Final Project Report

Group 6

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1. Description of Application

Background:

The NUS Integrated Virtual Learning Environment (IVLE) features workbins where students can download files uploaded by course instructors. However, students have to download files manually from the IVLE website each time a new file is uploaded. This may be troublesome to students since they have to access the website each time they want to download a new file, and students are forced to check the website each time they want to know if new files have been uploaded.

NUSCloud:

NUSCloud is an app that helps students sync files in IVLE instantly to their own cloud platforms. We support Dropbox, Box, Google Drive, OneDrive. Students only need to do three steps - log in with IVLE, select the modules whose workbins they want to sync and select the cloud platforms they want to sync to. All the files from the workbins of the modules they choose will be uploaded to a folder (NUSCloud folder created by us) in their chosen cloud platform, and the NUSCloud folder are automatically kept updated. For example, if new lecture notes are uploaded, these lecture notes will be synced to the cloud platform, without a need for the user to manually sync again.

We appealed to users based on some benefits that our app provides.
Firstly, we value our users' privacy. No credentials are stored by us, besides the tokens required to sync the files. Authentication is done by the relevant third-party providers, such as IVLE and the various cloud platforms. Moreover, we stress that we do not have access to change or view other files in your cloud platforms (except Box). Also, we pointed out that we cannot upload anything to their IVLE and neither do we have access to their grades at IVLE. This way, users can use our app with peace of mind, and they do not have to worry about us being able to delete files or view their private files.
Secondly, users only need to sync once and never again. This is the main reason for making our app, since manually downloading files from IVLE is inconvenient. With NUSCloud, users just need to sync once and new files will automatically sync to the cloud platforms as we monitor all files in IVLE.

Thirdly, one of the main benefits of syncing their IVLE files to cloud platforms is the ability to access files from anywhere, as long as users have a mobile device or computer. Even if they lose their devices, they can still access their notes from any other computer devices; their notes are not lost. Also, their notes can be shared with anyone.

2. Competitive analysis

There have been numerous attempts to build such an application that downloads files from IVLE automatically. However, most of them are now deprecated.

Similar applications:

1. https://nusync.sshz.org
    - Website is deprecated and no longer maintained as all the developers have graduated
    - Only supports Dropbox

2. http://yjyao.com/2012/08/nus-ivle-downloader.html
    - This app has stopped working as the school revamps the IVLE API and limits the poll rate.
    - Desktop version only, does not help mobile users
    - Upon rename of the folder, it does not work anymore.

What makes our application special:

- The existing softwares are mostly deprecated, and do not work with the current IVLE and LumiNUS.
- Students need to download files from the ivle workbin to see their lecture slides, tutorial files, and so on. However, folder managers usually upload the files periodically, thus students need to check the ivle periodically for all the modules. Since this process is very tedious, we want to simplify this process by using this app by syncing everything to the cloud folder (i.e Dropbox, Google drive).
- We emphasise on security and privacy. The other apps may not be secure (storing passwords and user id), and they do not emphasise on privacy (e.g. They do not specify the permissions that their app has).

3. Review of Milestones and Timeline

Timeline	**Milestones**

7 October	● Set up backend ● Check how to use APIs
14 October	● Wire up to IVLE API and Dropbox API ● App prototype using simple front-end
15 October	● User validation ● User feedback Submit Progress report 1 (Monday, 15 October 2018, 23:59)
21 October	● **Hook up frontend with backend** ● **Deploy prototype** ● **Start getting friends to try and test app** ● Customer contact report
28 October	● Add support for more cloud storages (Google Drive) ● Improve prototype based on feedback
29 October	Submit Progress report 2 (Monday, 29 October 2018, 23:59)
4 November	● Add support for more cloud storages (One Drive, Box) ● Customer contact report ● Improve prototype based on feedback ● Marketing ● Prepare for presentation on 5th November ● Fix security issues before security check ● Make final project video and poster
5 November	Submit In-Class Progress Report (Monday, 5 November 2018, 18:30) Present on project in class Submit final project video and poster
11 November	● Prepare for presentation
14 November	Submit Poster session (Wednesday, 14 November 2018, 23:59)
18 November	Submit Final report (Sunday, 18 November 2018, 23:59)

<u>Milestones we hit:</u>
Most of the milestones are hit.
By October 7, we have set up the basic backend. We also did a UI prototype, and refined the UI according to discussions that we have.
By October 15, the front end was set up using React and styled according to the prototype. Besides that, we also went around to interview people and ask for their feedback on the app concept so that we can validate our app assumptions.

The period after that was spent on including more cloud platform besides Dropbox, which took some time due to unforeseen problems. We also modified the look and content of the website after some feedback from users. For example, initially, we just briefly described the application on the about page, which led to some users complaining that the information was too vague and they did not know what they were supposed to do. Hence we changed the about page to appeal to users by stating what they can gain from using our app, and also added an FAQ page for common questions.
By 29 October, we had a functional app that helps students sync their files from IVLE to Dropbox and Google Drive, although it is not perfect.
After that, we focused on marketing and adding cloud storages which are OneDrive and Box. Posters were designed and different colour schemes were made to see which one engages the target audience the best. We put up posters in different parts of many areas such as computing, engineering, fass and yale nus. Also, we made the promotional video that was meant to be shown during steps.
By 5 November, we presented our app to the class, and had planned out marketing strategies to promote our app. However, OneDrive could not be set up due to problems with the OneDrive API.

Milestones we missed:
Although most of the milestones were met, there were a few that could have been done better and a few that could not be met.
Our marketing progress was quite slow as we did not plan it properly. Initially, we were supposed to promote our app to students once we set up the link with Dropbox. However, after much discussion, we decided to postpone marketing till after all the cloud storages were set up because we thought a fully functional app would make a better impression on users, but this was not the most logical thing to do. We should have pushed on and promoted our app to the student body, though it is not fully functional. Hence, our marketing milestones could have been better fulfilled.
Also, we could not set up OneDrive because there were some problems encountered, though we managed to fix it in the end.

4. Individual Contribution and Roles

Mok Wei Xiong, Edmund
Designed database schema
Wrote APIs for frontend to connect with using Django
Wrote initial prototype syncing from IVLE to Dropbox
Wrote backend code to sync from IVLE to Dropbox, Box and OneDrive
Setup nginx, gunicorn, nodejs server on Google Cloud
Setup Celery and redis for repeated tasks

Setup HTTPS with Lets Encrypt for *.nuscloud.com
Report writing

Chiang Weng Kiat
Validation
Marketing
User feedback and customer contact
UI workflow
Gdrive feature
Database schema
nginx, gunicorn scripts
Https
Report writing

Samuel Henry Kurniawan
Website design (userview, header)
Website responsive design
API AJAX calls from backend, IVLE, and cloud services
UI/UX user testing
Google analytics
Customer services
Marketing (putting posters in several faculties, nuswhispers, and some targeted users)
Report writing

Tan Su Yee
Logo design
Website design (home, about, contact, faq pages, footer)
Auto email system for the contact form
Final poster for steps
Posters for marketing
Final project promotional video
Some api calls on frontend
Get domain name
Report writing

5. Application Design

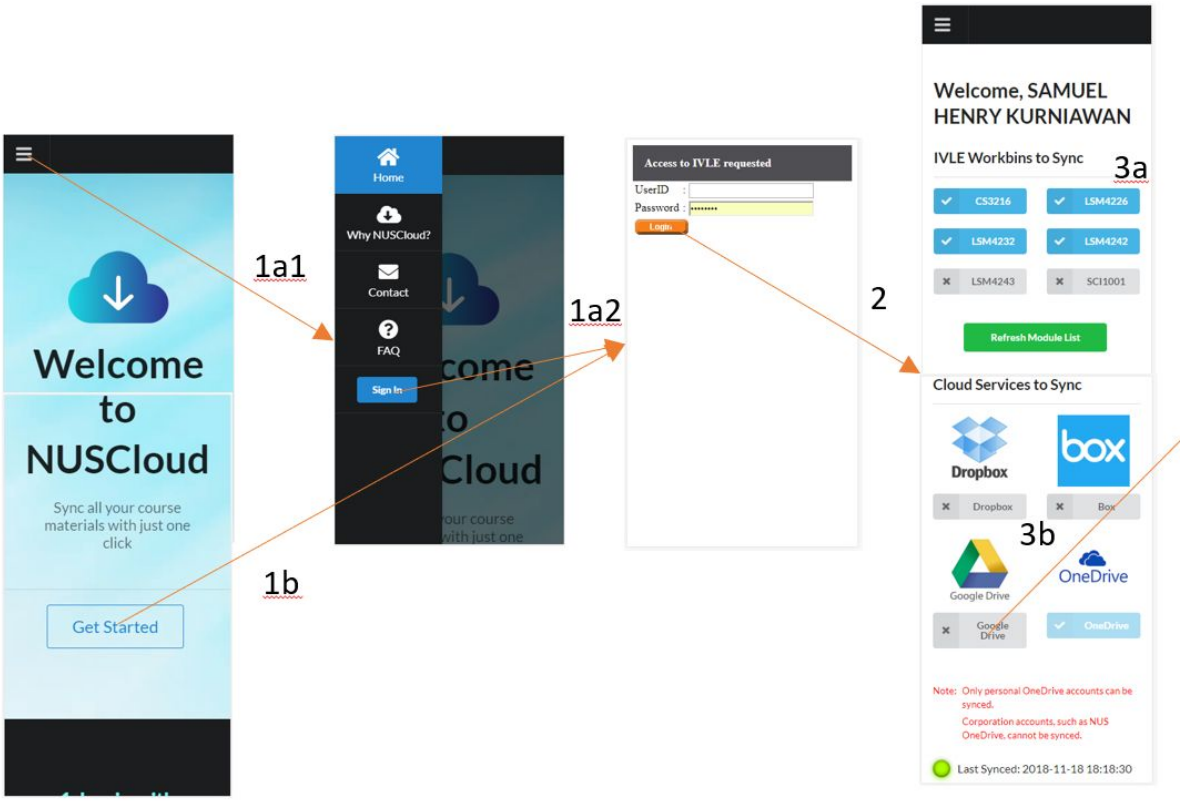
High-level design:
The front end allows users to login and select which IVLE workbin folders they wish to synchronize with their cloud storage, or to start and stop syncing. The backend will poll the IVLE API regularly to make sure that the folders in the user's cloud storage

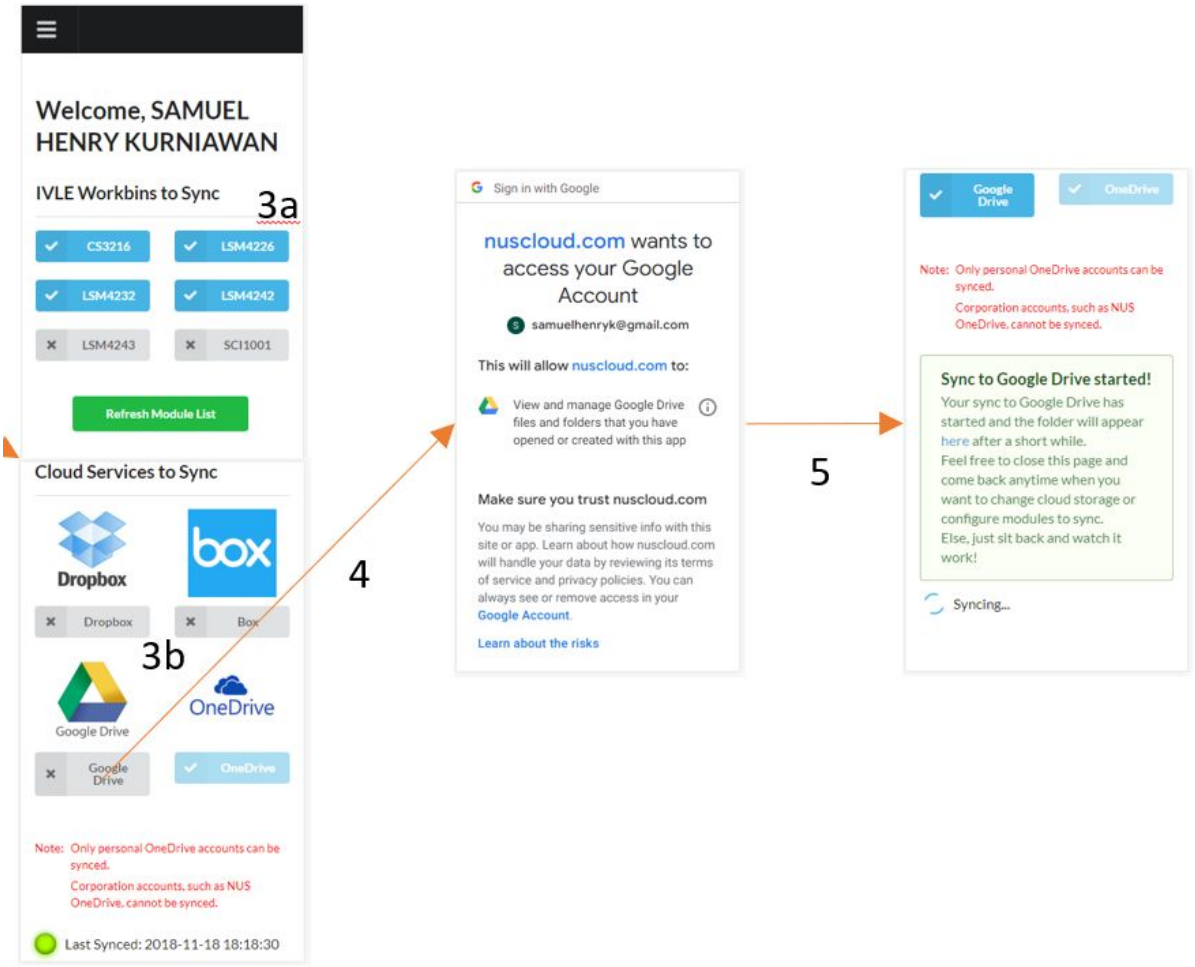
are in sync with that in IVLE. Any changes in the IVLE workbin folders are detected by the backend and will interact with the cloud storage APIs to push the detected changes. The user simply needs to interact with his or her cloud storage folder which is automatically updated for him or her. The backend also interacts with a relational database to store user settings (e.g. synchronization settings) and authorization to IVLE and cloud storage APIs.

Tech stack:
For the frontend, we used React as our view library and node.js to serve our front-end files. The front end will then communicate with our backend API server.

For the backend, we used Django as our web framework and MySQL for the database. We used Celery as our task queue, Celery Beat as the repeated task scheduler, Redis as task broker for Celery. The scheduler initiates a check for update for every user every 10 minutes, and we have set up 10 Celery workers to execute the tasks. 10 is just a magic number for now, and we can easily scale our application by simply increasing the number of workers. CPU load is not really a concern since the updates are all network heavy rather than CPU intensive. The only concern would be API rate limits, since we are quite dependent on these external APIs.

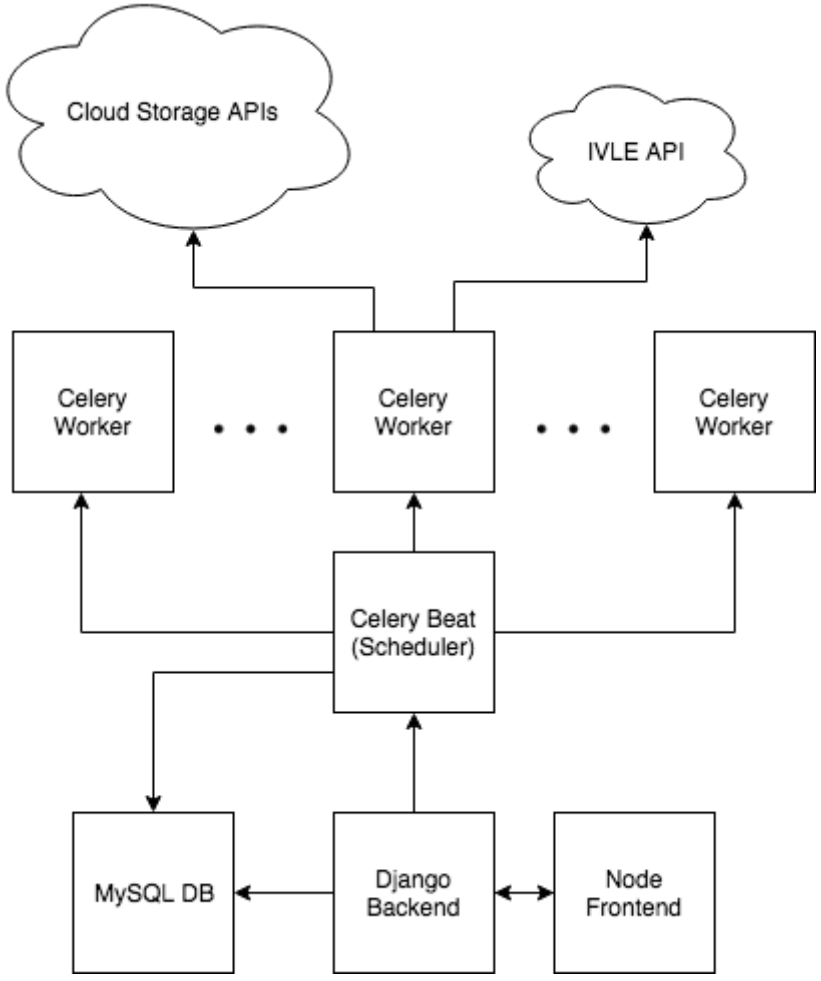
User flow:


Welcome to NUSCloud
Sync all your course materials with just one click
Get Started
Home
Why NUSCloud?
Contact
FAQ
Sign In
1a1
1b
1a2
Access to IVLE requested
UserID :
Password :
Login
2
Welcome, SAMUEL HENRY KURNIAWAN
IVLE Workbins to Sync
3a
CS3216
LSM4226
LSM4232
LSM4242
LSM4243
SCI1001
Refresh Module List
Cloud Services to Sync
Dropbox
box
Dropbox
Box
3b
Google Drive
OneDrive
Google Drive
OneDrive
Note: Only personal OneDrive accounts can be synced.
Corporation accounts, such as NUS OneDrive, cannot be synced.
Last Synced: 2018-11-18 18:18:30

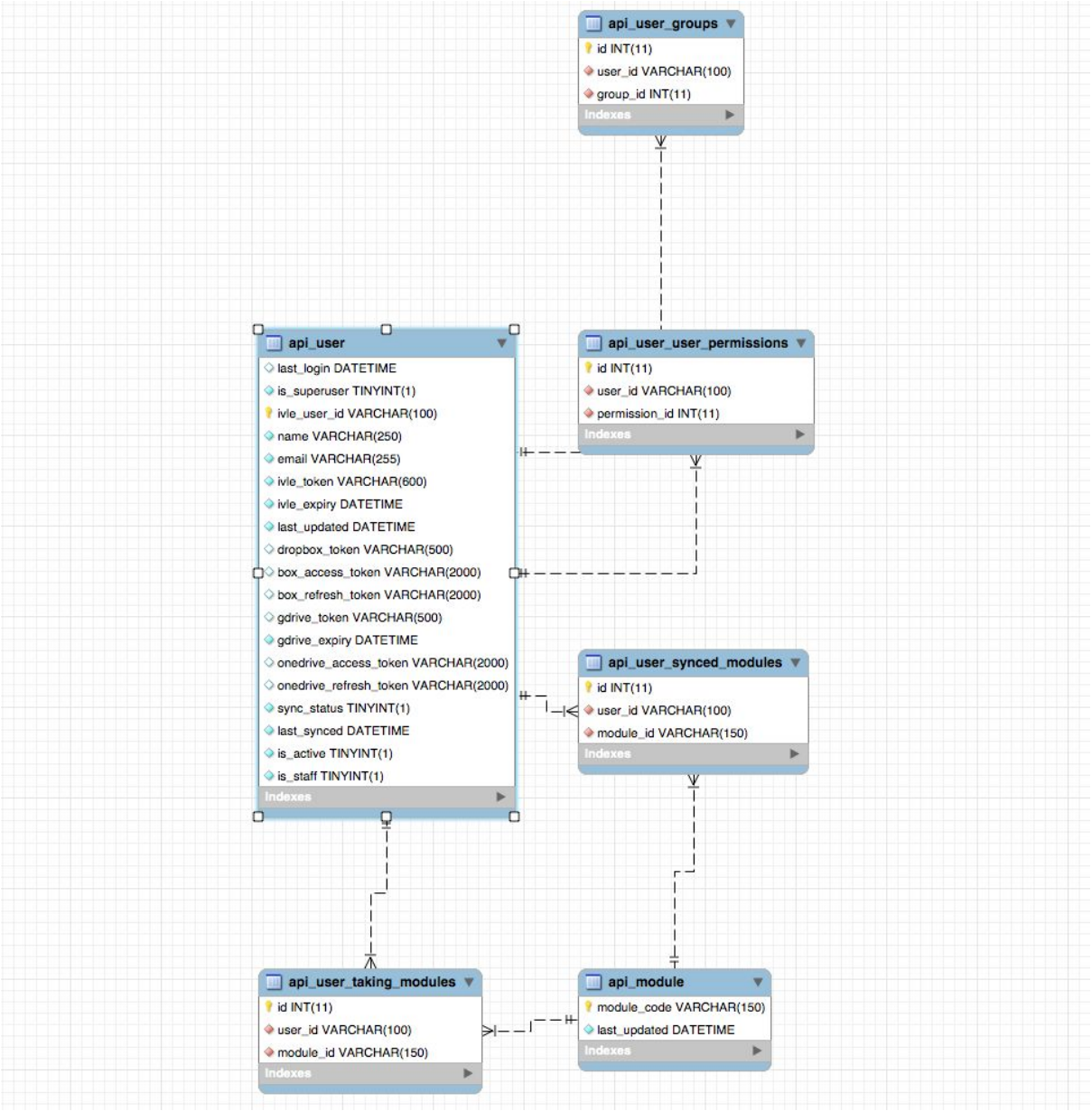


1.
    a.
        i. Click the menu in the header
        ii. And click the sign-in button to sign in via IVLE
    b. Or click the get started button in the home to immediately go to IVLE sign in page
2. Key in your UserID and Password in IVLE and click Log in
3.
    a. Choose your modules that you want to sync (it is all ticked by default, but you can change the settings)
    b. Choose a cloud storage that you want to sync the workbin to
4. It will be redirected into the cloud sign in, read and authorize the page to be redirected back to nuscloud website
5. The sync is starting, wait for a while (until the animation changes back into a green LED light, as seen in below part of 3b), and see the workbin files in the cloud service

Architecture:



Database schema



6. Analytics

Google analytics:

NUSCloud
All Web Site Data

GO TO REPORT

Audience Overview

All Users
100.00% Users

Nov 7, 2018 - Nov 17, 2018

Overview

Users	New Users	Sessions
254	253	509

Number of Sessions per User	Pageviews	Pages / Session
2.00	783	1.54

Avg. Session Duration	Bounce Rate
00:01:30	83.50%

	Language	Users	% Users
1.	en-us	142	55.91%
2.	en-sg	50	19.69%
3.	en-gb	48	18.90%
4.	en	5	1.97%
5.	zh-cn	3	1.18%
6.	ko-kr	2	0.79%
7.	c	1	0.39%
8.	fr	1	0.39%
9.	ko	1	0.39%
10.	vi-vn	1	0.39%

NUSCloud
All Web Site Data

GO TO REPORT

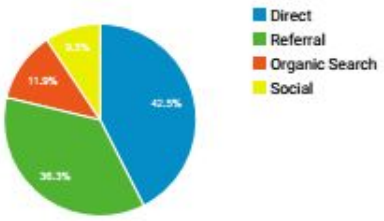
Acquisition Overview

All Users
100.00% Users

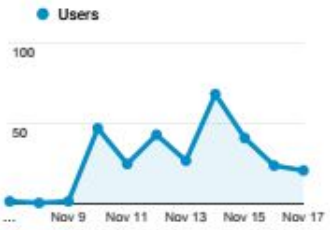
Nov 7, 2018 - Nov 17, 2018

Primary Dimension: Top Channels | Conversion: All Goals | Edit Channel Grouping

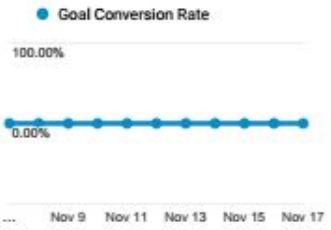
Top Channels



Users



Conversions



		Acquisition			Behavior		
		Users ↓	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration
		254	253	509	83.50%	1.54	00:01:30
1	Direct	150			80.21%		
2	Referral	128			83.75%		
3	Organic Searc	42			93.18%		
4	Social	33			87.88%		

To see all 4 Channels click here.

Conversions

Set up a goal.

To see outcome metrics, define one or more goals.

GET STARTED

Our marketing campaign aims to increase the number of users exponentially. Looking at the google analytics report, most of our users come directly (typing manually the address). Thus, it seems it comes mostly from email blasts, STEPS' campaign and poster placement in several faculties. The poster placement seems quite successful since we are placing some of the posters in the strategic places that people will see, for example water coolers (people will stay and see the poster since they need to fill their bottles) and toilet cubicles (people have tendency to look at anything in front of them, thus we were placing posters there). The second most prominent source is referral links, which is from other websites. Likely from NUSWhispers that we posted some time ago. Posting in NUSWhispers is a targeted campaign since most of their users are NUS Students. A huge increase in page views in the google analytics the day after our post in NUSWhispers (posted on 9th November night). Another source would be social media, most likely from the link that we shared in our social medias and group chats. These sources provide relatively less users since probably most people tend to ignore advertisement people sent in group chats or facebook posts.

7. Future Plans and Strategies

The current objective of the application is to help to download files from IVLE automatically. However, we are aware that IVLE is currently in the process of being phased out and will be replaced by the newer LumiNUS system next academic year AY19/20. Despite that, we think that implementing this application will still solve a pain point for NUS students at the current point in time. Furthermore, once we have the infrastructure in place, we should be able to migrate from the IVLE API to the LumiNUS API easily.

In the future, we also intend to expand the set of features beyond just an automated downloader, into an IVLE enhancer (or LumiNUS enhancer), with some new features like webcast downloader (by converting the downloaded streaming chunks into a full video).

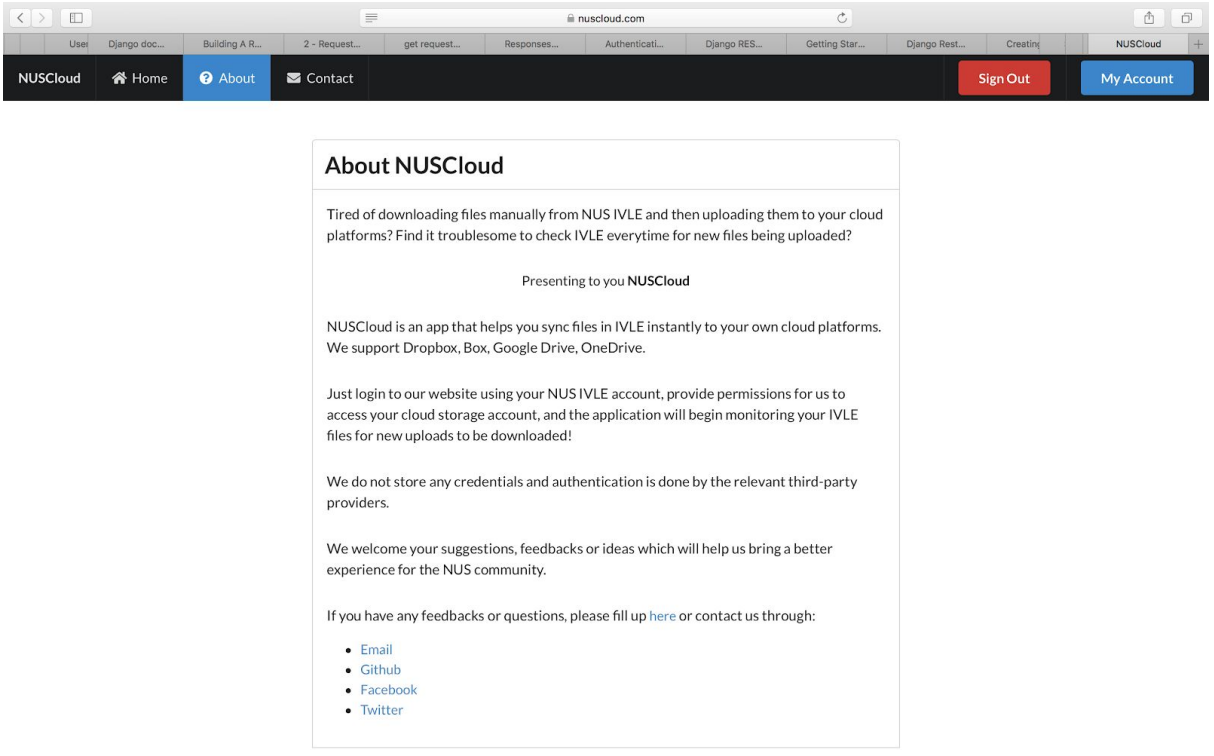
We also plan to make the source code open so that people (especially from NUS) can also contribute to the code to make the system better. Even after migrated from IVLE to LumiNUS, we also hope this app will gain interests from NUS Hackers or even the NUS itself so that someone can take over this app (since most of us are year 4 students) and continue to help more students via this app.

Another possibility is talking to the CIT department to integrate this application directly with the new LumiNUS platform, since it would be useful for students as well as be officially supported by the school.

We aim to be able to promote this application at the start of next semester as we were told by a lot of potential users that they will use it next semester since the semester is coming to an end. This could perhaps explain the discrepancy in the number of pages views and the actual sign up numbers. (google analytics)

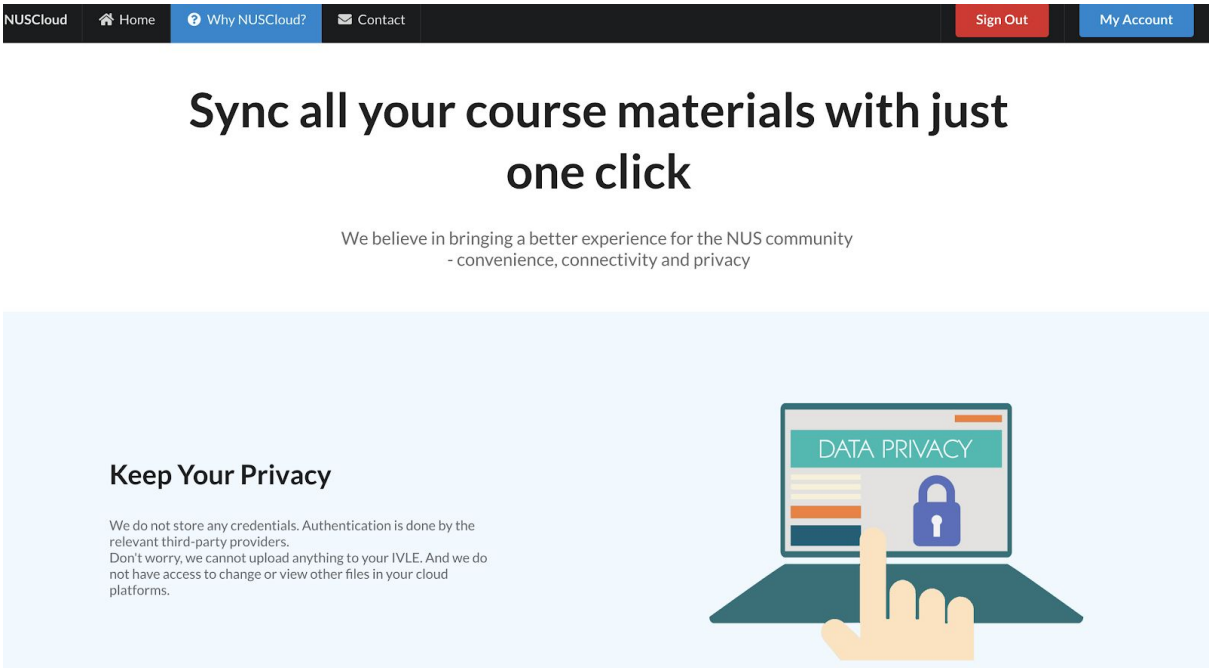
8. Insights Gained from the Project

Frontend



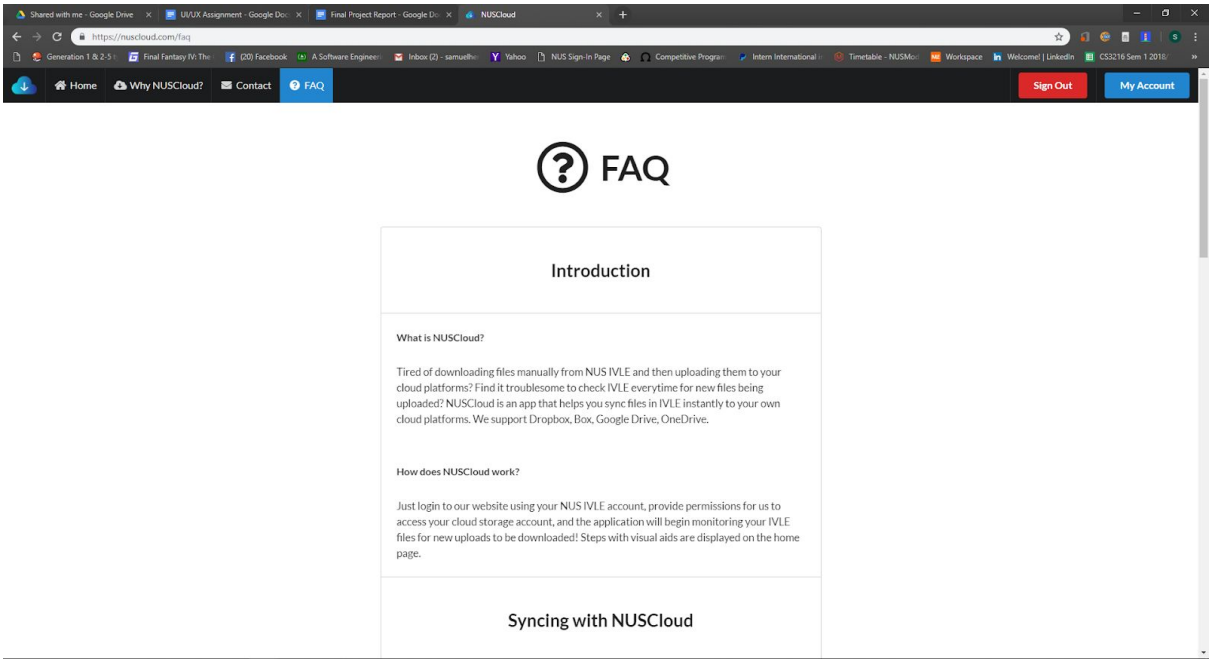
Depicted above was our initial about page. It is common to think the about page is not important and only to state details about the project. However, for our application, it is of significant important. We realised that there are two potential types of users for our application, users who care about security and those who don't. We focused on making the home page of the application to explain how our

application works to attract users. We left out security concerns since we thought that it would be too much information on the home page. Hence, this is where the about page comes into play. People who care about security would tend to want to find out more about the project and would visit the about page. Hence, the about page is essential to our application to address these concerns and yet not clutter users who do not care about it with unnecessary information. Our new about page is depicted below.

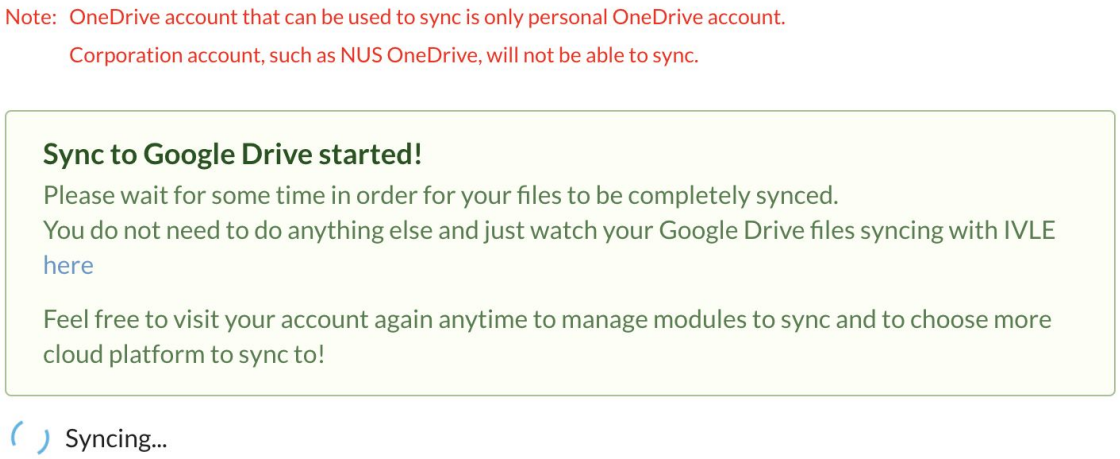


FAQ

Because there are a lot of details that users want to know, we decided to put FAQ, so potential users that are interested but have concerns can see the faqs and hopefully clears their doubt instead of just leave the page. This would also ensure that the homepage would not be cluttered with information which may make users not convert and use our application due to a overload of information.



We used to think that people would know that once they click on the settings and link up their cloud service, it is understood that syncing has begun. We then realised that it is not intuitive since such an application is rare in today's market and we would need to take steps to educate the market. We hence came up with the UI below to teach users on how the syncing would work.



Using API of external parties is often quite difficult, especially when the documentation is not that complete, and the structure of the documentation is quite confusing. We learn that if we are going to build our API, it is always good to do a proper documentation, structuring, and if possible include all the error possibilities / mistakes and how to solve it.

Backend

- Hard to make a product that is unique for each user
    - The core product is the same for every user, since to them it will just sync from IVLE to their cloud storage
    - However, every user has a different set of modules and every module has a different code, name, folder structure, folder names, etc. Thus, there will always be some edge case that is hard for us to find since IVLE's API documentation does not declare what are valid or invalid names.
    - Most drives SDK are built for personal use, using the SDK to build a product at scale requires tweaking. The documentation is mostly poor and requires trial and error.
    - Need to reactive to changes by external parties unlike standalone applications.

Marketing

Marketing efforts:
https://drive.google.com/open?id=1k5kiXCV_tNg4PofgsbWKnQbqpHhmzzh1

It is not enough to do validation just for features, it needs to be done for user profile as well. We did user profiling by starting with a set of assumptions and then coming up with experiments to validate them similar to what we did for features in the earlier two reports.
One of our assumptions was that students only care about convenience. However, upon promoting the application in SOC, we realised that students there were concerned about security and privacy. Hence, in our posters and email blasts to the SOC population, we take care to emphasize security over convenience.
In other faculties such as FASS, Engineering and Science, we realised that they are not too concerned with security and interested in the convenience, hence, when we create posters and promote to those faculties in terms of facebook and email posts, we emphasize more on the convenience our application provides.

We also learnt to use google analytics to gather which strategies were more effective than others. We would put up posters on monday, then get engineering to blast on tuesday, nuswhispers on saturday. Since they are carried out on different days, we take care to track the new page views as a result the new page view as a result of the action. We would tweak it if we could, for example, if putting up posters did not lead to a huge increase in page views, we would change the location of the poster the next day or change the colour of the poster to see if it would be more effective.

We were also were mindful of how to carry out each marketing action. Most people would not read emails on weekends so we made sure those blasts were done on weekdays. Most students won't be in school on fridays and weekends so we made

sure to put posters up during weekdays before the weekend. Most students would be on nuswhispers towards the end of the week or on weekend killing time. we made sure our post was out near the end of the week, 9th Nov, friday.

We also learnt that credentials matter in pushing out a product through official means. Despite enlisting help from business, arts, SDE and NUSSU for spreading the word, they would like confirmation of a professor to validate that the application is safe due to security concerns before helping us spread the word. We are currently awaiting feedback from the pentesting to be done by professor Ben Leong's colleague to verify our application's security. We can then proceed to get professor's Ben Leong backing for the application and would be able to use official channels to spread out application next semester.