MERN Stack in Web Development: An Interactive Approach

Nikunj Mani Gupta
School of Computing Science and Engineering
Galgotias University, Greater Noida, India
nikunj.mani3a@gmail.com

Rinkul Singh
School of Computing Science and Engineering
Galgotias University, Greater Noida, India
rinkulsingh8171@gmail.com

Suman Shekhar Das
School of Computing Science and Engineering
Galgotias University, Greater Noida, India
shekhard417@gmail.com

Dr. Raju Ranjan
School of Computing Science and Engineering
Galgotias University, Greater Noida, India
Drraju.ranjan@galgotiasuniversity.edu.in

Abstract— There are many notable web stacks, but one that has stood out as particularly important is the MERN stack. This is due to the ease with which it can deliver and implement user interfaces, as well as its low cost, availability as open source software, and adaptability when switching between customers and servers. Its primary objective is to enhance the overall presentation of the application. The process of creating applications on the web is not the same as it was even just a few years ago. As a result of the plethora of choices available today, many people have trouble determining which path to take. This paper argues that the MERN stack is the best option for developing an end-to-end web application. It examines the four parts of the MERN stack (Mongo DB, Expresses, React.js, and Node.js) and how well they operate together, highlighting their beauty as a full stack in web architecture. This study figurate further into the characteristics, analyses the differences between the MEAN and MERN stacks, and sheds light on the crucial elements that play an important role during the selection of one out of these technologies that make up the MERN stack.

Keywords— MERN Stack, WEB technology, React, Node, Express, HTML, CSS, Website, Web development.

I. INTRODUCTION

MERN is a dictionary that is used to talk about a certain set of JavaScript-based technologies that are used to make web apps. Made so that the development process goes as smoothly as possible. All of these things are very important to the process of making a web application. All of this gives the engineers the final structure in which they can work.

- The letter "M" for "MongoDB", the No SQL database system known as Mongo DB.
- The letter "E" for "Express.JS", which is generally used to create Node.js web systems.
- The letter "R" for "React", which is typically used to support a JavaScript system on the client side.
- The letter "N" for "Node.JS" Node.js, which is generally used to support the main JavaScript web server.

[1] Front-End (React.JS)

React.JS: It is a JavaScript toolkit used to create modular user interface (UI) elements. Following is the definition from React.JS official documentation: A library for creating modular user interfaces is called React. React essentially makes it possible to create massive, complicated online applications that can alter their data without
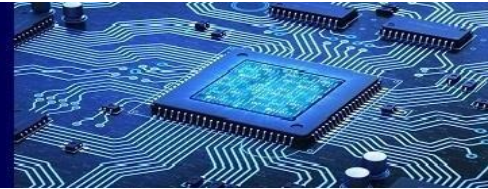
requiring further page refreshes. It serves as the Model View Controller's(MVC). React provides a straightforward, effective, and reliable application development environment by abstracting the Document Object Model (DOM). React mostly uses NodeJS for server-side rendering, whereas React Native supports native mobile apps. Because React uses unidirectional data flow, which reduces boilerplate, it is significantly simpler than traditional data binding.

[2] Back-End (Node.JS and Express.JS)

Node.JS: JavaScript code can run server-side using the open source development platform NodeJS (Node). Node is helpful for creating real-time apps like chat, news feeds, and web push alerts that need a permanent connection from the browser to the server. Node.js is designed to use a single thread with one process at a time and run on a dedicated HTTP server. Applications built using NodeJS execute asynchronously and on events. The Node platform does not use the conventional model of receive, process, transmit, wait, and receive for its code. Instead, Node sends small queries one after the other without stopping to wait for answers, processing incoming requests in a continual event stack.

Express.JS: A NodeJS web application framework called Express.JS providing a wide variety of features for developing web and mobile apps. A single page, multipage, or hybrid web application can be created with it. It's an extension to Node.JS that makes it easier to control servers and redirect traffic. A web application framework for Node.js is called Express.js. It offers a number of capabilities that speed up and simplify the creation of online applications, which would otherwise take longer when using solely Node.js. The Node.js middleware module connect, which employs the http module, is the foundation upon which Express.js is built. Therefore, Express.js will operate with any middleware that is based on connect.

[3] Database (MongoDB)

MongoDB: A NoSQL database management system by MongoDB Inc. is known MongoDB. NoSQL databases are an alternative to traditional relational databases that rely on the SQL query language (Structured Query Language). A relational database organizes its information into rows, columns, and tables, and it may keep track

of connections between different types of data. Data in MongoDB is represented and interacted with using documents having a JSON-like structure. Due to its JSON-like document structure, MongoDB's most well-known feature is its adaptable data store. Records are kept in MongoDB as collections of documents, specifically BSON documents. The architecture of MongoDB is horizontal scale-out.

MongoDB, a highly adaptable data management system, offers strong scaling, consistency, fault tolerance, agility, and flexibility features to support quick development and minimal downtime operations.

[4] Top brands using MERN Stack
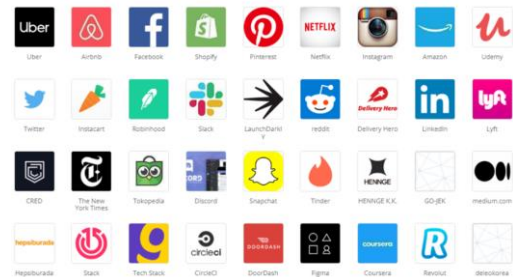
Companies of all sizes use MEAN Stack Development to build robust web apps with a solid front end and back end. Numerous international organizations employing MEAN Tech Stack to create their web applications are presented below.

LinkedIn, eBay, Netflix, Uber, GoDaddy, NASA, Walmart, PayPal, Mozilla, Yahoo and other.

[5] Business benefits of MERN Stack

Fantastic User Experience: Any high-tech product's success depends on how well it works for the customer. With its look and feel, the Respond Native application is a fully responsive one.

Security and Evolvement: React Native is still growing and getting help from a huge community.

Engineers Accessibility: The designer's business area in React local is a strong one. You can hire consultants through websites like Upwork, or you can talk to business experts.

Less Market hour of Kickoff: When compared to local apps, React Native development helps the mobile development industry grow. It gives businesses less time to get their products on the market**.**
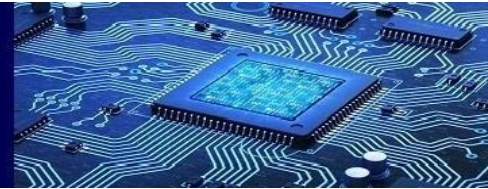
Set aside Cash: Making a smart choice to build a single app that works on both iOS and Android is much smarter than making two separate apps for each platform.

Save Time: With React Native, you don't have to make two separate apps for two different stages. Also, don't show how much time it will take to fix and update them.

[6] Traditional Technologies in Web Development

Web technologies are often classified by their areas of application. To put it another way, do they focus on the back-end processing or front-end presentation of web applications? If you want to be a player in the field of internet development, you should know the basic categories of internet technologies. As a result, the following is a possible classification of web development tools:

Browsers, HTML, CSS, Programming Languages, Frameworks, Web Servers, Databases and etc.

II. FULL STACK DEVELOPMENT: ALL TYPES OF STACK

One who works on both the front and back ends of a website or application is known as a "full-stack developer.". They can work on projects that need databases, make websites for users, or even talk to clients during the look phase of projects. It describes the actions of both the client-side (front end) and server-side (back end) components of an internet application. The versatility of full stack developers allows them to design full websites and online applications.

1) MEAN Stack: MongoDB, Express, AngularJS and Node.js.
2) MERN Stack: MongoDB, Express, ReactJS and Node.js
3) Django Stack: Django, python and MySQL as Database.
4) Rails or Ruby on Rails: Uses Ruby, PHP and MySQL.
5) LAMP Stack: Linux, Apache, MySQL and PHP.

III. REVOLUTION OF WEB DEVELOPMENT

In traditional web development "Separation of concerns" is a design idea used in web development that is linked to effective application architecture. Essentially, it means that each "area of interest" (such as the business logic or the user interface) is created independently of the others. This makes replacement simple in the future.

The separation of HTML, CSS, and JavaScript was largely thought to be a good thing, but we unwittingly limited ourselves by doing so.

Why is React so good?

Most websites contain interactive components that edit, reorganize, or style browser content. Consider Google. The search box lets you enter terms to see search results. Without React, this meant using the DOM API to tell the browser what to display at each stage. React surrounds this imperative syntax and provides an easy way to construct interactions, so we no longer need to make DOM API calls. React uses "declarative syntax" to describe what to do.

When we write our applications in a declarative way, the code is much easier to understand and much more predictable. It is very powerful to be able to open a React component and know exactly how it will act. Developers now have the freedom and confidence to make changes more easily. Before making a change to a small part of the code, they don't have to spend a lot of time trying to understand the whole codebase.

Most popular front-end JavaScript libraries and frameworks of the past few years have seen rapid adoption followed by rapid abandonment in favour of the latest and greatest. The difficulty of keeping up with these kinds of changes has inspired the phrase "JavaScript weariness" to be used among the development community. React was first released in May of 2013, but its popularity has only increased since then.

IV. MERN STACK ARCHITECTURE

MongoDB — NoSQL database
Express.js — Node.js web framework
React.js —JavaScript framework
Node.js —JavaScript web server
MERN is a full stack application that utilizes the tried-and-true three-tier architectural pattern, with a React.js-based front-end display tier, an Express.js- and Node.js-based application tier, and a MySQL-based back-end database tier (MongoDB).
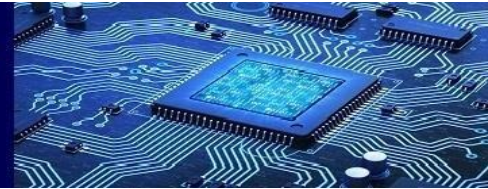
V. MERN VS MEAN

1 MEAN

MEAN is a collection of Open Source components that, when combined, offer a complete framework for creating dynamic web applications, from top to bottom (i.e., code running in the browser). The MEAN stack frequently uses JavaScript as a component. Because everything is done using standard notions like JS objects and asynchronous calls, using JS puts a developer at ease.

The stack is made up of:
- Angular.JS
- Express.JS
- Node.JS
- MongoDB

2 MERN

With the help of MERN, a scaffolding tool, it is simple to create universal apps utilising Mongo, Express, React, and NodeJS. It uses tried-and-true technologies to cut down on setup time and get you up to speed.

The stack is made up of:
- React.JS
- Express.JS
- Node.JS
- MongoDB

3 Difference between MEAN and MERN

Attribute	MEAN	MERN
Churn	Reduced	High
Tooling	Low	High
Design	JS in HTML	JS only
JS Fatigue	Less	More
DOM	Regular	Virtual
Complexity	High	Low
Packaging	Weak	Strong
Abstraction	Weak	Strong
Failure	Run time	Compile time
Binding	Two-way	Unidirectional
Template	In html	In JSX
Model	Strong	Medium
Rendering	Client side	Server side

4 Difference between Angular and React

Attribute	AngularJS	Angular 2	ReactJS
Author	Google	Google	Facebook
Language	JavaScript/ HTML	Typescript	JSX
Size	143k	746k	151k
MVC	Present	Present	View only
Performance	Good	Better	Best
Third party support	Low	Low	High

5 React or Angular

Downloads per year
Click and drag in the plot to zoom in
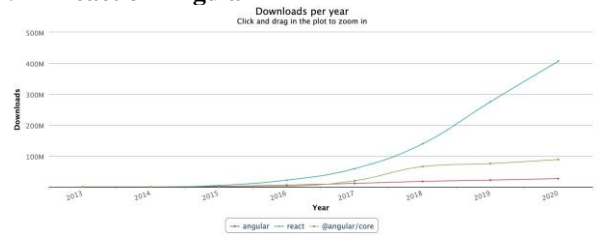
VI. ANALYSIS REPORT

- The MERN stack is a great option for businesses looking to create top-notch online Web-apps. In fact, this stack enables the rapid development of online applications and software in addition to leveraging high-performance and customized technologies.

- The MERN stack consisted of two distinct elements: the back-end and the front-end. In addition, the entire database system is segregated from them.

- The REST API serves as "middleware" between the various components of the system, allowing them to easily be reused in other applications.

- Users of web app will greatly benefit from the increased speed with which they may access their data if its back end is quick to process requests. This is especially true when taking into account the fact that the average amount of time users are willing to wait for a web page to load is now less than 1 second and that a faster server will result in lower operational expenses.

- As a front-end development tool, React.js is amazing, and it is used in the MERN stack. For the sake of completeness, we'll include a few notable companies that have adopted React.js due to its superior performance: Brands like Facebook, Dropbox, Airbnb, Atlassian, Tesla, etc.

VII. LITERATURE SURVEY

The goal of the research is to learn about the basic parts of MERN Stack technology, like MongoDB, Express.JS, ReactJS, and the NodeJS platform. Using
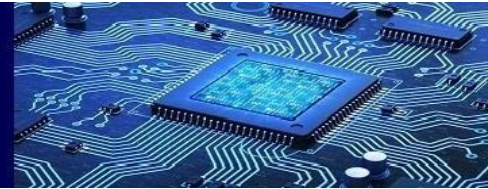
the basic features of an MERN stack web application, such as sign-up, sign-in, showing dashboards, and showing store categories and products. Using MERN Stack technology, we built a web app that lets people shop at online stores and pay for things, book vehicles, etc. Set up admin functions for the website, like managing users and stores, keeping track of statistics, and making reports.

React.JS-

It is a JavaScript toolkit used to create modular user interface (UI) elements. Following is the definition from React.JS official documentation: A library for creating modular user interfaces is called React. React essentially makes it possible to create massive, complicated online applications that can alter their data without requiring further page refreshes.

NODE JS-

Node.js is a free, open-source system application and server environment. NodeJS is an independent development platform built on Chrome's JavaScript that lets us quickly and easily build web applications.

EXPRESS JS-

Express.js is a framework that is made on top of Node.js. It has many advanced features for building websites and apps for mobile devices. Express.js works with HTTP, which makes the API very reliable, powerful, and easy to use. Express adds extra features for developers that make their programming environment better without slowing down NodeJS.

MONGO DB-

MongoDB is an open source database that is also the most popular NoSQL database in use today. It is written in a programming language that is one of the most widely used ones today.

JAVASCRIPT-

JavaScript is a scripting, object-oriented and cross-platform programming language. Objects of host environment can be connected to JavaScript and arranged in such a way so that it can be operated.

VIII. CONCLUSION

You now have a solid understanding of the MERN stack's contents. But is it greater than other masses, such as LAMP or MEAN. Any of these storage options will suffice for the vast majority of current web apps. But MERN holds a unique position. Ideal for web apps with many pre-built connections. You may experience the same with other stacks, but you will find that MERN makes things much simpler.

This study provides a comprehensive review of the performance of the most recent technology, MERN stack. It also investigates web development utilizing various technologies and frameworks. It provides the architecture, components, and implementation of the MERN stack. It demonstrates the Node.js Frameworks and tools, as well as the advantages of utilizing Node. We looked at Express JS. In addition, we examine React and its components, React Virtual DOM and its benefits. In addition, we examined Mongo DB. The report concludes with a discussion of the benefits of the MERN stack, as well as a comparison of MERN vs. MEAN, React vs. Angular and the leading companies that use it.

REFERENCES

[1] Hoque, S. (2020). Full-Stack React Projects: Learn MERN Stack Development by Building Modern Web Apps Using MongoDB, Express, React, and Node.js, 2nd Edition. United Kingdom: Packt Publishing.

[2] Wilson, E. (2018). MERN Quick Start Guide: Build Web Applications with MongoDB, Express.js, React, and Node. United Kingdom: Packet Publishing.

[3] L., R. (2016). Express.js: Guide Book on Web FrameworkforNode.jss. (n.p.): CreateSpace Independent Publishing Platform.

[4] Naimul Islam Naim, ReactJS: An Open-Source JavaScript library for front-end development, Metropolia University of Applied Sciences, accessed on 1 Jan 2022

[5] Wikipedia.org,'AngularJS']Online[. Available: https://en.wikipedia.org/wiki/AngularJS .

[6] Cloudboost.io,'MEAN and MERN']Online[. Available: https://blog.cloudboost.io/mean-and-mern-stacks-eb4cee991390.]Accessed: Feb- 2018[

[7] Angular.io,'AngularJS Documentation']Online[. Available: https://angular.io .

[8] MongoDB.com,'MongoDB Official']Online[. Available: https://www.mongodb.com/ . W3schools.com,'AngularJS']Online[. Available: https://www.w3schools.com/angular/angular_intro.asp

[9] Velliangiri, S., Karthikeyan, P., Xavier, V. A., & Baswaraj, D. (2021). Hybrid electro search with genetic algorithm for task scheduling in cloud computing. Ain Shams Engineering Journal, 12(1), 631-639.

[10] Velliangiri, S., & Karunya, P. K. (2020, January). Blockchain Technology: Challenges and Security issues in Consensus algorithm. In 2020 International Conference on Computer Communication and Informatics (ICCCI) (pp. 1-8).