NUS IT

STUDENT DEVELOPMENT PLATFORM

INTERNSHIP

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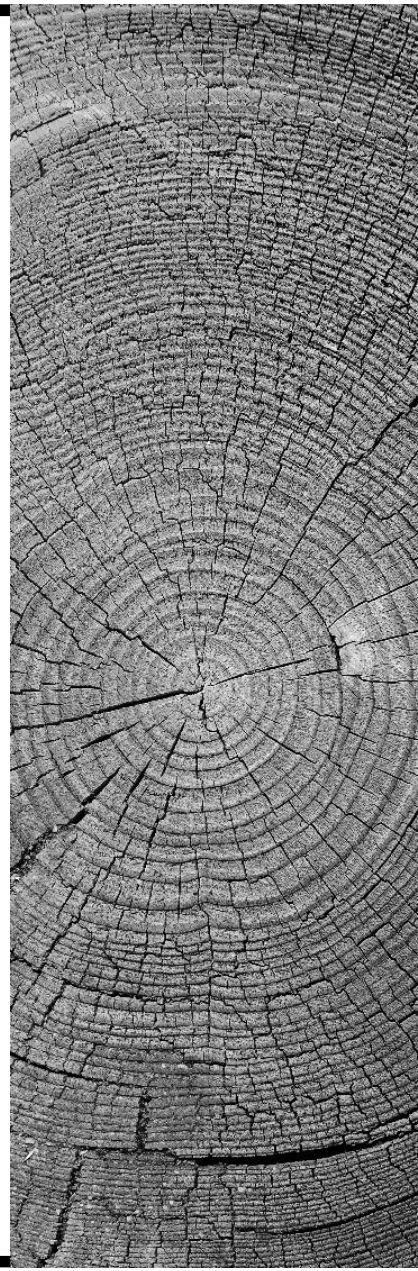


Overview

1. Background and Introduction
2. Objectives
3. Scope of Internship
4. Deliverables of Internship
   - Application, **Bao**
   - Infrastructure, **Ming Soon**
   - Governance, **Shen Kai**
5. Challenges Faced
6. What we have achieved
7. Further improvements
8. Looking Forward
9. Lesson Learnt
10. Summary

Background

- Arises from NUS management request to put up student related initiatives to **tap on their innovations**, ideas and to **contribute to the student learning** of real-life scenarios.

- **Increasing requests** from NUS halls and offices to adopt Student-developed applications, such as NUSMods, Hall Dining's Menu, NUS Buffet Response Team, etc.

- Applications developed by students usually **lack security measures** and often students are held back **hosting costs**.

Introduction

- Student Development Platform (SDP) is a secured platform that is built on top of the Amazon Web Service EC2/VPC.

- It is made **available for free** for student developers to **develop and host their applications** that are **useful to the NUS** student community.

Objectives

- To establish a **secured development and deployment platforms** to enable and support student developers to develop applications for students.
- To encourage student developers to produce potentially useful applications **for the NUS community.**
- To allow student developers to **access specific non-confidential NUS data** via API easily from their applications.
- To offer a **self-served service catalogue** for student developers to select various development environments from.

Scope of Internship

Student Development Platform

- **Application (Bao)**
  - Design the SDP Website to market and popularize the platform among NUS Students. Utilize the website when conducting outreach programs to the NUS community. Deploy the website to SDP
  - Develop the Science Research Programme Registration System (SRPRS) as an application to be deployed to SDP
- **Infrastructure (Ming Soon)**
  - Outreaching to Student Developer Community
  - Manage the SDP Website Deployment Architecture to host various applications
  - Creating a key performance index for evaluation and improvement
- **Governance (Shen Kai)**

  Establish/revise the existing guidelines and IT governance for SDP:
  - open source license
  - documentation
  - user guides
  - access control
  - Git development workflow

Deliverables of Internship

Student Development Platform

- **Application (Bao)**
  - Science Research Programme Online Registration System Application Prototype
  - SDP Webpage Design
  - Git Development Workflow Template
  - Recommendation of Open Source License
  - Revision of User Guides
- **Infrastructure (Ming Soon)**
  - Outreach and Engage
  - Identifying Needs of Students Developers
  - Recommendation for Improvements of SDP
  - SDP Website Deployment automation
  - Key Performance Indicators
- **Governance (Shen Kai)**
  - Documentation of Guidelines and Policy
  - Updating FAQs
  - Documentation on Vulnerability Scan Management SOP
  - Recommendation of Open Source License
  - Revision of User Guides

Application

Software Tools Used for Applications

EC2

- **HTML** is used to create the basic design of the SDP site.
- **CSS** is used to describe the presentation and beautify our website.
- **Javascript** is used to make the website reactive and responsive to users' actions.

- **Angular** is a Typescript-based front-end application framework to create dynamic web apps.
- **AngularJS** is a Javascript-based front-end framework to develop single-page applications.
- **Bootstrap** is a CSS Framework that allows us to beautify and create animations for our SDP website.

- Learn about Amazon Elastic Cloud 2 **(EC2)** and discuss the challenges when deploying our applications to SDP.

- **Successfully deploy the SDP Website to the Student Development Platform's AWS EC2 instance.**

Demonstration

- Student Development Platform Website

  Science Research Programme Online Registration System (SRPRS)

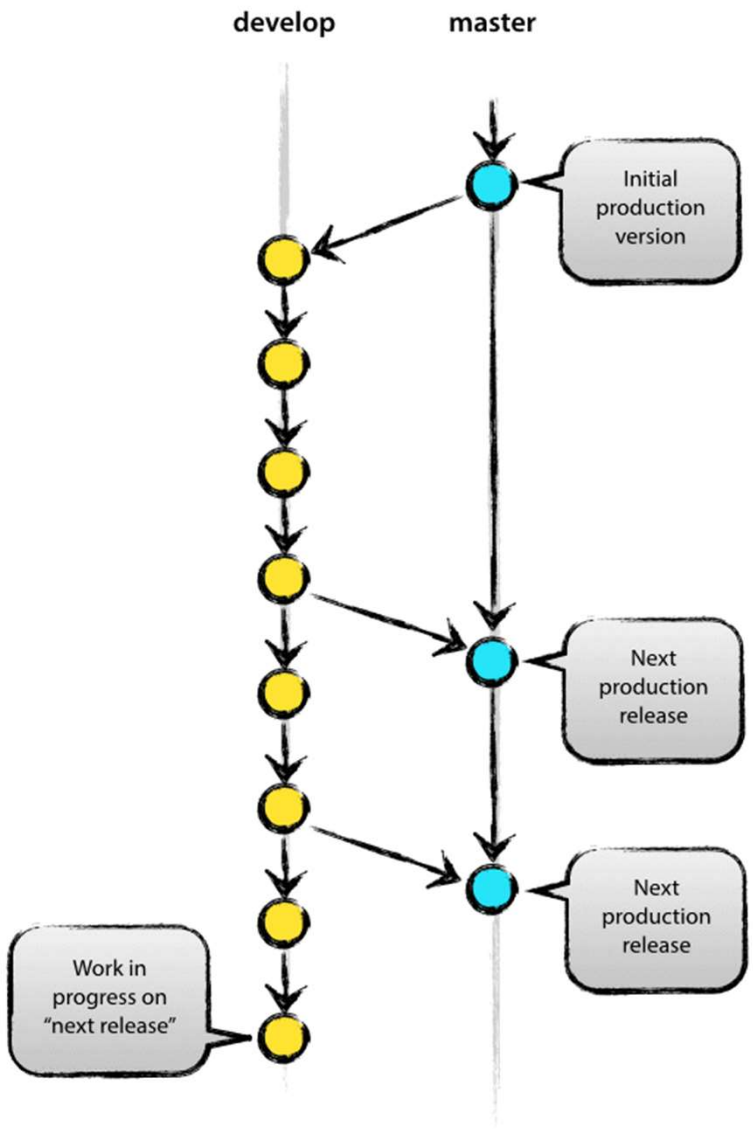
Science Research Programme Online Registration System (SRPRS)

- The Science Research Project (SRP) is a collaboration between NUS Faculty of Science and MOE to provide selected JC1/IP students the opportunity to take part in research projects under the guidance of NUS faculty members and established research centers.

- Our Registration System aims to facilitate a platform for interested students to register for SRP projects, as well as for mentors (who are NUS faculty members or external researchers) to recruit students for their research.

Demonstration

- Student Development Platform Website
- Science Research Programme Online Registration System (SRPRS)


develop
master
Initial production version
Next production release
Next production release
Work in progress on "next release"

Infrastructure

Outreach


Friends
Event
Group Channels
Aphrodite Project
Promotion
Engagement
Onboard

Onboarding – Telegram Bot

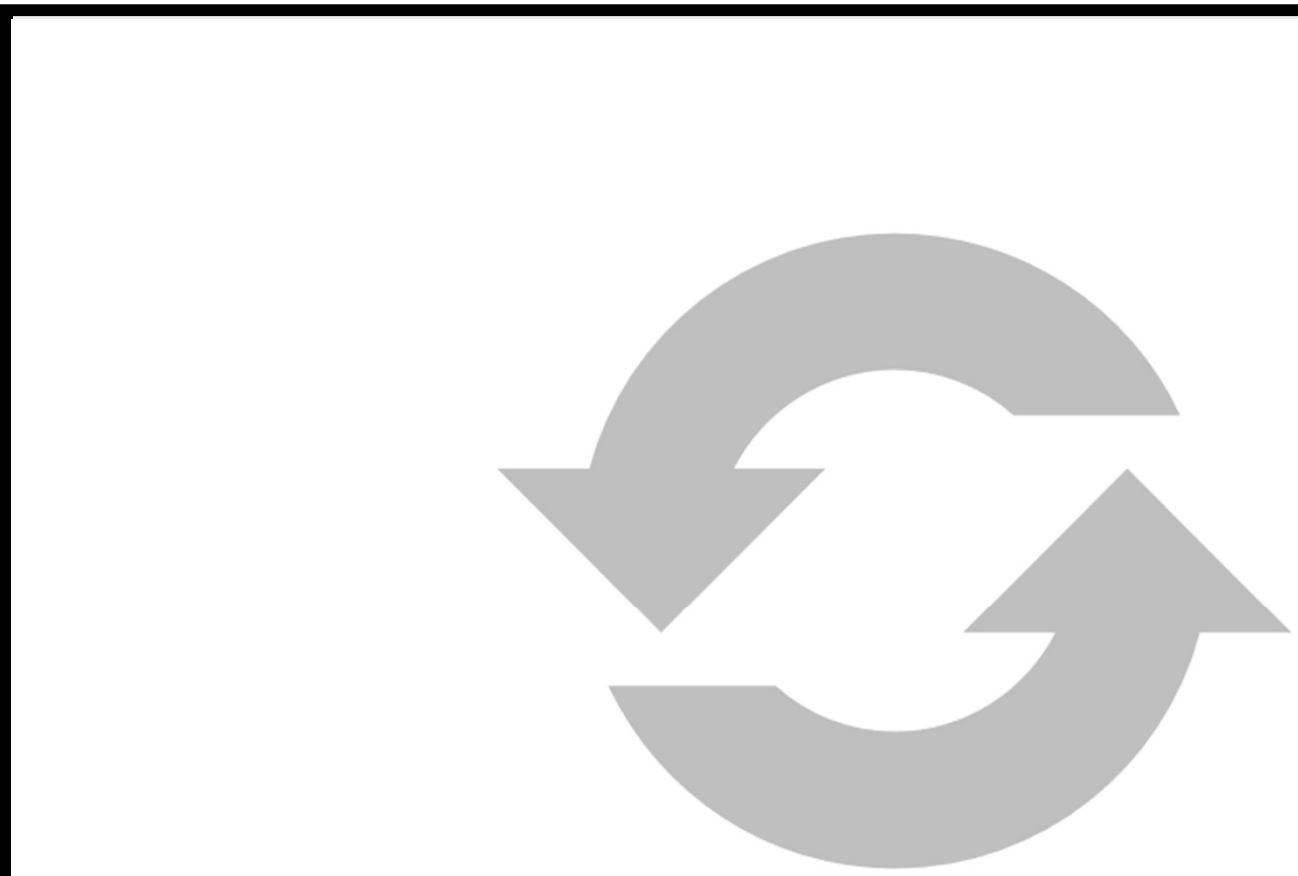
Case

Jet New - Year 1 CS Student
Project: DrFAQ Telegram Bot
Description: Q&A Answering NLP Chatbot – NUS USP Q&A

- OS: Mac – Unix Terminal
- Framework:
  - Built with spaCy
  - BERT Language Model
  - ElasticSearch
  - Telegram Bot API
- Language: Python
- Hosted on Heroku

Feedback – Onboarding Experience

- **Unaware** of features of EC2
- No concerns with regards to intellectual property rights
- **Lack of knowledge** about Licenses
- Concerned about **responsibility to commit** towards deployment
- **Recognition** as a developer



Needs Of Student Developers

Outreach

Developmental Stack - Survey Methodology for NUS Students

- Google Form
- Scraping Past Module Projects

Mobile Application Stack

Web Application Stack

Developmental

Frame	Mobile App Stack	No. (Total: 20)	Web Application Stack	No. (Total: 15)
Command Line Interface	Linux	15	Linux	3
	Windows	3	Windows	10
	MacOS	2	MacOS	2
Language	JavaScript	9	JavaScript	9
	Java, Kotlin, Dart	9	Ruby	6
	Swift	2	-	-
Framework (Frontend)	**React Native**	14	React Native	5
	Android Studio, Flutter	4	**AngularJS**	**10**
	Xcode, AppCode	2	-	-
Framework (Backend)	**Django**			12
	ExpressJS			3
	Ruby on Rails			5

Recommendation

Recommendations for Improvement of SDP

	Suggestions	Possible Results
Stronger Onboarding PDF guides	• Troubleshooting Guides • Templated Emailing Guides • Responsibility	• **Stronger User Experience** with SDP platform • **Reducing emailing time** on both ends • Reducing chances of being '**poached**' by other distributors • **Increased popularity** amongst student developers
Education & Branding	• Easing hosting process • Associating Creditability to SDP-Deployed Applications	
Student Developer Centric Improvement	• Feedback Survey System	

SDP Website Deployment

SDP WEBSITE DEPLOYMENT ARCHITECTURE

Redacted

1. User **retrieves code** from AWS CodeCommit.
2. User **deploys code,** using Terraform.
3. EC2 Instance is **launched.**
4. Security Group is created, configured and tagged to EC2 Instance.

SDP WEBSITE DEPLOYMENT ARCHITECTURE

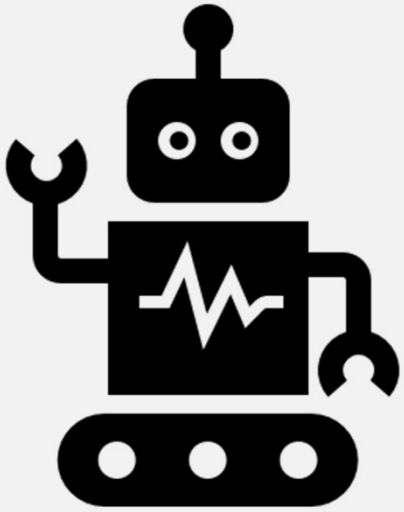
Redacted

5. Ansible is **executed.**
6. **Automated** SSH into created EC2 instance.
7. **Runs** 'install update' and installs Apache.
8. **Copies** SDP Website Files to EC2 instance.
9. Apache **hosts** SDP Website.

Redacted

SDP WEBSITE DEPLOYMENT ARCHITECTURE

ADVANTAGES



AUTOMATED

REDUCED DEPLOYMENT TIME

SECURITY

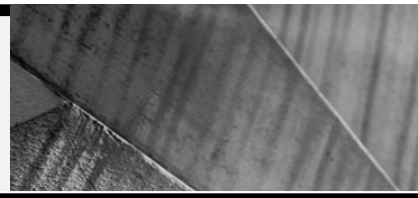
☛ Demonstration

Key Performance Indicator

How can we tell that SDP is Successful?

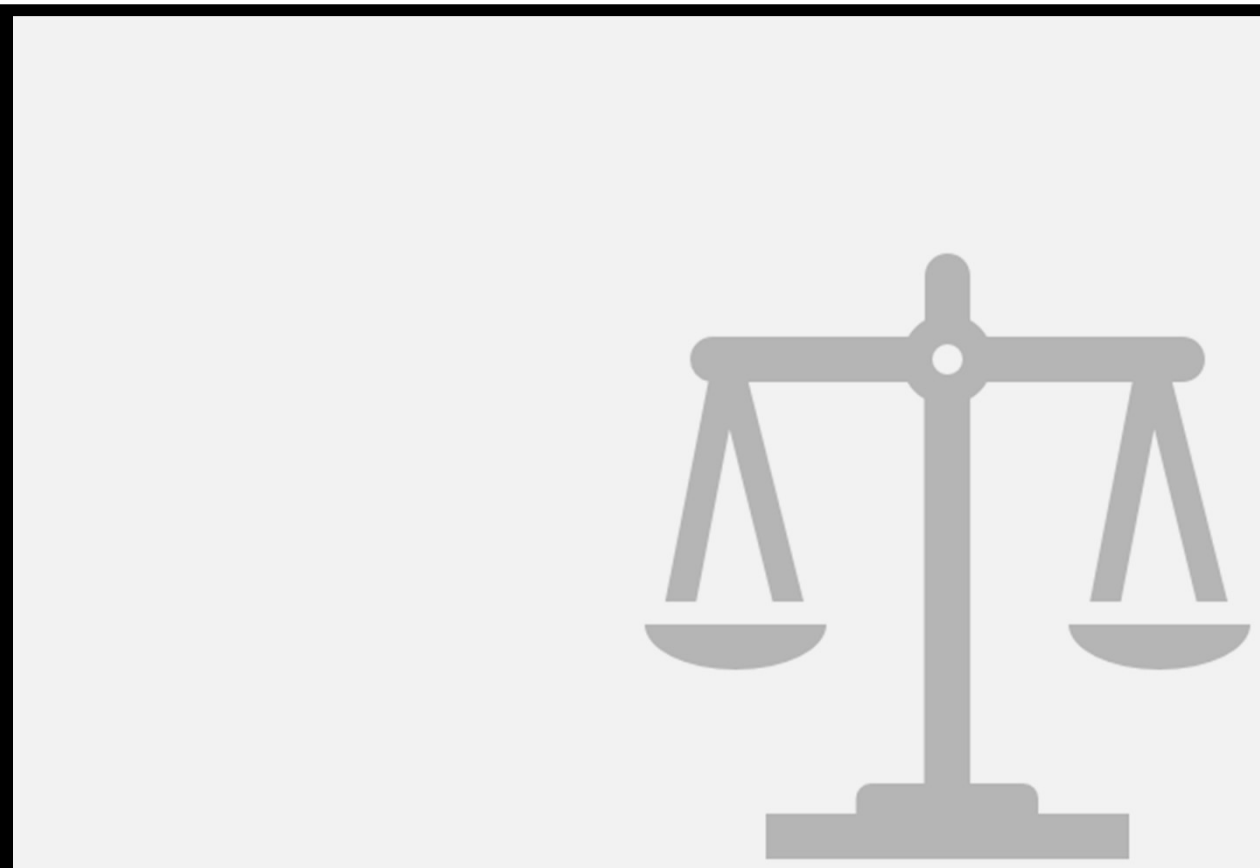
	Popularity	**Degree of Collaboration / Mutual Learning Opportunities**	**User Feedback** (User Satisfaction Score) – Rating Based Survey	**Usefulness of SDP-Hosted Applications**	**Successful Deployed Projects**
Measurement Components	Number of Club Partnerships • Mentions at events	Number of Open Source Projects Deployed	Ease of Onboarding Process • Time taken from application to development phase	Number of Deployed Projects	Hit Rate of Hosted Application
	Number of Project Applicants for SDP	Number of API referenced from any deployed application • Github	Ease of Hosting • Comfort level with AWS Cloud Services	Number of **Successful** Deployed Projects	Average Time Spent on Application
	Hit Rate of SDP Website	-	-	Number of Projects in Development	Returning Visitors
	-	-	-	Number of request for additional features on AWS	New Visitors

Measurement Tools Proposed



	Tools	
Feature	Google Analytics	Elastic Search
Application Type	Mobile and Web Only	Wide Range of Applications – Logging
Deployment Speed	Quicker	Slower
Learning Curve	Simple, Easy to Understand Dashboards	More Challenging
Customization	Restrictive	Flexible – able to retrieve customized information
Report Automation	Possible	Possible

Evaluation:
Short Term – Google Analytics
Long Term – Elastic Search & Google Analytics



Governance

Community Guidelines

Community Guidelines

- **Be Caring and Respectful**
  - To build an inclusive, diverse community, members have to be more polite, accepting and friendly/understanding/respectful to one another.
- **Be Responsible**
  - Make the effort to ensure the codes are safe and secure before moving it onto the platform. Your code will be scanned for vulnerabilities on the platform
- **Don’t upload inappropriate content**
  - Our platform don’t support any of the following content: Infringing Content, Nudity or sexual content, Illegal Content, Harmful or dangerous content, Hateful content, etc.

Terms of Service

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Privacy Policy

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Vulnerability Scan & Management SOP

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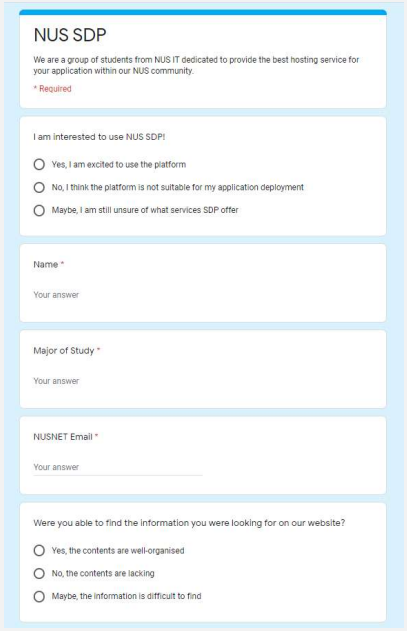
Survey Feedback for SDP Website



NUS SDP

We are a group of students from NUS IT dedicated to provide the best hosting service for your application within our NUS community.

* Required

I am interested to use NUS SDP!

- Yes, I am excited to use the platform
- No, I think the platform is not suitable for my application deployment
- Maybe, I am still unsure of what services SDP offer

Name *

Your answer

Major of Study *

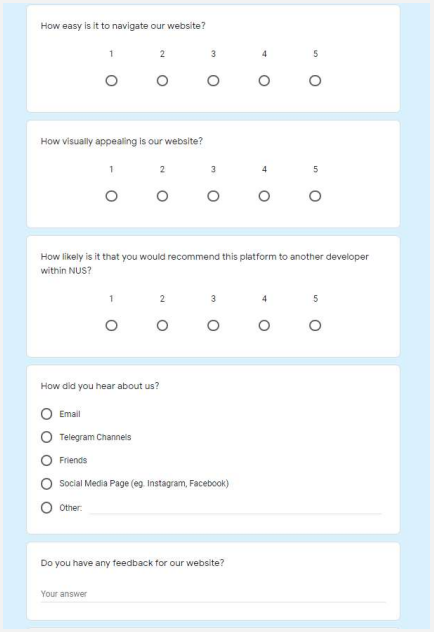
Your answer

NUSNET Email *

Your answer

Were you able to find the information you were looking for on our website?

- Yes, the contents are well-organised
- No, the contents are lacking
- Maybe, the information is difficult to find



How easy is it to navigate our website?

1 2 3 4 5

How visually appealing is our website?

1 2 3 4 5

How likely is it that you would recommend this platform to another developer within NUS?

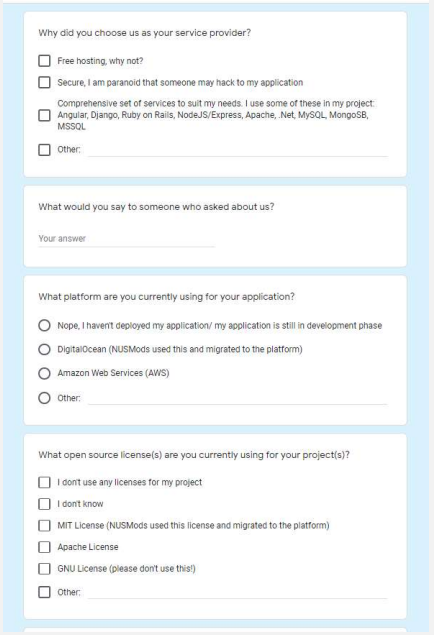
1 2 3 4 5

How did you hear about us?

- Email
- Telegram Channels
- Friends
- Social Media Page (eg. Instagram, Facebook)
- Other:

Do you have any feedback for our website?

Your answer



Why did you choose us as your service provider?

- [ ] Free hosting, why not?
- [ ] Secure, I am paranoid that someone may hack to my application
- [ ] Comprehensive set of services to suit my needs. I use some of these in my project: Angular, Django, Ruby on Rails, NodeJS/Express, Apache, .Net, MySQL, MongoSB, MSSQL
- [ ] Other:

What would you say to someone who asked about us?

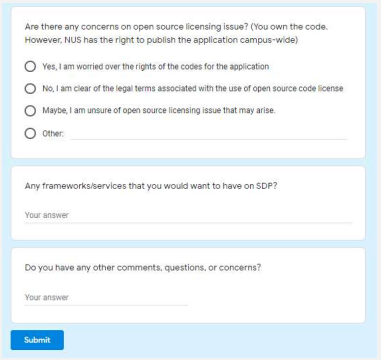
Your answer

What platform are you currently using for your application?

- Nope, I haven't deployed my application/ my application is still in development phase
- DigitalOcean (NUSMods used this and migrated to the platform)
- Amazon Web Services (AWS)
- Other:

What open source license(s) are you currently using for your project(s)?

- [ ] I don't use any licenses for my project
- [ ] I don't know
- [ ] MIT License (NUSMods used this license and migrated to the platform)
- [ ] Apache License
- [ ] GNU License (please don't use this!)
- [ ] Other:



Are there any concerns on open source licensing issue? (You own the code. However, NUS has the right to publish the application campus-wide)

- Yes, I am worried over the rights of the codes for the application
- No, I am clear of the legal terms associated with the use of open source code license
- Maybe, I am unsure of open source licensing issue that may arise.
- Other:

Any frameworks/services that you would want to have on SDP?

Your answer

Do you have any other comments, questions, or concerns?

Your answer

Submit

Challenges Faced

- Initial difficulty in learning and implementing front end technologies to create a good user experience design
- Open source license incompatibility posing a future issue when migrating application onto SDP
- Develop effective strategies to market and advertise SDP platform effectively
- Sourcing student developers

What we have achieved

- Build and design SDP website
- Build and design the Science Research Programme Online Registration System (SRPRS), an application to be migrated to SDP
- Guidelines and Policy
- Address FAQs
- User Guides
- Vulnerability Scan Management SOP — Using → sonarqube
- Surveys to gather feedback
- Develop marketing strategies
- Assist with developers in migrating their applications onto SDP
- Automated Deployment of SDP Website
- Understanding student developer needs
- Crafting of KPI for SDP

Further Improvements

- Use web tracking metric tool (Google Analytics) to gain vital insights on how visitors find SDP site, what they do when they get there, and other important information

- Gather feedback on webpage experience to improve future user experience

- Produce better marketing strategy to have greater outreach, as well as target the student developer community

Looking forward

- Continue to improve the Student Development Platform.
- Build more useful applications for NUS IT and the NUS community.
- Explore Machine Learning/IoT projects available.
- Elastic Search for KPI Measurement

Lessons Learnt

Bao

1. Technical skills:
   a. **Front-end Web Development:** HTML, CSS, Typescript/Javascript, Angular, AngularJS, Bootstrap, website deployment to SDP.
   b. **Copywriting** – creating attractive and appealing content on the website, which is in the form of text, animations, and design.
   c. **Experience in deploying websites** – SDP website
2. Soft Skills:
   a. **Communication** – presentation and public speaking skills, interacting with supervisors and fellow interns.
   b. **Marketing** – writing content that attracts students to join SDP.
   c. **Time management** – dealing with multiple projects in the internship period

Ming Soon

1. Soft Skills:
   a. **Business Acumen** – ability to better understand intention of higher management.
   b. **Communication** – relaying and presenting technical concepts to varying audience.
2. Hard Skills:
   a. **Documentation** – providing concise information for handing
   b. **Marketing** – 'Selling' SDP to Student Population
   c. **Systems** – Understanding of Workflow Process for large-scale applications
   d. Greater Exposure to AWS Cloud Services

Shen Kai

1. Understand the importance of good **network infrastructure** (NUS IT Infrastructure)
2. Learn **Agile Software Development** & **DevOps practices**
3. Understand **Software Development Process**
4. Acquire experience in **running a start-up IT business**
5. Learn to create **better front end user experience design**

Thank you!

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