

Research and Analysis on FERN Stack in E-Commerce Web Application Development

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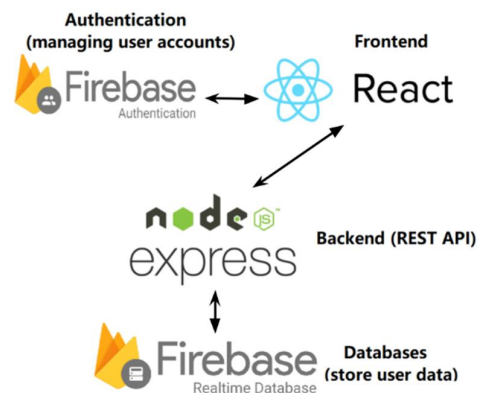
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Abstract: With web technology rapidly expands out in recent years, there is a significant trend that Hypertext Markup Language (HTML)5 turns into a worldwide web consortium and leads the front-end development to stand on the front stage of internet history. Whereas data transfer frequency rates increase significantly due to adaptation of dynamic website. However, there are numerous front-end development frameworks and libraries such as React, Angular and Vue. Similarly, in back-end we have MYSQL, MongoDB and Firebase. How to select a suitable framework or library to establish the e-Business and reach out to maximize the user experience becomes a priority operation in full stack web development. This paper starts with introducing an overview of the leading frameworks and libraries in the field of full stack development and examine each performance with respect to FERN stack in web services. How it is implemented in e-Business under separate commercial criteria. Finally, the paper summarizes the contributions and concludes with some possible future of FERN stack development in e-Business.

Keywords: Bootstrap, HTML5, CSS3, JavaScript, Firebase, e-Business

I. INTRODUCTION

JavaScript is a high-level, dynamic, programming language that is one of the most popular and widely used programming languages in the world today as most of the websites and web browsers use and support JavaScript. With JavaScript becoming very popular, many tools, libraries, and frameworks are built upon it over the years that solves the common programming problems more easily and efficiently. Often the lifespan of the frameworks/libraries is not too long as a newer one gets to be introduced almost every 6 months claiming to have a better user interface development according to another study published on stack overflow website (Allen, 2018). With the rapid changes in the tech industry regarding the frameworks and libraries, developers are forced to keep up and constantly learn new technologies which are commonly referred to as JavaScript Fatigue. Each of these technologies come with their advantages and disadvantages which makes the process of decision making when building a web application pretty hectic. Angular.js, Backbone.js, Amber.js, Vue.js and React.js are a few very popular and commonly used frameworks and libraries with Vue.js and React.js having the lead positions. When choosing one of these frameworks or libraries. This study will focus on FERN Stack and how popular JavaScript library React.js can combine with FIREBASE (a NoSQL real-time database), Node.js (a server-side run-time



environment) and Express (a Node.js framework) the reason behind this choice of FERN stacks because it's the world's scalable and lite web stack. FERN a collection of technologies that helps you build web apps. It is made up of 4 parts:

Firestore: A Google platform that gives you access to a bunch of developer tools, most notably their realtime, NoSQL database, which allows you to modify the database through their website. Express: A fast and minimalist web framework for building APIs. React: An open-source, front-end JavaScript library for building user interfaces. Node.js: An environment that allows you to write back-end code using JavaScript. As you can see, FERN makes it very easy to update your codebase and debug errors. This is what our stack looks like overlapping topics.

Table 1: Popularity Statistics of 2021

	Bootstrap	NodeJS	ReactJS	Firestore
Downloads	5	4	9.2	6.2
	million	million	million	million

In continuation these two stacks will be referred to by their abbreviations, MERN (MongoDB, Express, React.js, Node.js) and FERN (Firestore, Express, React.js, Node.js).

II. FRONT – END LIBRARIES & FRAMEWORK

2.1 Java-script

JavaScript is a high-level, dynamic, object-oriented programming language that was developed by Brenden Eich in 1995. It is one of the most popular and widely used programming languages in the world today as it is shown in a recent study published by the website stack overflow in Figure 1 -Most Popular Technologies (stackoverflow.com 2019). JavaScript was traditionally only used for manipulating Document Object Model (DOM) and Cascading Style Sheets (CSS) and was known to be a client-side scripting language. In 2009 an engineer called Ryan Dahl developed a JavaScript run-time environment named Node.js that can be used to run server-side applications.

2.2 React.JS

React.js is the client-side software used in the FERN stack. It is an opensource, JavaScript component-based library that was developed by Facebook in 2011. Unlike others JavaScript libraries such as jQuery that is used to create an MVC (Model, View, Controller) pattern, React.js creates only views in HTML. In MVC architecture, the Model manages the application's data, View renders the model for the client and Controller updates the model when there is a change. In a regular MVC model, Views listen to the models and get updated according to the changes accruing in the model. Using MVC pattern, it can be more difficult to maintain since every time there is a small change in the view, the model gets updated and that update might cause another update in the view.

III. BACK – END LIBRARIES & FRAMEWORK

3.1 Node.JS

Node.js is a JavaScript runtime environment. JavaScript itself, is only a computational language, to execute the JavaScript code on the server-side, a runtime environment is needed. Node.js runtime environment consists of additional functionalities to JavaScript including access to the file system (read and write the files in the file system with JavaScript) and access to the network (using JavaScript, Http requests can be sent, and responses received). That means Node.js can execute JavaScript code that was written in an environment where it has access to the functionalities that are not natively part of the JavaScript language. Node.js is built on Chrome's V8 engine (an open-source runtime engine that is written in C++) and can run on Linux, Mac OSX and Moreover, any other language that compiles into JavaScript before execution can be run by Node.js. TypeScript, Coffee-Script and Dart are a few examples of many.

3.2 Express

Express.js or simply Express is a Node.js framework originally built by TJ Holowaychuk. It simplifies building server-side code. Although this technically, could be done with Node.js alone, Express helps the developer to achieve the same result with less and cleaner code while having access to additional functionalities. Express can essentially be described as a set of middleware that is built to manage all responses expected of a web-application such as response codes, setting cookies

or sending custom headers. While Express is lightweight and has a limited set of built-in middleware, the developer can customize their own sets to fit their specific needs or choose to use middleware from third parties.

3.3 Firebase

Google Firebase is a Google-backed application development software that enables developers to develop iOS, Android and Web apps. Firebase provides tools for tracking analytics, reporting and fixing app crashes, creating marketing and product experiment. Firebase offers a number of services, including:

1. **Authentication** – Firebase Authentication makes it easy for developers to build secure authentication systems and enhances the sign-in and onboarding experience for users. This feature offers a complete identity solution, supporting email and password accounts, phone auth, as well as Google, Facebook, GitHub, Twitter login and more.
2. **Cloud messaging** – Firebase Cloud Messaging (FCM) is a cross-platform messaging tool that lets companies reliably receive and deliver messages on iOS, Android and the web at no cost.
3. **Realtime database** – the Firebase Realtime Database is a cloud-hosted NoSQL database that enables data to be stored and synced between users in real time. The data is synced across all clients in real time and is still available when an app goes offline.
4. **Performance** – Firebase Performance Monitoring service gives developers insight into the performance characteristics of their iOS and Android apps to help them determine where and when the performance of their apps can be improved.
5. **Test lab** – Firebase Test Lab is a cloud-based app testing infrastructure. With one operation, developers can test their iOS or Android apps across a variety of devices and device configurations. They can see the results, including videos, screenshots and logs, in the Firebase console.

IV. CONCLUSION

This paper describes both the development of frontend and backend technologies and libraries in developing web applications and list potential solutions for developing a web application. It can be possible to conclude that FERN stack contains the most comprehensive functions and features that are suitable for the creation of enormous commercial projects, especially in e- Business. Developing an entire front-end section and backend section.

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