PearTree Property Management Web Application

By

Matt McFarland and Tim Poirier

Submitted to
the Faculty of the Information Engineering Technology Program
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Engineering Technology

University of Cincinnati
College of Applied Science

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_____	_____
Matt McFarland	Date
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Acknowledgements

Matt and I would like to thank the tireless efforts of Mr. John Poirier being there for us for any request or question throughout this senior design process. We also wish to thank Professor McMahon, for his words of wisdom and great voice of reason during these stressful times over the last three quarters. We would also like to thank the Drupal community for providing us with the basis for our entire project; without this valuable open-source platform, this project wouldn't be possible.

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Abstract

The PearTree Property Management Web Application is a web application that contains two main environments that are for the landlord and the Tenants. This web application has been built to the specifications of PearTree Properties owner John Poirier. The need for this project is that the company's recent state of growth has been halted due to disorganization. Features to alleviate this are a database containing all the leases, properties, and units; also, reports will be generated for the Tenant. For financial reasons, rent payments will also be tracked and transferred on this web application. This web application is built using the Drupal content management system. Drupal allows for a large amount of expansion through modules. Once this web application is deployed, it will be easily managed by a computer user of any level.

PearTree Property Web Application

1. Statement of the Problem

PearTree Property Management is a growing company that owns and rents properties throughout the Cincinnati, Ohio area. Currently, owner and operator John Poirier is responsible for management of all properties and renters. With the company expanding, John is finding it difficult to keep track of maintaining all of the properties, collecting rent, and adequately advertising his business. PearTree Property Management needs a solution to all of these problems that will allow John to continue to manage the business as it grows.

Currently, all payments by renters are collected by hand, or are mailed in. Payments can be made in either cash or check. Either way, time is lost. A person must drive to each individual's house and collect payments, or wait for the payments to arrive in the mail. Once a payment is received, a trip to the bank is made to deposit the money, costing even more time (9). As the company grows and more properties are acquired, this process will become lengthier. There is a definite need to have a centralized system that will allow quick payment and collection of rent.

If a resident of a house has an issue with a property, or a repair that needs to be made, they contact John Poirier via a phone number. While the call may cover an important issue that required immediate attention, the resident may also have a less urgent need, just wanting to let John know about it (9). Managing the various requests, and the urgency of each, can be an organization problem. Therefore, there is a need to allow reporting and tracking of resident requests.

Keeping track of money spent on a property versus money earned by that same property is also time-consuming. Currently, this data is tracked via a Microsoft Excel spreadsheet. While

this allows John to make an accurate assessment on the value of a property, the process is disconnected from everything else. Once a payment is received, or a repair is made, this is data recorded manually (9). There is a definite need to add some automation to this process that will allow the data to be managed more easily.

Lastly, PearTree Property Management has no way to advertise their properties for rent. Word of mouth is presently used to spread awareness of openings for a property (9). It is clear that PearTree Property Management needs a more effective way to advertise rental openings. A Web site would help to fill this need.

Therefore, a need exists to create a Web Content and Property Management Application for PearTree Properties. This online application will serve as a central solution to all of the needs discussed previously. It will allow renters to pay their rent securely and electronically. This application will allow the owner of PearTree Properties, John Poirier, to more easily manage Tenant requests, as well as tracking money spent versus money earned on each property he owns. Lastly, Tim Poirier and Matt McFarland will design a new Web site layout for PearTree Properties. The Web application will also allow John Poirier to easily manage the Web site without requiring any technical knowledge.

2. Description of the Solution

Tim Poirier and Matt McFarland propose to create a “Web Content and Property Management Application” that will allow PearTree Property Management to continue to manage its properties as the company grows. This Web application, which will primarily be a Web technologies and database project, will be built upon the Drupal Content Management System (CMS), and will also involve the use of Hypertext Preprocessor (PHP), Hypertext Markup Language (HTML), Cascading Style Sheets (CSS), and MySQL. The Drupal CMS is a very modular and extendable

application that “allows an individual or a community of users to easily publish, manage and organize a wide variety of content on a website” (1). Drupal is an open source free software package that will serve as the base for this application.

The “Web Content and Property Management Application” will fill these four primary needs for PPM:

1. The secure electronic payment of rent by Tenants.
2. The submission and tracking of Tenants requests. These requests will also have varying levels of priority.
3. The tracking of expenses and revenue for each property.
4. The advertisement of rental openings.

The development and delivery of the “Web Content and Property Management Application” will encompass the following:

- Development using various Application Programming Interfaces (API).
- Modification of existing Drupal modules that will allow the application to meet PPM specific needs.
- Creation of new Drupal modules, primarily for secure electronic payment options.
- Management of a MySQL database that hold all of the data for this application.
- Development of the Web site design and layout.
- Development of training and help documents.

2.1 User Profiles

There will be three different user groups in the application: Administrator, Tenant, and Guest. Please see Figure 1.

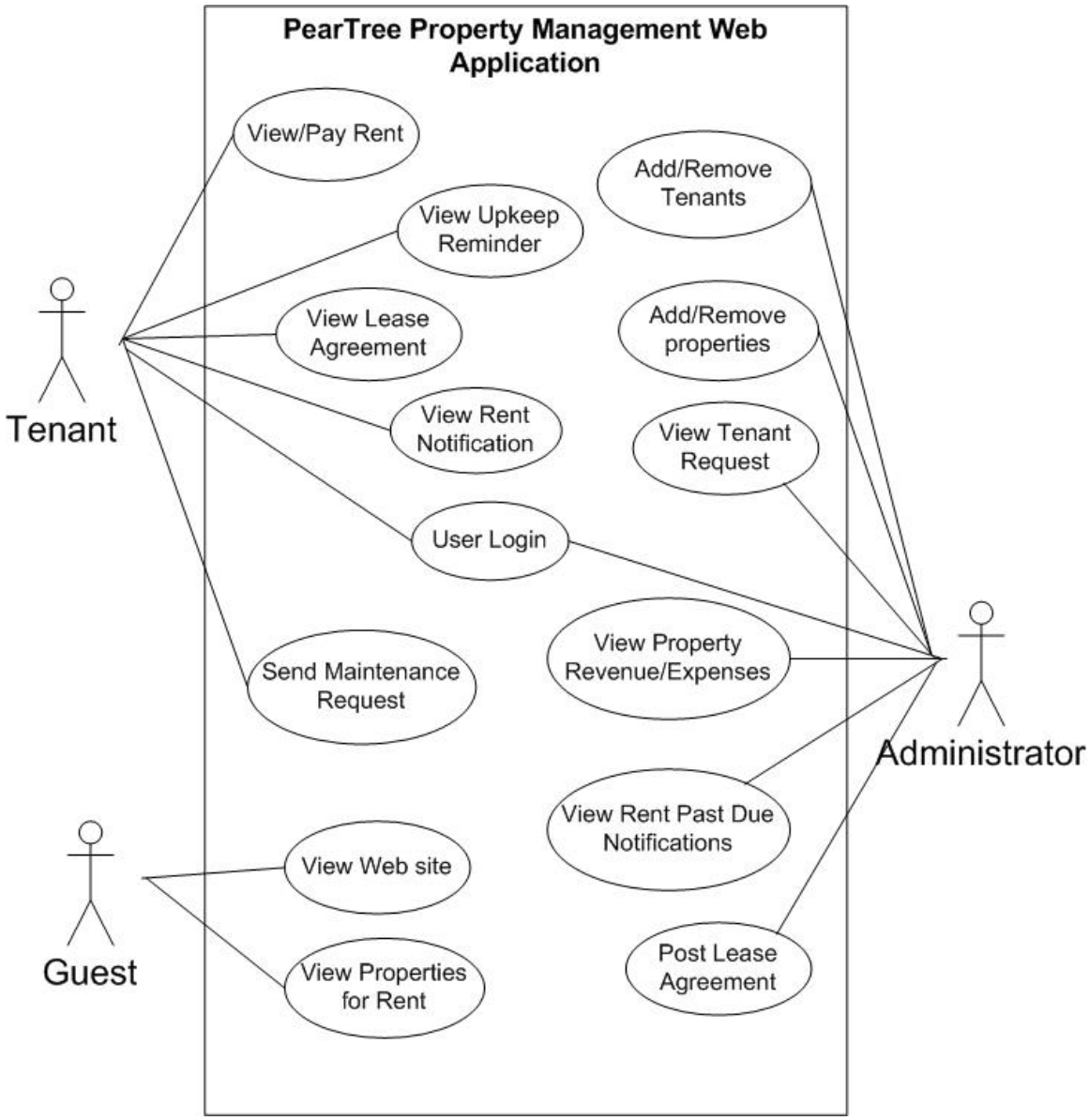

Figure 1. Use Case Diagram

2.1.1 Administrator

The Administrator will be either Mr. Poirier or someone chosen by him. The Administrator will have full access to change any site settings including: general Web page edits; adding or removing Tenants; adding or removing rental properties; viewing income and expenses

of rental properties; receiving notifications on past due rent; and receiving maintenance requests from Tenants. Because the Administrator will have access to modify critical parts of the application, he or she will have to have a basic understanding of computers and Web sites.

2.1.2 Tenant

Tenants will be individuals who are renting a property from PPM. Upon login to the application, they will have a limited number of tasks they are able to perform. Among other things, Tenants will be able to pay rent electronically, make a maintenance request, and view their lease agreement.

2.1.3 Guest

A Guest will simply be a visitor to the Web site. He or she will be able to view available rental properties as well as other parts of the Web site.

2.2 Design Protocol

2.2.1 Drupal

As mentioned previously, Drupal 6 will serve as the base framework for this application. A default installation of Drupal provides the ability to create generic Web pages with a generic presentation. Our Site will be built upon the core of Drupal to create this application by using third party modules, as well as creating our own custom modules to meet needs of our project.

2.2.2 Administrative Interface

Drupal has a very nice and customizable graphical user interface or GUI. The GUI displays all the menu options for an Administrator on the left navigation column (See Figure 2.). Within all of those navigation links are all the tasks an Administrator would need.

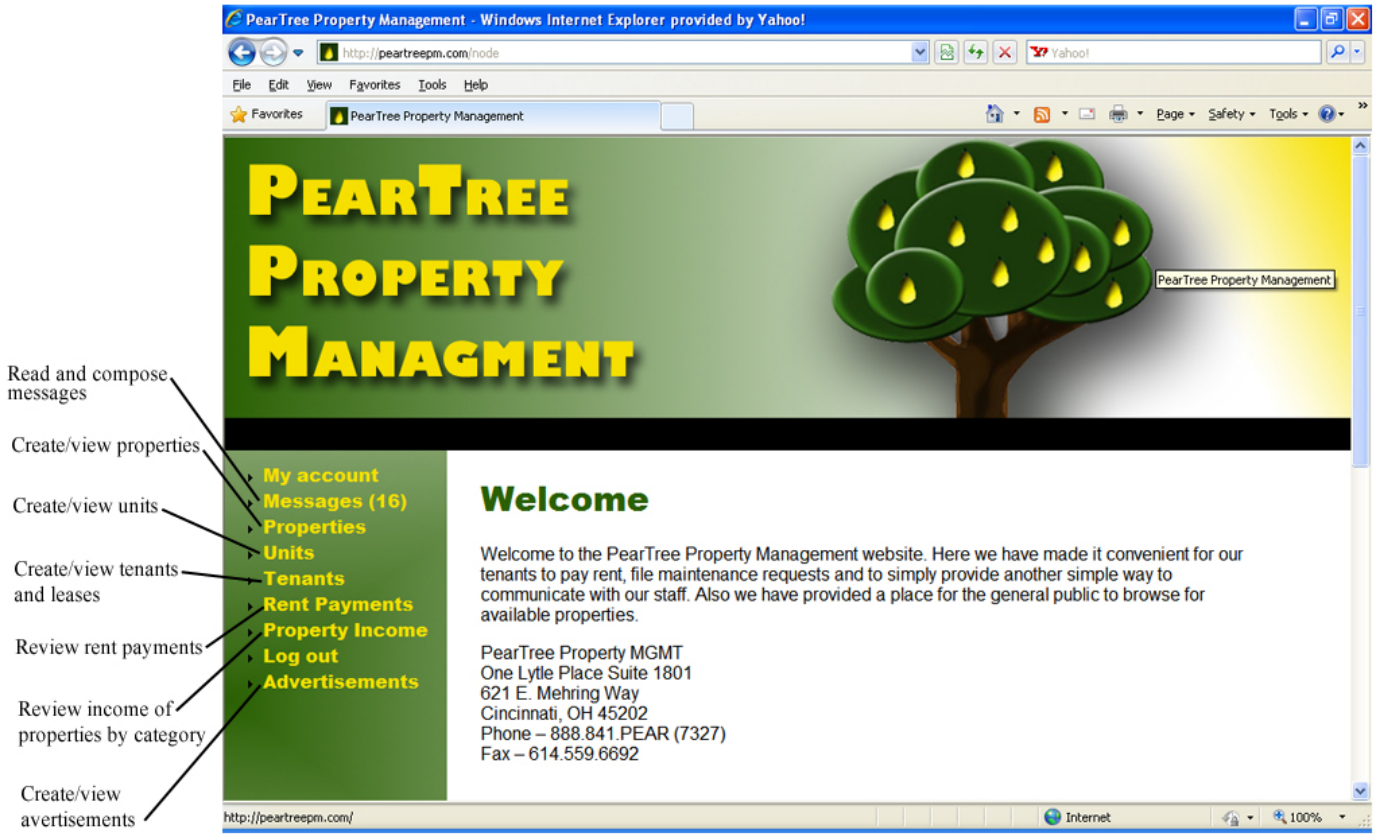

Figure 2. Administrator Interface

Through the GUI Administrators can create all the web content they might need. For example, by clicking on the properties link the admin can now create a new property by completing the simple form. Several of the other content types such as Units, Leases, Tenants, and Advertisements can also be created in the same manner.

3.1 Deliverables

This is the primary list of deliverables for this Web Application.

Electronic Rent Payment – Tenants are able to pay rent electronically through PayPal.

Tenant Environment – An environment was constructed so that when a Tenant is logged into the system, they have the option of performing several actions including rent payment and submission of property issues.

Administrator Environment – A separate environment was constructed that will allow an Administrator to perform various actions within the system including tracking rent collected and sending notifications to Tenants.

Advertisements – The Administrator is able to create dynamic advertisements by simply filling out a form and uploading a number of pictures. This advertisement can be easily viewed by any visitor of the site.

Income and Expenses Tracking – The income of properties are recorded over time. This data will have the option to be represented visually to provide easier readability. Only an Administrator will be able to view this information.

Notification System – A notification system is in place that will allow automated and manual communication to take place between Tenants and Administrators.

Reporting – This system works in conjunction with the Income Tracking. It will allow for easily readable and printable reports to be available to Administrators.

Documentation – Documentation has been produced that will explain how the system works and will allow a new user to gain familiarity with the system.

4. Proof of Design

4.1 Messaging System

An important feature to the PearTree Property Management Web site is the built in messaging system. This feature is a requirement for this company because it builds the communication bridge between Administrator or landlord and Tenant. Not only does this increase communication, but it also creates a hierarchy of Tenant requests ordered by urgency or need. Figure 3 is an example of the Administrator’s inbox.

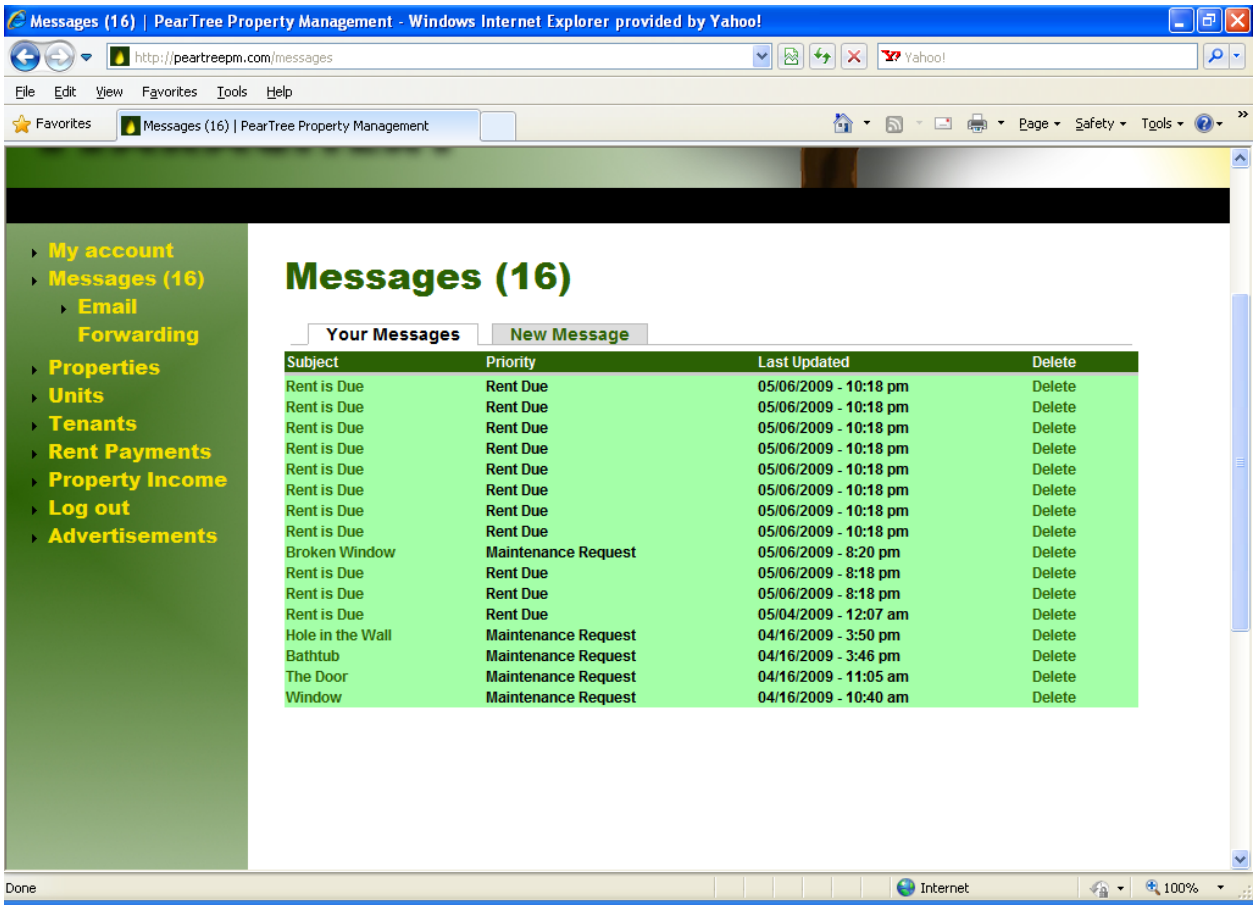

Figure 3. Administrator Inbox

4.2 Rent/Income Tracking

In the past, PearTree Property Management recorded income by tracking by whether or not a rent check was received. This posed a big problem because things often became lost. Accurate tracking of money, and if it made it to the bank was an issue as well. With our new systems of Rent Payments, and Property Income these issues were fully resolved. Figure 4 is what an Administrator will see when reviewing income for a property in during a given year.

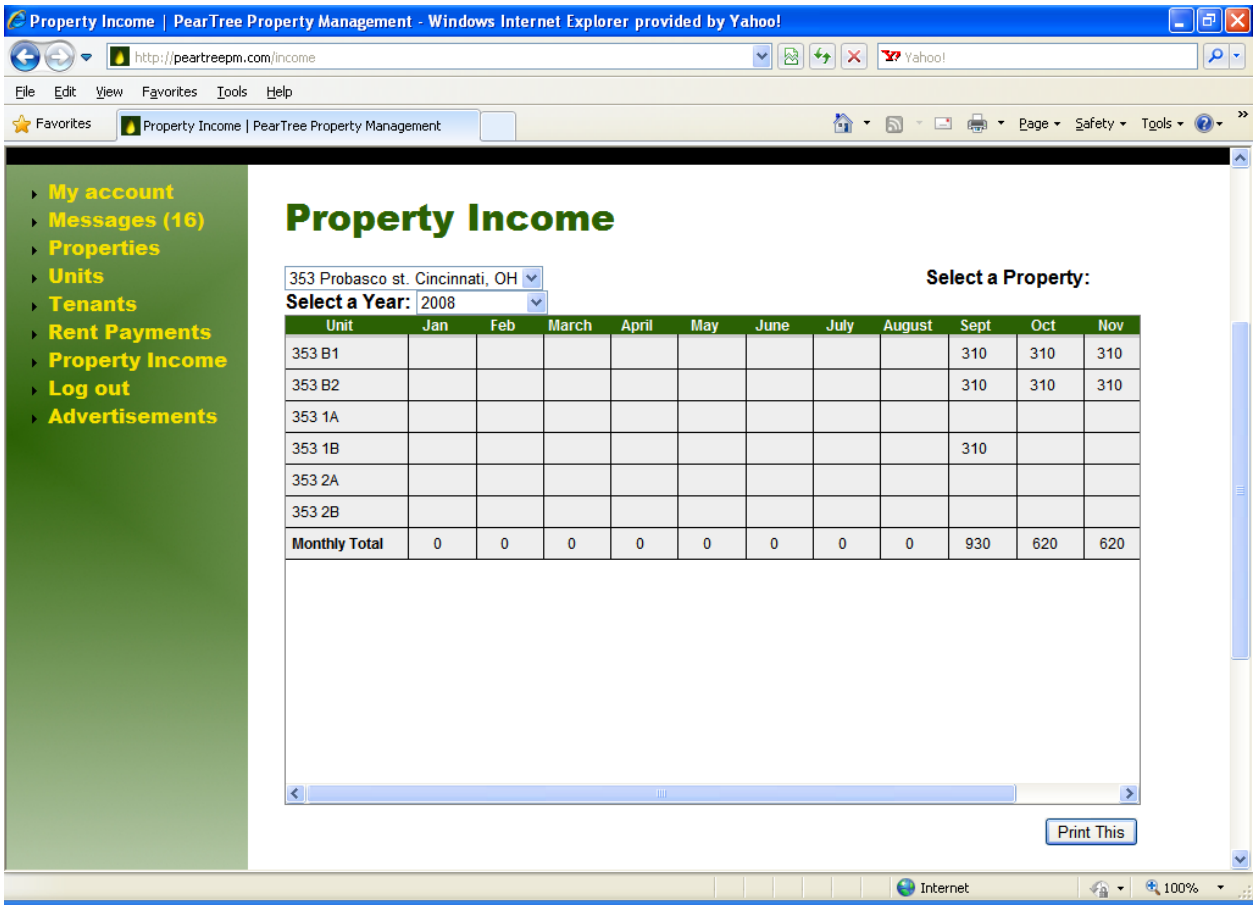

Figure 4. Property income tracking page

Figure 5 is an example of how the Administrator manually inserts a check payment. This verifies whether or not the check has been cleared, is pending, or has failed.

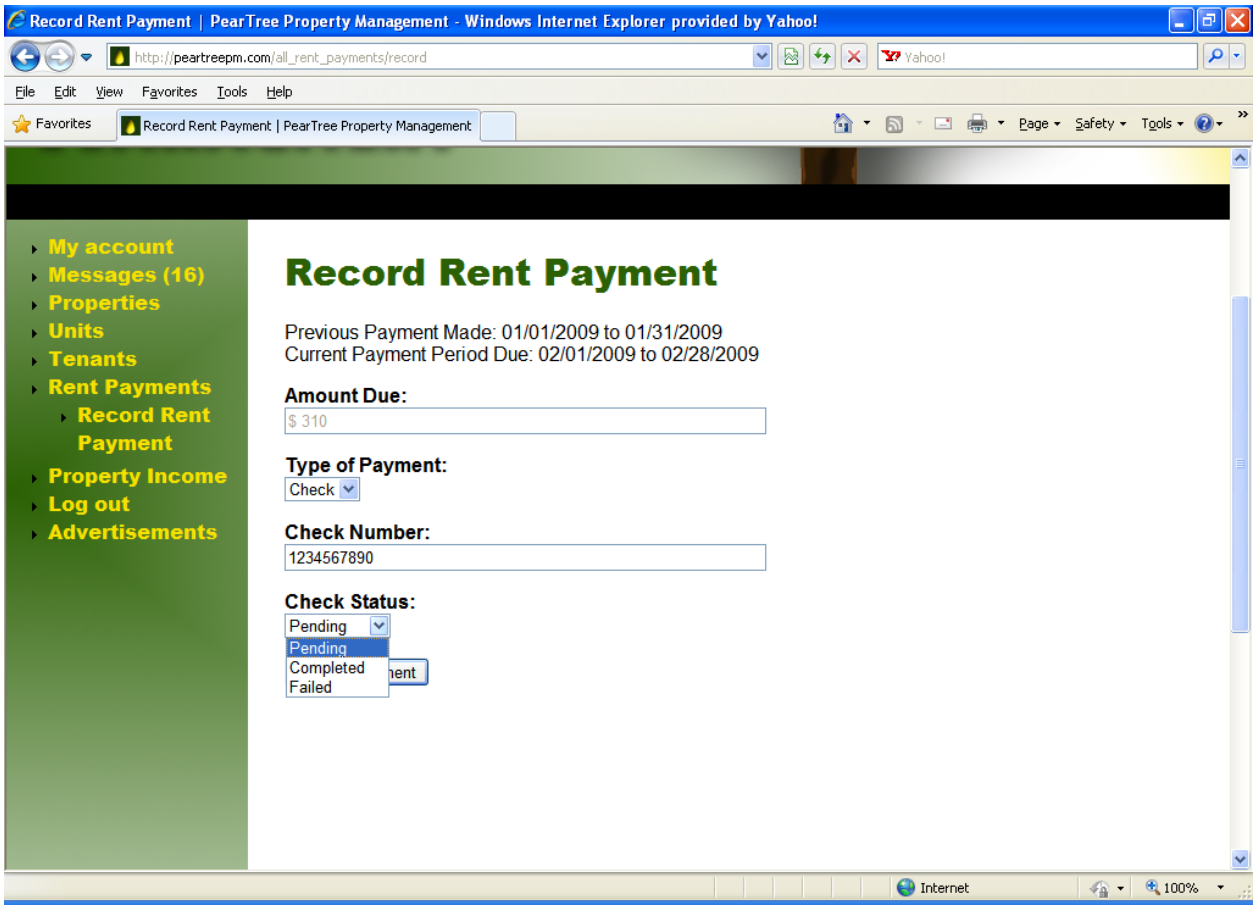

Figure 5. Manuel Rent Recording

4.3 Properties and Units

The tracking of properties and units can at times become confusing for one person. With this small company continually growing, tracking of the properties and their child units had become quite an issue. This new system has eliminated any issues. The properties are entered into the database by the admin filling out a simple form seen in Figure 6.

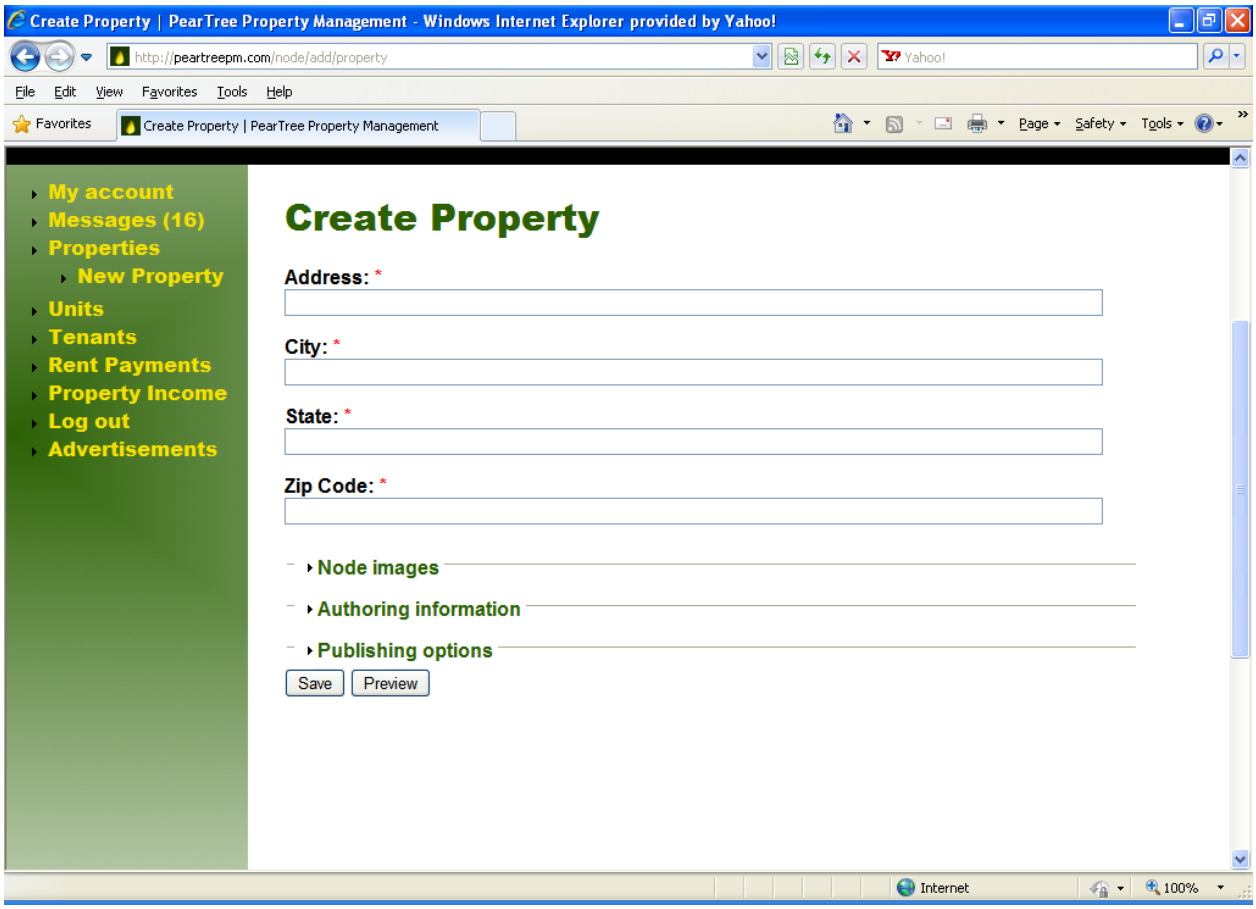

Figure 6. Creating a Property

Units are created in a similar way. Once a property is created, it must contain units. For example, when a house is purchased it may contain one or many units, meaning it could be a single family, multi family, or even an apartment building. An example of how a unit is created is in Figure 7.

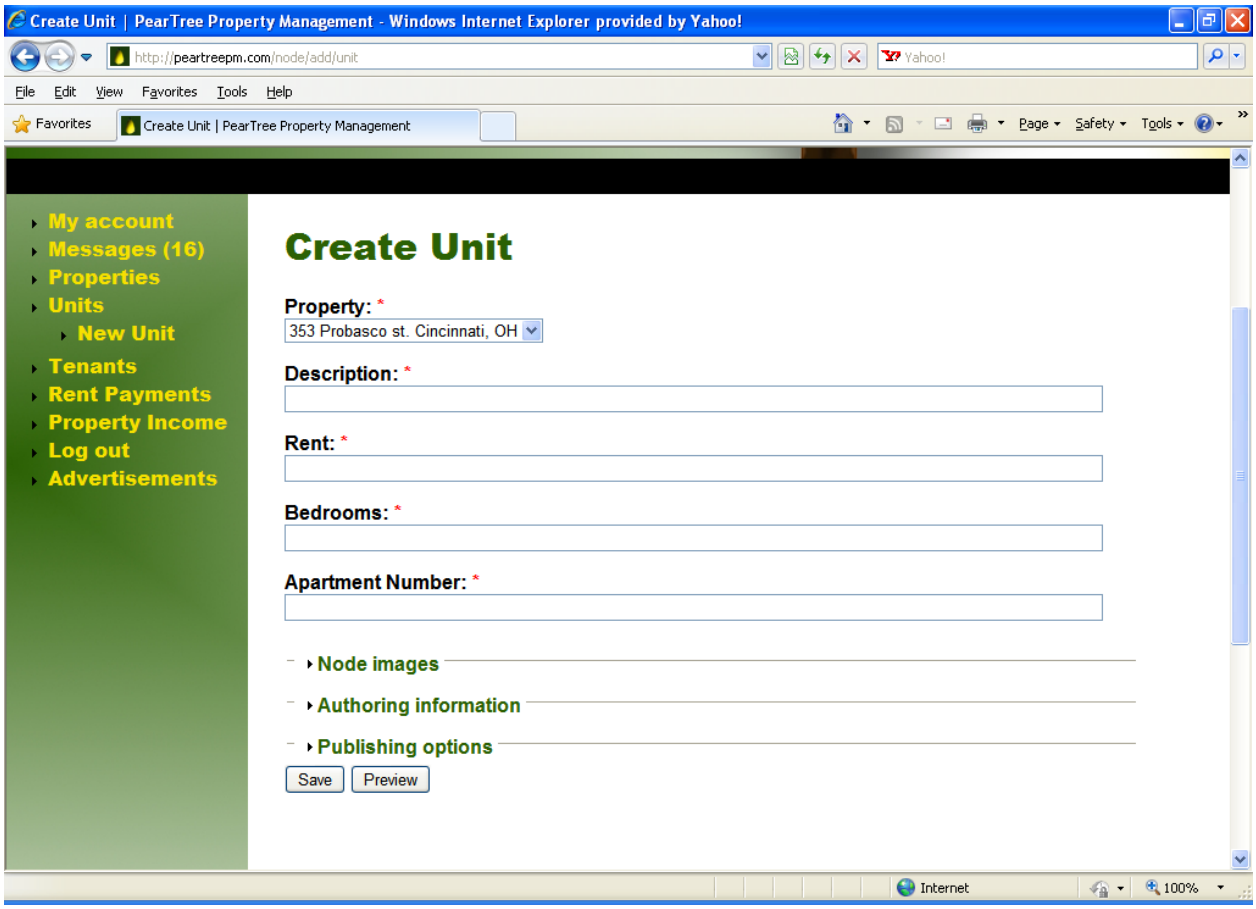

Figure 7. Creating a Unit

4.4 Tenants and Leases

The tracking of Tenants and their leases had also been a problem at PearTree Property Management. This solution was very similar to the one that had solved the property and unit disorganization. Tenants are created to have accounts, login, and have their own environment. Figure 8 is an example of how the Administrator creates a Tenant.

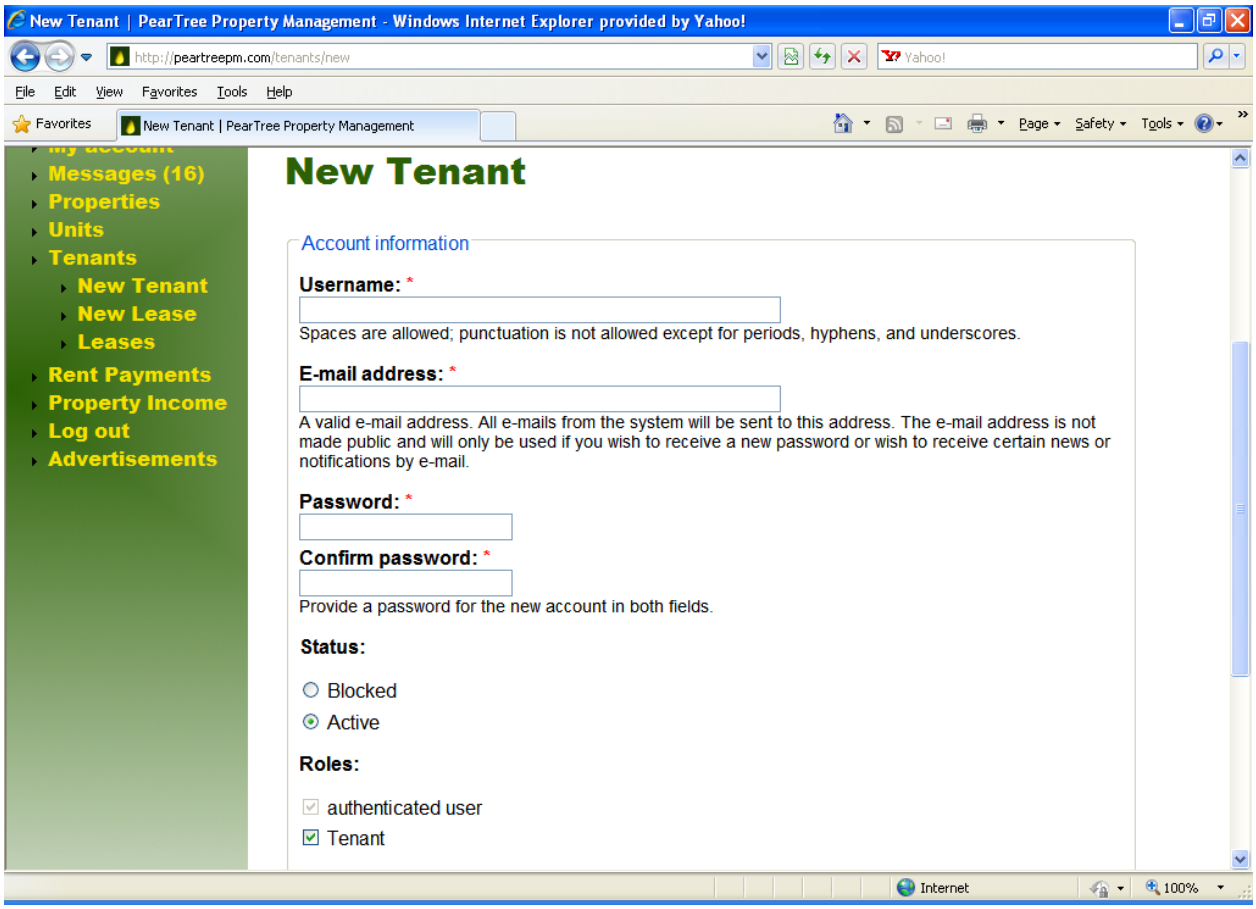

Figure 8. Creating a Tenant

The lease is the most important aspect of the organization of this company. A lease ties all three components, the property, the unit, and the Tenant together. Leases have a start date and as well as an end date. These dates will drive the due dates for rent. An example of the “create a lease” is seen in Figure 9.

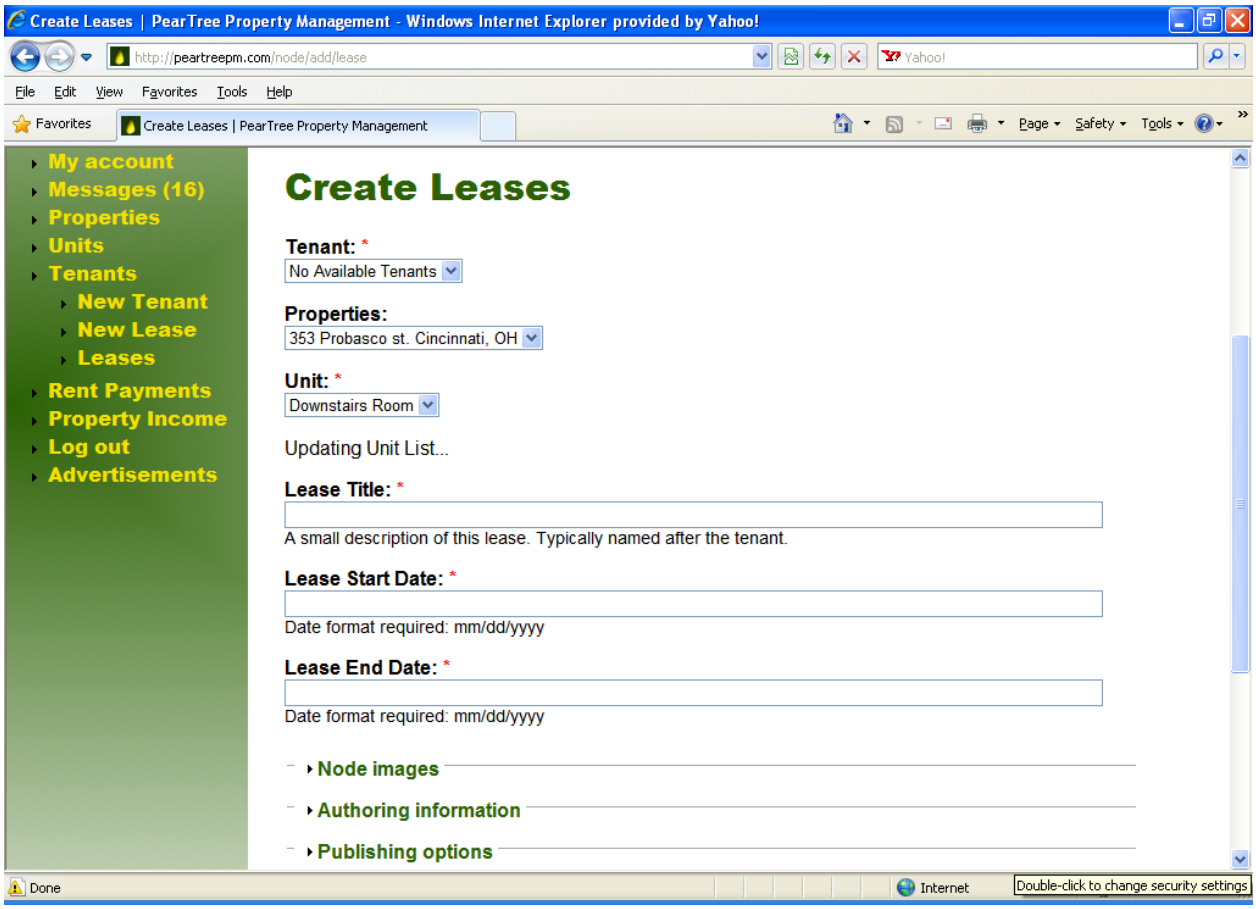

Figure 9. Create a Lease

4.5 Modules

Modules are an integral part of Drupal. According to the Drupal Web site, modules are "plugins for Drupal that extend, build or enhance Drupal core functionality" (1). Throughout the development of this application, many modules will be added and modified. Table 1 shows a list of modules that will be used. These modules do not come with the default installation of Drupal. They will be downloaded from the Drupal Web site, installed, and configured.

Drupal Modules Used
Block
Filter
Node
System
User
CCK
Database Logging
Date
Help
Menu
Path
Search
Taxonomy
TinyMCE
Trigger
Update Status
Views
Image Node
Google Analytics

Table 1. Modules Used

4.6 Custom Drupal Modules

Most of the features in this application will be implemented through the creation of custom Drupal modules. Below is a list of custom features that will require the creation of one or several modules for each.

- PayPal secure payments will be made possible by a custom rent, lease and PayPal module.
- The Tenant and Administrator system, which will involve the creation and management of Tenants and properties by the Administrator, will be created using Drupal's built in user system.
- Notifications will alert both Tenants and Administrators to many upcoming or past events. Rent coming due, past due rent, and seasonal reminders are among the types of notifications.

- Property, Unit and Lease tracking will all be handled by a custom module that is stored in the database.
- Income will be tracked and represented by implementing a custom module that categorizes the incoming rent by property as well as year, unit and Tenant.
- Advertising properties will be implemented by a module that will automatically build a Web page advertisement for available properties for rent.

4.7 Menu System

During the development of this project, the menu system of Drupal will be used and modified heavily. Additionally, the menu system will be integral for the two primary users: Administrator and Tenant. Drupal allows this interface to be modified programmatically, and Drupal also allows menu items to be restricted depending on, among other things, user type. Because of this, Administrator and Tenant users will have different and exclusive menu interfaces.

4.8 Theme System

Drupal also makes use of “theming”, which the Drupal Web site defines as “a collection of files that define the presentation layer or "look and feel" of a Drupal site” (1). This application will make use of theming to build the appearance of the Web site. The theming will be accomplished by making use of Cascading Style Sheets (CSS), Hypertext Markup Language (HTML), and custom-made template files which will be written in Hypertext Preprocessor (PHP) programming language. Below is what a visitor to the PPM Web site currently sees. (Figure 6)

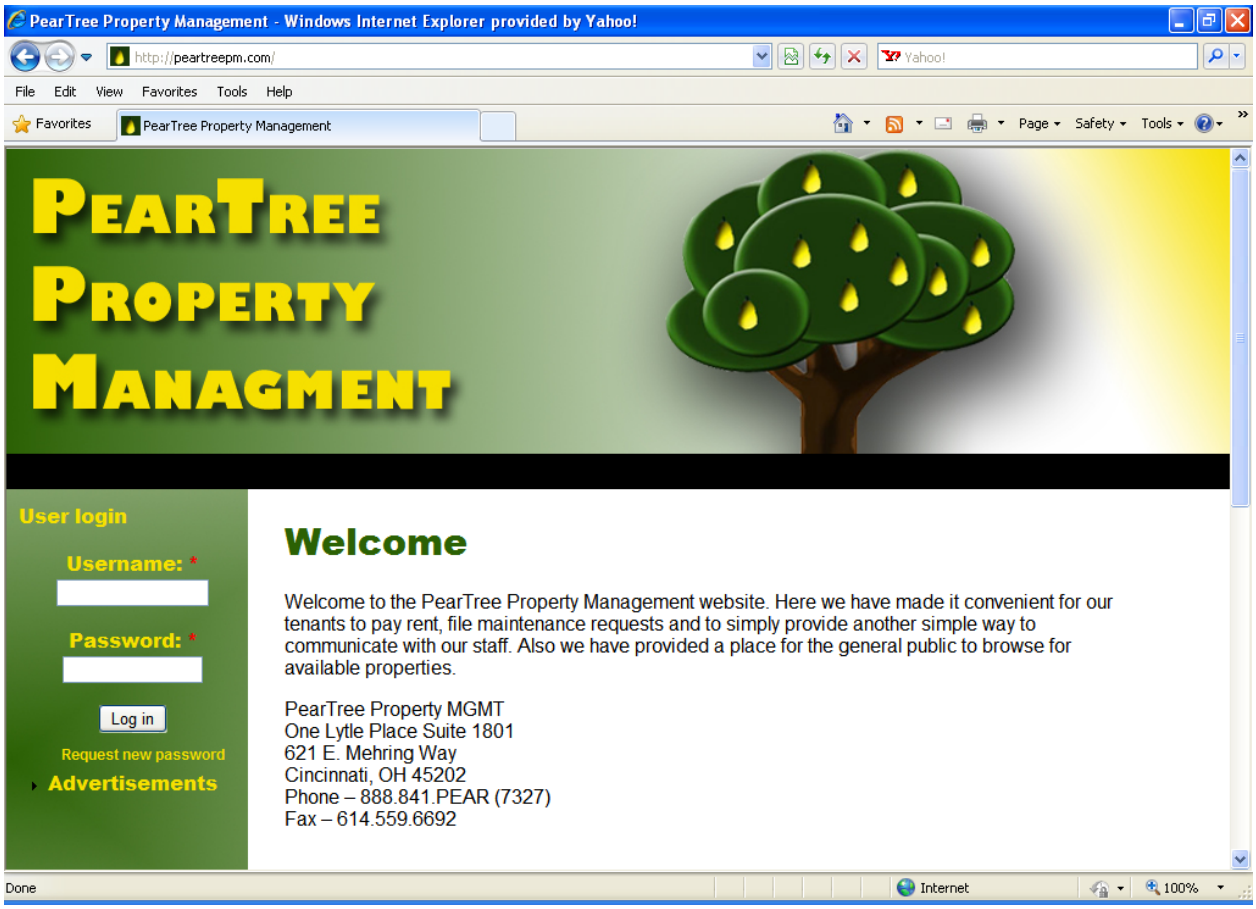

Figure 10. PearTree Property Management Home Page

5. Design and Development

5.1 Timeline

Table 2 shows the timeline from senior design I, II and III.

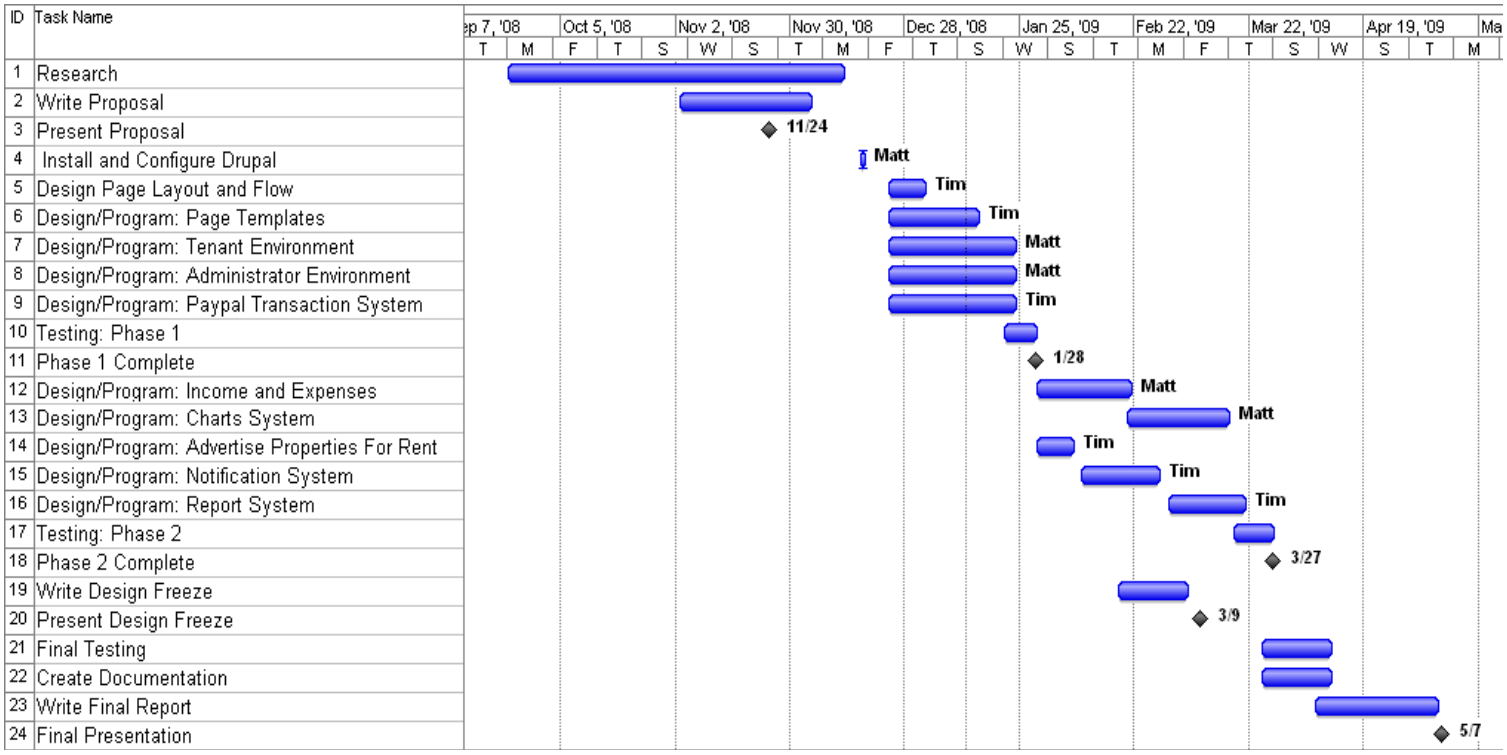

Table 2. Timeline

5.1.2 Division of Duties

As shown in Table 2, the duties have been split evenly. Matt McFarland was responsible for the designing and programming of the Tenant and Administrator environment. These two environments will be the user interface and functionality of the two primary user types. Upon successful implementation of these two environments, the income and expenses system were designed and programmed. Lastly, Matt McFarland implemented the charts system, which allows for visual representation of the income and expenses, as opposed to viewing text only.

Tim Poirier was responsible for designing the layout of the Web site, as well as the internal user interfaces for each the Tenant and Administrator user types. Tim Poirier also

designed and programmed the PayPal payment system that will allow each Tenant to make electronic rent payments. The advertising system for rental openings also was programmed by Tim Poirier. Additionally, Tim Poirier designed and programmed the notification system and the reporting system. Other responsibilities such as testing, documentation and the writing that will be required for Senior Design will be split as evenly as possible.

5.2 Budget

Item	Description	Retail Cost	Cost Incurred
Hosting Server for 2 years	Provided by Go Daddy	$4.50/Month	$108.00
.com transfer	Provided by Go Daddy	$9.99	$9.99
2 GB USB Junk Drive	Own	$7.99	$0.00
Canon PowerShot S200	Own	$59.99	$0.00
XAMPP	Free download	$0.00	$0.00
Drupal 6.0	Open Source content management system	$0.00	$0.00
GIMP	Free download	$0.00	$0.00
MySQL	Included with the Drupal download	$0.00	$0.00
PayPal Business Account	Service by PayPal	$3%/Transaction	$0.00
Notepad++	Free download	$0.00	$0.00
PC Laptop	Matt's Laptop used for development.	$499.99	$0.00
PC Laptop	Tim's Laptop used for development.	$459.99	$0.00
	Retail Total:	**$1145.85**	
	Project Total:		**$117.99**

Table 3. Budget

5.3 Hardware

- Go Daddy Servers

  This Web application will be hosted on a Go Daddy server. Go Daddy will be able to provide proper hosting for all of the databases, email address, and other applications on one of their servers.
- 2Gb USB Junk drive

  A 2 GB USB Junk drive will be used to backup all data for the project.
- Canon PowerShot S200

  A digital camera will be used to take pictures of the properties for this Web application.

5.4 Software

The PearTree Properties Web application will be using software that is available in the IT computer lab as well as free software found on the Internet.

- **XAMPP**

  XAMPP is a free application found online used to develop PHP sites locally using Apache.
- **Drupal 6.0**

  Open source content management system which the entire site will be built off of.
- **GIMP**

  GIMP will be used to create all the designs/images necessary for this project. It will also be used to edit the images.
- **MySQL**

  MySQL will be used to create the database, table, relations, and queries that this project needs.
- **PayPal Business Account**

  PayPal will be relied upon for all exchanges of money. PayPal will also provide secure transfers.
- **Notepad++**

  Notepad++ is an open source program used for coding. It will be used for the programming of the site.

6. Testing Plan

This application was tested as progress is made developing it. After each major addition it was tested with the head of PearTree Property Management Mr. Poirier. Security is one major issue because money transactions will be dealt with during rent payments. Because of this issue PayPal was used to fully secure all money transactions. Before the Tenant environment was fully deployed, several tests were implemented using paper prototyping to ensure everything was easy to find read and flows as smoothly as possible. Finally, once the product was completed, The Web Application was sent to Mr. Poirier for approval. See table 4 to view the tests performed on our application before sending it to Mr. Poirier.

	Task	**Pass/Fail**
1	Create a simple page for the site	**Pass**
2	Create a new property	**Pass**
3	Create a new unit	**Pass**
4	Create a new Tenant	**Pass**
5	Create a new lease	**Pass**
6	Record a manual rent payment (Cash)	**Pass**
7	Record a manual rent payment (Check)	**Pass**
8	Test the messaging system from the Administrator side by messaging all Tenants, a certain Tenant, a certain unit and finally a certain property.	**Pass**
9	Test the messaging system for the Tenant by sending a maintenance request, an improvement request and a general message.	**Pass**

10	Test the paypal online rent payment system	**Pass**
11	Review rent payments from both the Administrator and Tenant side	**Pass**
12	Review income by property, who sent the income, and what year and payment period it was sent.	**Pass**
13	Create/view an advertisement.	**Pass**

Table 4. Tests performed

6.1 Risk Analysis

Table 5 outlines several possible risks this application will face, and the steps that are being taken to mitigate those risks from occurring.

Risk	Level	Mitigation
SQL Injection Attacks	Low	Drupal's database management layer has SQL injection protection built in. Additionally, secure coding practices outlined in the Drupal documentation will be followed.
Authorization Bypass – Unauthorized users attempt to gain access to a user account. Gaining this access to the Administrator interface would, at worst, give them full control over the site.	Med	A password creation policy will be created to help users create a secure password. In addition, error messages will be constructed so they can help prevent user enumeration attacks. Drupal currently handles the creation of an md5 hash for all passwords.
Loss of Credit Card, Banking, or Social Security Information	Low	PayPal assumes all risk involved with the storage of this information. This system will not hold any of this data.
Adding Additional Features – A programmer would have to have knowledge of the architecture of our system and Drupal in order to add extra features to the site.	Med	The eventual owner of this system, Mr. Poirier, does have programming knowledge. He should be able to make small system alterations himself.
Maintaining the system.	Low	Documentation will be created to assist Administrators with the operation of the system. All Administrators will have basic computer knowledge that will help them operate the system.
Upgrading Drupal Core System to the next major	Med	Keeping this site up to date on security fixes should help

release. – Core versions of Drupal on live web applications are typically upgraded due to major security issues having been fixed or extra core features that have been added. Additionally, this type of upgrade requires all dependant modules to be upgraded as well.		minimize the need to perform this type of upgrade. Minimizing the use of 3rd party modules in this application should also help to minimize this risk.

Table 5. Risk Analysis

7. Recommendations and Conclusion

The selection of using Drupal was an easy choice at first. After working with it over the last six months the learning curve was steep but the reward was great. Overall Drupal was a good choice as a base for our application. After surpassing the learning curve, we were able to effectively implement our designs. Drupal has several useful API's, decent documentation, and a strong developer community. However, the difficulty in working with Drupal occurs with its sometimes poor documentation and support. This can cause a seemingly simple issue to become a significant problem.

The PearTree Properties Web Application makes it easy for this property management company to get and stay organized with all the custom modules that have been created. It will give Administrators the ability to track properties, unites, leases and even Tenants and their issues. Tenants will be able to view their property or unit as well as file for a repair or improvement, and most important, pay rent online. This is the web application that PearTree Properties has been needing ever since it was established, this application will organize the company, make it run more smoothly, and allow for company expansion into the future.

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