

**PERFORMANCE ANALYSIS OF CODEIGNITER AND LARAVEL
FRAMEWORKS ON ADMIN-BASED WEB APPLICATION
PROTOTYPES**



Composed as one of the requirements to complete Strata I Study Program in
Informatics Study Program the Faculty of Communication and Information

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**INFORMATICS STUDY PROGRAM
THE FACULTY OF COMMUNICATION AND INFORMATION
UNIVERSITAS MUHAMMADIYAH SURAKARTA
2022**

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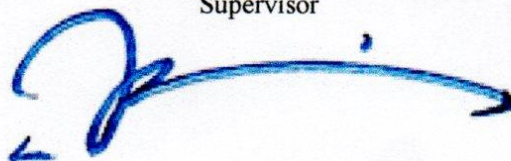
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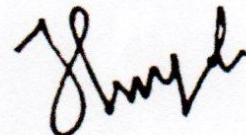
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Abstract

Hypertext Preprocessor (PHP) is one of the easiest programming languages used in making either front-end or back-end of web applications has several different frameworks, and each of them has the same goal, which is to simplify the web development process. However, developers are sometimes confused in determining the proper framework when starting the development process. The response time and the ability to handle numerous requests are the first deciding factors when developing web applications. This research was conducted to measure the performance of admin-based web applications created using CodeIgniter and Laravel frameworks. Hypertext Transfer Protocol (HTTP) request will be recorded using Blazemeter software which is then simulated into the Apache JMeter program with numerous users ranging from 50 to 200. From the simulation result, it is found that the average response time and errors that occur did not show any significant difference. The t-test hypothesis result also show that the t-value of both parameters was smaller than the t-critical either in local or live set up so the H_0 hypothesis cannot be rejected, meaning there was no significant performance difference between CodeIgniter and Laravel frameworks both in local and live set up.

Key Words: PHP, Frameworks, CodeIgniter, Laravel, Blazemeter, HTTP, JMeter.

Abstrak

Hypertext Preprocessor (PHP) sebagai salah satu bahasa pemrograman yang paling mudah digunakan dalam pembuatan *front-end* maupun *back-end* dari suatu web aplikasi mempunyai beberapa *framework* yang dimana masing - masing memiliki tujuan yang sama yaitu untuk mempermudah proses pengembangan. Namun beberapa pengembang kadang bingung dalam menentukan *framework* yang tepat ketika akan memulai proses pembuatan. Faktor waktu respon dan kemampuan dalam menangani jumlah permintaan yang masuk menjadi hal penting ketika web aplikasi tersebut digunakan. Penelitian ini dilakukan untuk mengukur performa dari aplikasi web berbasis admin yang dibuat menggunakan *framework* CodeIgniter dan Laravel. Permintaan Hypertext Transfer Protocol (HTTP) akan direkam menggunakan aplikasi Blazemeter yang kemudian disimulasikan kedalam program Apache JMeter dengan jumlah pengguna mulai dari 50 hingga 200. Dari hasil simulasi didapatkan bahwa rata-rata waktu respon dan *error* yang terjadi tidak menampakkan adanya perbedaan yang signifikan. Hasil hipotesis uji-t juga menunjukkan bahwa nilai t dari kedua parameter tersebut lebih kecil dari nilai t-kritikal baik dalam kondisi *local* maupun *live* sehingga hipotesis H_0 tidak dapat ditolak, artinya tidak terdapat perbedaan performa yang signifikan antara *framework* CodeIgniter dan Laravel baik pada *local* maupun *live* set up.

Kata Kunci: PHP, Frameworks, CodeIgniter, Laravel, Blazemeter, HTTP, JMeter.

1. INTRODUCTION

The growth of technology makes the internet a necessity of daily life because some activities are very dependent on it. Internet houses web applications used for various transactions, social media, paying utility bills, emailing, shopping banking, etc (Ibrahim et al., 2018). These applications consist of a client-side that is used by web browser users and a server-side that is executed on a web server. The web server performs several processes that create documents in HTML format and then sent them to the client which will translate and display the HTML content (Kaluža et al., 2019).

The increasing use of web applications has an impact on the increasing number of requests for manufacture. Server application speed is becoming increasingly important. Applications with good performance are applications that can handle many requests from clients without consuming a lot of computing resources from the server device, and thus reduce the costs incurred by the application manager (Rompis & Aji, 2018). Computers require a language processor to translate the complex programming language. The language processor itself consists of three classes namely the assembler, interpreter, and compiler (Harismawan et al., 2018). Each programming language has a different architecture in processing a program code until it can be executed by a computer. This can affect the performance of the CPU (Central Processing Unit), in a web server, the use of different programming languages will affect server response time significantly.

Hypertext Preprocessor (PHP) was introduced in 1995. In beginning, those who were using PHP had issues regarding performance (Solanki et al., 2017), because of that came what we know as the framework, which is a set of functions, classes, and rules unlike libraries that are for a specific purpose only, the framework is comprehensive in regulating how we build applications (Ruli Erinton, Ridha Muldina Negara, 2017). The use of a framework in the development process is highly recommended because it can save time in making applications that are more complex and secure (Benmoussa et al., 2019). PHP frameworks that are often used and have architectural similarities are CodeIgniter and Laravel, both use the model, view, controller (MVC) method as their coding cycle. CodeIgniter is believed to have the fastest execution process compared to other frameworks, while Laravel provides more complete features to help developers in the web application development process (Widodo Purbo, 2021).

In making a web application, one must also consider a responsive interface design to provide ease of navigation for the user regardless of the device and its resolution properties. The device may be a personal computer, telephone, tablet, television, vehicle, or almost anything in the near future. In other words, it is a design approach used to provide the same or very similar user experiences for different usage scenarios (TURAN & ŞAHİN, 2017).

The data request cycle will affect the performance of a web application, if every request that comes loads all data from the beginning it will burden the server. The Ajax technology addresses this issue by making asynchronous Hypertext Transfer Protocol (HTTP) requests to the server without having to reload the client application (Turc, 2019).

After the development process, software testing is mandatory for every type of software product whether it is desktop standalone software or web-based application. Without proper testing, the software application can behave abnormally or can crash with specific inputs that cause the failure of the software applications (S. Pradeep & Yogesh Kumar Sharma, 2019).

This research was conducted by considering the aspects described above to measure the performance of the two PHP frameworks, namely CodeIgniter and Laravel in a prototype admin web applications that implement AJAX technology and responsive design using Admin LTE template. Performance testing will be performed using open-source Apache JMeter by calculating the average response time and error occurred both in local and live set up.

2. METHOD

2.1. Development Tools

This research was conducted using the environment and tools consisting of hardware and software as shown in table 1.

Table 1. Development environment and tools

Hardware	Software
<ul style="list-style-type: none"> Laptop Asus A455LD, Intel Core™ i3-4030U CPU @ 1.90GHz with 10.0 GB RAM 	<ul style="list-style-type: none"> Windows 10 Education 64-bit Composer CodeIgniter 4 Laravel 8 Xampp PHP 7.4 VS Code Editor Blazemeter JMeter Apache Brave Browser

2.2. Application Developments

The initial stage is to design a system that will be used as a performance analysis between the CodeIgniter and Laravel frameworks by building an admin-based website application. Both frameworks already provide MVC architecture to simplify the development process.

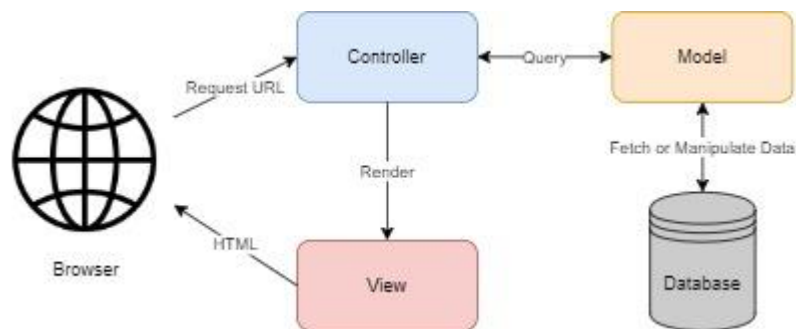


Figure 1. MVC

The picture explains how the website application process will run on both frameworks, where the view will function as front-end development or presentation logic and controller and model that handles business logic which can also be called back-end development.

2.2.1. Designs

The admin web application will be designed with simple features from a web admin in general, the theme of the web application is to simulate a sales system admin, with the following feature:

1. Users can do login and logout activities
2. Access the dashboard page which contains a summary of the amount of data from each page and the transaction chart
3. Users can change profile data and login password
4. Users can enter, change and delete customers data

5. Users can access product pages which are divided into 2 categories, namely foods and drinks, each of which has data variants.
6. Users can process transactions in the form of purchases and sales
7. Users who have admin access rights will be able to access the user page which can be used to add new users.

The Front-end of the web application will use free templates from Admin LTE 3 and some of the plugins provided by them.

Table 2. Plugins

Plugins	Version
Bootstrap	4.0.0
Chart.js	2.9.4
Datatables	1.11.4
Fontawesome Free	5.15.4
Jquery	3.6.0
Select 2	4.0.13
Sweetalert 2	11.4.0
Toastr	2.1.4

2.2.2. Codings

Data retrieval and manipulation will use AJAX technology in all application pages which will be stored in the MySQL database that already exists in the Xampp software. The query coding of the two frameworks is made as similar as possible so Laravel did not maximize the use of Eloquent ORM.

2.2.3. Deployments

The application will be tested into a local server using an Apache web server from Xampp and a live server using free hosting from InfinityFree.

2.3. Application URLs

URLs needed to perform performance testing is obtained from HTTP requests from each page contained in the web application, where the retrieval uses the Blazemeter add-on browser.

The step is to turn on the record from the Blazemeter then open every page on the web application.

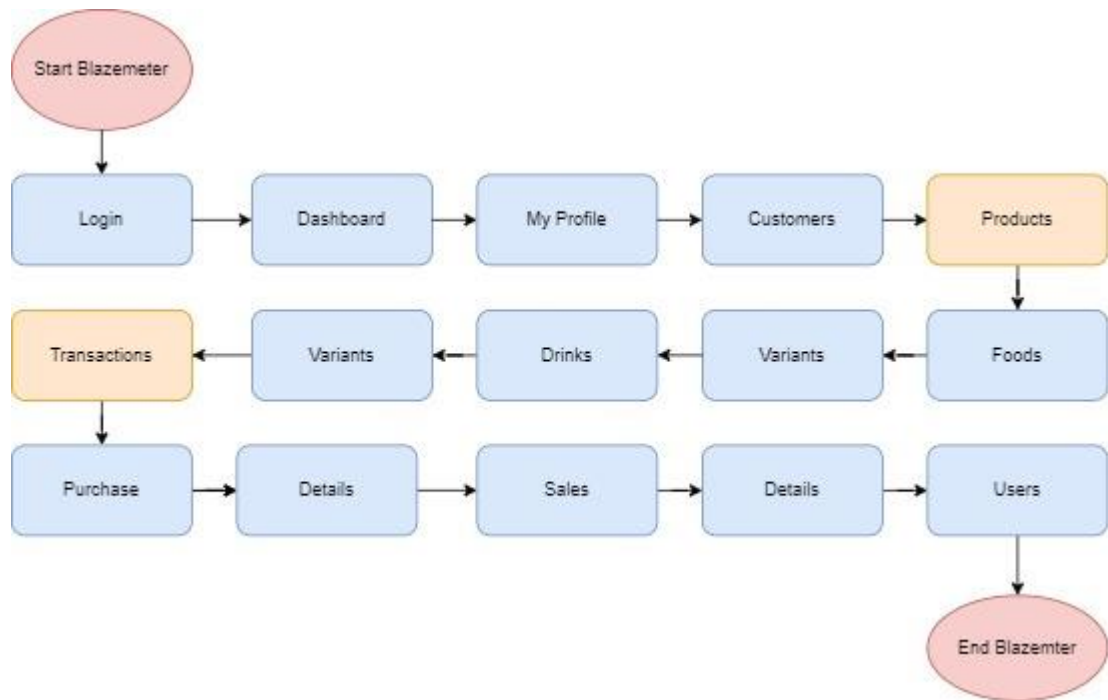


Figure 2. Flow Blazemeter Record

From the recording activity, HTTP Request data is obtained as shown in the following table.

Table 3. Total HTTP Request

No	Pages	Total HTTP Request
1	Login	1
2	Dashboard	3
3	My Profile	2
4	Customers	3
5	Products	12
6	Transactions	10
7	Users	3
Total		34

2.4. Testing Scenarios

The test is carried out using the Apache JMeter software by adding a different number of virtual users on each test, the web application is made based on the admin system where only registered users can access it so the number of virtual users added are adjusted compared with the web application that can be accessed freely. Started at 50 users and increased by 50 users in the next test until total of 200 users.

To get the test scenario to be similar to the actual conditions when the web applications will be used, the ramp-up time is set at 30 seconds. Ramp-up is the amount of time needed to add all of the test users to a test execution. Or in other words, how long it will take for Apache JMeter to start execution of all the users.

Table 4. Apache JMeter Testing

No	Users	Ramp Up	Loop
1	50	30	1
2	100	30	1
3	150	30	1
4	200	30	1

2.5. Hypothesis

2.5.1. Null Hypothesis (H0)

In the test results, there are no variants of performance load and error requests from the CodeIgniter and Laravel frameworks in the local environment or live setup.

2.5.2. Alternate Hypothesis (H1)

In the test results, there are variants of performance load and error requests from the CodeIgniter and Laravel frameworks in a local environment or live setup.

3. RESULTS AND DISCUSSION

3.1. Evaluation of Response Time on Local Set Up

The chart shows that there is no significant difference in the results of load testing on both applications in the local setup, the Laravel framework performs slightly better than CodeIgniter when the incoming request is higher.

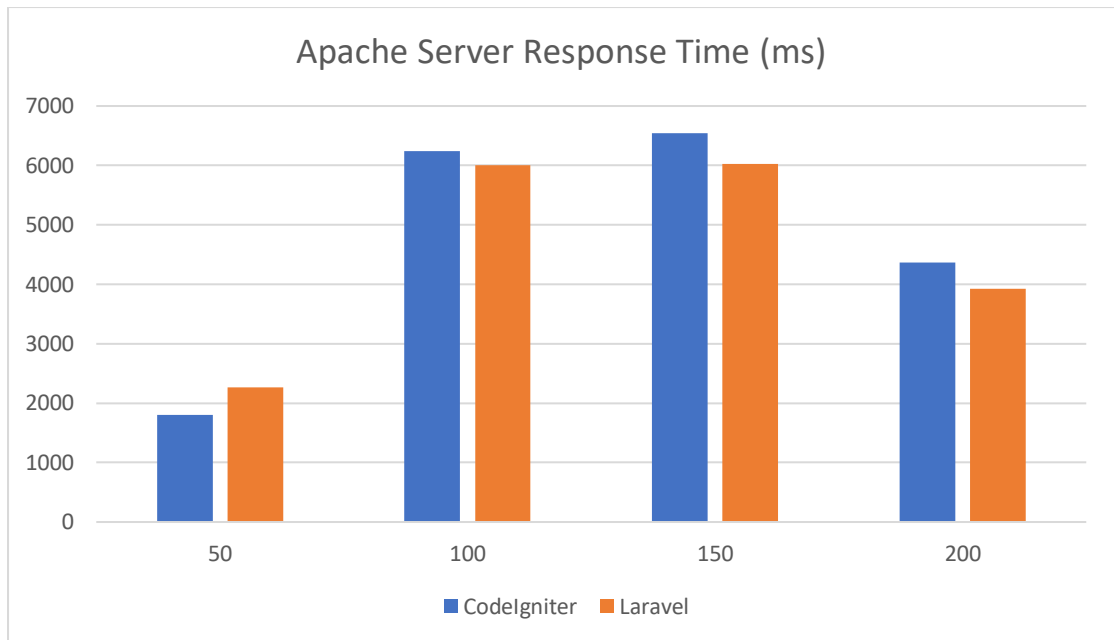


Figure 4. Error Request CodeIgniter and Laravel on Local Set Up

Based on the hypothesis test on the results of the average response time data, it produces a t-value with a value of 0.128 with a critical t of 1.943, because t-value < t-critical, the null hypothesis is accepted.

3.2. Error Request on Local Set Up

The Chart show the result of an error request from CodeIgniter and Laravel in local setup. CodeIgniter experiences fewer errors than Laravel in each increase OF users, although the difference is not significant.

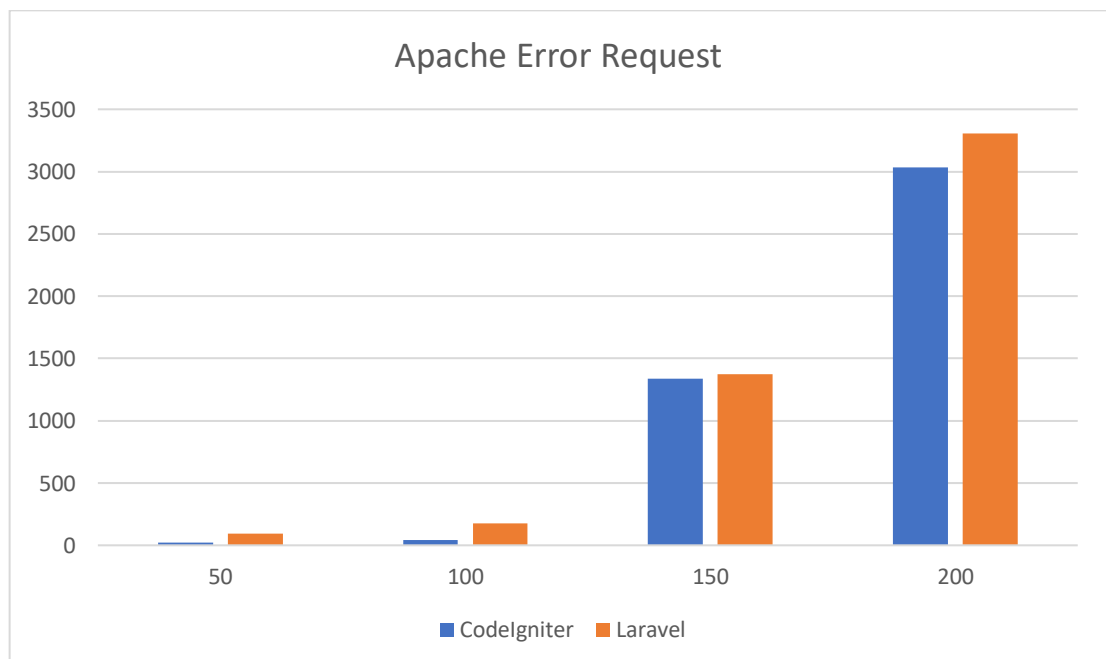


Figure 4. Error Request CodeIgniter and Laravel on Local Set Up

In the data of average error request, the t value is -0.123 which means it is smaller than t-critical, then the null hypothesis is accepted.

3.3. Evaluation of Response Time on Live Set Up

Live setup testing shows that the Laravel framework tends to have a faster response time than CodeIgniter.

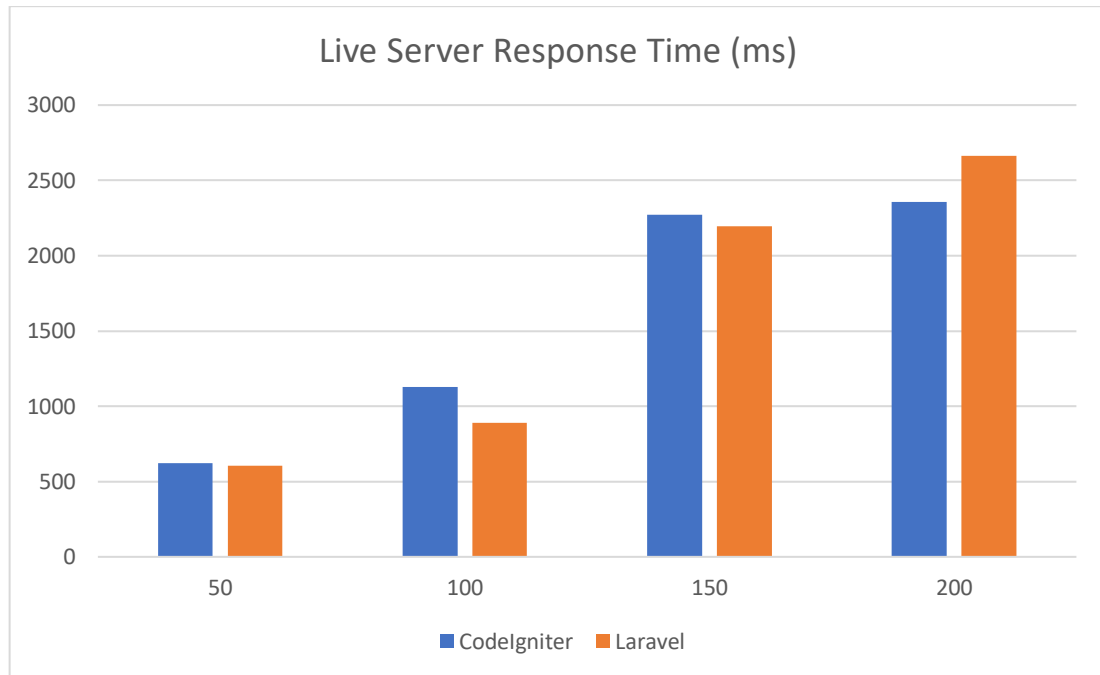


Figure 3. Average Response Time CodeIgniter and Laravel on Live Set Up

The t-test conducted on the live set up data shows a t-value of 0.007, which is smaller than the critical t-value of 1.943, so the null hypothesis is accepted.

3.4. Error Request on Live Set Up

An error request that occurs on a live server shows that Laravel is superior in all tests with fewer errors than CodeIgniter.

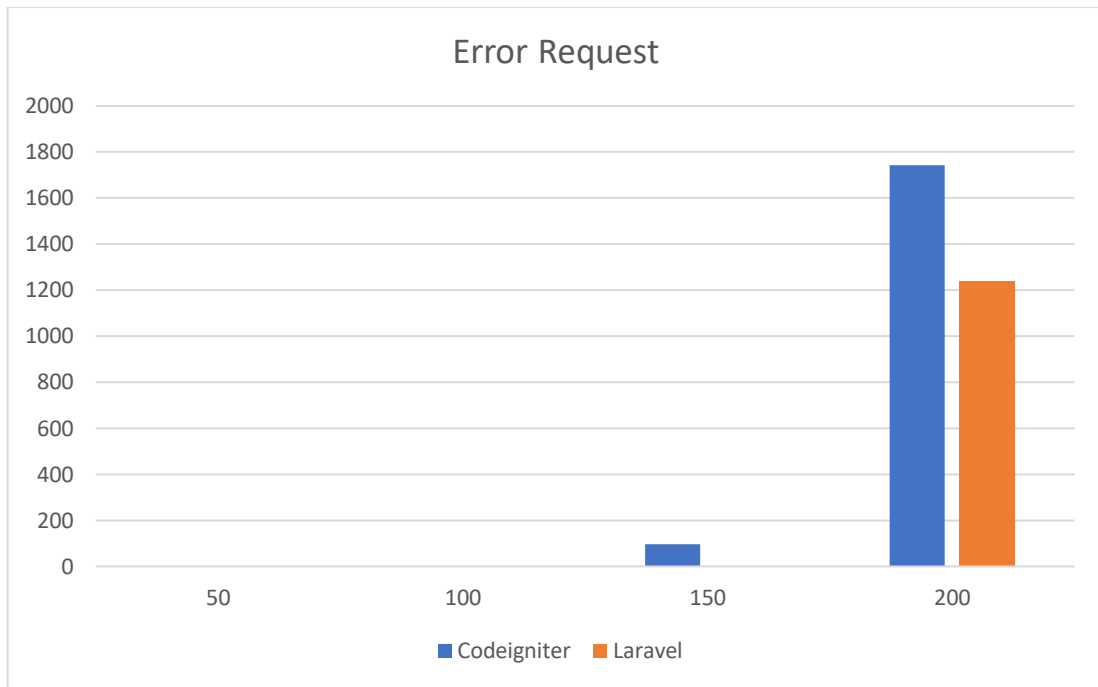


Figure 3. Error Request CodeIgniter and Laravel on Live Set Up

The hypothesis test shows a p-one tail-value of 0.39 which means it is greater than the significant value of 0.05, then the null hypothesis is accepted.

4. CLOSING

From the performance tests conducted on admin-based web applications that were created using CodeIgniter and Laravel frameworks, it shows that there is no significant difference between the two in terms of response time or error requests that appear either in local setup or live setup. This conclusion is also emphasized by the results of the t-test which consistently show a t-value that is smaller than the t-critical value of 1.943 in both parameters so the H_0 hypothesis is accepted.

Response time and error requests in both frameworks will rise when the number of incoming users is increased. The error request occurred due to the server's inability to handle incoming requests will affect the calculation of the average response time generated, as in the figure above where the number of users accessed reaches 200 but the response time decreased compared to the previous data because sometimes the response time generated 0, 1, or 2 on error result. Errors that appear in the live set up tend to be less than in the local setup, it can be concluded that the ability to withstand load stress on the live server is better than in the local setup.

Further research is still necessary with regards to web application performance where the application made needs to maximize the features of each framework. Laravel has

outstanding packages that CodeIgniter does not have such as Breeze or Jetstream which are used for authentication like login, registration, password reset, email verification, and password confirmation. Valet or Sail packages that facilitate the development process in a different environment (Mac OS or Docker). Security tests also need to be conducted to prevent any kind of malicious attack from the outside that can cause a breach, alter or loss of data.

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