VAULT

A shared distributed and redundant storage solution

Project ID: 19-002

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Structure of the SRS

(Software Requirements Specification)

B.Sc. Special (Honors) Degree in Information Technology

DECLARATION

I, W.M.U.K.M.T.Bandara declare that this is my own work and this software requirement specification document does not incorporate with acknowledge any material previously submitted for a Degree or Diploma in any other University or institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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1. Introduction

1.1. Purpose

The purpose of this SRS document is to describe the requirements and the process related to virtual disk allocation and deallocation module. The document will explain the purpose, features, functional and non-functional requirements, design constraint, project approach, constraint under which above mentioned modules must operate and how the modules will interact with the other modules and the external applications. This document is designed not only with the intention of proposing the solution to a customer in order to get the approval but also to give an idea to the developers and the other stakeholders about, what are the functions available, in what order they needed to be done and the boundaries within which they need to work

1.2. Scope

The component which will be discussed in this document is called "Virtual Disk Allocation and Deallocation". The component mainly contain two main functions, memory allocation process and memory deallocation. The main goal of the virtual disk allocation and deallocation is to use to manage the storage pool of an organization and planning the exit strategy. Virtual storage pool technology, which allows multiple attached physical disk to be used as single instant virtual space. Virtual storage pool describes the health and operational states of data storage. The main objective of virtual storage pool is describe how physical disk added to the storage pool and create virtual partition from free space in the pool. The virtual storage pool can be monitor administrative users of the system to check whether what are the disk space that are used and free at a certain time, and to check the disk usage of every nodes.

1.3. Definitions, Acronyms, and Abbreviations

VHD	Virtual Hard Disk
OS	Operating system

1.4. Overview

Remainder of this document mainly can be divided into two sections plus appendix. First section is called overall description and it provides readers an understanding about the overall functionalities of the component, and the interactions of the component with the other components. Future more this section describes functional and nonfunctional requirements, design constraints which includes user interfaces, system interfaces, hardware interfaces and system constraints.

Second section which called specific requirements provides requirements specifications in a detailed manner. Specify requirements clearly for different audiences to understand by using various kinds of specification techniques. Future more software system attributes and performance requirements will be discussed in this section.

2. Overall Description

Virtual Storage Allocation and Deallocation

Virtual storage pool management is a part of the storage management and it provide the facility to create storage space for the user to store data. The space is create from the virtual storage pool which will collect physical storage from the network. There are two option for creating a disk image: fixed-size or dynamically allocated. If create a fixed-size storage from virtual pool an image file will be created roughly the same size as the virtual disk’s capacity. For a 10 GB disk, will create 10 GB file. Dynamically allocated storage will initially be very small and not occupy any space for unused virtual disk sectors, but will grow every time a disk sector is written to for the first time, until the drive reaches the maximum capacity chosen when the drive was created.

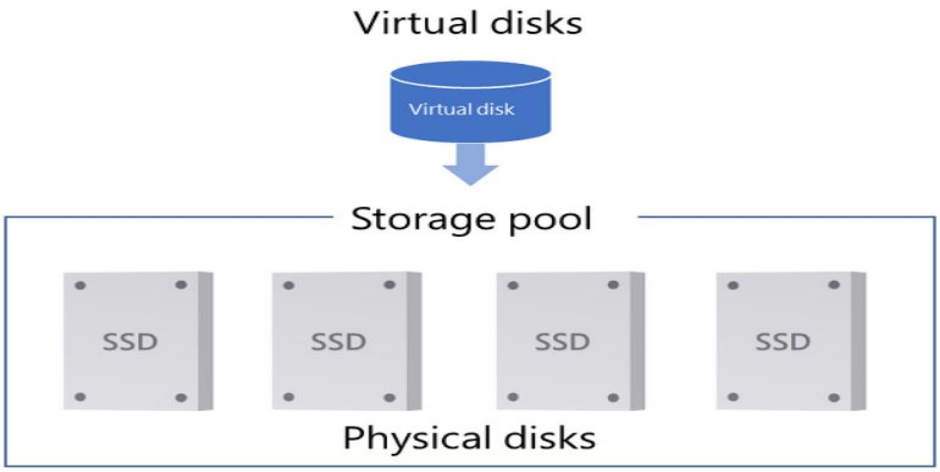


Figure 1 Virtual Storage Pool

Storage deallocation function will work when user delete the data from the virtual storage disk. In this case all data will be stored in another nodes.

2.1. Product Perspective

Below diagram will describe the similarities and the differences of the final product, not only the component mentioned in this document, with the existing products.

Table 1 Feature Comparison

Features	MooseFS	IBM Spectrum Scale	OCFS 2	OrangeFS	BWFS	Minio	Ceph	VAULT
High Availability	✓	✓	✓	✓		✓	✓	✓
Scalability	✓	✓	✓	✓	✓	✓	✓	✓
Minimal Investment	✓			✓		✓	✓	✓
Big Data Support	✓	✓	✓	✓		✓	✓	✓
Data encryption		✓				✓	✓	✓
Data Recovery	✓	✓		✓	✓	✓	✓	✓
Platform independent	✓	✓						✓
Security		✓	✓	✓		✓	✓	✓
Data Redundancy					✓	✓		✓
Minimum additional storage for backup								✓
Blockchain integration								✓
Easy to setup and run								✓
File Sharing								✓

2.1.1. System Interfaces

Since the system will be designed and developed according to the module-based approach each research component will be designed, developed and tested out individually since they all are developed as modules which then can be imported and assemble the complete software. Since NodeJS will be used as the developing language application can be run inside any Linux, MacOS and Windows environments (Platform independent). Since the final product and the component mentioned in this document both acts as standalone solutions final product, and the component mentioned in this document won’t be interacting with the other existing applications other than the web browser which will be needed to display the user interfaces of the web-application. Although hardware monitoring function will be interacting with the Operating Systems build in features such as Self-Monitoring, Analysis, and Reporting Technology to gather hardware health related data.

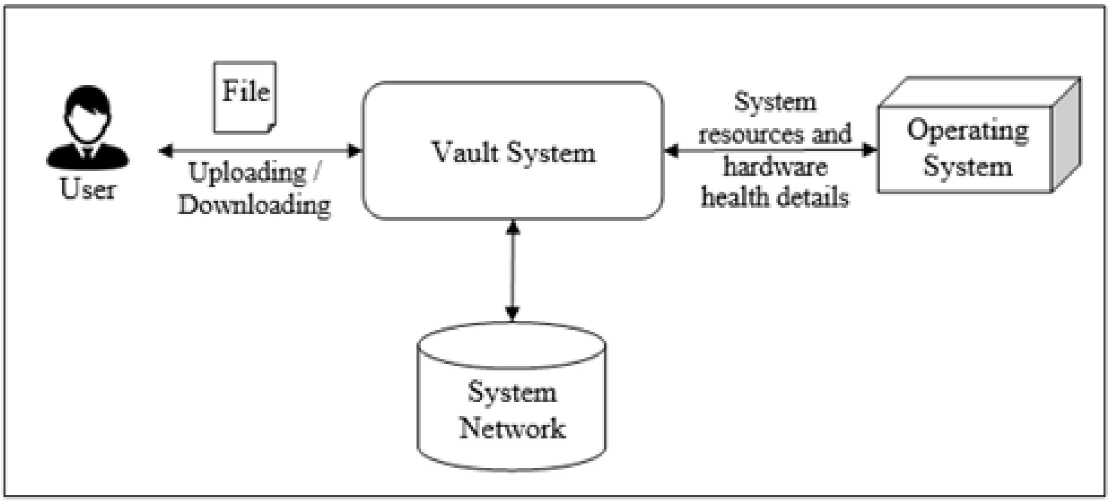
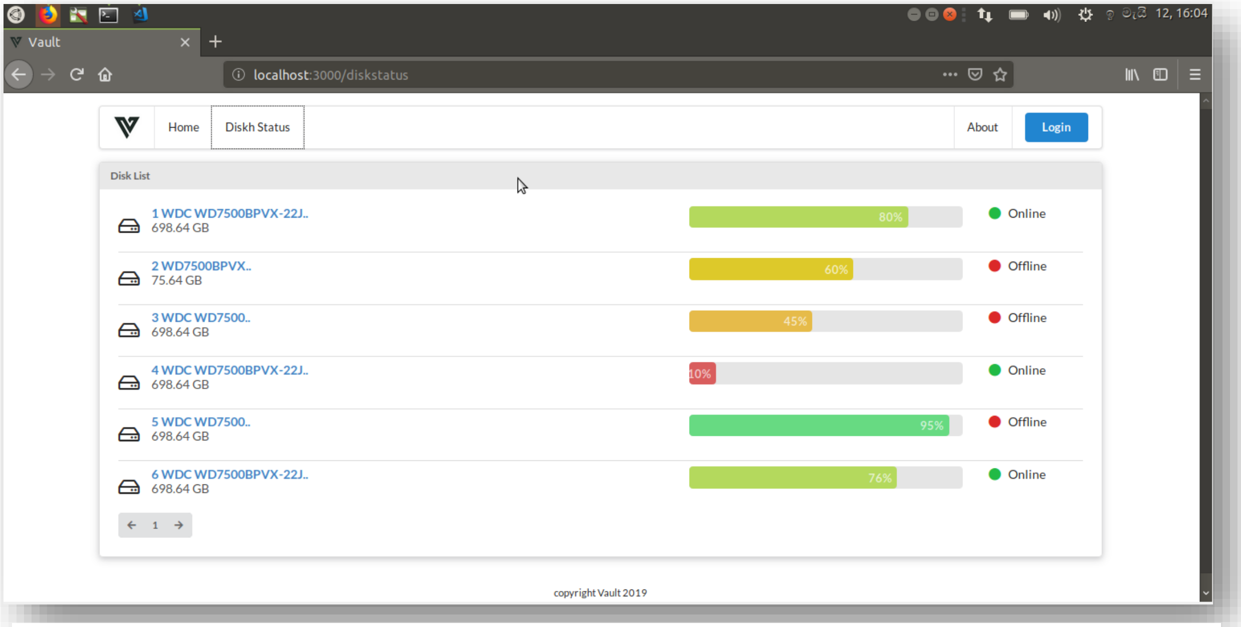


Figure 2 System overview

2.1.2. User Interfaces

The disk health interface indicates all connected physical drives. Here, administrator can view what are the workstation currently online/offline. Also can view workstation storage status. When workstation storage capacity low it will indicates as a percentage.



Disk List

1 WDC WD7500BPVX-22J.. 698.64 GB	80%	●	Online
2 WD7500BPVX.. 75.64 GB	60%	●	Offline
3 WDC WD7500.. 698.64 GB	45%	●	Offline
4 WDC WD7500BPVX-22J.. 698.64 GB	10%	●	Online
5 WDC WD7500.. 698.64 GB	95%	●	Offline
6 WDC WD7500BPVX-22J.. 698.64 GB	76%	●	Online

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Figure 3 User interface

2.1.3. Software Interfaces

The system is developed using module-based approach, in this document was mainly developed as one module, virtual storage management module. In this module only connecting with external application such as Operating system build in features. Only requirement needs to run the components successfully is a physical machine with NodeJS installed on them (Platform Independent).

2.1.4. Communication interface

The communication between the different parts of the components is important since they share functionalities on each other. The communication among the virtual storage management will be established over the local area network. To identify the workstation this required local area connection. It will load the user storage data from the physical hard drives to the web application. However, the storage module will be communicate with the operating system.

2.1.5. Memory constraints

Since the application is engineered to use disk space more than Memory, a machine with at least 2GB is sufficient.

2.1.6. Operation

Prior to use, Docker application will be deployed among the users by using the internal network or else physically. Application basically have two types of user accounts called administrator accounts.

The user account related activities will be carried out by the administrative users using the web application through web browsers. Administrators can connect/ disconnect workstations form the system, can view available workstations at a certain time and can view the disk status related to all the workstations connected. Administrator’s most important task is to assign storage space from the workstations to create the storage pool where all the data will be stored.

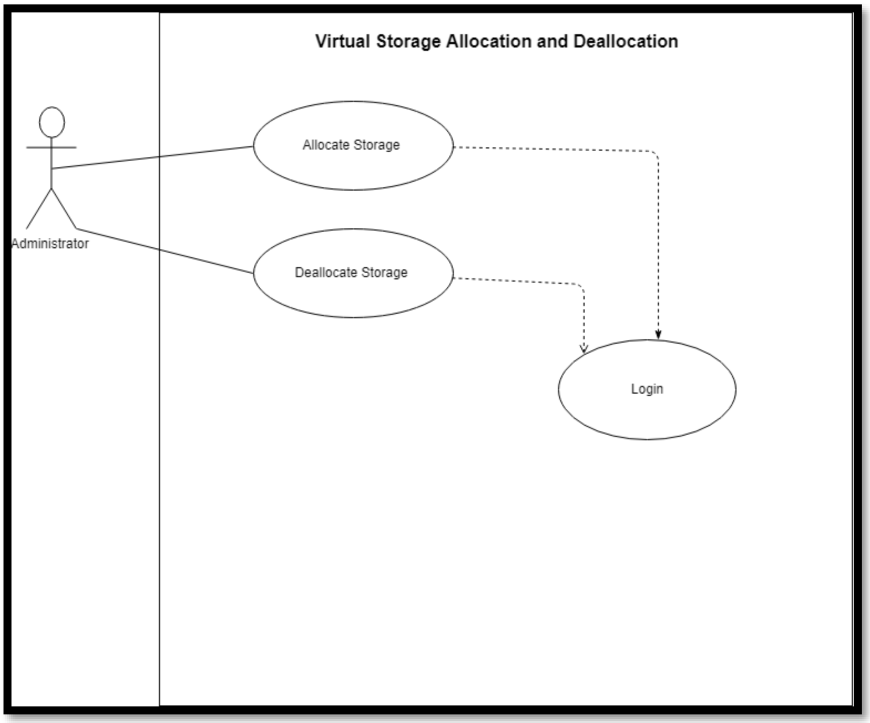
When a normal user can finally can access the web application from the web browser a logging page will be displayed to the user, and users can use the logging credentials provided by the administrators to logged in to the application.

2.1.7. Site adaption requirement

In order to run the application users must complete few tasks in a certain order which will be presented below in the order that users must carry them out. When users accessing the application, they will be guided using English language.

1. NodeJS must be installed
2. Docker application which contains the system must be deployed
3. All the workstations must connect to the local network.
4. At least there must be 6-10 users that can contribute 10 GB storage space by each
5. Web browser must be installed
6. Users must have login credentials to access the web application

2.2. Product function



Login

Table 2 Login use case scenario

Use Case No	01
Use Case	Login
Actors	Administrator
Pre-Conditions	User must be a registered user
Flow of Event	1. Enter the username and password 2. Click Login
Post Conditions	Allow user to the web application
Alternatives	Display an error message to inform that the user credentials are invalid.

Allocate storage

Use Case No	02
Use Case	Allocate Storage
Actors	Administrator
Pre-Conditions	User must be logged in
Flow of Event	1. Press on “Allocate Space” button 2. Give storage size 3. Press on “OK” button 4. Web application will display message “Successful”
Post Conditions	Display “Allocate Successful” message
Alternatives	Display an error message to inform user that the allocation won’t be allocated due to some reason.

Deallocate storage

Use Case No	03
Use Case	Deallocate Storage
Actors	Administrator
Pre-Conditions	User must be logged in
Flow of Event	5. Press on “Delete Space” button 6. Select storage device 7. Press on “OK” button 8. Web application will display message “Successful”
Post Conditions	Display “Device Removed” message
Alternatives	Display an error message to inform user that the deallocation won’t be deallocated due to some reason.

2.3. User characteristics

Administrator- Software/hardware professional who will be configuring the system and maintain the consistency of the system.

2.4. Constraints

Virtual storage management module constraints

- NodeJS must be installed
- Hyper-V support system architecture
- At least 10 GB Hard disk free space
- User login and the user authentication is must
- User should have the Local Network connection to deal with the application.

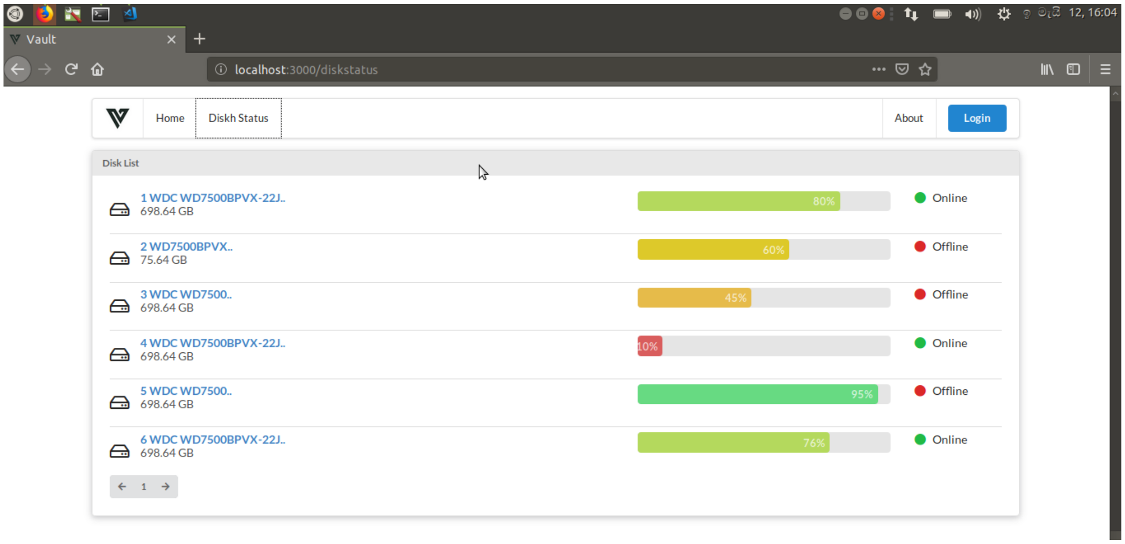
2.5. Assumptions and dependencies

There was no assumption made due to the reason Virtual storage management module is platform independent and require no additional assist from third party application. In hardware level should have healthy HDD and SSD drive.

3. Specific requirements (for “Object Oriented” products)

3.1 External interface requirements

3.1.1 User Interfaces



1 WDC WD7500BPVX-22J..	698.64 GB	80%	● Online
2 WD7500BPVX..	75.64 GB	60%	● Offline
3 WDC WD7500..	698.64 GB	45%	● Offline
4 WDC WD7500BPVX-22J..	698.64 GB	10%	● Online
5 WDC WD7500..	698.64 GB	95%	● Offline
6 WDC WD7500BPVX-22J..	698.64 GB	76%	● Online

Figure 4 User Interface

Table 3 workstation status interface description

Name of item	Disk status
Description of purpose	Workstation availability and storage status of the each and every hard disk will be presented to the user by this interface.
Source of input or destination of output	Storage related information from Operating system
Valid range, accuracy and/or tolerance	80%
Units of measure	-
Timing	-
Relationships to other inputs/outputs	Storage status information will be outputted to the distribution API when segments of a file is recollecting.
Screen formats/organization	Screen is organized in a monitor view
Window formats/organization	-
Data formats	Alphanumeric

3.1.2 Software interfaces

Other than NodeJS and Operating System the research component mentioned in this document won't be interacting with any other software application.

3.1.3 Communication interfaces

The local network connection will be needed by the users as well as for the storage management purpose. Since the storage management deal with physical hard drives, there should be an LAN network connection.

The LAN network connection will be used to communicate in between application and all other physical hard drives in the network.

3.2. Classes and Objects

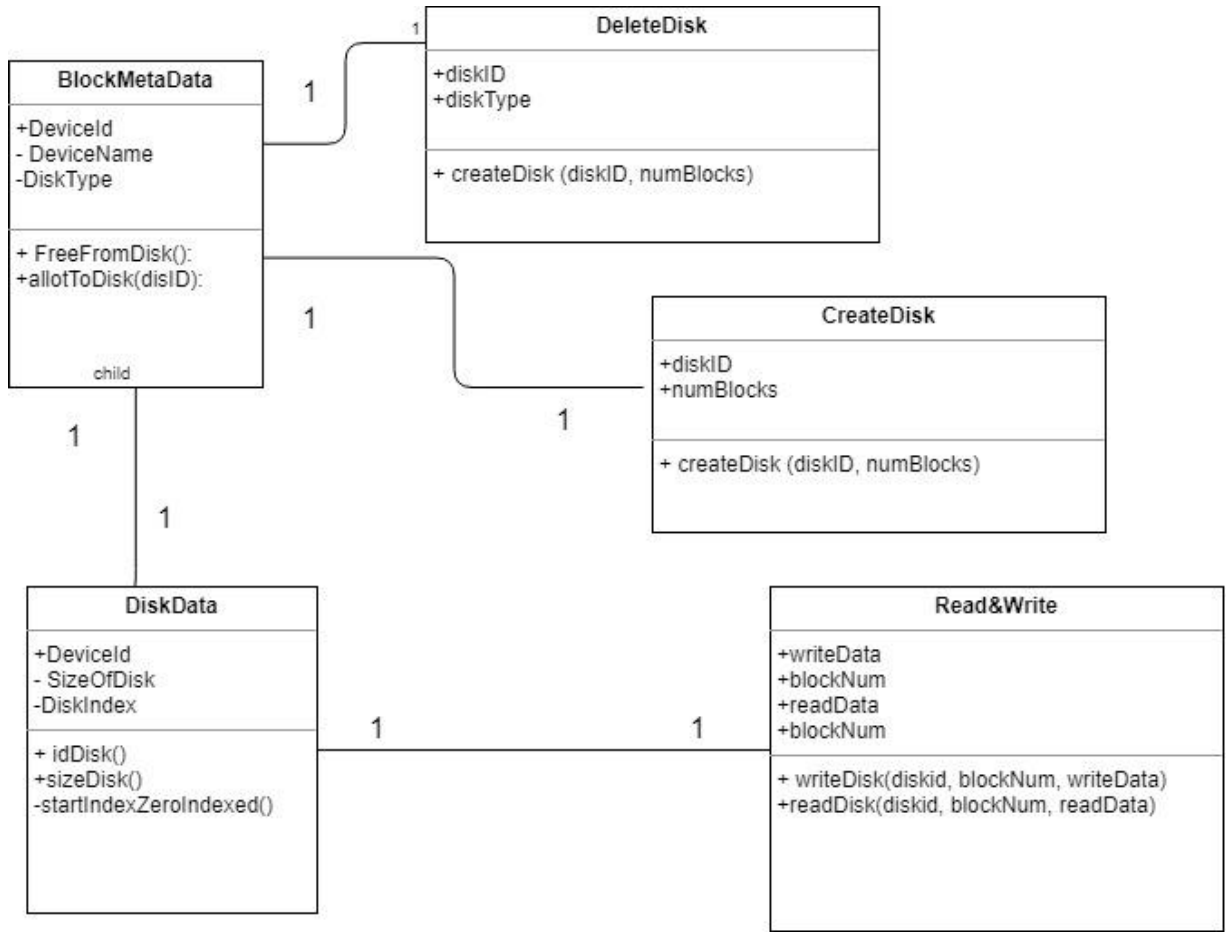


Figure 5 Class Diagram

3.3. Performance requirements

Storage and network requirements can be identified for the block-chain and Messenger API facilitation. The host machine should have the necessary capacity to host storage for the Rethink DB server. The network should be reliable. Network speed/bandwidth is not a main concern since the amount of data throughput required by the module is very low.

3.4. Design Constraints

There are no specific design constraints involves with the component which is mentioned above in this document, as long as the interfaces are easy to understand and use.

3.5. Software system attributes

In this section the features which will be offered to the customers will be described.

3.5.1. Reliability

Ability of a system to maintain its ordinary operation within given time in a given environment with minimum failures is called reliability. Storage management system increase the reliability by checking the hash value from the fragmented list and compare the list hash value and the file hash value. When both hash values does not same the error message request to redundancy part.

3.5.2. Availability

Probability a system is functioning when its services are required by the users of the system is called availability of a system. Storage status module will continuously monitor availability of the system. It will display workstations are online or offline. Then administrator can easily identify at what time which workstation going offline.

3.5.3. Security

Security of a system is the function which allows system to provide its services to its legitimate users, while resisting the other unauthorized users from gaining access to the system or its data and resisting authorized users from performing unauthorized actions.

Disk availability module doesn’t involves with security process but since it increase the availability, which is one of the main three component of a secure system it indirectly contribute its part in the security.

3.5.4. Maintainability

Maintainability is the ability to change the systems functionalities and increase the performance by applying system repairs and updates while maintaining systems availability, security and reliability.

That means the proposed system can be maintained easily if it needs some modification without causing any damage or interrupt to other system functionalities. As well as modifications can be done through low cost solutions. It is also a somewhat important feature to having a high maintainable system

3.6. Other requirements

4. Supporting information

4.1. References

4.2. Appendices