Python-WSGI and PHP-Apache Web Server Performance Analysis by Search Page Generator (SPG)

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Abstract

The web servers (WSGI-Python) and (PHP-Apache) are in middleware tier architecture. Middleware architecture is between frontend tier and backend tier, otherwise it's a connection between frontend tier and backend tier for three tier architecture. The ELearning systems are designed by two different dynamic web technologies. First is by Python-WSGI and the second is by Personal Home Page (PHP-Apache). The two websites were designed with different open source and cross platform web technologies programming language namely; Python and PHP in the same structure and weight will evaluate perform over two different operating systems (OSs): 1) Windows-16 and 2) Linux-Ubuntu 20.4. Both systems run over the same computer architecture (64bit) as a server side with a common backend MySQL web database for both of them. Nevertheless, the middleware for PHP is a cross Apache MySQL PHP Perl (XAMPP), but the middleware for Python is Pycharm and the web server gateway interface (WSGI). WSGI and Apache are both web servers and this paper will show which of them has a better response time (RT). On the one hand, the experimental results demonstrate that the Python-WSGI is even weightier in Mbyte than PHP-Apache, on the other hand Python is still faster and more accurate than PHP. The designed SPG is by handwriting codes: one time designed the SPG by PHP source code and the other time designed by Python source code. Both Python-WSGI and PHP-Apache results are targeted to compare by the least time in milliseconds and take in to account enhanced performance.

Keywords: Python, PHP, Web Server, Web service, SPG, Performance.

1. Introduction

The handwriting codes are used to design an SPG application to evaluate response time. Nevertheless, the ready application like PageSpeed insight (PSI) was downloaded from the internet.

Three stages of benchmarking classification are management, operational and strategic benchmarking. Thus, an operational benchmark is located in between management and strategic benchmarking (Faraj et al., 2020). Moreover, there is a direct relationship between all three classifications of benchmarking; for example, the enhanced management and operational will provide better strategies.

After the computer revolution and internet facilities became very popular, all businesses modified to E-business. The very primitive benchmark is traditional changes to the E-benchmark. The operational benchmark modified to the E-operational benchmark (Nooruldeen, 2017).

Most software uses multiple programming languages to implement specific functionalities based on the strengths and weaknesses of different web programming languages. Researchers in the past have studied the impact of independent

programming languages on software quality; however, there has been little or no research on the impact of multiple languages on the quality of software (Kochhar et al., 2016) (QoS).

The software (SW) and hardware (HW) for web servers and E-management are an essential factor, but this paper concentrates on software and application. Since web application is a crucial part of every functioning web application system designed in different web technologies, Python and PHP with different web applications are WSGI-Python and Apache-PHP and benchmarked. The benchmark has been developed to assist society in its practice of delivering quality improvement (QI). QI for the proposed system is two different web servers (i.e., WSGI and Apache). Other sections in the paper investigate which web server is enhanced and is calculated by handwriting codes for SPG. The enhanced QI illustrates the results in this paper for the mentioned technologies of a search page generator in milliseconds.

The high-quality information source code measurement is considered privileged and is commonly associated with precision and accuracy. However, it is not always pure results what features of the measurement process justify the public trust and how the quality of measurement results are at a good level (Maul et al., 2020).

Performance can be measured in many ways, including transmit time and response time. Transmit time is the amount of time required for a message to travel from one device to another. Response time is the elapsed time between an inquiry and a response. The response time is the elapsed time between the end of the inquiry and the beginning of the response (Kamaran et al., 2017). Figure 1 shows the performance by response time is elapsed time between the end inquiry and the beginning of the response.
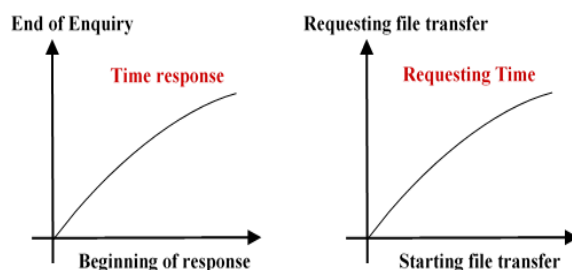

Figure 1. Performance by response time is elapsed time between end enquiry and the beginning of the response (Kamaran et al., 2017).

In the service sector, long cycle times can frustrate customers who have to wait to get service. For example, a long cycle time in a customer service center may result in losing customers or creating negative publicity. Longer cycle time may mean opportunities for improving the efficiency of an existing process in terms of cost and time savings and enhancing customer satisfaction (Ramakrishnan & Kaur, 2019). The purpose of electronic technology and test web server particularly is to support continuous quality improvement (QI) in technology-enhanced learning (Marshall & Sankey, 2017). Correspondingly, the QI is an essential factor in this paper for evaluating web servers, and it's a target of enhancement for only software and application. The QI in the web server is helping for better quality of performance (QoP) and quality of result (QoR). The QoP by the electronic operational category benchmark has opened an academic door for researchers to investigate the new contribution, which is the workload for web servers (i.e., Apache-PHP and WSGI-Python). Both web servers are evaluated by SPG in milliseconds. The less milliseconds is better for performance. This means that the QoP is improved. While QoP is improved, the QI becomes much better. There is a direct relation between QoP and QI. When the QoP and QI are enhanced, the quality of information (QoI) is definitely at a higher level in information. In contrast, the QoP and QI are at a higher level also QoR in a perfect stage. This means that the QoP and QI have a direct relationship between the three of them. Figure 2 shows the direct relationship between QoP, QI, and QoR. Nevertheless, the QI and QoE are the same as each other.

Figure 2. Relationship between QoP, QI and QoR.

The purpose of this paper is to evaluate capacity added to WEBSERVER list factors. The different weight in MB for eLearning systems is a target which is designed and implemented once by PHP-Windows and PHP-Ubuntu and another time Python-Ubuntu and Python-Windows. The basic capacity of the web programming technique Python is 42 MB before adding data, but the capacity of PHP is 35 MB before adding data. The WEBSERVER capacity evaluation over different operating systems with ELearning, was designed by PHP once and by Python another time. In order to find out the results (i.e., capacity load) of the WEBSERVER by method Search Page Generator (SPG) method was used. The method investigated for the proposed WEBSERVER is designed by handwriting codes once by Python and the other time designed by PHP, and was run through different operating systems, namely Linux and Windows, to investigate new contribution parameter load capacity. The load capacity parameter was placed in the list of electronic operations.

Ranges of Operating Systems have been used over the years, having different features and functionalities. Given this, the comparative analysis of varying OS becomes inevitable. Thus the need arises for a comparative study that will give an overview of the similarities and differences in different types of OS with the view to presenting and mapping the features of the OS with various user services (Adekotujo et al., 2020).

WBRP stands for "Web Base Response Performance" which is an aspect of measuring the speed of web technology-XAMPP over the different OS. This, in turn, is related to the design and developments, as the faster website is shown to enhance visitor attention, loyalty, and satisfaction for XAMPP, which is currently the widespread web technology application software and support web servers of Apache (Othman et al., 2020).

The Web Server Gateway Interface (WSGI) is a standard interface between web servers and Python web application frameworks. By standardizing behavior and communication between web servers and Python web frameworks, WSGI makes it possible to write portable Python web code that can be deployed in any WSGI-compliant web server. WSGI is documented in PEP 3333 (Reitz et al., 2016).

The virtual world became more significant, and the overall number of internet users increases in the world. For that reason, web services and web servers have become more important than ever. Web servers provide services that must maintain reliability and maintain tolerability in terms of server response time (Samad et al., 2017). Nevertheless, the response time of the web server is a target of investigation in this paper. The web application performance based on load testing using performance response time in fewer results is used as a benchmark. The paper compares the results generated from only handwriting code in Python and PHP.

2. The Architecture of the Proposed System

Electronic learning services benchmark (ELSB) is achieved in different types of web technologies over different OSs. This paper investigates the contributed parameter in the list of operational benchmark electronically, which is more applicable for the proposed system, and the capacity parameter for web servers parts are both Apache and WSGI is E-operational benchmark system. Moreover, a parameter was added as a contribution of the EOB list, namely capacity and tested by SPG method handwriting codes for ready application. The functional part covered is only the dynamic web application because of the web database behind the website with web services in the middleware layer. Finally, the performance benchmarking was done by applying load tests with different load sizes (i.e., 64MB, 256MB, 512MB, and 1024MB). Comparing all test results achieved for load capacity in EOB. Figure 3 shows the PHP web technology over different OSs, also a general description of the proposed system for web technologies. Windows Apache MySQL PHP (WAMP) by XAMP also over the Linux operating system which became LAMP.
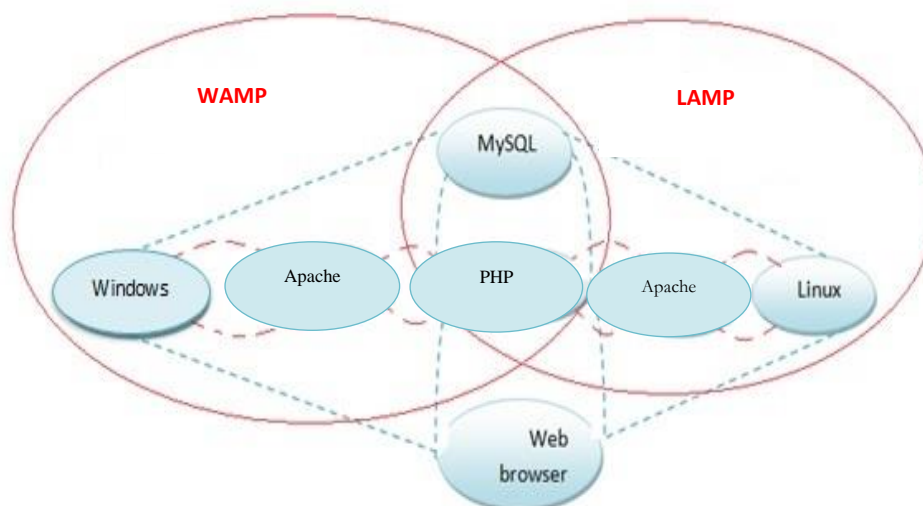
Figure 3. PHP web technology over different Oss.

Figure 4 shows Python web technology over different operating systems (i.e., Windows and Linux). Windows, WSGI, MySQL, and Python (WWMP). The other operating system is Linux which became (LWMP).
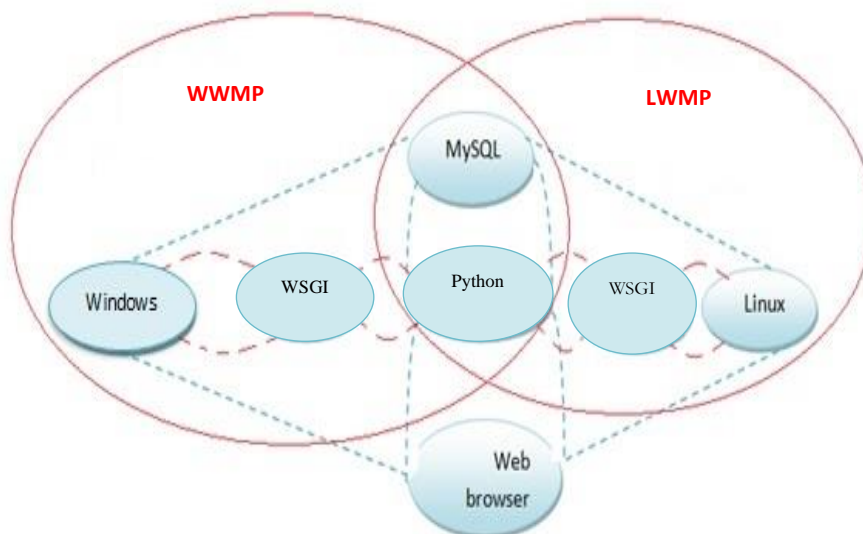
Figure 4. Python web technology over different OSs.

In order to implement and test the system we designed and implemented the search engine for Search Page Generated (SPG) in the unit of milliseconds for software requirement and hardware requirement. The system requirements for the proposed system are hardware and software, are are explained in the next section.

2.1. Software Requirements

Software is an untouchable or soft part of the proposed system, which includes operating system and applications. All software and applications are used for designing search engines by Search Page Generated (SPG) system. Table 1 describes all software requirements that were used for designing SPG systems by PHP web technology over different OSs.

Table 1. Describes all software used for designing SPG by PHP over different OSs.

Windows OS	Linux-Ubuntu 20.04 OS
Development Server-WAMP (i.e. XAMP) X: cross platform A: Apache M: MySQL P: PHP	Development Server-LAMP L: Linux A: Apache M: MySQL P: PHP
Backend: database MySQL	Backend: database MySQL
Frontend: HTML, CSS and JavaScript	Frontend: HTML, CSS and JavaScript
Scripting language: PHP	Scripting language: PHP
Application: Sublime text3	Application: Sublime text3

Table 2 describes all software requirements used for designing SPG systems by Python web technology over different OSs.

Table 2. The software requirements of Python web technology.

Windows OS	Linux-Ubuntu 20.04 OS
Development Server-WWMP W: Windows W: WSGI M: MySQL P: Python	Development Server-LWMP L: Linux W: WSGI M: MySQL P: Python
Backend: database MySQL	Backend: database MySQL
Frontend: HTML, CSS and JavaScript	Frontend: HTML, CSS and JavaScript
Scripting language: Python- Server side	Scripting language: Python- Server side

Application: PyCharm	Application: PyCharm

2.2. Hardware Requirements

The computer hardware architecture used for testing the proposed system is as below:

• Computer Laptop: HP ZBook 14.
• Processor: Intel® Core™ i7-4600U CPU @ 2.10GHz
  2.70GHz.
• Installed Memory (RAM): 8.00 GB.
• System type: 64-bit architecture, x64-based processor.
• Hard drive: SSD

3. Results Analysis and Comparison

All components with different operating systems were evaluated by SPG application in milliseconds.
Table 3 shows the results of the proposed system over different OSs, namely (Windows and Linux).

Table 3. The results of the proposed system over different OSs.

Weight\Capacity	Load time by SPG			
	Python-Windows	Python-Ubuntu	PHP- Windows	PHP- Ubuntu
64MB	0ms	0ms	1ms	1ms
256MB	8ms	4ms	14ms	9ms
512MB	16ms	5ms	23ms	15ms
1024MB	24ms	9ms	38ms	30ms

The Python-Ubuntu outcome results chart illustrated in milliseconds response time by SPG is better than Python-Windows for all capacity sizes. The overall accurate outcome results should be above two out of four and in fewer milliseconds out of capacity. Otherwise, the perfect record result is Python-Ubuntu because the result is 4 out of 4, or 100% will be acceptable. Thus, the outcome of 100% or 4 out of 4 is the same for selecting the best OS and web technology. Ubuntu and Python are more optimumal than Windows and PHP. Table 3 shows the rate of overall results out of four or 75% Capacity (i.e. 64MB, 256MB, 512MB and 1024MB). All results show that Ubuntu with Python is in the perfect state. The investigated result show that Python-Ubuntu is much more accurate and accessible than Python-Windows; also, PHP-Ubuntu performs better than PHP-Windows. In both cases, Ubuntu and Python show a perfect outcome. Figure 5 shows in detail all specifications of load capacity tests for Python web technology and different OSs generated by the SPG application in the unit of millisecond.
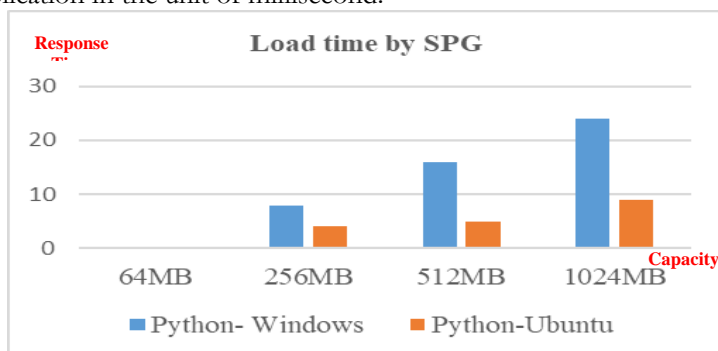

Figure 5. Details of all specifications of load capacity tests for Python web technology and different Oss.

In Figure 6, the page load time is shown in milliseconds. The page load time is a measure for performance analysis. The designed source code is by Python web technology.
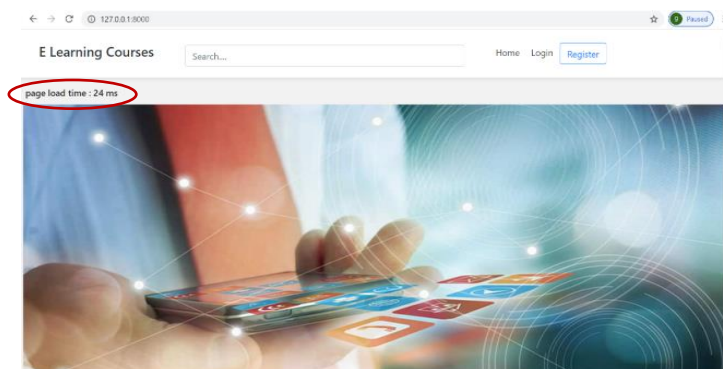
Figure 6. Load page generator by SPG for Python.

Figure 7 illustrates all specifications of load capacity tests for PHP web technology and different OSs generated by SPG application in the unit of milliseconds.
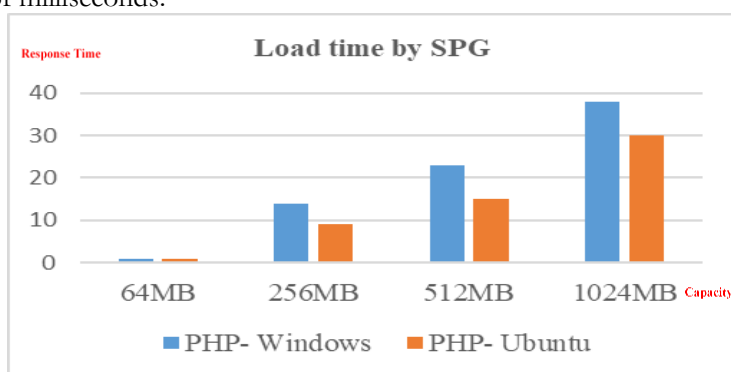

Figure 7. Illustrates all specification of load capacity tests for PHP.

There is an indirect relationship between response time and capacity which is shown in Figure (7); when the capacity increases, the response time result needs more time. Thus, the overall performance is decreased.

In Figure 8, the page load time is shown in milliseconds. The page load time is a measure for performance analysis. The designed source code is by PHP web technology.
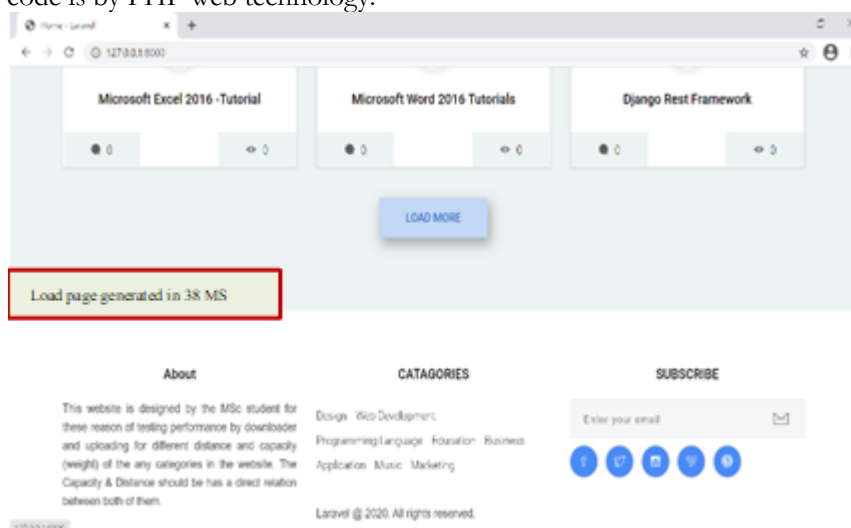

Figure 8. Load page generator by SPG for PHP.

The results for 1024 MB, which is designed in PHP web technology and tested by the SPG method, show that the load page generator is too high in the units of milliseconds.

There are several types of architecture (i.e., tier architecture, computer architecture, internet architecture). Examples of tier architecture are one tier architecture (1TA), two-tier architecture (2TA) and three-tier architecture (3TA). Computer architecture examples are (32 bit, 64 bit etc.). Different types of devices or hardware are required to setup up the internet network architecture. It can operate with both networks, such as wired or wirelessly. There are lots of components that are involved in maintaining the architecture of internet technology.

4. Conclusion

New modifications have occurred in web servers, namely WSGI and Apache as mentioned and known and introduced in modern web server communication, for example, Python-WSGI and PHP-Apache. Both were tested using handwriting codes with difficulty to write codes if compared to ready application for testing. The ready application is much easier to download and evaluate for both web technologies, Python, and PHP tests. The basic python capacity is larger but executes faster. The PHP capacity is more lightweight than the Python, but time execution is faster than the Python. This means that parallel programming in Python is better than the parallel programming of PHP. From the results that were evaluated the Python Ubuntu is much better than PHP Ubuntu. Also, Python Windows is much better than PHP Windows. In all evaluations, Python is run or executed at a much faster rate compared to PHP. Parallel computing is constant for both cases; the only factor is parallelizing of programming or multitasking of Python is higher than the PHP. That is all is related to parallelism programming of Linux-Ubuntu of users are two important factors that affect the resulting test of capacity response time (minimum and maximum). The two factors that concentrate on the proposed system are web technologies Python and PHP web servers that tested.

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