

NATIONAL UNIVERSITY OF SINGAPORE

Skylab: NUS Orbital Project Platform

by

Gu Junchao

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degree of Bachelor of Engineering

in the
Faculty of Engineering
Computer Engineering

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Declaration of Authorship

I, Gu Junchao, declare that this thesis titled, ‘Skylab: NUS Orbital Project Platform’ and the work presented in it are my own. I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University.
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

Signed:

Date:

“If debugging is the process of removing software bugs, then programming must be the process of putting them in.”

Edsger Dijkstra

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Abstract

Faculty of Engineering

Computer Engineering

Bachelor of Engineering

by Gu Junchao

The Thesis Abstract is written here (and usually kept to just this page). The page is kept centered vertically so can expand into the blank space above the title too...

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Chapter 1

Introduction

Orbital is the School of Computings self-driven programming summer experience. It is designed to give first-year students the opportunity to self-learn and build something useful. It is designed as a 4 modular credit (MC) module that is taken pass/fail (CS/CU) over the summer. With its focus on hands-on experience, it has been catching more and more attention and an increasing number of year-one students are joining the program to code something useful and interesting. During the academic year of 2015-2016, more than 250 students completed Orbital program.

For the evaluation of Orbital program, students are supposed to submit to Milestones as a team, stating what they have done during that phase. And then assigned peer teams(each team will be assigned for about 3 peer teams) will be giving feedback regarding the submission and the application built by the team of students. At the same time, there will be an adviser who will overlook the whole process and provide evaluation of a team's submission too. After 3 submissions and evaluations are done, a feedback is expected from a team to its peer teams and its adviser regarding the quality of evaluations received.

The nature of Orbital defines the scope of Skylab - A development project built for peer evaluations. It also provides students with a real-life Software Engineering training ground to learn and sharpen programming and system design skills.

1.1 Challenges

1.1.1 System design

Skylab is built on top of Ruby on Rails, a mature convention-over-configuration web framework. So the first challenge for me is to get familiar with the conventions and recommended ways of doing things in Rails community. Then I can design the web application on the top of main-stream philosophy in Rails community. Another issue with the design of Skylab is that this is the first time I have been designing such an application from ground up, without any guidance from any experienced Ruby on Rails developers. Therefore, it is all about try-and-error and explore my own way. Reading books and browsing on-line tutorials helped me a lot and luckily there are plenty of resources about Ruby on Rails development due to its popularity.

1.1.2 Evolving requirements

Although the scope of the project is very clear and well-defined, changes in requirements are expected and did happen a lot due to lack of consideration during initial system design phase, evolving features of Skylab project and Skylab users' feedback. The challenge is to cope with all changes and make necessary adjustments to the Skylab as new requirements are brought up. Therefore agility in development and adaptability of the system is expected.

1.1.3 Security

To be continued

1.1.4 Data migration

Sometimes schema migration is required as a result of change in requirements. Therefore, dealing with old data and migration of data without affecting the use of application is another challenge during the development of Skylab. Extreme attention when migrating is required as data may not be clean enough and careless migration may even cause the system to be unusable for some users.

1.1.5 Coding quality/maintainability

Although currently there is only me constantly contributing to Skylab repository, a good development cycle which is agile enough is not only important for me to keep track of history and manage different issues but also convenient for developers who will join later to jump in and get started. Testing is also a very important factor when it comes to long-term maintenance. A continuous integration would also help me in catching regression errors in development early and easily. Besides all mentioned above, refactoring is helping in the growth of the project.

1.2 Objectives

To be continued

1.3 Outline

In this report, I will discuss various accomplishments I have done in the development. Chapter 2 will be an overview of current architecture of Skylab, and methodologies I employed during the development. Then security related issues such as user authentication and access control will be discussed in Chapter 3. Chapter 4 is about problems in the implementation of submissions. Chapter 5 will be talking about design for peer evaluations. After then feedback related details will be discussed in Chapter 6. Chapter 7 is about adviser focus group meeting and its findings. Last but not least, a summary of work and an overlook of future development will come in Chapter 8.

Chapter 2

Background

Skylab is built on top of Ruby on Rails, a well known web development framework, with a great support of large communities, used widely in the industries by companies like Twitter, Groupon, Bloomberg, Airbnb and many more.

2.1 Literature review

To be continued

2.2 System design

To be continued

2.3 Development process

To be continued

Chapter 3

Security

3.1 Prevention of various attacks

3.2 User authentication

3.3 Access control

Chapter 4

Submission

4.1 Handling of rich text

4.2 Usability

Chapter 5

Peer Evaluation

5.1 Loading of different evaluation templates

5.2 Storing the response

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Chapter 6

Feedback

6.1 Survey template system

6.2 Question creation and storing of response

Chapter 7

Adviser focus group meeting

7.1 Focus group meeting

7.2 Results and findings

Chapter 8

Conclusion and future work

8.1 Conclusion

8.2 Future work

Appendix A

An Appendix

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