/14	27							-									
32		Deday Obtietio Test Server	1 day	Thu 36%4	Thu 36/14	31												-				
33		Religinary Englined Testing	18/14/5	Thu 227/14	Mm 3/24/14	30.27	-			-			¥					-				
- 24		Eastin Data according	Odar	Max 2/24/14	Man 2/24/14	39	-									3934		_				
- 34				MU13/29/14		30		<u> </u>					į		<u> </u>			-				
30		System veniication Prase	Godays	MON 1713714	H1 4/11/14			<b>Y</b>									•	•				
36	✓	venication testing Hans written	zucays	MON 1/13/14	HT2//14								1		1							
37		Verification Testing Starts	Odays	Mm 3/24/14	Min 3/24/14	34,36										324						
38		Verification Testing	5 days	Tue 325/14	Man 3/31/14	37				1			1			1						
39		User Acceptance Testing	5days	Tue 4/1/14	Man 4/7/14	38							-				1					
40		System Demonstration Defined	1 day	Tue 48/14	Tue 4/8/14	39				1			1				1					
41		System Demonstration Rehearsed	3 days	Vied 4/9/14	Fri 4/11/14	40												1				
42		Verification Testing Complete	Odays	Fii <b>4/11/1</b> 4	Fri 4/11/14	41				!			1				•	411				
43	-	Deckyment	9 davs	Mon 4/21/14	Thu <i>91</i> /14	42FSI5dars	-												,			
44	-	Instal Returned Server Software At Darts Res	2048	Mm4/21/14	Tue 4/22/14		-			-										-		
15		Saluro Navel Lore on Suctorn	20436	100102240	Thu #24/14	<b>M</b>	-												-			
	_	Tripl ban On May O atom	Z daya	TE ACEMA			-															
40		inanusers of new system	Suays	HI4/2014	ILD STAN	40	_													<b>1</b>		
4/		System Leptoyed At Lens Hes	Udays	101570714	101571/14	46														÷ =1		
48		Rinal Report Development	10days	Mon 4/28/14	Sun 5711/14																	
49		Witerough draft	5days	Min 4/28/14	Fri 52/14															-1		
50		Roof-read and edit rough draft	2 days	Mn 5/5/14	Tue 56/14	49				-										1		
51	1	Witefinal report	3 dajs	Vied 577/14	Fri 5944	50														<b>`</b>	7	
52		Final Report Submitted	0 days	Sin 5/11/14	9.n5/11/14	51	-			1											-	<b>5</b> 11
58	1	Presentation Development	10 days	Mon 4/28/14	Sun 5/11/14					1											—j	
54	-	Construct Rower Brint	5025	Mm4/28/14	FTI 50214		-												•	<u></u>		
	-	Bild and heart Dearance	1.05	Mn 5644	Min 6644	54														-+[		
		Daias Departation Departments	1.00	Tue SEM 4	Tue Sector																	
- 50	-	Notes First Deves Driet				on, du an														<u> </u>		
- OV		Manerita FOWEr FOIT	30446	V180.57//14	H159/14	30															1	-
58	1	Hesenlation Delivered	0 days	Sin 5/11/14	Sin 5711/14	5/															- <b>4</b> 4	J