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COMP-1004 design documentation

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# Introduction

In this documentation I will be outlining the steps taken to design, plan, implement, and test my project for the COMP-1004 module. Due to my focus on the course being cyber security, I will be creating a program which caters towards this aspect of my course.

For this project, I will be developing a single page web application which will aim to act as a username and password storage system. The user should be able to enter a username and password to be stored and the system will also indicate to the user the strength of their password.

# Software development life cycle

A crucial part to the development of any software development is conforming to a software development cycle designed to keep developers on track and to effectively resolve any time delays and issues faced during the development process. The five stages of the SDLC include:

* Requirement analysis
* Design
* Implementation
* Testing
* Evolution

If these steps are not followed as intended, a project could take end up taking much longer to complete than initially planned or even fail entirely if it is deemed that the development cost is higher than the potential return.

*Hackr.io. (2023).*

## Requirement analysis

There are 3 main requirement types in the first step of the SDLC, those being the functional, non-functional, and usability, each having different considerations that must be discussed and planned for. Firstly, the usability requirements of a project refer to how easy it is to use the program upon completion. Secondly, non-functional requirements refer to the limitations of a software and how it can meet the requirements of the program as well as how it may not be possible to meet specific requirements. Finally, functional requirements refer to what the program can do and how well it can handle different use cases such as being able to handle extreme or incorrect data inputs without crashing. External requirements are another part which must be considered, this refers to any legal, ethical, or social issues which must be acknowledged.

## Design

The next step is to take the requirements and design a piece of software based on them. The main ways of designing a software from requirements is to look at the style and details of the software. The style section of this design refers to the outline of how the program will work on a basic level and detailed design refers to a more in-depth design template, outlining how specific functions will be implemented into working code. Furthermore, UML’s will be created to visualise the project design and include models such as state, sequence, and component diagrams.

Upon completing these steps, the program will be implemented into working code before being tested and any issues resolved with further code (evolution). During testing, each function of the program will be subjected to various use cases to identify any logical errors within the program such as by testing with extreme or invalid data, or no data for inputs, or trying to request data which is not present. Once testing results are obtained, the code will undergo evolution where necessary to resolve any issues such as certain functions or data cases not performing as intended.

## Waterfall model

The waterfall model is a straightforward method of software development that has been in use for many years by which developers follow a linear progression between each stage by completing one section before beginning the next such as completing implementation then beginning testing. This methodology allows developers to follow clear deadline and gives clients a better understanding of when goals may be completed. However, the flaw with this methodology is that if changes to the project requirements arise, it could lead to significant delays as the current stage must be completed before re-evaluating and designing new features.

A diagram of a waterfall model

Description automatically generated

Waterfall model - (www.instagantt.com, n.d.)

## Agile model

The agile model is designed to provide fast results whereby stages are completed in sprints usually lasting a few weeks. First a very basic version of the software is developed (minimum viable product). In the agile development cycle, user stories are used to understand and keep track of the project requirements and product backlogs are used to keep track of how tasks should be handled across sprints.

## Model application

For this project, I will be making use of the agile model, therefore making use of 2-week sprints to develop my software. First I will establish the functional requirements for my project and use the MoSCoW (Must-have, Should-have, Could-have, Won’t-have) method, this will be used to inform my decisions on creating use case diagrams.

## Description

My vision for this project is for it to be made use of by non-professional web users who wish to securely store their usernames and passwords whilst being informed on the individual security of each password being stored to prevent the use of easily cracked passwords.

Username and password management systems have been available for public use for over 20 years and aid the user in keeping track of each individual login for various websites. The use of password managers has been widely observed to encourage higher standards of login security as the user does not need to remember various usernames and passwords as the manager keeps track for them, therefore security standards are more likely to be adhered to. (Anon, 2023)

Due to the nature of data being stored by username and password management software, legal, and ethical considerations must be taken to comply with current regulations. The’ Data Protection Act 1998’ and ‘Data Protection Act 2018’ are the UK legislation which govern how data can be collected and stored as well as what steps an organisation must take to ensure the security of said data. In this case steps must be taken to ensure that only the necessary data is stored, e.g., Usernames, Passwords, and the site they are for. Furthermore, the program should securely store any data collected to comply with legislation and prevent data leaks.

## GDPR

One of the aims of this project was to follow all current GDPR regulations surrounding data collection and protection including making the user aware of their user rights such as the right to access their personal data and their right to erasure where they may wish to remove data from records. These aims will be a high priority non-functional feature of the software and I will aim to complete this however time constraints may provide a challenge and therefore not all requirements may be met.

## Functional requirements

Below is a list of all functional requirements for my program followed by a priority ranking of each feature.

1. The program must be an interactive single page web application.
2. The Program must take a URL input to store.
3. The program must take a username input to store.
4. The program must take a password input to store.
5. The program must output a password rating based on the security level of the password on a scale of 1-10.
6. Must be able to read from a JSON file to provide the user with stored login information.
7. The user must be able to enter the URL for the website they want to retrieve their login information from if available.
8. The website should have a layout that is easy to use.
9. The website should have a description of its functionality.
10. The website should make the user aware of their GDPR rights in the footer.
11. The user should be able to delete, or update specified login details to comply with GDPR.
12. The page should use a colour scheme that is accessible to users with sight issues or colour blindness.

Must: 1, 2, 3, 4, 5, 6, 7

Should: 8, 10, 11

Could: 9, 12

## UML Diagrams

### User stories and use case scenarios.

in this section, the user stories and use cases will be outlined in the following diagram.

|  |  |
| --- | --- |
| **User** | **User with accessibility problems** |
| As a user I want to be able to enter a Username and Password to store with a URL | As a user with poor sight, I want the text to be a large enough size to be easily read |
| As a user I want to be able to Enter a URL to access a previously stored login under that URL | As a user with colour blindness, I want the colour scheme to allow me to easily see the program. |
| As a user I want to be able to enter a URL to specify a login to delete. |  |
| As a user I want to be able to enter a password to check its strength level. |  |

A diagram of a computer program

Description automatically generated

Strength of password displayed.

### Use Case Description

|  |  |
| --- | --- |
| Name | Check password |
| Description | Check the strength of a new password |
| Pre-Condition | Customer enters password |
| Post-Condition | Password strength returned |
| Error situation | No password entered |
| System state in error case | Display error message to user. Password cannot be checked |
| Triggers | Customer wishes to check password strength |
| Actors | User |
| Standard Process | 1. Password is entered. 2. Password length checked. 3. Password checked for capitals. 4. Password checked for numbers. 5. Password checked for special characters. 6. Password strength is displayed to the user. |
| Alternative Process | 1. Password not entered. 2. Password not checked. 3. Error message displayed |

|  |  |
| --- | --- |
| Name | Store new login |
| Description | Stores a new set of login details to a json file. |
| Pre-Condition | N/A |
| Post-Condition | Login details are stored. |
| Error situation | Login details are not stored |
| System state in error case | Details cannot be stored.  Return error message. |
| Triggers | User wishes to store login details. |
| Actors | User |
| Standard Process | 1. User enters website URL. 2. User enters Username/ email. 3. User enters Password. 4. User hits ‘Submit’. 5. Login details are stored to json file. |
| Alternative Process | 1. Login details are not entered. 2. Error message displayed. 3. User enters new details. |

|  |  |
| --- | --- |
| Name | Retrieve data |
| Description | Retrieve previously stored login details for the user to use elsewhere. |
| Pre-Condition | Login details previously stored |
| Post-Condition | Login details displayed to user. |
| Error situation | User requests login details to a URL that has not been stored. |
| System state in error case | Details cannot be displayed. |
| Triggers | User wants to retrieve stored data. |
| Actors | User |
| Standard Process | 1. User enters URL of website they wish to log into. 2. Stored data is searched for specified URL. 3. Corresponding username and password are displayed to the user. |
| Alternative Process | 1. Details are not available. 2. User enters new URL to retrieve login details of the corresponding website. |

### State diagrams.

A diagram of a software flow

Description automatically generated with medium confidence

### Sequence diagram.

A diagram of a computer program

Description automatically generated

# References

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