



Enhancing the User Experience using Redux or Vuex: State Management in JavaScript Frameworks

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Abstract:

The internet is most spread on the web applications in the form of complex networks as web applications can be operated directly without the need for installation. The complex features of websites are possible nowadays due to the availability of a vast language called JavaScript. The emergence of web applications would not have been possible without the use of JavaScript as it provides the developer the ability to reflect any idea to implementation. The highlight of this diverse language is the platforms and libraries it provides to the developers as a solution to the new challenges with the increased complexity of the applications. State Management is one of the solutions to build more robust applications. This can help to later extend the projects and is therefore suitable for large projects. The state management implementation is possible with the use of Redux and Vuex which are the most prominent libraries of JavaScript. This paper presents the architecture of both of these to understand how they can support development. The aim is to analyze the architecture to understand its usage rather than just making a comparison between the two. So, informed decisions can be carried out by the developers after reading this document.

Keywords: React, Redux, State Management, JavaScript Frameworks, Vuex, frontend Optimization.

1. Introduction

Worldwide revolutionizing the world, it brings a new vision of the world that broadcasts and exchanges information through visuals, text, and audio. The World Wide Web is the connection of devices throughout; the digital world seems like a web of spiders. The web has gone through different transitions and it evolves and provides a pathway to communicate effectively with time [1]. In the later stages of web evolution, JavaScript and its frameworks provided a boost to the evolution of web-based systems.

JavaScript was a client-side language till 2009. Node.js revolutionize JavaScript to enable it to run on a computer rather than the browser. Initially, JavaScript is used in browsers for the client-side development. However, the emergence of Node.js equipped JavaScript to be used on the server side to manage the background task and database. It streamlined web development in a completely new direction. JavaScript can be used on both ends, the developer only has to work on one language and it's also executed rapidly.

Optimization of the front end is very crucial in web development. User retention is based on the first time visit to any site. In 2013 Facebook launched the React frontend framework which uses JavaScript. It uses the Component to

build the website, DOM (document object model) understanding is necessary to build the React application, and React renders the component according to the DOM model. React applications are lightweight and highly optimized, and many companies prefer React and Vue.js over other frameworks because one programming language solution is appreciated worldwide. Vue.js is another framework that is backed by open-source contributors which is also very famous for the Single Page Application. These components are specially used for a single-page application because they can render many pages on a single page without reloading the whole page which cements the good user experience.

The frontend framework uses different components that work like a tree data structure. Different framework renders them to complete their architecture. Every component has its state which acquires the current state of that particular component. As we know components work in parent and child relationships due to tree data structure which is quite difficult for this framework to store the state of each component efficiently and rapidly. There state management tools come into action. However, this study encompasses Redux and Vuex only. These tools focused on the state management of the website to enhance the user experience without lagging the site [2].

2. Literature Review

Web has three primary evolutions web 1.0, web 2.0, and Web 3.0. Web 1.0 was introduced in late 1980 and it is the only way of communication and it is unidirectional. It is also called the static web because visitors can read the information but are unable to share and comment on it. After one and half decades in 2004, web 2.0 came into the industry which includes the read and write option. The first time two-way communications were made possible because it changed the infrastructure of the web. This web 2.0 booms the web development industry and it is continuously growing day by day. Web 3.0 is also considering being used but it is still in the development stage. Web 3.0 is capable of connecting many digital devices remotely and elevating the lifestyle of the user [3], & [4].

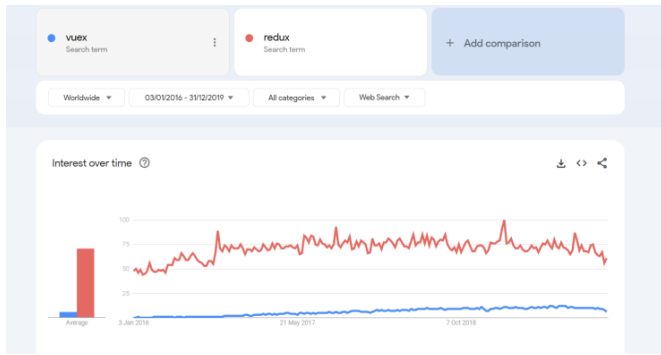


Figure 1: Use of Redux and Vuex from 2019

The above graph demonstrates the usage of Redux and Vuex from the launch date of Vuex to 2019 which shows that state management is very crucial to be obtained in the website. The state management option is also present in frameworks like React and Vue but they lack efficiency. It is the adoption of the JavaScript framework which uses components to manage their state. As the project becomes enterprise-level the state can only be tackled by the Redux and Vuex. These are specially designed for JavaScript frameworks like React JS, Vue JS, Angular JS, etc.

According to the Data, React is the most used framework of JavaScript [5]. This means that state management tools for reaction are also quite significant. Redux was launched to optimize state management. Although this famous framework can manage the state the delay in the fomented that can raise an issue for the best user experience [6].

3. Benefits of State Management Tools

These state management tools provide the complete and optimized infrastructure for the elevation of the front-end

code. That is why many companies prefer Statement over the in-built function of Redux [7] and Vue JS. It offers a diverse range of benefits. Some of them are listed below:

Simple: It provides a separate container for state management solution and keeps separate it from the frontend code which makes it Simple and easy

Easy Integration: These tools are easy to integrate with a frontend framework using a single language i.e. JavaScript. The structure of the framework is easy to communicate with frameworks.

Debugging Tool: These State management tools come with the option of the debugging tool which provides the facility to trace and sort out the error of the website.

Rich User Experience: Client regeneration ensures the user experience of the website. Redux and Vuex are designed to provide a better user experience using state management.

Single Store: It provides a single solution to store and manage the state. It used the approach to decrease the clutter of different stage management in one place.

4. Problem Statement

Every business uses the potential of the Internet to flourish in the market. Digitalization of the business starts from the presence on the World Wide Web and different social media platforms. Many companies prefer the JavaScript framework to use the latest technology with one web programming language. The user interface of the application is responsible for getting the attention of the user and also triggering them to come to the website for the next time. There are many alternative websites of the same categories, competition is also increasing. There is a need for appropriate solutions to make more optimized and diverse user interfaces for better state management.

Web application demand is increasing continuously, which is an opportunity for the developer but to maintain the state of the component and keep the record of the data changes is not possible for the developer. Without a containerized approach, it cannot be done efficiently. Developers many times lead to different bugs in the code that are difficult to identify. The performance is another factor that also affects the website like memory usage, loading time, etc. In the end, it yields a less friendly user experience.

5. Solutions with Architecture

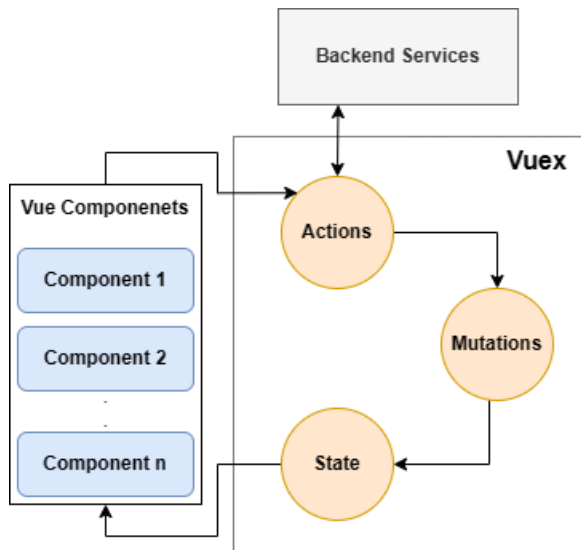


Figure 2: State Management with Vuex

Vue JS utilizes the Vuex for state management, which is primarily designed for Vue JS. It provides one unit store for applications to manage the state of different components. There are four elements which are crucial for the understanding of the Architecture. When the state of any component is going to change, the action method takes the current state and sends it to mutation, mutation can store directly the current state of the component. All current states that occur through mutation are stored in Container names State as shown in the figure. The getter is a function that keeps the record of all derived states by using the current state. The action function is responsible for communicating with component and backend services as well.

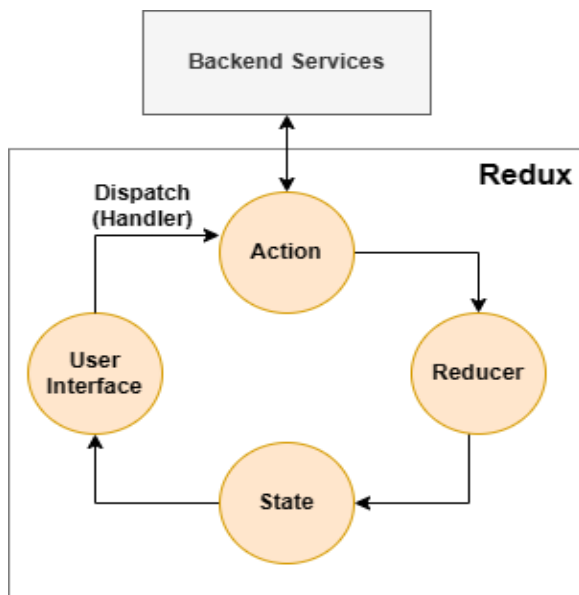


Figure 3: State Management with Redux

The architecture of the Redux is demonstrated in the figure. React integration with Redux is quite good due to which many developers preferred it over other state management tools. A store is a container that holds the states of the whole application. When the component state is going to be changed, there is a need to update the state in store for this purpose it uses the dispatch method to store the current state. Components are allowed to subscribe to the store so that they can get the latest state when a state is updated in the background [8].

JavaScript framework uses components to design the website. Many components are changing their state continuously to keep them updated with background services. State management tools provide the solutions for these management activities. Redux is officially designed for the React Framework and Vuex is officially designed for the Vue JS [9]. It provides the solution to manage the state in a single place. These tools are equipped with debugging tool which helps to debug the code and also help in case of data inconsistency. These tools offer scalability and robust building solutions for the enterprise application. There are many websites where huge computation is involved in the background and the state is continuously changed, so Redux and Vuex are helpful in those scenarios. Furthermore, it provides a flawless user interface and experience. Trading applications are continuously changing, there is a huge number of state changes in one second, and if one state is missed it can cause a loss in the business. So that's why developer uses these tools to manage every state.

6. Research Impact

State Management is one of the important concerns when utilizing JavaScript implementation. Therefore, the presented research document is focused on the use of Redux and Vuex as state management tools along with their architectures. This will help the developer to understand these libraries more deeply to effectively take advantage of their usage. The most significant use of both Redux and Vuex comes when someone is working on a large-scale project. The architecture and further solutions will help to identify the strength of these JavaScript libraries.

7. Conclusion

In summary, JavaScript is the most widely used language due to the diversity of its features and is growing rapidly. The use of JavaScript has enabled developers to achieve many complex tasks that wouldn't have been possible otherwise. State management is one of the highlights in this language and

it also presents an effective solution for this. The two most famous libraries Redux and Vuex help to achieve useful results. The architecture of these libraries slightly differs and therefore their usage is dependent on the type of project. The scalability however can be achieved with the use of any of these in bigger projects.

References

[1] W. Hall and T. Tiropanis, "Web evolution and Web Science," *Computer Networks*, vol. 56, no. 18, pp. 3859-3865, Dec. 2012.

[2] S. b. Uzayr, N. Cloud and T. Ambler, *JavaScript Frameworks for Modern Web Development*, Apress, 2019.

[3] K. Jacksi and S. M. Abass, "Development History Of The World Wide Web," *International Journal of Scientific & Technology Research*, vol. 8, no. 9, pp. 75-79, Sep. 2019.

[4] K. Nath, S. Dhar and S. Basishtha, "Web 1.0 to Web 3.0 - Evolution of the Web and its various challenges," in *2014 International Conference on Reliability Optimization and Information Technology (ICROIT)*, Faridabad, India, Apr. 2014.

[5] C. L. Mariano, "Benchmarking JavaScript Frameworks," *Masters dissertation-School of Computer Sciences at ARROW TU Dublin*, 2017.

[6] D. Bugl, *Learning Redux*, Birmingham-Mumbai: Packt Publishing, 2017.

[7] T. McFarlane, "Managing State in React Applications with Redux," *Business Information Systems*, Nov. 2019.

[8] L. Happe, B. Buhnova and R. H. Reussner, "Stateful component-based performance model," *Springer-Verlag Berlin Heidelberg* 2013, Apr. 2014.

[9] E. Saks, "JavaScript frameworks: Angular vs React vs Vue," *HAAGA-HELIA University of Applied Sciences*, 2019.