

**VIETNAM GENERAL CONFEDERATION OF LABOUR  
TON DUC THANG UNIVERSITY  
FACULTY OF INFORMATION TECHNOLOGY**



**WEB PROGRAMMING AND APPLICATIONS  
MIDTERM ESSAY**

# **SINGLE PAGE APPLICATION**

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**Class : 20H50204**

**20H50303**

**20H50202**

**Course : 24**

**HO CHI MINH CITY, 2021  
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## **THANK YOU**

I would like to thank Ton Duc Thang University and the Faculty of Information Technology for creating conditions for students to prepare middle essays so that students can complete midterms in the safest and most appropriate conditions. Thank you to Ts. Mai Van Manh for guiding me through the study process and midterm essays of the semester to achieve the best results.

## **THE ESSAY WAS COMPLETED AT TON DUC THANG UNIVERSITY**

I hereby declare that this is my/our own project and is guided by Dr. Nguyen

Van A. The research contents and results in this topic are honest and have not been published in any form before. The data in the tables for analysis, comments, and evaluation are collected by the author himself from different sources, clearly stated in the reference section.

In addition, the project also uses a number of comments, assessments as well as data of other authors, other agencies, and organizations, with citations and source annotations..

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*Ho Chi Minh City, day month year*

*Author*

*(sign and write full name)*

*Phan Ngọc Hoàng Anh*

## **TEACHER'S CONFIRMATION AND ASSESSMENT SECTION**

**The confirmation part of the instructor**

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## **SUMMARY**

We reviewed the video recordings of the lecturers, actively looked up knowledge related to single-page applications, and read official documents on technologies and frameworks related to the topic to learn. From there we divide the essay into the following sections. The first is the introduction, we will introduce the selected topic, leading to the theory part. In the theoretical basis, we will talk about the concept, how it works, advantages, disadvantages, and when to use single page application. In the third part, we will talk about the sample website, the technologies, and knowledge we have applied, and how it works. Finally, as a summary, we'll talk about what we've learned during the writing of the essay, its limitations, and future improvements. Now let's go to the main content.

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## **LIST OF SIGNS AND ABBREVIATIONS**

### **ABBREVIATIONS**

SPA    Single page application

MPA    Multi page application



## **CHAPTER 1 – TOPIC INTRODUCTION**

At the present time, we have heard the phrase "Single Page Application" a lot, it has almost become the standard for creating modern web applications because it brings so many benefits related to time and user experience.

Tech giants have also applied this technology to develop websites including Facebook, Gmail, LinkedIn...

But with all this, is it really good to apply to your upcoming project? And what is Single Page Application, its benefits, and when should you use it. We will clarify it in this essay.

## **CHAPTER 2 – THEORETICAL BASIS**

### **2.1 What's Single Page Application?**

Single page application could be a single page where a lot of information stays the same and just some pieces must be updated at a time.

The SPA only sends what you would like with each click, and your browser renders that information. this is often different from a standard page load where the server re-renders a page with every click you create and sends it to your browser.

For example, every time you search for a user on Facebook using the search bar, only some information about the name, address, etc. is changed. Other things like the navigation bar, sidebar, header, and more information remain the same.

Now let's dig a bit deeper into SPAs and see how it works.

### **2.2How does it work?**

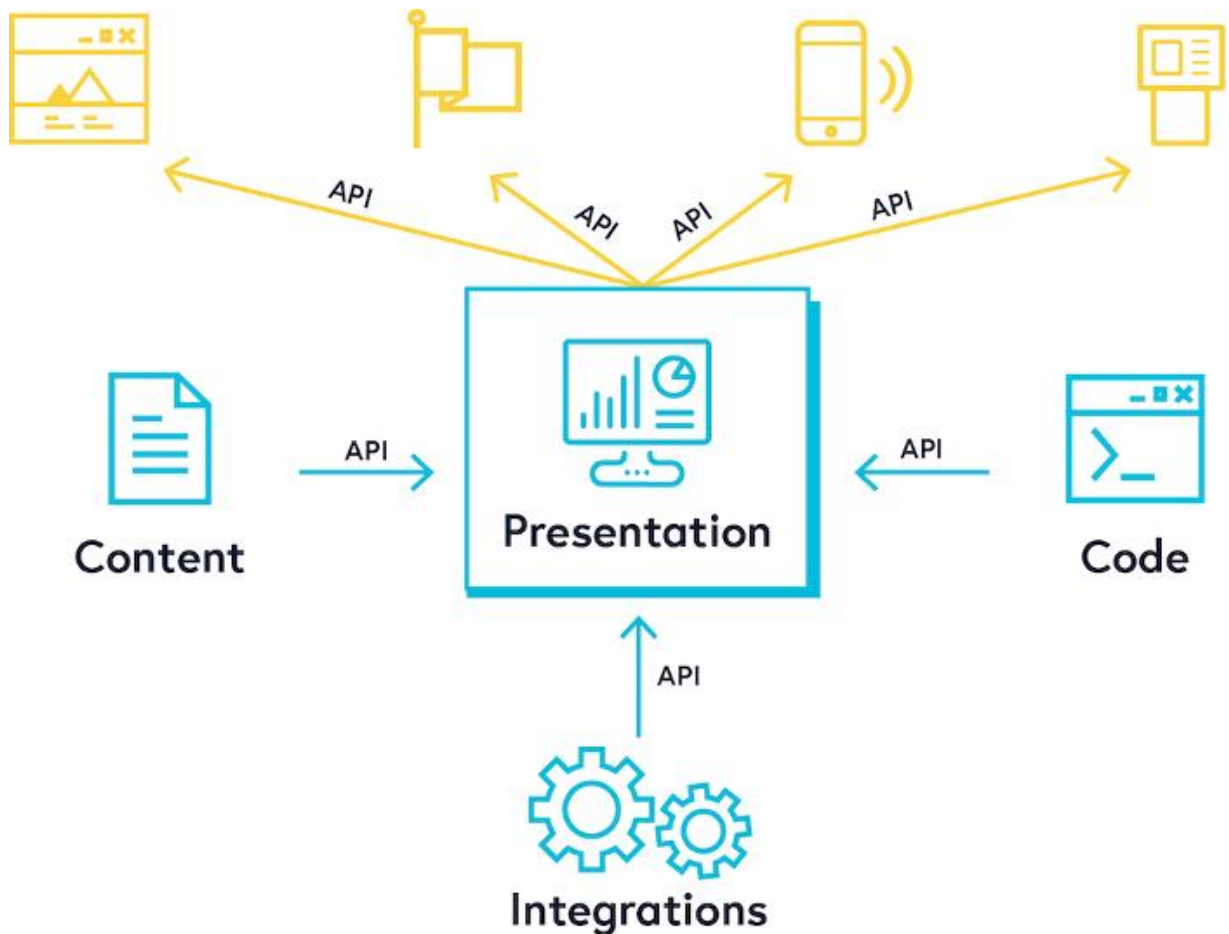


Figure 2.1: Single page application content integration API

(Source: [What Is a Single Page Application and Why Do People Like Them so Much?](#))

An SPA (Single-page application) is a web app implementation that loads only a single web document, and then updates the body content of that single document via JavaScript APIs such as XMLHttpRequest and Fetch when different content is to be shown.

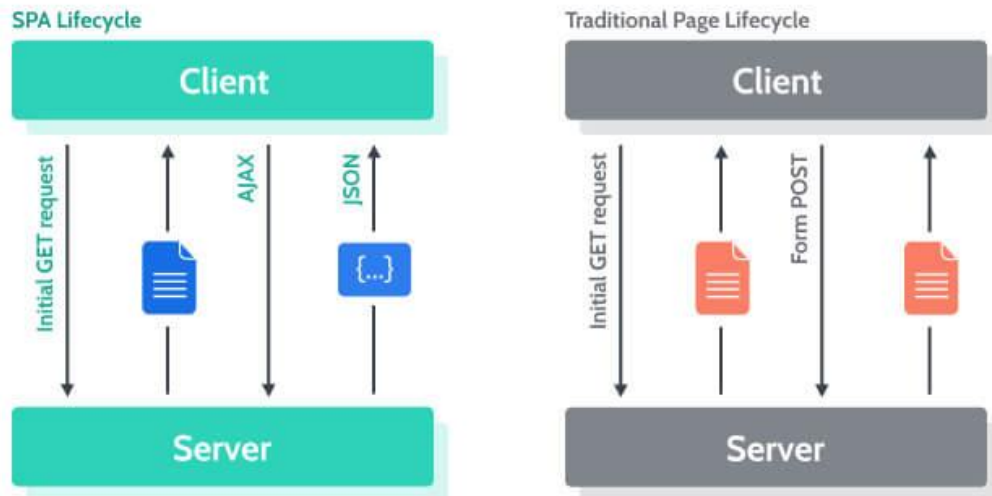


Figure 2.2: SPA and MPA lifecycle

(Source: [What Is a Single Page Application \(SPA\)?](#))

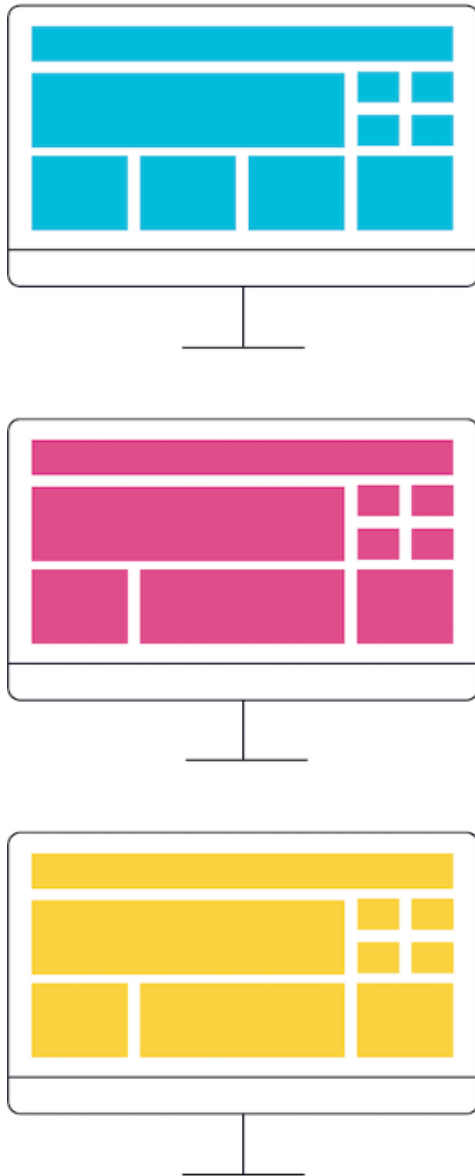
Differences between single page application and multi-page application.

There is a lot of content that is repeated in a web page and there is also a lot of content that remains the same even when switching between different pages such as logo, header, footer, navigation...

Single page application interacts with the user without having to reload the entire page, but only dynamically rewrites the web page with the necessary content. This can avoid interruption of user experience when they switch between pages similar to if they are experiencing a desktop application or a mobile application.

## Traditional

Every request for new information gives you a new version of the whole page.



## SPA

You request just the pieces you need.

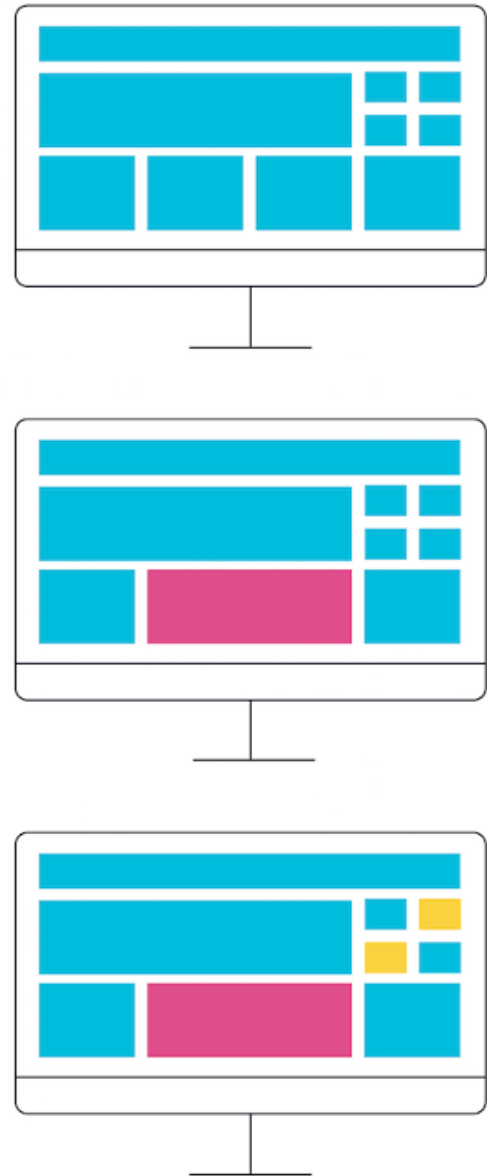


Figure 2.3: How MPA and SPA load new content

(Source: [What Is a Single Page Application and Why Do People Like Them so Much?](#))

## **2.3 Advantages of Single-Page Applications**

### **2.3.1 Single Time File Load**

SPA does not update the entire page and only updates the necessary content, most of the resources like HTML, CSS, Javascript are loaded once at the start.

This ability of SPA is extremely useful on pages that are heavily navigated and use repetitive templates. This is a huge benefit in reducing page load times and especially has a big impact on business and sales websites.

### **2.3.2 No Extra Queries to Server**

You can save money by using fewer servers for the same amount of traffic because the server doesn't have to spend time and energy updating the entire website and reduces the overall impact on your server.

### **2.3.3 Fast and Responsive Front-end Built**

Due to the decoupled architecture of SPAs and the separation of back-end and front-end services, SPAs allow developers to build user interfaces much faster.

### **2.3.4 Enhanced User Experiences**

With SPAs, scrolling is convenient and uninterrupted; there's no need to click on endless links. Indeed, the scrolling nature of SPAs makes them perfectly suited for mobile users who have become accustomed to scrolling.

### **2.3.5 Easy for development**

Many people prefer to develop in a certain programming language, and thanks to APIs, SPAs built in one programming language can work with back-end services developed in different languages.

Many frameworks have their own Chrome developer tools that make debugging easier. SPAs allow inspection of page elements and the data associated with them.

## **2.4 Disadvantages of Single-Page Applications**

### **2.4.1 SEO optimization**

Because SPA applications operate on JavaScript and download data on request from the client side. The URL doesn't actually change, and the different pages don't have their unique URL addresses. It makes it difficult to optimize these web pages for search engines because most of the pages cannot be scanned by search engines.

But don't worry, Google now indexes dynamic pages. What developers need to do is make sure their JavaScript files are indexed by Google and need to verify that the website uses HTML 5 mode in the URL scheme.

### **2.4.2 Browser history**

The browser only takes the user back to the previous page, not the previous state of the website, which means that in some cases when they hit the back button, they won't be able to return.

To get around this, the SPA frameworks provide an HTML History API that gives developers access to the browser's navigation history via Javascript.

### **2.4.3 Security issues**

If the developer is not careful about the data contained on the initial page load this can lead to the display of unwanted data to the user.

SPA can be unsafe because access control is difficult at a functional level. Since the features are transferred from the server to the client, the user has the ability to access the functions that are not allowed.

## **2.5 When to use an SPA**

Single page application is suitable for building dynamic platform with moderate amount of data.

Choose a SPA if your application requires rich features that go beyond what a typical HTML form provides, like constant updating and display of data, form submission without having to submit the form...

If you already support the web API for use by other clients, you are simply creating a SPA that queries and updates the data via the API instead of recreating the logic in the server-side form.

Finally, writing SPA requires you to be familiar with Javascript and client-related techniques and libraries. So if you and your team are familiar with Javascript, this is really a good choice.



## CHAPTER 3 – EXPERIMENT

### 3.1 Technologies used

React: library for creating the user interface that interacts with the web browser by dynamically rewriting the current web page with new data from the web server, instead of the default method of the browser loading entire new pages.

Tailwind CSS: CSS framework for rapidly building custom user interfaces.

ExpressJS: Is a Node.js framework, we used it to create Restful APIs.

MongoDB: We use MongoDB to save web data, its flexiable schema makes it easy to evolve and store data.

### 3.2 Feature

We make a website to store notes with features:

- Displays a list of notes.
- Search for notes based on title and content.
- Add new notes.
- Update new notes.
- Delete new note.
- Real-time data updates.

### 3.3 How it works

Note
_id: ObjectId title: string content: string createAt: Date updateAt: Date

Table 3.1: Database schema for note

Rest API design:

- **GET** localhost:8080 – display all notes
- **POST** localhost:8080 – create a new note
- **GET** localhost:8080/{id} – display note by ID
- **GET** localhost:8080/search?q – search list of note by query string
- **PUT** localhost:8080/{id} – update a note by ID
- **DELETE** localhost:8080/{id} – delete a note by ID

The user interface will be displayed at localhost:3000 and use the fetch method to connect to the APIs

### 3.3 DEMO

Here are some pictures of our sample website

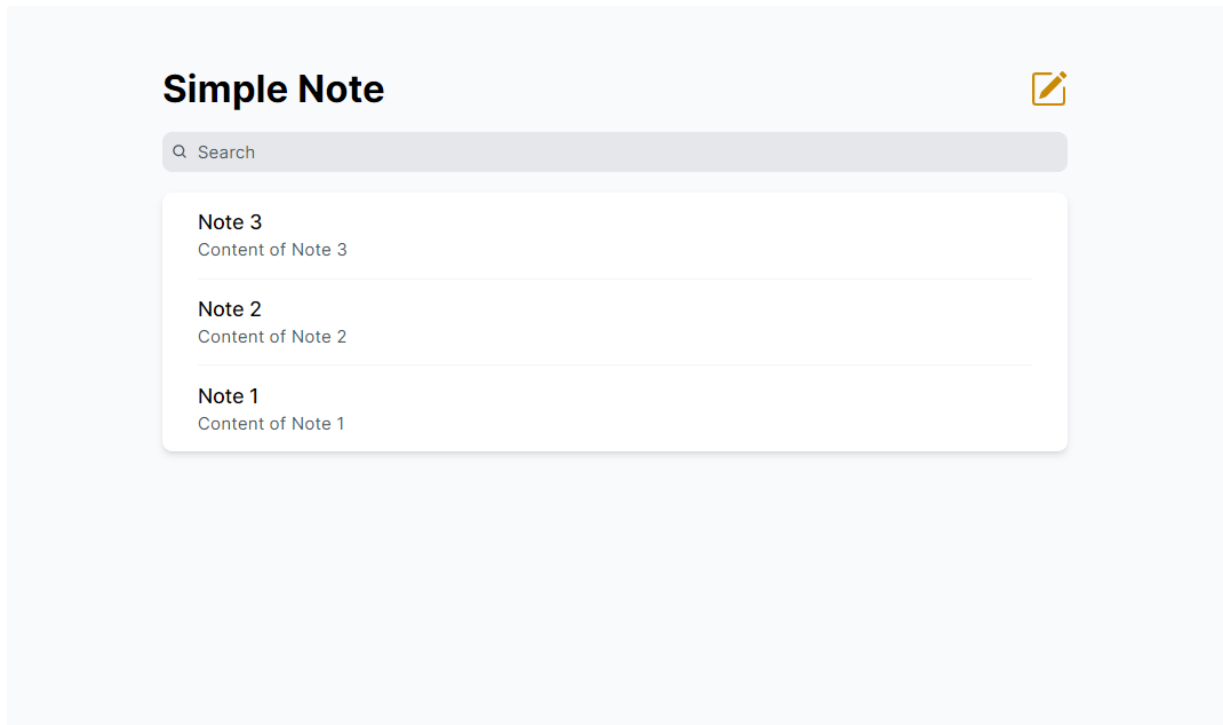


Figure 3.1: List of notes

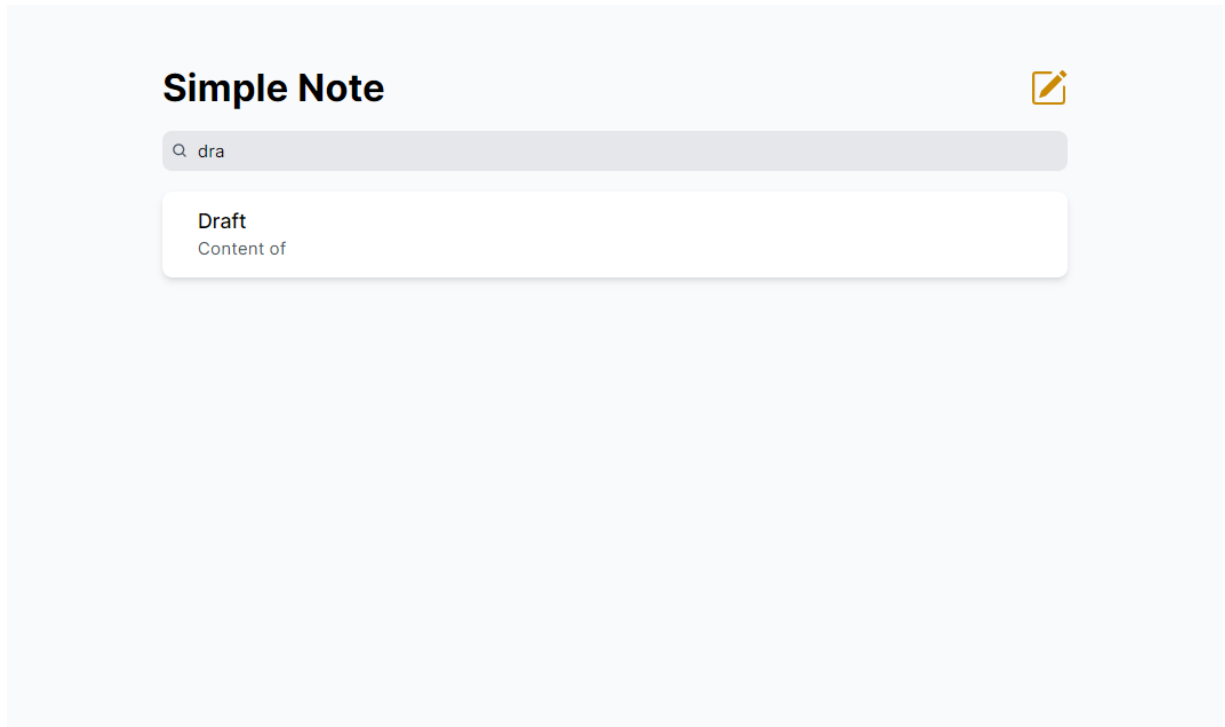


Figure 3.2: Search note

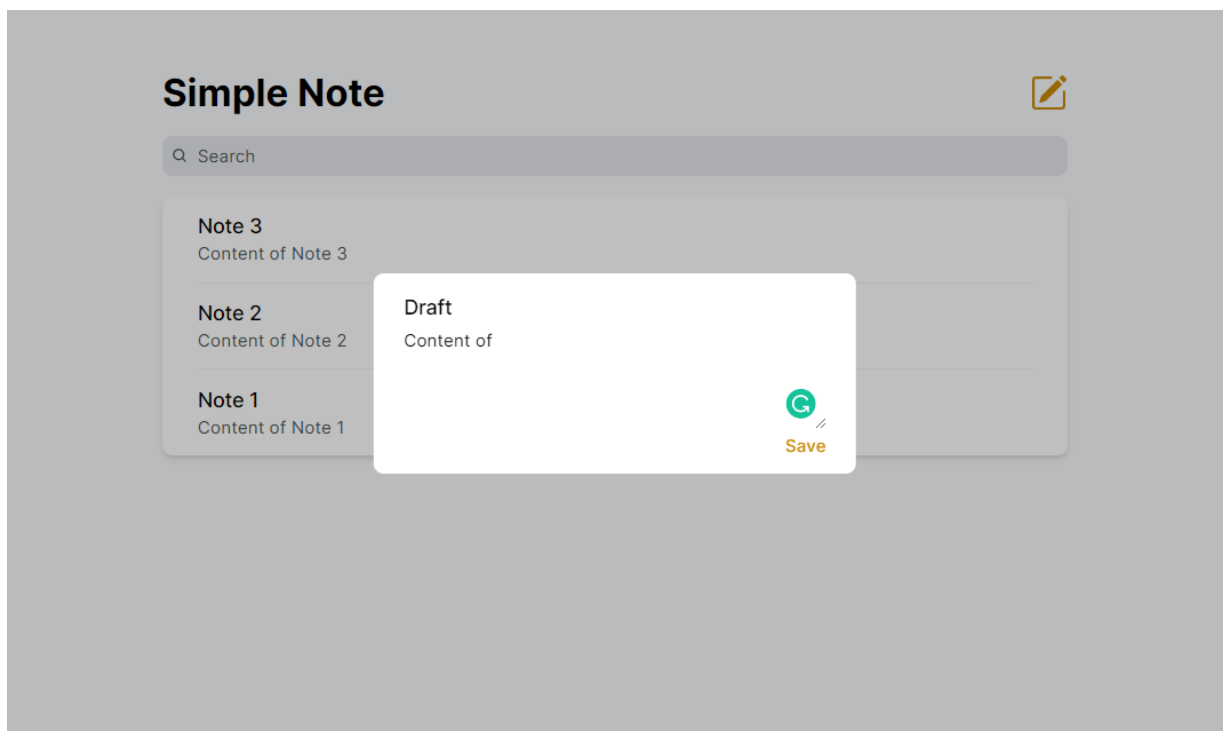


Figure 3.3: Add a note

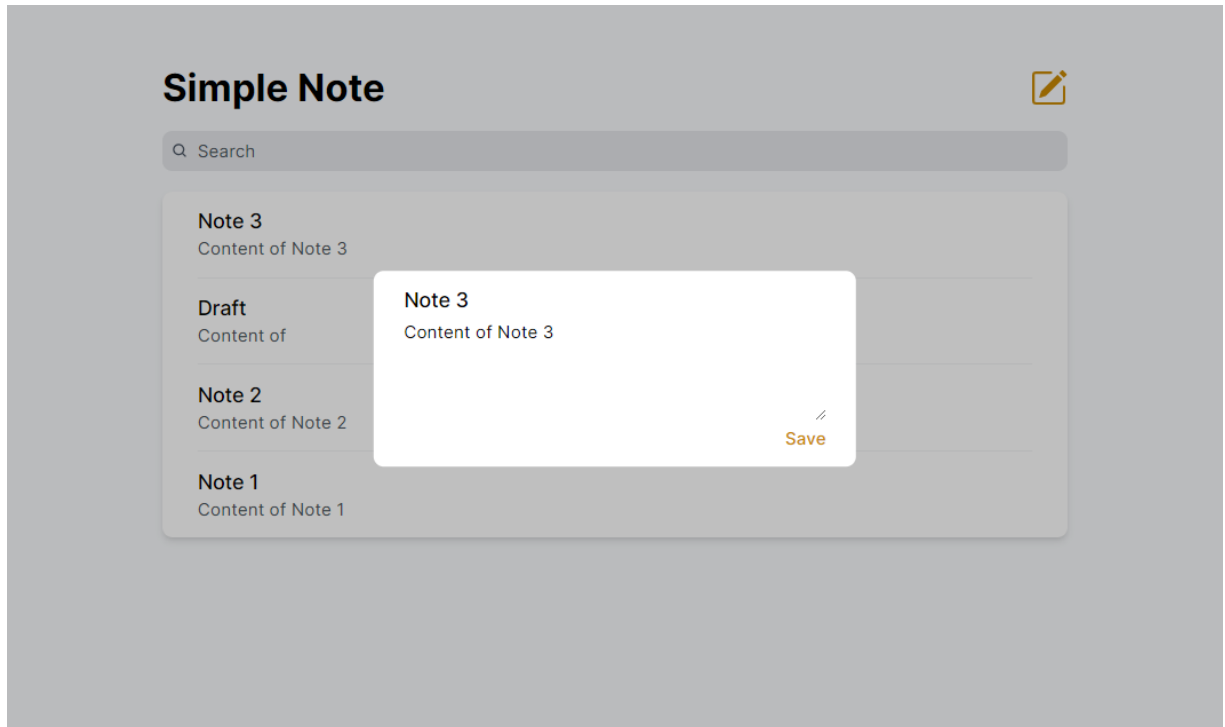


Figure 3.4: Update a note

## **CHAPTER 4 – SUMMARY**

### **4.1 Result**

We have better understand about single page application, concept, how it works, advantages, disadvantages...

This is also an opportunity for us to both learn the theory and get to experience what is involved in single page application by writing a web application using this technique.

### **4.2 Limitations**

Theoretically, we have researched in a short time and learned on our own, so it is possible that it is not detailed enough, complete and there is a possibility of errors.

Regarding the sample website, we have taken advantage of the knowledge we have learned and learned about new related technologies to build the functions in the website which are quite simple, just enough to meet the items we need to learn.

The reporting time took place at the same time with many subjects and our group had many subjects with different times, so it was difficult to have a common time to exchange and discuss, but we tried to spend the time we had. able to complete the report on time and as best as possible.

### **4.1 Future development**

We will try to learn and improve the knowledge of Single pace applications.

Learn more about the technologies involved to make web applications more functional and practical.

For the sample website we used for the essay, we will improve the login and registration features for users, improve the interface, add a rich text editor so that users can format the content need notes...

We also look forward to receiving comments from lecturers to improve our essay and future development directions.

## REFERENCES

1. [SPA \(Single-page application\) - MDN Web Docs Glossary: Definitions of Web-related terms | MDN](#)
2. [What's the Difference Between Single-Page and Multi-Page Apps](#)
3. [What Is a Single Page Application and Why Do People Like Them so Much?](#)
4. [What Is a Single Page Application \(SPA\)?](#)