Software Requirements Specification

for

HCDocs

Version 1.0

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Gregory Bajgier
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Document Information

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Revision History

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1 Introduction

1.1 Purpose

This document specifies all the software requirements for the Healthcare Document Management System, hereinafter referred to as “HCDocs” system or “the system”. These requirements directly relate to the functionalities, performances, constraints and attributes of the system. HCDocs is a document management system which electronically stores, organizes and manages healthcare documents and provides fast, security-controlled access to these documents. HCDocs provides the look and feel of a standard word processor with capabilities for storing documents in an encrypted non-local repository-style database. All documents stored in the system are associated with the patient’s identity and related fields such as patients’ care provider identity, facility, author, or referring physicians, which can be used as keywords for document searching, retrieving and recordkeeping. HCDocs is designed to comply with HIPAA (Health Insurance Portability and Accountability Act) and focus on identity management to prevent unauthorized use and fraud. Our goals within HCDocs are to develop a user-friendly and cost effective document management system while providing simplicity, flexibility, security, accessibility and reliability to its users.

1.2 Scope

This document describes the software requirements for the initial release of HCDocs, version 1.0. The intended audience of this document exclusively includes the developers, the testers and the end-users of the HCDocs system.

1.3 Definitions, Acronyms, and Abbreviations

BLOB Acronym that stands for Binary Large Object. Binary data stored in the database. Examples include images, audio, video, or other binary data.

Database A database refers to a collection of related pieces of information stored electronically. A database provides a way for other computer programs to quickly retrieve and update desired pieces of data.

Document Service A document service is a "backend" engine which controls document creation and distribution.

Document Template A document template is a super-structure of an otherwise normal word processor template which contains data regarding its distribution (who it was originally given to) and other document identifiers, including patient data and relevant physician data.

HCDocs Title and project name referring to Healthcare Document Management System.

HIPAA Acronym that stands for the Health Insurance Portability and Accountability Act, a US law designed to provide privacy standards to protect patients’ medical records and other health information provided to health plans, doctors, hospitals and other health care providers.

Network A computer network is the interconnection of multiple computers using a telecommunications system, which allows for the communication and sharing of resources.

Privilege The HCDocs system limits user accounts from performing certain actions on certain documents; whether a user account can or cannot perform these actions is called the user's privileges. The defined
privileges are: create, edit, delete and view; each action the user can take upon the system must be classified as one of these categories. User privileges are specific to different parts of the software system.

**Patient**  A patient is a person who receives medical attention, care, or treatment.

**Repository**  A repository is a collection of resources that can be accessed to retrieve information. Repositories often consist of several databases tied together by a common search engine.

**System Administrator**  A system administrator is a special user whose user account has all the possible privileges available to any other user account as well as direct access to the underlying HCDocs system processes and server(s). This person is the one permitted to access the physical machines running the HCDocs system. The role of the system administrator is to perform system maintenance and configuration. There may be more than one System Administrator present in the system.

**User**  A user is a person who interacts with the HCDocs system.

**User Account**  A user account is an independent collection of user information that the HCDocs system uses to recognize individual users. Each user account is uniquely identified by a user name and allows the software to track individual user privileges.

1.4 Key Stakeholders

Key stakeholders for this project are:

Paul Seelaus  
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Penn Presbyterian Medical Center

1.5 Points of Contact

The main points of contact for this document are:

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<td>512 264-4829</td>
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1.6 Overview

The rest of this document contains background information regarding the HCDocs system along with the functional and non-functional requirements of the system.

2 Overall Description

2.1 Background

With the growth of technology, increased security threats, and HIPPA regulations, health care systems realized a need to be able to securely store, search, and manage patient records. The University of Pennsylvania Health System needed a way to keep organized patient records. Under their current system, a local hard drive is used to store those records without any control measures, which allows users to have open access to read, write, and modify patient records. Also, these systems are unable to track a revision history of the documents. Currently, there are a multitude of document management systems within the healthcare industry such as ClickON Document Management, DOCSVAULT and ITAZ doQument to name a few. However, these systems are generally expensive, inflexible, difficult to learn, and they are not customizable for University of Pennsylvania Health System needs. To fulfill this need, HCDocs provides a product that allows simple, flexible, secure and reliable access to documents as a user-friendly and cost effective document management system.

2.1.1 System Interfaces

The HCDocs system integrates several internal systems to provide functionality.

**Authentication:** The HCDocs system provides the capability to use an external authentication interface for the verification of user login. In the absence of such an external system, HCDocs has capabilities to create its own authentication interface. However, it is known that the external stakeholders already have an authentication interface and therefore will not be implemented in this release.

**Client/Server:** The HCDocs system provides an interface to its users that translates user input into data the server will understand and vice versa.

**Database:** The HCDocs system has a connection to a database to archive documents.
2.1.2 User Interface

The HCDocs system includes a simple interface with a point and click method to guide users during their use. The system is built as an OpenOffice extension and will launch automatically each time OpenOffice is started.

![Diagram of Administrator User Interface]

*Figure 1: Administrator User Interface*
2.1.3 Hardware Interface

The HCDocs client runs on any hardware meeting the following criteria:

- Capable of connecting to the hospital's network.
- Running the applicable version of OpenOffice.
- Includes a keyboard and pointing mouse.
- Includes writable volatile storage.

The HCDocs server runs on any hardware meeting the following criteria:

- Capable of connecting to the hospital’s network as a server.
- Capable of interfacing with modern database software.
- Capable of running a modern suite of networking software.

### 2.1.4 Memory constraints

The HCDocs system requires that the computer must be able to run OpenOffice. Typically this requirement is met with most modern desktop computers which have approximately 256 megabytes of RAM. The server system requires no greater than 1 gigabytes of RAM.

### 2.2 Product Functions

The HCDocs system will provide the following functions:

- Templates for typical medical documents created.
- Search methods to find patient/doctor history.
- Revocation/granting of permissions to users based on User Account Type listed in section 3.1.

### 2.3 User Characteristics

The users of the HCDocs system need to be familiar with the basic operations of a computer and the OpenOffice software.

### 2.4 Requirements Apportioning

The priority levels for the requirements are:

<table>
<thead>
<tr>
<th>Priority</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This is the highest priority level; all requirements of this level must be fully satisfied and verified in order for the HCDocs system to be released. Requirements of this priority are not expected to be verified by the current release of HCDocs. The absence of these requirements must not create hazards for the system. However, these requirements are expected to be fully satisfied and verified by the next minor release of the system. The features satisfying these non-verified requirements must be clearly documented to the end user as such.</td>
</tr>
<tr>
<td>2</td>
<td>Requirements of this priority are not expected to be fully satisfied in the current release of HCDocs. But, these are expected to be fully satisfied and verified at the next major release of the system. These requirements are of the lowest priority and are not within the current scope of the system design. These requirements are included only to indicate where the system is expected to change in future development.</td>
</tr>
</tbody>
</table>
All requirements are assumed to be priority 1 unless otherwise noted.

3 Specific Requirements

3.1 External Interface Requirements

3.1.1 External authenticator

*Purpose:* The external authenticator is a third party program that validates user accounts through comparing user account names and passwords.

*Input:* The input is supplied by the user through a login module that formats and forwards the username and password to the external authenticator.

*Output:* The output comes in the form of a positive or negative validation returned to the login manager.

*Data Format:* The format will be dependent on the third party software interface and is usually configurable by the System Administrator.

3.1.2 Patient Picker Window

*Purpose:* The Patient Picker Window is provided by the hospital for the use of searching patients in the database.

*Input:* The input is supplied by the user through a Patient Picker module that formats and forwards the supplied fields to the database.

*Output:* The output comes in the form of a list displaying all patients who receive a match when searching the database.

*Data Format:* The format will be alphanumeric.
3.1.3 Physician Picker Window

*Purpose:* The Physician Picker Window is provided by the hospital for the use of searching physicians in the database.

*Input:* The input is supplied by the user through a Physician Picker module that formats and forwards the supplied fields to the database.

*Output:* The output comes in the form of a list displaying all physicians who receive a match when searching the database.

*Data Format:* The format will be alphanumeric.
3.2 Functional Requirements

3.2.1 User Accounts

**User Account Types and Privileges** - The system classifies user accounts on the basis of roles and privileges. These are referred to as user account types.

The following are the user account types that exist on the HCDocs System.

*Regular* - Can have either read only or full access to documents of different departments depending on privileges.

*Systems Administrator* - Will have full read and write access to entire system as well as privileges to
add/remove templates, add/remove users, and change user rights.

The user account type defines the user permissions that are enabled for the account.

At all times, one user account with full administrative privileges exists in the system as the System Administrator.

The system allows for the System Administrator to perform administrative functions through the Systems Administrator program. For more details of the System Administrator privileges, refer to section 3.3.

3.2.1.1 Creation of User Accounts

The HCDocs system allows for the creation of user accounts.

The system allows for any number of user accounts limited by hardware and software resources.

The system allows only the System Administrator to create user accounts.

The system requires certain information for the creation of new user accounts. These fields are mandatory and cannot be left blank. The following information is required and necessary for a new user account:

- **Last Name** – Must be limited to 15 characters.
- **First Name** – Must be limited to 15 characters.
- **Username** – Must be at most 15 characters, alphanumeric, unique, and case insensitive.
- **Password** – Must be between 6-15 characters.
  All characters are displayed as a * when entered on the screen.
- **Email Address** – Must be in the form name@example.com and must be a valid address as all passwords are sent to this email address.

3.2.1.2 Modification of User Accounts

The HCDocs system allows for the modification of user accounts.

The system allows for modification of user accounts only through the System Administrator.

All fields listed in section 3.2.1.1 except password are modifiable by the System Administrator.

3.2.1.3 Deactivation of User Accounts

The HCDocs system allows for the deactivation of user accounts.

The system denies deactivated users from being logged onto the HCDocs system.

A user account that has associated history can only be disabled, and never fully deleted from the system.
A disabled user can be reactivated by the System Administrator

3.2.2 Application Login

The login screen is displayed as soon as the user clicks the HCDocs icon in OpenOffice (See Figure 1).

*Username* - This corresponds to the username used by the user to login the network.

*Password* - This corresponds to the username used by the user to login the network (See figure 2).

*Login authentication* - The login authentication is taken care of by the external authenticator in Section 3.1.1.

*Figure 5*
3.2.3 New Document

The system allows for new document to be created by users.

The new documents users can create are limited by their user privileges.

The new documents the users can create are limited to the templates installed by the System Administrator.

The system launches a New Document Wizard each time the user selects to create a new document (See Figure 3).

The New Document Wizard generates patient and physician info to be used in the document heading and provides keys for saving the documents.

The patient and physician data is not editable in the document, irrespective of account privileges.
3.2.3.1 New Document Wizard

User enters criteria needed to create new document with the following steps:

User selects a template from the list of templates.

**Templates available with first release:**

*Patient Letter*

*Referral Letter*

![Select a Template](image)

*Figure 7*

User then searches for patient using patient picker window. (See Figure 4)

**Search fields:**

*Patient Last Name*
*Patient First Name*
*Patient ID*
*Patient Date of Birth*
User searches for physician using Physician Picker window. (See Figure 5)

**Search fields:**

- **Physician Last Name**
- **Physician First Name**
- **Physician ID**

**Buttons**

*Reset* - Clears all the search fields mentioned in Patient and Physician Picker windows.
Back - Goes back to the previous stage in the wizard.

Next - Goes to the next stage in the wizard.

Cancel – This button closes the window.

Figure 9
3.2.2 Open Document

The system allows documents to be opened from the database for viewing/editing. The documents a user is allowed to retrieve are limited by their user privileges. All changes will be tracked upon saving. All changes will be versioned upon saving. The document is locked as soon as it is opened. The document is unlocked when the user closes the document. The system launches the Open Document Wizard each time the user selects Open Document (See Figure 7).
3.2.2.1 Open Document Wizard

User enters in criteria to search by in the first page of the Open Document Wizard.

The Wizard is capable of searching by any or all of the following fields.

**Patient fields:**

*Patient name:* Last and First name.

*Patient ID*

*Date of Birth*

**Physician fields:**

*Physician name:* Last and First name.

*Physician ID*

**Document info:**

*Date created checkbox*

*Date modified checkbox*

*Date from*

*Date to*

*Date dropdown*
Figure 7

The results are provided in a list. (See Figure 8)

Search result fields:

*Patient name* - If the user clicks on this field, he is taken to the next screen.

*Physician Name*

*Patient Date of Birth*

*Last visit*

If only one patient, automatically goes to next screen (see Figure 9).
The user selects the desired patient and then the wizard returns a search list relevant to that patient (See Figure 9).

**Search result fields:**

*No.* – When the user clicks on this field, the document is opened.

*Description*

*Physician Name*

*Modified date*

*Created date*

*Template Type*

![Figure 13](image-url)
Buttons

*Back* - This button returns to the previous window.

*Cancel* - This button closes the physician picker window.

3.2.3 Logout

The user is logged out of HCDocs.

3.2.4 Save

The file is saved directly to the database (See Figure 10).

The user is asked to enter the description of the file. The description is optional.

The user clicks save and it is saved to the database, in the form of a BLOB.

If an existing file is being modified, the document is marked `amended' according to the HIPPA requirements.

Figure 14
3.2.5 Document Finalizing

Documents can be finalized by users. Once a document has been finalized, it goes into a locked state, and cannot be edited again. If changes need to be made, the document will be opened under a new version and an audit trail will begin.

3.2.5.1 Document Signoff Privileges

The administrator can permit or disallow users from signing off documents by assigning *document signoff privileges*. Two types of privileges exist, *author* and *document type*. The *author* privilege allows users to signoff documents that were created by a specific author. The *document type* privilege allows users to signoff documents of a specified type (created using a particular template).

3.3 Administrator Mode

The System Administrator will be provided with a stand-alone program for administrative functions.

There can only be one System Administrator account on the system at a time.

The System Administrator is allowed to manage users.

The System Administrator is allowed to manage documents.

The System Administrator is allowed to manage templates.

Application Login

The login screen is displayed as soon as the System Administrator clicks the Administrator Icon. (See Figure 11 -12)

![Administrator Login](image)

*Figure 15*
**Username and Password**

The system administrator is given a unique username for the system administrator program.

The system administrator is given a password for the system administrator program.

The username and password follow the same compliances as regular users.

**Manage Users**

The system allows for the System Administrator to manage User Accounts (See Figure 13).

The Manage User functionalities implemented on the system are:

- *Add user*
- *Remove/modify user*
- *Main Menu*
Add User

The administrator enters the information for the new user (See Figure 14).

**Required Fields:**

- **Username**
- **Last Name**
- **First Name**

**Department** – Primary department the user belongs to. Selection is made from a drop down list containing all the departments and this function also sets the permissions for the user.

**Email:** This should be unique and valid. The password is sent to the user at this email address.

**Generated Fields:**

- **Password:** When the user is added to the system an email is sent to the user with a randomly generated password.

The user logs into the system for the first time, the password has to be changed.

The administrator can then assign other departments to the user.

The departments can be added or removed from the following two groups:

- **Read only:** The user has read only rights when accessing the documents of that department.
- **Full access:** The user has read and write rights when accessing the documents of that department.
Remove/Modify User

Modification Fields:

Username
First and last name
Department
Email

A table containing the search results is displayed
Results Fields:

*Check box*: The administrator can select a user who they want to remove from the system.

*Name*: Displays the first and last name of the user. When the administrator clicks on the name it takes them to the modify user screen.

*Username*

*Department*

*Email*

Remove User

User is selected using the check box

When the administrator hits the Remove user button, a confirmation message is popped up to confirm the deletion.

Confirmation Message

*Message*: "Are you sure you want to remove the user?"

*OK*: Removes the user from the system

*Cancel*: Does not remove the user and returns to the previous page

Modify User

Information Displayed:

*Username*

*First and last name*

*Department*

*Email*

The administrator can then assign or remove other departments to the user.

The departments can be added or removed from the following two groups

*Read only*: The user will have read only right when accessing the documents of that department.

*Full access*: The user will have read and write rights when accessing the documents of that department.
The administrator can also reset the user password.

An email is sent to the user containing the new password.

The password is randomly generated by the system.

Figure 19
## Modify User

<table>
<thead>
<tr>
<th>User Names</th>
<th>User ID</th>
<th>Department</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Smith</td>
<td>100001</td>
<td>Department 1</td>
<td>-------</td>
</tr>
<tr>
<td>James Smith</td>
<td>100002</td>
<td>Department 2</td>
<td>-------</td>
</tr>
<tr>
<td>Joe Smith</td>
<td>100003</td>
<td>Department 3</td>
<td>-------</td>
</tr>
<tr>
<td>Tod Smith</td>
<td>100004</td>
<td>Department 4</td>
<td>-------</td>
</tr>
<tr>
<td>Will Smith</td>
<td>100005</td>
<td>Department 5</td>
<td>-------</td>
</tr>
</tbody>
</table>

*Figure 20*
Manage document

The system allows the System Administrator to manage document records and privileges.

The System Administrator can perform the following functions on a document:

- **Lock** – Lock a document from being edited by any user on the system.
- **Unlock** – Unlock a document to allow editing by any user.
- **Restore** – Restore a document previously deleted from the system.
- **Remove** – Delete a document from the system.
Manage Document Wizard

The Systems Administrator enters criteria needed to retrieve the document needed to modify.

The System Administrator can retrieve all revisions of a document.

The Systems administrator searches for the document by entering any or all of the following fields (see Figure 19):

**Patient Fields:**

- Patient ID
- Patient DOB
- Patient Last Name
- Patient First Name

**Physician Fields:**

- Physician ID
- Physician Last Name
- Physician First Name

**Document Info:**

- Created Date
- Modified Date
- Date To
- Date From
- Date shortcut
- Search Deleted Files
Buttons

Search - This button returns a table of results.

Reset - This button clears all the search fields in figure 8 and 9.

Cancel - This button would close the physician picker window.

The results are provided in a list as shown below:
Figure 23

**Search Result Fields:**

- **Number List** – Displays in numerical order the search results
- **Patient Name**
- **Physician Name**
- **Patient DOB**
- **Date of Last Visit**

**Buttons**

- **Search** - This button returns a table of results.
- **Back** - This button returns to the previous window.
- **Reset** - This button clears all the search fields in figure 20.
Cancel - This button closes the physician picker window.

The System Administrator selects the patient by clicking on the name.

The Wizard shows the following results in the next screen. (See Figure 21)

![Figure 24]

Search Result Fields:

- Number
- Description
- Template Type
- Physician Name
- Created Date
- Last Modified Date
Buttons

*Search* - This button returns a table of results.

*Cancel* - This button closes the physician picker window.

The System Administrator selects the document of interest.

The Wizard goes to the next screen and document information is displayed. (See Figure 22)

![Search Result Fields](image)

**Figure 25**

Search Result Fields:

*Document ID* – This field is read only.

*Document Name* – This field can be modified by the Systems Administrator.

*Created By* – This field is read only.

*Created Date* – This field is read only.

*Last Modified By* – This field is read only.

*Last Modified Date* – This field is read only.

*Status* – This field is read only.
Department – This field can be modified by the System Administrator.

Functions

Lock - This prevents the modification of the document by any user.

Unlock – This allows users to modify the document.

Restore – Allows the deleted document to be viewed and edited on the system again.

Remove – Marks the document as deleted. The document is not deleted from the database.

Buttons

Apply - This button applies the changes made to the fields by the System Administrator.

Back - This button returns to the previous window.

Reset - This button clears all the search fields in figure 20.

Cancel - This button closes the physician picker window.

Manage Templates

The system allows for the System Administrator to manage templates used in the system.

The System Administrator is allowed to add or remove templates currently used in the system.

The removed templates are not fully deleted from the system; they are stored in the database and can be added back later on.

If a template is removed, already created documents in such a template can be viewed and modified, but no new documents can be created with the template.

The System Administrator can change the layout of templates (Priority 4). The system will not provide an interface for editing templates; instead, the administrator must download the template file and edit it locally, and then upload it.

Manage Templates Wizard

The system administrator is given a list of available templates and current templates.

Available Templates – All templates available on the HCDocs System

Current Templates – Current templates available for users to create new documents.

To add and remove templates the System Administrator is given the following functions:

Add – adds the selected template from available templates to current templates
Remove – Removes the selected template from current templates. (See Figure 23)

**Figure 26**

**Add / Remove Templates**

<table>
<thead>
<tr>
<th>Available Templates</th>
<th>Current Templates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Template 1</td>
<td>Template 1</td>
</tr>
<tr>
<td>Template 2</td>
<td>Template 2</td>
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<tr>
<td>Template 3</td>
<td>Template 3</td>
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<td>Template 19</td>
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<td>Template 20</td>
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</tbody>
</table>

**Buttons**

*Apply* - This button adds the available templates selected and remove the current templates selected.

*Cancel* - This button closes the Add/Remove Templates window.

*Upload New Template* - This button launches the wizard to create a new template by the System Administrator.

*Add* – This button moves the selected item from available templates to current templates.

*Remove* – This button moves the selected item from current templates to available templates.
3.4 Help Menu

_New Document_ – User is given step by step instructions to create a new document.

_Open Document_ – User is given step by step instructions to open a document.

_Save_ – User is given step by step instructions to save a document.

_Search_ – User is given step by step instructions to search documents.

3.4.1 Admin Help Menu

_Manage user accounts_ – System administrator is given step by step instructions to use the manage user functions.

_Manage documents_ - System administrator is given step by step instructions to the manage documents functions.

_Manage templates_ - System administrator is given step by step instructions to use the manage templates functions.

4 Non-functional Requirement

4.1 Security Requirements

4.1.2 System Security

Documents must be encrypted within the repository when saving or editing.

Documents must be compliant with HIPAA.

Physician creating record, members of his or her primary group, and members of any other assigned group will have full access to record.

Communication between the client and server will take place over an encrypted connection.
4.1.2 Input Error Checking

All input fields must be error checked to prevent SQL Injection.

4.1.3 User Security

Username will be used to keep track of all documents viewed and/or changed and will store the auditory trail.

Authentication will occur directly with HCDocs (Priority 1), or with an external authentication system (Priority 4).

Users will only be allowed a maximum of three unsuccessful attempts at logging in. An unsuccessful attempt is one in which the provided password is incorrect.

User accounts may be disabled by the administrator. Disabled accounts may not be used by the user.

Passwords will not be directly stored in the database. Passwords must be stored in a form in which it is not possible to derive the password from, such as a one-way hash.

4.1.4 Patient and Physician information modification

Data fields as defined in the active template will not be directly editable within the document.

4.2 System Requirements

All computers using the system must be equipped with OpenOffice and the HCDocs extension.

All computers using the system must have the following minimum system requirements:


Memory: 256 Mbytes RAM.

Hard Drive: At least 600 Mbytes available disk space.

Monitor: 800 x 600 or higher resolution with at least 256 colors.

4.3 System Evolution

The system will be created with future needs and flexibility in mind. Future versions of the system will include Priority 2, 3 and 4 requirements as described in Section 2.2.
4.4 Design Constraints

HCDocs is not officially recognized by any medical facility other than the one for which it is developed. However, it will follow certain guidelines required by health care institutions to help gain acceptance. Following these guidelines will place further constraints on the systems.

4.4.1 HIPAA

When operating on a computer system owned by a U.S. based organization, all functionality of the system must be compliant with the Health Insurance Portability and Accountability Act of 1996 (HIPAA), specifically the Administrative Simplification (AS) provisions. The purpose of this requirement is to guarantee the privacy of all patients for whom the system contains information on.

4.4.2 Audit Trail

At any point in time, an administrator should be able to view any and all changes made to a document. The combined set of changes is known as an audit trail.

4.5 Software System Attributes

Reliability

The HCDocs system must not crash or hang under normal operating conditions. The system must not take an unreasonable amount of time to perform normal operations.

Availability

The HCDocs system is acceptably robust such that it can remain up and running as long as hardware and network conditions permit. In addition, the hardware must maintain the OpenOffice software suit.

Security

A number of factors are used to protect the software from accidental or malicious access, use, modification, destruction, or disclosure. For these items please see section 4.1.

Maintainability

The HCDocs system is segmented into several different modules which allows for long term maintainability and future evolution. For evolutionary requirements, see section 4.4.

Testability

The HCDocs system is broken into modules that allow them to be easily tested and verified to perform as this document describes.