Comparative Analysis of Web Development Stacks

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Abstract: The research paper is provide an overview of different types of stacks used for web development platforms. It gives an idea about how to choose a technology stack for web application development. The right technology stack is, to a great extent, the key to the project's success, while the irrelevant choice of web development technologies leads to failure of the project. The technologies discussed in this paper are LAMP, WAMP, MAMP, MEAN. The comparative result analysis with different development parameter is studies and performed.

Index Terms—**Web application development, Technology Stacks, LAMP, WAMP, OS, MySQL.**

I. INTRODUCTION

Computer Technology is the construction of technologies through computer to help people through various modes. Like it helps in developing computer program so that one can do their work by being at home. It may involve software or hardware but it should contain some or the other form of system [1]. According to John Von Neumann, we have reached the limits of whatever is possible to achieve through computer technology. Although one should be careful with such kind of statements, as they tend to sound silly in years [2]. In most easily recognized form of computer mainframe and minicomputers is mostly found in businesses, government offices, and schools. Computers are used on most business and personal desktops in various application word processing, data storage, entertainment games, and electronic shopping. It can also be found in many home appliances, telecommunication devices, automobile dashboards and elevators.

Web Application is a client-server computer program that is stored on remote servers that utilizes web browsers and are developed using browser-supported languages such that HTML, JavaScript. Web applications depend on web browsers for execution. Businesses present themselves through attractive web application to grab the opportunities in the ever increasing competitive era. Web-site development involves very different skill sets during the development process [3]. It is based on some concept of service-oriented computing. It is based on the connectivity and sharing of business process where different vendors, languages and technology platforms communicate [4].

A technology stack is a combination of programs working together to produce a result. Technology stack is a package of programming languages, framework, and tools used by a web developer for design of web based or mobile based applications. Applications comprises of two component front-end, the visual part which the users interact with and the back-end where the business logic is written and which works behind the scenes. Various types of technology stacks are LAMP, WAMP, MEAN, MAMP.

The rest of this paper is organized as follows. Chapter II briefly describes about the various technologies LAMP, WAMP, MAMP, MEAN. Chapter III outlines the parameters for web development stacks like operating system, programming language, database, web server. Chapter IV deals with the result and discussion and the paper is concluded in Chapter V.

II. WEB TECHNOLOGY STACKS

A technology stack is a combination of programs working together to produce a result. Technology stack is a set of programming languages, tools and framework used by a web developer for creation of web based or mobile based applications. Applications comprises of two component front-end, the visual part which the users interact with and the back-end where the business logic is written and which works behind the scenes. Various types of technology stacks are LAMP WAMP, MAMP, MEAN.

2.1 LAMP Stack

LAMP stack is an open source web development platform. Linux is used as operating system, Apache as web server, MySQL is used for relational database management system and PHP is used as object-oriented scripting language. For web applications LAMP stack is generally recommended because of its features which include free, open-source, easy to develop and deploy, security concerns of Apache [5]. LAMP stack allows developers to do what they are best at: develop, without spending a disproportionate amount of time in the administrative details.

Fig. 2.1 LAMP Stack

2.1.1 Linux

Linux, popular operating system used in web servers, is open source which makes the availability of free Linux distribution. Open source means that it can be obtained without any payment. Linux, named after Linus Torvalds, refers to the core of the operating system, the so called "kernel," which interacts directly with the hardware and supervises the operation of other programs.[6]

2.1.2 Apache

Apache is cross platform web server which serves as security purpose. It is a software that serves web pages over the internet via HTTP protocol. It provides a variety of Multi-Processing Modules, which allow Apache to run in a process-based, hybrid (process and thread) or event-hybrid mode, to match the demands of each particular infrastructure in a better way [7].

2.1.3 MySQL

MySQL is an open-source, multithreaded SQL database management system, SQL is structured query language. MySQL is a central component of the LAMP open-source web application software stack [8]. MySQL is written in C and C++. Its SQL parser is written in yacc. MySQL works on many platforms like Windows, Linux, Symbian, Solaris, etc. MySQL has many versions in which 8 is the latest.

2.1.4 PhP

PhP is an important player in the software development market. PhP is heavily used in the development of web based software. PhP is a full featured comprehensive programming language. It was called a scripting language in the past, today it is more referred to as a dynamic programming language. It is a server side scripting language used for web development [9].

2.2 WAMP Stack

WAMP is the abbreviation of the package: Apache, MySQL, and one of Perl, PHP, or Python in Microsoft Windows operating system. WAMP are the packages of independently-created programs.

2.2.1 Windows

Windows is an operating system which is developed and sold by Microsoft. It has many versions like DOS, XP, 7, 8, 9, 10, etc. Windows came to dominate the world's market with 90% of its share and overtaking MAC. Windows has much larger support for hardware and devices. Windows can be expensive for home use, its cost depends upon version to version [10].

2.2.2 Perl

Perl is the extraction language as its name suggested "Practical Extraction and Reporting Language". Perl is the first great language for people which require no prior programming experience. Perl is the language of Unix /Linux environment and comes pre-installed on most of non-Windows operating systems. CPAN, the Comprehensive Perl Archive Network, is main and huge library for Perl and it is freely available and makes Perl exceedingly simple to create useful programs. In common language the Perl program are known as Perl scripts [11].

Fig. 2.2 WAMP Stack

2.2.3 Python

Python is a high level programming language and it is widely used. Its syntax are so easy that the programmer can express their codes in very few lines. Python integrates multiple programming paradigms uses the concepts of procedural, object oriented, functional, and imperative. It is a dynamic system and also it supports for automatic memory management. Python is a scripting language and it also uses a third party tools like Py2exe or Pyinstaller [12]. Python come with a package which consists standalone executable programs. It also provides interpreters for many operating system.

2.3 MAMP Stack

MAMP is the abbreviation of : Apache, MySQL, and one of Perl, PHP, or Python in Macintosh Operating System. MAMP is a stack which is free and open source and developed by Apple.
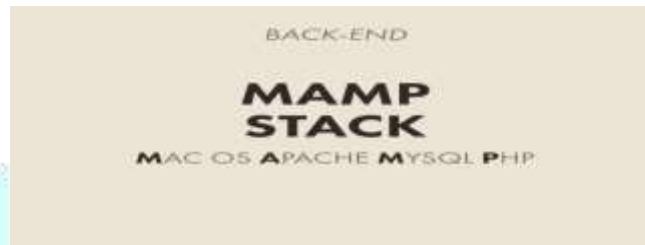

Fig. 2.3 WAMP Stack

2.3.1 Macintosh

Macintosh also known as MAC is a family of computer which is manufactured and sold by Apple. Early Macintosh models were expensive and therefore dominated by the consumers.Then apple introduced other models of macintosh which was less expensive. Apple contracts with Foxconn and Pegatron for hardware production. It has many versions but the latest one is MAC OS High Sierra.

2.4 MEAN Stack

The four Technologies used in the MEAN stack are MongoDb which is used as database, Express JS as the Server Framework, AngularJS for front-end and NodeJS as an event-driven I/O(input/output) server-side JavaScript environment. Four technologies are based on javascript and JSON (JavaScript Object Notation) which is used to exchange data across these technologies [13].

2.4.1 MongoDB

MongoDB stores data as document in a binary-encoded form called BSON or simply Binary JSON. It organizes documents that tend to have similar structure as collections. A Collection in MongoDB corresponds to a table in relational databases, a document is a row, and a field is a column [14]. In MongoDB data is stored in the denormalized form in which related data in stored in single document. This is known as Embedding [15].

2.4.2 Express JS

Express is a relatively small framework that sits on top of Node.js web server functionality to simplify its APIs. It makes it easier to organize application's functionality with middleware and routing; it also adds helpful utilities to Node.js HTTP objects. Express facilitates the rendering of dynamic HTML views [16].

2.4.3 AngularJS

AngularJS is front-end frameworks manage by Google, it help build responsive sites. AngularJS is a JavaScript framework. It can be added to an HTML page with a script tag. AngularJS extends HTML attributes with Directives, and binds data to HTML with Expressions. AngularJS extends HTML with new attributes. AngularJS is perfect for Single Page Applications (SPAs).AngularJS is easy to learn [17].

2.4.4 NodeJS

Node.js is a popular platform for building server-side web applications written in JavaScript, and JavaScript is one of the primary languages used for application development [18]. It is an open source, cross-platform runtime environment for developing server-side

and networking applications. JavaScript is a language for Node.js applications and this application can be run within the Node.js runtime on OS X, Microsoft Windows, and Linux.
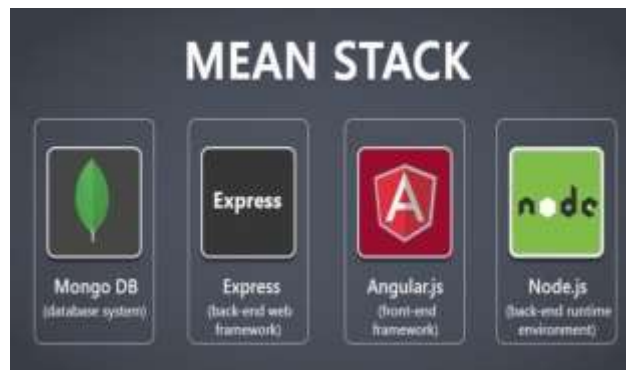

Fig. 2.4 MEAN Stack

III.   PARAMETERS FOR WEB DEVELOPMENT STACKS

3.1. Operating System

Operating System provides an environment in which a user can execute programs in a convenient and efficient manner [19]. It manages input, output and memory allocation. Within the broad family of operating systems, there are various types of operating systems. The categories are: Batch Processing operating system: Batch processing operating system are ideal in situations where the large amounts of data to be processed or similar data needs to be processed or similar processing is involved when executing the data. Real-time operating system: A real-time system is one whose correctness involves both the logical correctness of outputs and their timeliness [20]. It responds to inputs immediately and generates results instantly. Single-user, single task operating system: Single-user OS are usable by a single user at a time. Single-user, multi-task operating system: It allows more than one program to run concurrently like printing, scanning, word processing etc. e.g. MS Windows and Apple's Mac OS. Multi-user operating system: - A multi-user operating system allows different users to use the computer's resources simultaneously.

3.2 Programming Languages

Programming language is basically a set of instructions used to produce desired output. There are thousands of programming languages. It is divided in 2 parts syntax and semantics. Programming language takes input, process it and produces the result. The programming language should be chosen according to our needs.

3.3 Database

Database is basically a collection of data used by the user to access, retrieve, insert, delete. Data stored in the repository is called database. The user interface of database is called Database Management System (DBMS). DBMS is a software that interacts with user. It helps to keep data organized for easy retrieval and faster access [21].

3.4 Web Server

Web Server is a software which takes request from the http protocol and deliver web pages to clients. Web Server stores information and serve client requests. Web server request to the domain name server (DNS) to serve the client requests [22]. Web servers support server side scripting language like PhP. It also maps component of Uniform Resource Locator (URL) into local file system for static requests and internal or external program name for dynamic requests.

IV. RESULTS AND DISCUSSION

4.1 Results and analysis of web development stacks

As we see from the table, Operating system used by LAMP is Linux, MEAN uses Mac, WAMP uses Windows, while MAMP uses both Windows and Mac. Perl/Php/Python is used by LAMP, WAMP, MAMP while MEAN uses AngularJs. These three stacks LAMP, WAMP, MAMP uses the RDBMS database MySQL while MEAN uses NoSQL database MongoDB. Web server used by LAMP, WAMP, MAMP is Apache but MEAN uses ExpressJS.

Table 4.1: Comparative Analysis of Web Development Stacks

Technology	LAMP	MEAN	WAMP	MAMP
Full Form	Linux, Apache, MySQL, PHP	MongoDB, ExpressJS, AngularJS, NodeJS	Windows, Apache, MySQL, PHP or Perl or Python	MacOS, Apache, MySQL, PHP or Perl or Python
Operating System	Linux	MacOS	Windows	Windows, MacOS
Languages	Perl/PHP/Python	AngularJS	Perl/PHP/Python	Perl/PHP/Python
Database	MySQL	MongoDB	MySQL	MySQL
Web Server	Apache	ExpressJS	Apache	Apache

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V. CONCLUSION

So as far we have discussed about the different kind of technology stacks like LAMP, WAMP, MAMP, MEAN. We have discussed how they all are different from each other and what functionalities each of them possess. We have done a comparative analysis on different parameters of the technology stacks on the basis of their operating system, language used, database used, and web server.

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