iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** II **Month of publication:** February 2022

DOI: https://doi.org/10.22214/ijraset.2022.40209

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue II Feb 2022- Available at www.ijraset.com

Review on Study and Usage of MERN Stack for Web Development

Sumangala A. Bafna[1], Pratiksha D. Dutonde[2], Shivani S. Mamidwar[3], Monali S. Korvate[4], Prof. Dhiraj Shirbhare[5]
[1, 2, 3, 4, 5]*Department of Computer Engineering, Government College of Engineering Yavatmal, Maharashtra, India,*
[5]*Assistant Professor, Government College of Engineering Yavatmal, Maharashtra, India Dr. Babasaheb Ambedkar Technological University Lonere, India*

Abstract: Building, creating, and maintaining websites is known as web development. Abandoning the traditional method of web development (HTML, CSS, JavaScript), MERN stack includes four key technologies namely: MongoDB, Express.JS, React.JS and Node.JS. Clearly, it is a JavaScript Stack and it allows smooth development and faster deployment. The main contribution of this work lies in the deep understanding of each technology component on the stack.
Keywords: ReactJS, NodeJS, MongoDB, ExpressJS, MERN

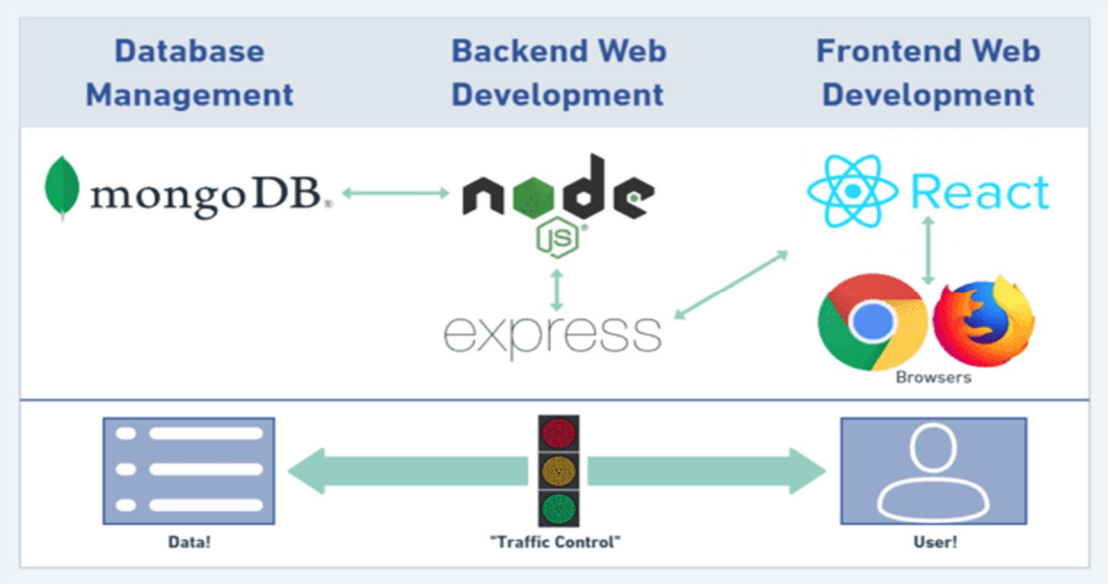
I. INTRODUCTION

MERN is a web development stack that helps you to create both Web and Mobile applications. React Native is one of the popular hybrid (supports both android and iOS) mobile development framework which is based on JavaScript and React JS. So once we master MERN stack, learning React Native is just easy. You can build the mobile app UI using React Native and back-end with Node JS.As JavaScript is used throughout and across the stack, developers don't need to learn and change gears to work with a different technology, enabling a fast learning curve. The entire stack is very easy to learn and good fit for beginners. It is widely adopted in the web industry. Developer community around MERN stack is very huge and growing exponentially. MERN Stack is one of the variations of MEAN, here MEAN is also comprises of four technologies, i.e., M is for MongoDB, ' E ' is for Express, ' A ' is for Angular.js, and ' N ' is for Node, here if you will observe, then you can identify that in MEAN, ' A ', i.e., Angular.js is replaced by ' R ', i.e., React.js in MERN, the main reason behind is - MERN Stack is mainly used for faster development of smaller applications as compared with MEAN, MEAN stack is a mainly better option for large-scale applications.

II. TECHNOLOGY

A. *Overview of Technologies*

Diagram 1: Overview of Technology



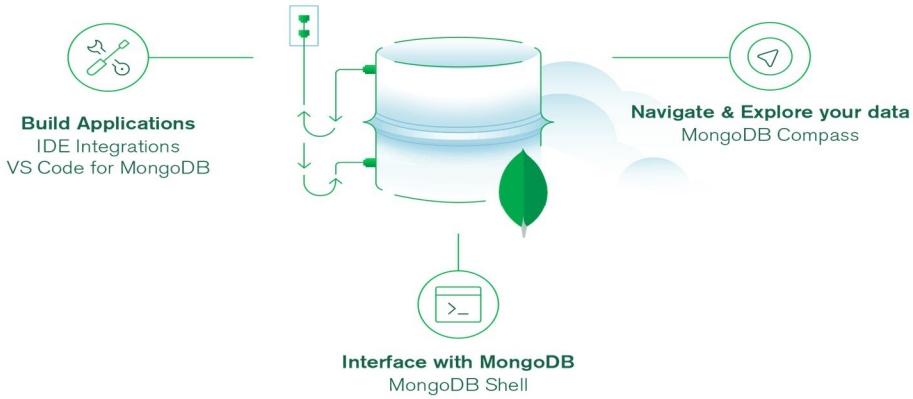
1) *MongoDB:* MongoDB is a NOSQL, open-source-available cross-platform document-oriented database program. It uses JSON-like documents with optional schemas. Licensed under the Server-Side Public License (SSPL), MongoDB Inc. is the father of MongoDB.
2) *React.js:* React (also known as React.js or ReactJS) is a free and open front end JavaScript library to create user interface or UI components. Saved by Facebook and the community of individual developers and companies. React can be used as a basis for the development of single page or mobile applications. However, the React is like that only concerned with state administration and delegating that status to the DOM, so to create Responsive applications often require the use of additional libraries to route, as well as the performance of a specific client side. Node. js: episode.
3) *Node.js:* Node.js is an open source, cross platform, JavaScript background environment that uses V8 engine and uses JavaScript code offline browser. Node.js allows developers to use JavaScript to write command line tools and with server-side scripting - uses scripts on the server side to generate dynamic web page content before the page is sent to the user's web browser. As a result, Node.js stands for "JavaScript Everywhere" paradigm, which includes web application development next to one programming language, there are different server-side languages and client-side notes. Although .js is an extension of the standard JavaScript code file extension, the word "Node.js" does not refer to a specific file in this context and is simply a name of the product. Node.js has an event-driven project that can create asynchronous I / O. These design decisions aim to improve performance and balance in web applications with many input / download functions, as well as real-time web applications (e.g., real-time communication systems and browser games).
4) *Express.js:* Express.js: Express.js, or just Express, is the backbone of Node.js, released as free and open-source software under MIT license. Built building web applications and APIs. It is called a standard de facto server Node.js frame. The original author, TJ Holowaychuk, described it as Sinatra-inspired server which means it is small compared to most available features as plugins. Express is the back part of popular development stacks like MEAN, MERN or MEVN stack, and MongoDB information software and Previous JavaScript framework or library

III. MONGODB

MongoDB is a documentary site designed to facilitate application development and measurement. If your app stores any data (user profiles, content, comments, uploads, events, etc.), you will need an easy-to-use site such as React, Express, and Node. This is where MongoDB comes from. to: the JSON documents created at the end of your React.js can be sent to the Express.js server, where they can be processed and (possibly allowed) stored directly in MongoDB for later retrieval.MongoDB stores data in documents like JSON and these documents also support arrays and objects placed in the nest. Example:

```
{ “id”: objectid=(“e4asd452a2789asdfw”), “title”: “MONGODB”, “content”: “MongoDB is a non-relational database”, “comments: [
        {“name” : “abc”, “email”: “abc@gmail.com”},
        {“name” : “xyz”, “email”: “xyz@gmail.com”}
      ]
}
```

Diagram 2
MongoDB Tools



A. MongoDB Compass

1) Connect to the data using our multi-tasking GUI. Apply updates, retrieve data, and complete other important tasks - all from a single user interface.
2) Get the data you need - quickly. Search your documents and collections directly in the Compass query bar.
3) Drag and drop the connecting pipe maker. Create pipelines from 200+ operators - and send them in your preferred language for use within your application.
4) Access MongoDB Shell directly from Compass. Control your usage by using the commands in the embedded MongoDB Shell.
5) Import and export data as required. Compass allows you to easily import and export JSON and CSV files to or from your collections.
6) Visualize, verify, and analyze the schema. Understand the structure of your documents. Create, update, and apply schema in all collections.
7) Check the functionality of the question with granular details. Explore each question - and then divide it into several sections - with the Visual Explain Program.
8) Prepare questions for reference analysis. View index usage and add or remove references to improve query performance.

a) *MongoDB Shell:* Use the MongoDB Shell to connect, configure and work with your database. The new MongoDB Shell lets you connect to MongoDB to work with your data and configure your database. With its enhanced usability features (intelligent autocomplete and syntax highlighting, easy to understand error messages and contextual help), it's the quickest way to work with MongoDB and Atlas.

Four distinguished features of MongoDB Shell are:

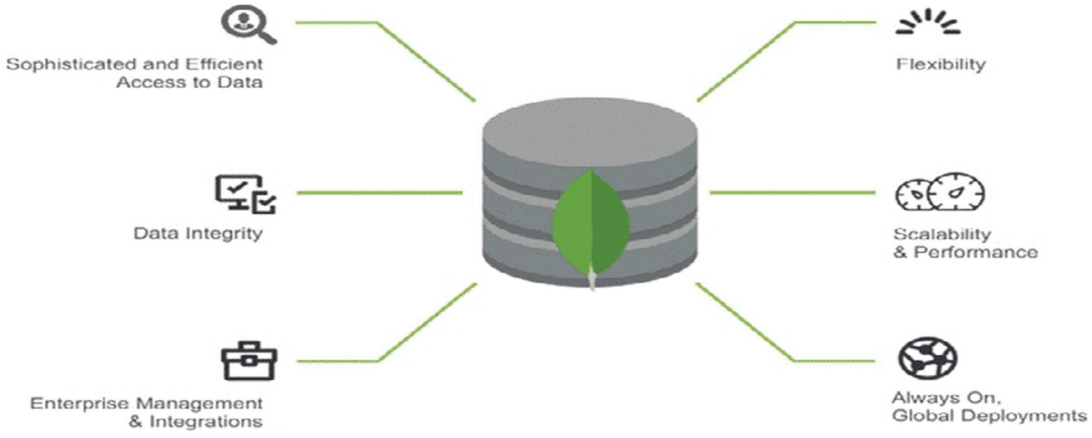
- Syntax Highlighting: Input and output are easy to read with color reading.
- Clear Error Messages: When something goes wrong, error messages are clear and to the point.
- Intelligent Autocomplete: Gives you autocomplete options based on the version of the server you are connected to.
- Extensible with Snippets: Add functionality to the MongoDB Shell with the built-in Snippets functionality.

b) *MongoDB for VS Code:* Easily work with MongoDB databases directly from Visual Studio Code. The best way to prototype your CRUD operations and MongoDB commands:

- Edit and run your playgrounds to see the results immediately
- MongoDB Syntax Highlighting
- Intelligent autocomplete for commands, operators and database, collection and field names
- Stage snippets to create aggregations quickly

B. What We Can Do

Diagram 3
Features of MongoDB



1) Store and query your data
2) Transform data with Aggregations
3) Secure access to your data
4) Deploy and scale your database

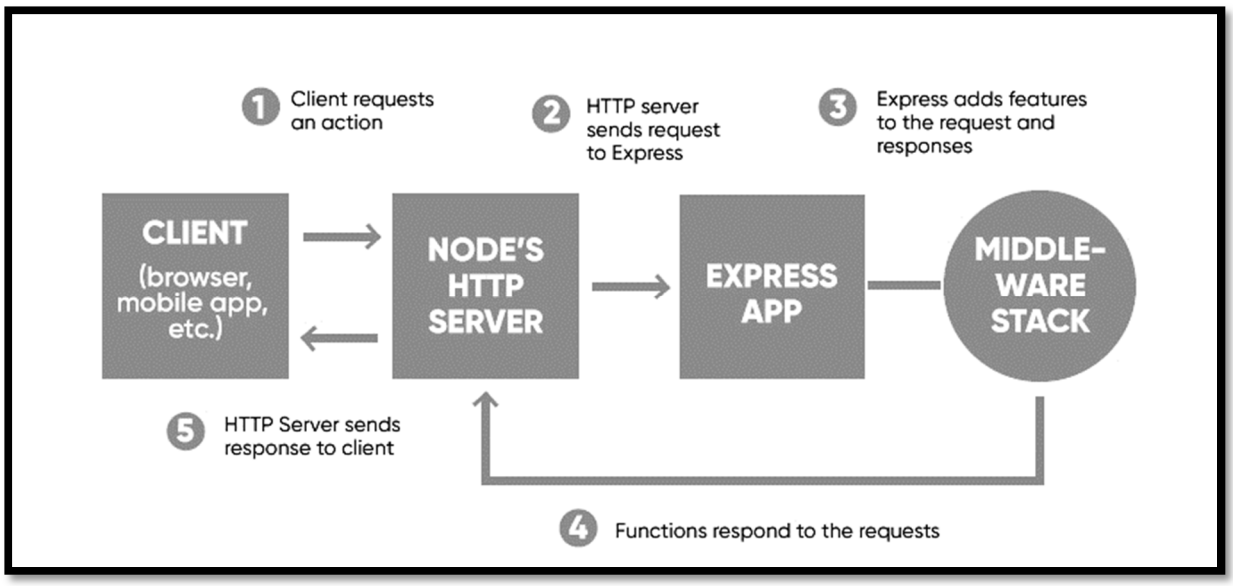
Important features of MongoDB are:

a) MongoDB has very high performance and data persistence compared to other information sites due to the presence of its positive features such as identification, rating, duplication, etc. Very good.
b) The second feature is Indexing. In MongoDB, every data item has a specific index, divided into primary and secondary indexes. With this identification, retrieving data is easy for the user; save a lot of time.
c) Third Feature Non-Schema Website: MongoDB has one of the best features, which means that a single set can hold different types of documents in it. Due to this unusual feature, MongoDB provides great flexibility in information. On the MongoDB website, a single collection includes multiple texts, and these documents may include different numerical values, fields, and more. One document does not have to be required to be associated with other documents, as is the case with a relationship site.
d) Fourth aspect is document retention. Here MongoDB data is not stored in a table but in documents, provided with a unique id, which allows for more flexibility and easier retrieval. Plus, it makes it faster.
e) Lastly, MongoDB has easy-to-set environment.

IV. EXPRESS

The next level down is the Express.js server-side template, which runs inside the Node.js server. Fast and Minimal. Express.js has powerful URL router models (matching incoming URL and server function), and handling HTTP requests and responses. By making XML HTTP Applications (XHRs) or GETs or POSTs from the beginning of your React.js, you can connect to Express.js services that enable your application. Those services use MongoDB's Node.js drivers, or by calling back to use Promises, to access and update data on your MongoDB website.

Diagram 4
Express Architecture

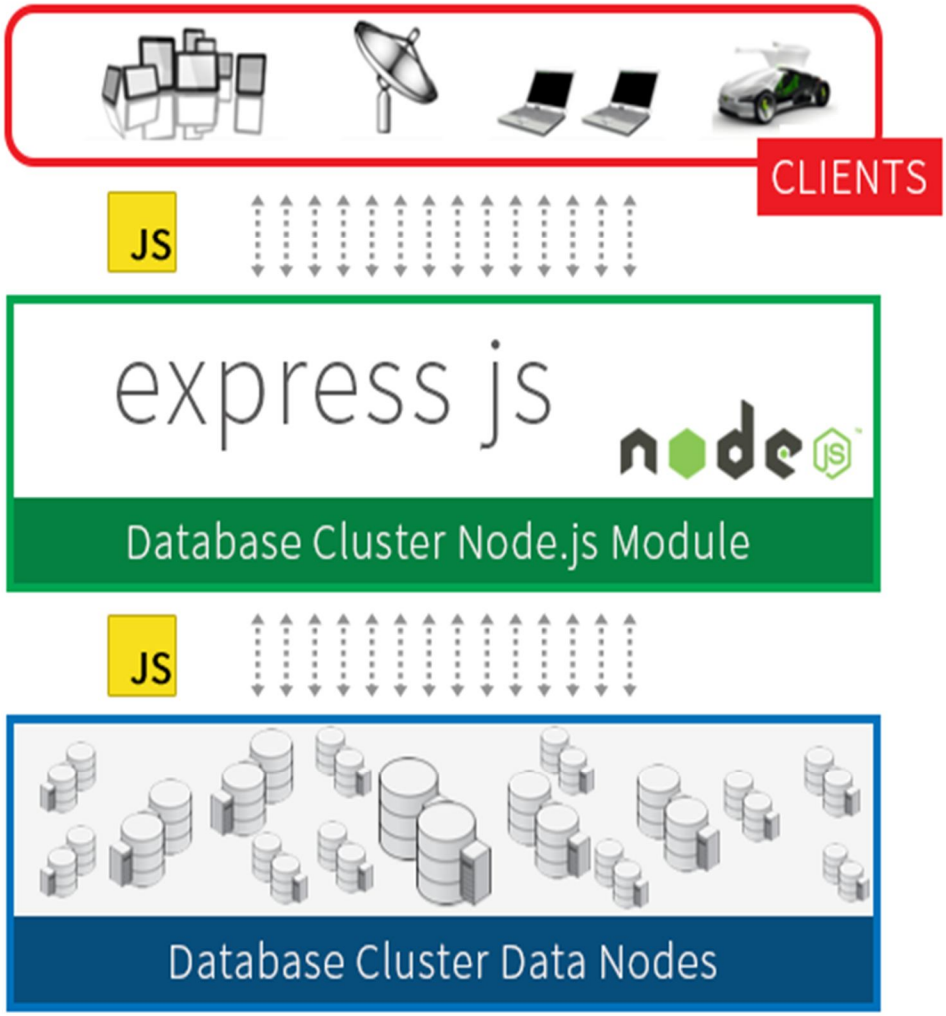


A. *Other important Features of Express*

1) If you want to perform additional tasks and tasks in any request and response, you can easily use the various intermediate modules available in Express. A request is a message that comes to the server to request something, and the Response is a message sent by the server to the client in the form of the result of whatever the client requested. In the event that you make a mistake and want to fix it, you can easily fix it using the middleware of debugging.

2) Middleware is used somewhere during the life cycle of a request or response in the form of a code. It is widely used to enhance performance or improve webserver behavior. Express also helps you create a REST API (Representational State Transfer Application Programming Interface). REST APIs also known as the RESTful API, is highly compatible with REST architecture style constraints, and also allows interaction with RESTful web services. The great advantage of the REST API is that it offers great flexibility; uses HTTP requests to access and process data.
3) Express is very easy to connect to Databases like MongoDB. Based on HTTP methods and URLs, Express lets you define routes for your application.
4) Route aims primarily to define the code that needs to be done in response to any request received by the server. Route is usually done based on the sequence of URL patterns and the HTTP method, which is associated with the application.
5) The flow of data into a website design can be easily implemented using two template engines, EJS and Jade, provided by Express. Express has a large third-party add-on suite so engineers can use it to provide better performance, help increase safety level, and improve speed. It works very well and is measurable; one can easily find it anywhere and use it simultaneously in different programs, and very quickly.
6) Express makes the Node.js web and mobile app development easier and faster. Express has a very simple natural setting. One can easily set up Express on his system and configure it without much effort.

Diagram 5
Working Architecture of Express



Role of Express on MERN

The Express web application framework works with NodeJS. Together, they build a web app backend, making sure the interaction between the app and the user goes smoothly. Each time a user performs a task within a web interface, the request is sent to the backend. Here, the request is verified and processed, following the request for action. For example, when a user clicks the "checkout" button on an e-commerce platform, the backend ensures that the user is, in fact, redirected to the exit page.
Express has structured HTTP application management structures, routes, times, required to build a fully functional web application. What this means is that based on browser requests, the Express application can use any code to restore a static web page or perform complete tasks that include verification testing or a read / write website. Middleware is a function that can access all incoming and outgoing applications and applications in applications. It can be used to modify or test requests (such as user authentication) before applications are processed by the application.

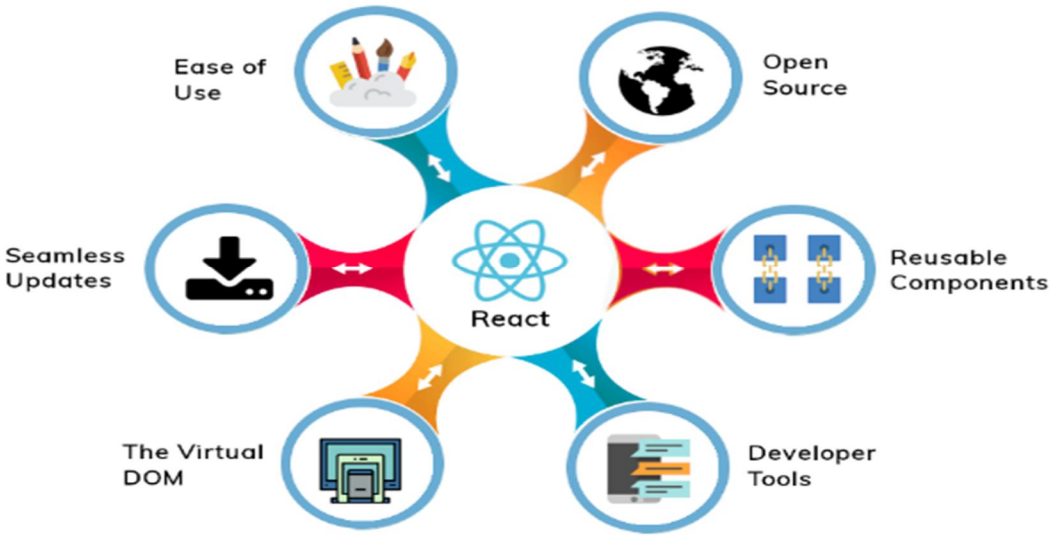
V. REACTJS

The main component of the MERN stack is React.js, a declaring JavaScript framework for creating powerful client side applications in HTML. React lets you build complex workspaces using Simple Components, connect to data on your back server, and render them as HTML.React Solid Suit has a strong, data-driven interface with minimal code and minimal pain, and has all the tools and whistles you can expect in a modern web framework: great form support, error management, events, lists, and more.

A. Other Important React Features

1) *Easy to Learn:* One of the great benefits of using the react as it is very easy for a beginner to learn and create web and mobile applications using this advanced framework. Anyone with a basic background knowledge in the system can easily understand React compared to Angular. Angular is called 'Explicit Domain Language', so it is suggested that it is very difficult to understand. To get a Learning React, you need a basic knowledge of CSS and HTML.

Diagram 6
Features of React



2) *Simple:* React is one of the leading JavaScript frameworks for open source web and mobile applications. It uses a phase-based approach, uses clear and simple JavaScript, as well as a well-defined life cycle, making the response simple and easy. For easy reading and building professional mobile and web applications. It uses a simple syntax called JSX, which allows readers or developers to combine HTML and JavaScript to make it easier for them to use and use it to make effective web and mobile applications. However, it is not necessary to use JSX, you can use plain JavaScript, but compared to JSX, JSX is a much better way over it because of its simplicity and simple syntax.
3) *Data Binding:* React uses an application architecture known as Flux to control the flow of data into segments with a single control point called a dispatcher. It uses a single data binding method, which is easy to remove the self-contained components of large React applications.

©IJRASET: All Rights are Reserved

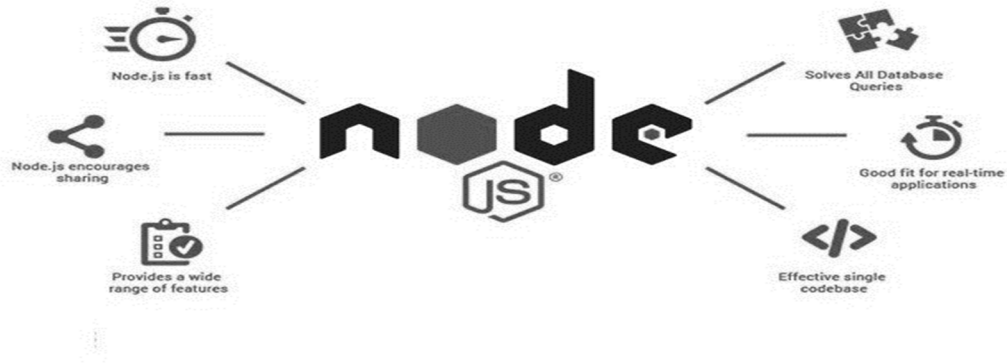
4) *Traditional Way:* React is used to create mobile applications (React Native) and web applications. React allows for reuse of code and can easily support it, which has many benefits and saves a lot of time. So at the same time, at the same time, we can make iOS, web applications and Android.
5) Performance - React works very fast due to data fluctuations. As the name suggests, we can predict that fixed data structures do not change and allow you to compare direct object indicators instead of making deep tree comparisons. The above reason ultimately affects the effectiveness of the reaction and makes it faster.
6) Testability - React is very easy to test; any apps we produce in response, whether mobile or web applications, are much easier for us to test when we share. There are certain world functions in the react, where different reaction ideas are considered to be these regional functions, and we can easily be deceived by the situation we transmit in the reaction view. Also, we can look at output and activated actions, tasks, events, etc.

VI. NODEJS

Node.js is a JavaScript workspace - the one that makes up all of your server-side code. Express is a framework that provides the basic features for developing a web application at Node.js. Although Node.js is already able to listen to requests in the port, Express makes it easy to set up a web server by removing the boilerplate and providing a simple API for creating storage space.

1) Large Number of Libraries
2) npm with its simple structure has helped the Node.js ecosystem expand, and now the npm registry handles over 1,000,000 open-source packages that you can use freely.
3) The Node.js application works in a single process, without creating a new series for every application. Node.js provides a set of asynchronous I / O primitives in its standard library that prevents JavaScript code from being blocked and, in most cases, libraries in Node.js are written using non-blocking paradigms, making blocking behavior different than usual.

Diagram 7
Benefits of Node.JS

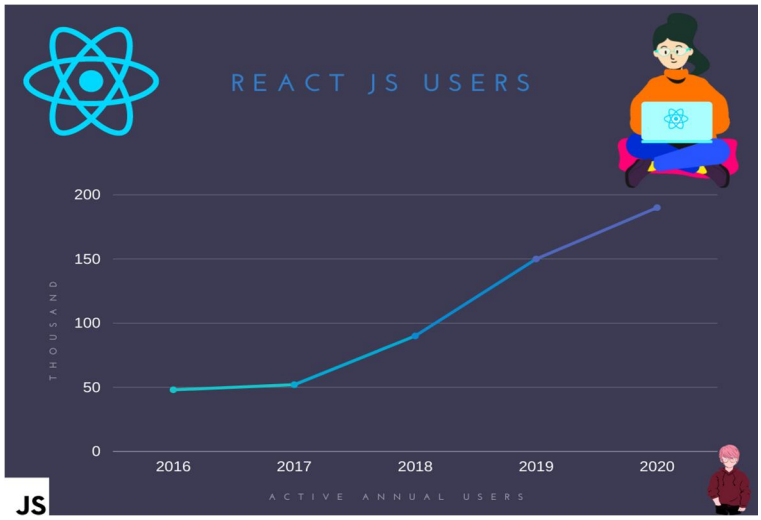


4) When Node.js performs an I / O function, such as network readings, access to a website or file system, instead of blocking the cable and wasting CPU waiting cycles, Node.js will restart operations when feedback returns.
5) This allows Node.js to host thousands of simultaneous connections with a single server without delegating the burden of managing cable compatibility, which can be an important source of distractions.
6) Node.js has a unique advantage because millions of advanced developers writing JavaScript on the browser are now able to write server-side code in addition to the client-side code without the need to learn a completely different language.
7) At Node.js new ECMAScript standards can be used without problems, as you do not have to wait for all your users to update their browsers - you are in charge of deciding which ECMAScript version to use by changing the Node.js version, and you can also provide enable certain test features using Node.js and flags.
8) There are thousands of open-source libraries of Node.js, most of which are hosted on the npm website. There are many developer conferences and events that support the Node.js community, including NodeConf, Node Interactive, and Node Summit as well as a number of regional events.

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue II Feb 2022- Available at www.ijraset.com

VII. DIFFICULTY LEVEL IN MERN

Diagram 8
MERN in Web Development, React Js Users stats from 2016



One can complete the MERN Stack learning process within 30 days. It's very easy because when you start learning and doing new things, you will love it. Of course, learning new things is always interesting and fun for coding. One will love the MERN Stack reading section. Difficulty level, hmm. In fact, MERN was not as difficult for me as math. Mathematics, a boring lesson, why do I get his 'x'? To determine the level of difficulty, let's split MERN into web development into Mongo DB, Express Js, React Js, and Node Js. You will probably spend more time on React Js compared to others. As well as interesting, React Js is great and will take more time to read and understand. Easy to read them, the only thing one needs to be "IMMEDIATELY".

VIII. DISTINGUISHED FEATURES

A. Fast response between backend and front-end and website, ultimately improves website speed and results in better performance, thus providing smoother user information.
B. Highly concerned with the security of applications manufactured using MERN; The security of his web application refers to the various processes, methods or technologies used to protect various web servers and web applications, such as API (App User Interface) from cyber-threat threats. Generally, secure hosting providers can easily integrate applications created using the MERN stack. For more or better security Mongo DB and Node.js security tools are also used.
C. All four technologies mentioned above, MERN (MongoDB, Express.js, React.js, and Node.js) are used in MERN Stack built on JavaScript which makes it affordable and within low cost the user will be able to for better results or output.
D. It is SEO friendly. SEO (Search Engine Optimization) explains that Google, Yahoo and other search engines can search each page of the website efficiently and easily, translate and link content effectively to the search text and easily index it on their website.
E. MERN-built web applications built quickly. Engineer and client, both are satisfied.
F. Also, the client requested changes can be done immediately.
G. All four technologies involved in MERN are open source. This feature ultimately allows engineers to access technical support, easily.

IX. LIMITATION

Since React is simply a library it uses a number of third-party libraries that offer low-grade developer productivity. And because of these improvements, React code requires extra effort. Ideal for a small project, as it is not uncommon for a large project where third-party libraries need to be connected. Productivity is low. Features are high. Security is in the middle. If you are looking for a technical stack that prevents common typing errors with its design, then the MEAN stack is the best option. As Angular uses Typescript, so it prevents common typing errors in the coding section itself. However, React lags behind here.

©IJRASET: All Rights are Reserved

ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue II Feb 2022- Available at www.ijraset.com

X. CONCLUSION

From now on, the MERN stack is suitable for small to medium-sized websites. Further learning and understanding of new technologies, new third-party libraries and testing tools will help the web app grow and perform better. Therefore, we can say that the MERN stack has a bright future as the foundation we need is a good follow-up of JavaScript and ES6.

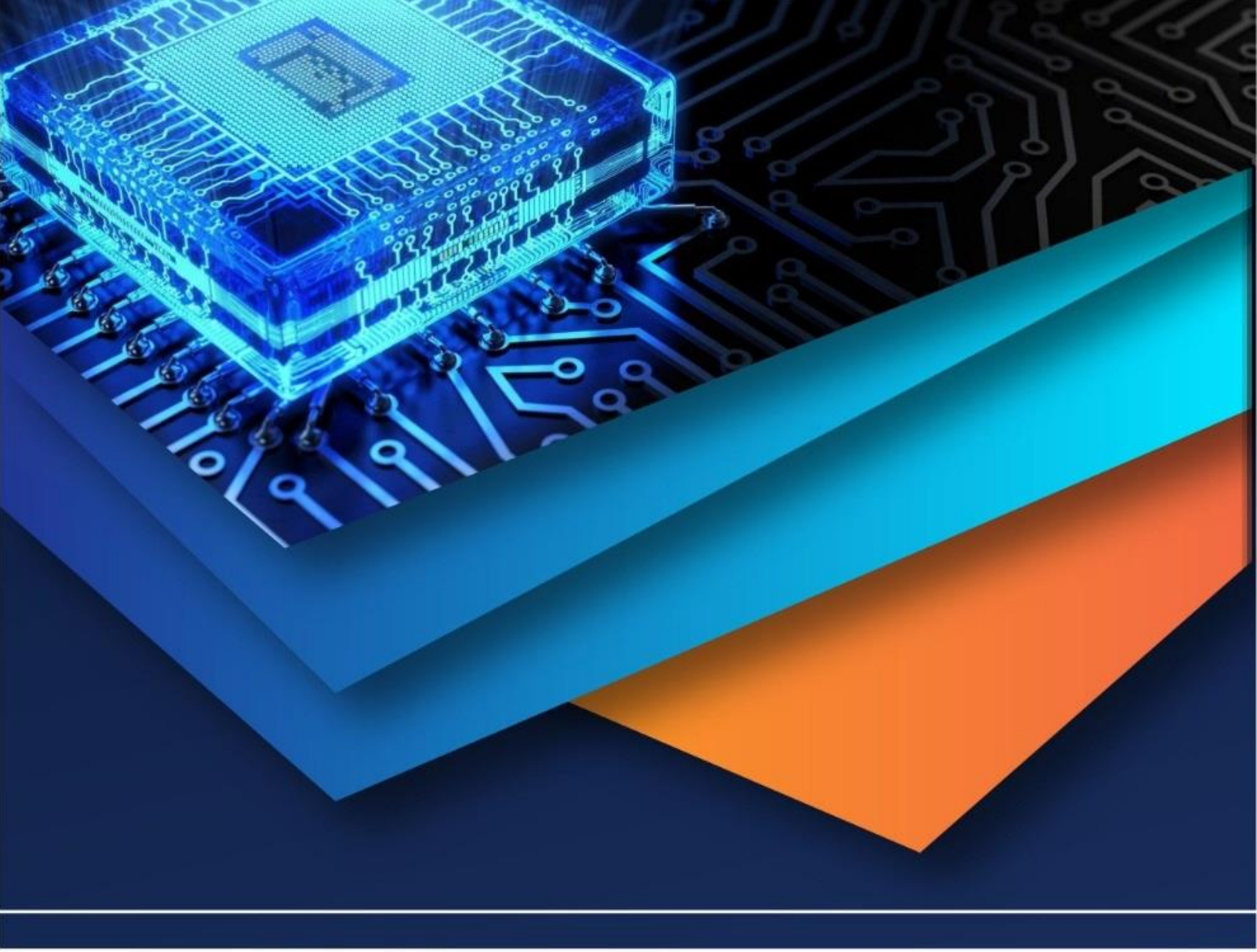
XI. ACKNOWLEDGMENT

Many thanks to our mentors, family and friends for their support. Without everyone's contribution, this project would not have been possible.

REFERENCES

[1] Markus Keinänen - Creation of a web service using the MERN stack
[2] Markus Monnikendam — An Introduction to MERN: ExpressJS Lizard Global
[3] MongoDB.com, Documentation https://docs.mongodb.com/manual/
[4] Expressjs.com (2019) Using template engines with Express https://expressjs.com/en/guide/using-template-engines.html
[5] Mongodb.com (2019), BSON Types https://docs.mongodb.com/manual/reference/bson-types/
[6] Sourabh Mahadev Malewade - Performance Optimization using MERN stack on Web Application

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)