



MEAN STACK

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ABSTRACT

MEAN is actually combination of different JavaScript frameworks and a NoSQL or document based Database technology which is used for web development. In MEAN stack M stands for MongoDB, E stands for Express JS, A stands for AngularJS, N stands for Node JS. This paper provides the introduction to concept and describes the MEAN stack open source and explain the meaning of them along with their future scope. This paper also describe the use of MEAN stack for communicate with IOT (internet of things) devices. JavaScript is used as scripting language for client-side programming that runs in any supportive browser. The most crucial part in a web development project is choice of the right combinations of front-end framework, back-end server, and database environment. This paper focuses on the benefits of the using the MEAN stack.

Keywords: Node, JavaScript, Server

[1] INTRODUCTION

MEAN.JS is a current full-stack JavaScript solution which assists you to design very fast, debug, and maintainable production web applications using MongoDB, Express, AngularJS, and Node.js. MEAN.JS will help out to getting started and give away from useless mumble work and common weakness, while keeping your application assembled. The main goal is to create and maintain a simple and readable open-source solution so that you can use and pay attention in your projects[1]. It represents a group of technologies which are known to concur well together. The major benefit of the MEAN stack is that it is highly quick to prototype with. Node.js allows you to use Javascript on the backend as well as the frontend which can

save you from having to learn a separate language. Apart from this, the nosql behaviour of MongoDB allows you to quickly modify and alter the data layer without having to bother about migrations, which is a very valuable attribute when anyone is trying to make a product without giving its clear specifications and requirement [1,2]. Finally, these technologies have a lot of collectively support beyond them such finding answers to questions or hiring and make it possible for going to be much easier using these technologies.

A. Components

The components of the MEAN stack are as follows:

- MONGODB
- Express JS
- Angular JS
- NODE Js

MongoDB

The MongoDB is simple and is used for storing database. MongoDB is a cross-way document-oriented database with Nosql attributes. MongoDB defines as a database that stores data for the web based application. MongoDB have some exciting features for your application and its architecture that makes it very popular among other databases.

The goal is to

far in these early stages of electronic commerce has been seen by numerous to be combative and not defensive of individual rights, it's likely that the preservation of these rights is one reason that private currencies are likely to crop on the Internet and to ultimately play an important part in global commerce generate a new breed between traditional database features and very high performance of NoSQL stores. MongoDB provides the supports for rich query to retrieve data from the database. It supports the Server-side JavaScript execution which allows any developer to use a single programming language for both client/server side code. MongoDB is very easy to install.

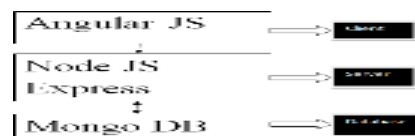


Fig. 1: MEAN Stack

Express

Express is one the most latest and widely used web frameworks in Node.js environment. Express is a minimal web server built on Node.js which provides the entire main feature required for delivering web applications to the browser and mobile phone. Express JS allows you to handle various networking devices like Routes, Server, and I/O stuff very easily. Simple command to install Express in Linux is \$ npm install express.

AngularJS

Angular JS is the next mean stack JavaScript framework used for web development. It is maintained by Google as open source web application framework. We can embed Angular JS into a HTML page with a <script> tag. Furthermore it extends HTML attributes with its own Directives, and then binds data to HTML with Expressions.

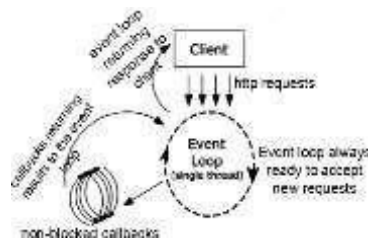
Node.js

Node.js is a next cross-platform, open-source runtime environment used for development of networking and server side applications. Applications in node.js are written using JavaScript language and can be run within the Node.js runtime environment. It also provides a collection of library with various JavaScript files. Whether you're looking for consolidation of technologies or to leverage in-house JavaScript expertise, the MEAN stack can offer a lot to a flexibility for designing web applications[3]. The back end team provides support for designing mean stack application. Due to technology's development in mean stack, various companies are moving from lamp to mean. Operating System.

The first choice in any technology stack is the operating system. As in mean stack operating system does not get locks. While the LAMP stack locked the operating system to a variant of Linux, Linux is still a good choice for an app built on MEAN, but it is by no means the only option; any operating system that can run Node.js is a viable alternative university digital campus, and share the data information of other systems in the digital campus through data exchange.

[2] LITERATURE SURVEY

The various building blocks and design components of MEAN stack, that are used in the design of web applications and other studies that have demonstrated the implementation of this technology are presented next.



A. MongoDB

Submit In 2009 Dwight Merriman and Eliot developed an open source V8-based database called MongoDB. MongoDB derived its name from humongous scalability. The NoSQL database is more scalable than other conventional databases and uses JSON-like data model called BSON with dynamic schemas. MongoDB gained a lot of attraction as a result of providing developers the needed flexibility when dealing with complex data and at the same

time scaling queries much more than the Relational Database Management Systems (RDBMS) (Rick, 2010). MongoDB cuts down large swaths of transformation logic. It is a leading NoSQL document oriented database with persistence storage strategy. BSON is used as a medium to transfer data easily from database to server to client (Ihrig& Bretz, 2015). It also expresses its model within codes. MongoDB is meant for fast and optimized updating using aggressive caching writes technique and by overwriting updated records where possible (Dirolf, 2010). However, non-readability is its main drawback.

MongoLab (mlab) was used to expound the management of MongoDB databases on the cloud platform. This profound improvement has proven greater level of control more than the relational database management systems (RDBMS) with related impedance mismatch problems. MongoDB is widely used in the cloud environments with no native libraries or drivers and offers more benefits over traditional databases. MongoDB are schema-less and works with object representations as oppose to storing those object in several tables with complex representations or schema, MongoDB like most NoSQL Databases support lustering and scaling application load. Its REST-enabled interfaces over Hypertext Transfer Protocol (HTTP) supports high-availability of data. The Mongoose model serves as a connection between MongoDB and NodeJS, this provides the required data structure and at the same time maintain flexibility in data storage and retrieval. Mongoose can *Best Practices for Integrated University*.

B. ExpressJS

ExpressJS is a being a lightweight web application framework that helps developers in organizing web applications in MVC architecture on the server side. It manages everything from routing to handling requests and views. Express.JS makes it easier to write secure, template engines, extending the response object to support various data format outputs, routing system, improved project structure, proper configuration of applications and breaking its logic into different modules. This framework was developed by T.J Holowaychuk within the JavaScript ecosystem to preserve node.JS and to facilitate building faster Single Page Applications (SPA).

C. Angular.JS

Angular.JS or just Angular is a frontend framework used in writing single page applications (SPA) with single page loading. It continued to streamline from several page loading and the use of Ajax call methods. Two-way data binding between views and models are made possible with Angular. This is useful for developers in terms of timelines, and placing tasks on a template is made much easier with HTML (Adam and Colin, 2014).

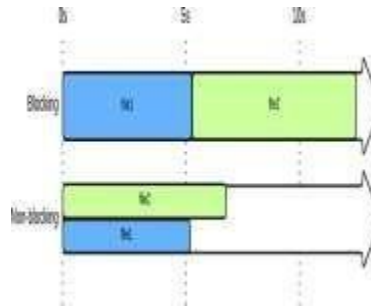


Fig. 3. Non -blocking capability of Node.JS adapted from Mathieu (2017).

D. Node.JS

Node.JS is not a framework, rather, it is a very low level program just like C programming language that is used in writing client side and server applications that requires speedy and efficient delivery such as real-time and server applications. Node.JS uses Google Chrome's super-fast highly optimized V8 execution engine in JIT (Just in Time) compilation fashion to execute JS code by transforming them into machine language and optimizes through complicated methods such as code inlining, copy elision etc. Some characteristics of node.JS include: single thread, exhibiting parallel execution of codes without interference of deadlock, handling concurrent request up to ten thousand connections and more, Node.js exhibits non-blocking to optimizes throughputs and has a main loop that listens to events, which then triggers a callback function (Kenneth, 2015). Its code algorithm is considered crucial to prevent users from wasting valuable time by allowing users do other task while waiting for longer tasks to complete execution. NodeJS maintain a great community and rapid growing history.

E. JavaScript Object Notation

JSON is used to transmit serialized data over a network connection, such as the interchange of data between a web server and a web application. Serialization means transforming objects or data structures in a format that is well suited for storage in the memory buffer or file, and then transmit over a network connection (W3resource, 2015). This data can be retrieved any time. JSON stores semi-structured data due to its nature. It is also lightweight and open standard data interchange format that is both human and machine-readable. JSON has wide acceptance from the community of developer. It was tagged on RFC4627 on IETF specified standard. JSON files is stored with the .json extension.

F. Benefits of Using MEAN Stack in building Web Applications

So many reasons has made MEAN to have an edge in developing web application. They include: 1) Unlike relational Database management system (RDBMS), MongoDB is a NoSQL BSON styled document oriented database which requires no conversion or relational models, it offers greater flexibility with accommodating layer for storing data dynamically because it was built for the cloud (Grover, 2015). It eliminates impedance mismatch problem encountered with the rigid structure of RDBMS (Peter, 2017) and has incredible performance

implications when running queries. 2) MEAN works with JavaScript technologies and provides complete frontend development with less hassle, unlike the frontend of LAMP that can work with many languages and components than the backend.

3) Node.JS is a server that runs the MEAN application. It is an event-driven I/O server-side JavaScript environment that performs more than Apache, IIS and Nginx.in terms of data-heavy and real-time task. 4) LAMP stack and related stacks restrict the operating system to a variant of its operating system. The MEAN stack has no such restrictions. MEAN allows any operating system which can run node.JS 5) Mean is entirely open source and has great community support 6) MEAN uses JSON as data interchange format, and using the same language all through this stack makes it consistent.

[3] RESEARCH METHODOLOGY

This study was carried out using the agile method. That include the following processes: planning/listening, design, coding, testing and implementation. These processes are briefly discussed next.

Planning / Listening – This phase was conducted in order to determine the basic high level requirements needed for the design of the internal emailing as part of a caregiver- patient telemedicine application. User priorities were considered and refinement were made to come up with the user specifications.

Design – In the design phase, suitable designs were created with simple MVC architecture for the application. The process of refactoring was applied in the design phase until a desirable design was achieved. The specifications were streamlined based on the use of Node.JS for the server side run-time environment, Express.JS and Node.JS frame work for the server-side, MongoDB for the database and JADE template engine for the frontend design since they are fast and supports JSON. The MVC modular design was also implemented.

Coding – The coding phase was crucial in building the application based on the M.E.A.N stack RESTive API. The advantages of the coding style include the speed, scalability and simplicity of coding.

Testing – The process of testing was carried out at various stages during design and implementation, to ascertain that the developed application conforms to the requirements that were set during the planning phase.

Implementation – User evaluation was carried out to measure the system performance with respect to its aim and objectives.

[4] RESULTS AND DISCUSSIONS USER INTERFACE SCREENSHOTS

This section gives an overview of the result and discussion of this study. The screen shots are obtained from the conversation between caregivers and patient sending and receiving emails. for analysis or treatment then treatment recommendations. The inbox has the following: write mails, Inbox, Sent and trash as seen with the normal e-mail. There is a provision to search for mails, delete mails, sort read and unread mails and view acceptance request. It has a nicely collapse and shrink for user convenience.



Fig. 10. User interfaces screen shot for e-mails

[5] DATABASE RESULTS

Result of the email collection is presented in Fig. 12. It shows that data is stored using blocks of JSON and BSON as a JavaScript interchange format. Unlike relational databases and present data in the form of “name”: “value” pairs, the objects in the hospital collection include “Name”, “Address”, and “Active”. Values themselves could be arrays of other objects or nested objects. MongoDB does not enforce updating schema like in RDBMS which may sometimes be difficult. The output shows that MongoDB allows us to store objects in a very rich and dynamic way.

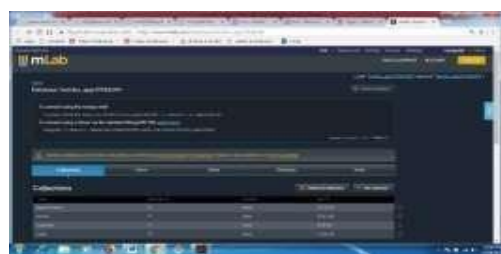
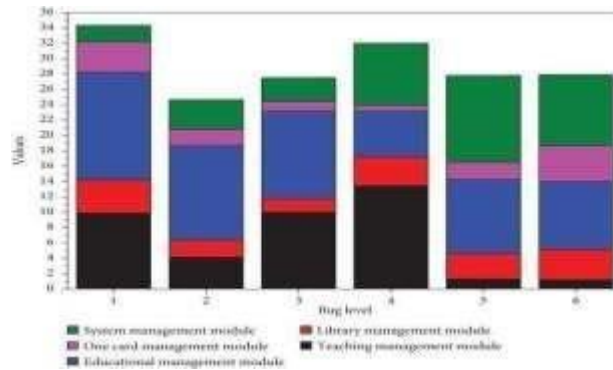


Fig. 12. Database interface from mLab.

[6] DISCUSSIONS

Due to little implementation of MongoDB, ExpressJS, AngularJS, Node.JS (MEAN stack) emerging technologies functioning as a single stack, the relevance of this study becomes obvious when components work together through one common language for internal data communication. This will forestall the benefits of using same language across the entire stack. MEAN allows for cost effectiveness in terms of developers expertise, speed, flexibility,

support for M-V-C, scalability, open source and cloud deployment support. These benefits are higher when compared to other technologies. Node.js allows developer to easily deploy the applications directly on the server without the need for an external standalone server. This reduces the overheads that come with the client server architecture.



In this study, the practical experience in the design of the emailing subsystem using MEAN stack technologies has been presented. The new concept reveals the variations which have been observed with the stack of most common web application technologies such as LAMP and older technologies. These components when compared to other choices offer more convenience for interaction. A secured emailing system was developed, with many of the benefits explained. The system allows access based on login credential. If login is successful, users are allowed to carry on their related operations. The login phase is a uniform interface that comes to life by login to the URL: hrtc.herokuapp.com. The applications run on Firefox, Opera and Google Chrome browsers. The user interface results of this study have shown that users are able to communicate with each other from any location conveniently. The application provided the users flexibility, easy interactions and the desired quality of service. The study has shown that applications developed with the MEAN stack technology are easy to develop, implement and highly interactive.

[6] CONCLUSION

LAMP and its varieties have been a historical technology that has given birth to rich and wonderful application across the globe, and this cannot be undermined. However, in today's technology, JavaScript is a leader in web application development. The MEAN stack, named after its constituents is a new cutting-edge and robust technology that will soon overturn the web development platforms. The decision of using any stack depends on the need and priority of the programmer, but the MEAN stack has proven to be a reliable choice for fast, scalable and real-time applications. Node.JS asynchronous non-blocking concept made it easy for handling concurrency. MongoDB document oriented No-SQL database has proven high performance, flexibility and scalability in emerging technologies with the use of the JSON-BSON data format. Express.JS was built on top of Node.JS to provide an easy to use framework for developers. AngularJS was developed by Google to promote the MVC framework for building SPA and quickly build beautiful interactive user interfaces. unified

identity authentication, based on which the entrance to other application systems can be easily found, providing great convenience to users.

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