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IN-DEPTH REVIEW OF BACKEND LANGUAGES FOR WATERFALL WEBSITE CREATION

Rina Lestari Sari, Muhammad Iqbal Pratama
Telkom Institute of Technology Purwokerto, Indonesia, Indonesia

Abstract
Programming languages serve as the bridge between humans and machines, enabling the creation of various applications, websites, and games. This journal focuses specifically on programming languages used for websites, which are applications containing documents, photos, images, videos, and music accessible through the HTTP protocol via a web browser. Websites have diverse functions, including serving as learning platforms, promotional tools, and platforms for e-commerce activities. Typically, websites are built using HTML, CSS, and JavaScript. HTML, or Hypertext Markup Language, describes the structure of a website. CSS (Cascading Style Sheets), while not a programming language, enhances the visual aesthetics of websites. JavaScript, on the other hand, is a versatile programming language that allows for both frontend and backend development.
To create dynamic websites, additional backend technologies are required. Common choices include PHP, Python, Java, and C#. PHP, originally standing for Personal Home Page, is a language similar to Java, C, and Perl. Java, developed by Sun Microsystems, is a widely-used language known for its application in both backend and Android development. Python, a multipurpose interpreted language, boasts clear syntax and is extensively used in data science and artificial intelligence. C#, developed by Microsoft, offers productivity, flexibility, and convenience compared to previous applications like Visual Basic.
This journal explores the features, advantages, and applications of programming languages for website development, shedding light on their diverse capabilities. By understanding the strengths and purposes of these languages, developers can make informed choices when building websites and ensure efficient and effective outcomes.

Keywords: programming languages, websites, HTML, CSS, JavaScript, backend development, PHP, Python, Java, C#

Introduction

Programming language is an intermediary language between humans and machines, using programming languages we can create various applications, websites, and games. But in this journal, we will focus on Programming Languages that are specifically for websites. A website is an application that contains documents, photos, images, videos, and music that uses the HTTP protocol, and to access it we must use a browser [1]. The function of the website is very much we can use for learning media, promotions, buying and selling, and so on.
Usually, websites can be created using HTML, CSS, and Javascript only. HTML stands for Hypertext Markup Language, HTML is commonly used to describe the framework of a website [2]. CSS (Cascading Style Sheet) is not a programming language but CSS is a tool used to beautify the rigid appearance of a website to be prettier and more beautiful [3]. Javascript is a programming language that can hold

application control, the meaning here is that this programming language can be used for both frontend and backend applications at the same time [4].

However, to create a dynamic website we cannot rely on HTML, CSS, and Javascript alone, we need a backend role here, we can use PHP, Python, Java, or C# here. PHP (Personal Home Page) is a programming language that we usually know, PHP is a language similar to Java, C, and Perl [5]. Java programming language is one of the popular programming languages developed by Sun Microsystems, java can also be used for making android applications and not only used for making backend applications [6]. Python programming language is a multifunctional interpretive programming language, python is claimed to be a programming language that combines capabilities, capabilities, and clear code syntax, Python is widely used in data science, artificial intelligence, and so on [7]. The programming language C # (C Sharp) was developed by the Microsoft company, in the application of writing C # promises to users productivity, flexibility, and convenience from previous applications such as visual basic and others [8]

1 Research method

In this study, we use the SDLC waterfall model and qualitative research methods whose data collection will be carried out at the requirements stage. Qualitative is used for research or a more descriptive study [9]. It is called the waterfall method because it must be passed step by step before it can proceed to the next step [10]. Below we include an illustration of the SDLC waterfall method.

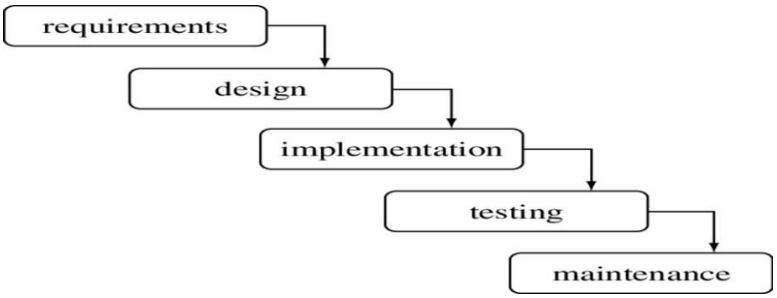

Fig. 1. Illustration of the waterfall model

In this waterfall we will do 5 stages first, namely the requirements stage (needs analysis), the second is the software architecture design, the third is implementation, the fourth we will do testing, and the last we will do maintenance or repair if all programs are running as expected so that the performance of the program can run well.

2 Result and discussion

2.1 Analysis stages

We analyze the system that the system must be able to handle requests or requests from users quickly and precisely so that users do not need a long time to get the results they want. The system must be able to perform the Create Read Update Delete (CRUD) function quickly, therefore we need the right programming language to process this huge amount of data. In this study, we have collected 2423 population data in Karangklesem Village, South Purwokerto, the system must be able to manage, find and process this much data quickly. The following is an example of population data that includes the full name of the resident, ID number, gender, and address of the resident.

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Table 1. Example of village population data

Name	ID Card	Gender	Address
Darsirah Vega Zulkarnain M. Farm	00016446386416504	L	Dk. Panjaitan No. 218, Tarakan 48692, NTB
Uli Dinda Astuti SEI	00016446386414157	P	Psr. Suniaraja No. 476, Denpasar 49483, Riau Islands
Farhunnisa Pudjiastuti	00016446386415207	P	Ki. Gatot Subroto No. 94, Kendari 17850, Central Kalimantan
Ellis Wahyuni	00016446386412218	P	Jln. Accordion No. 726, Pekanbaru 36315, Lampung
Agus Nasiruddin	00016446386415324	L	Ki. Main Division No. 630, Lhokseumawe 85595, DIY

We store the data in a database system called MySQL. Mysql is a SQL-based database system to create a DBMS or Database Management System [11]. Mysql is quite popular and widely used for various types of applications. And below, we also attach a screenshot of the table schema and an example of the population data.

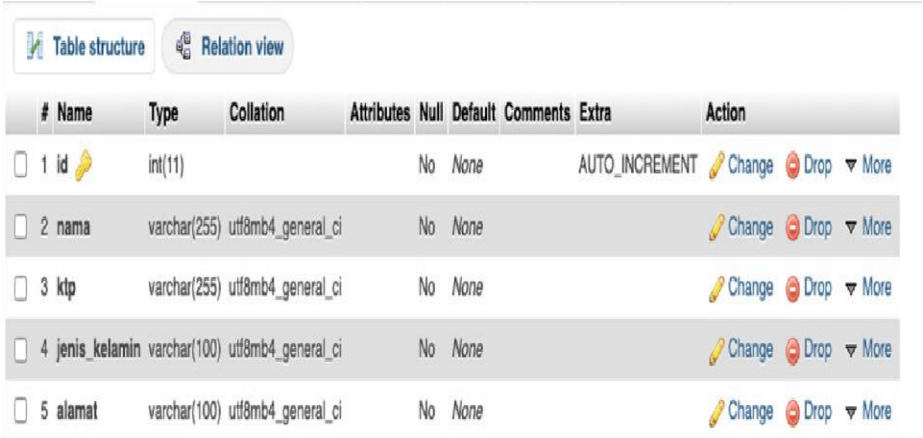
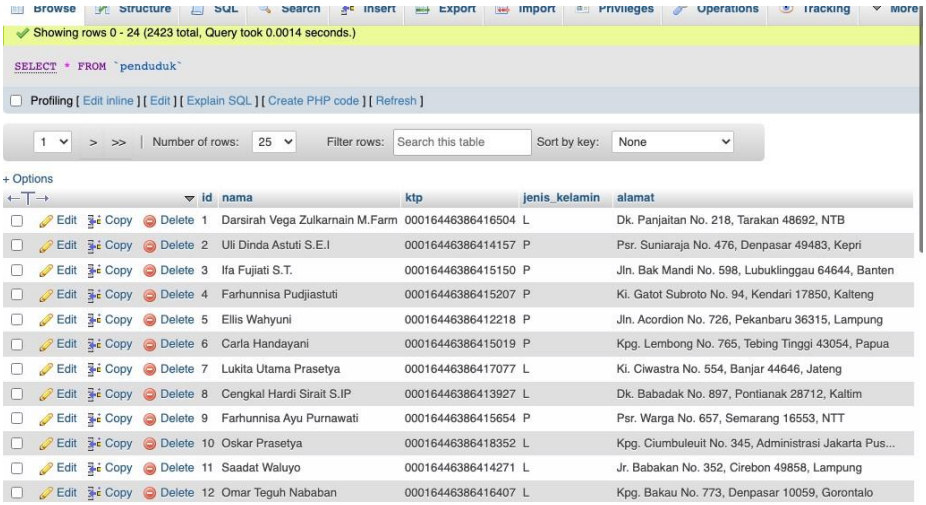


Fig. 2. Table structure


Browse Structure SQL Search Insert Export Import Privileges Operations Tracking More

Showing rows 0 - 24 (2423 total, Query took 0.0014 seconds.)

```
SELECT * FROM `penduduk`
```

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

1 > >> | Number of rows: 25 Filter rows: Search this table Sort by key: None

+ Options

	id	nama	ktp	jenis_kelamin	alamat
Edit Copy Delete	1	Darsirah Vega Zulkarnain M.Farm	00016446386416504	L	Dk. Panjaitan No. 218, Tarakan 48692, NTB
Edit Copy Delete	2	Uli Dinda Astuti S.E.I	00016446386414157	P	Psr. Suniaraja No. 476, Denpasar 49483, Kepri
Edit Copy Delete	3	Ifa Fujiati S.T.	00016446386415150	P	Jln. Bak Mandi No. 598, Lubuklinggau 64644, Banten
Edit Copy Delete	4	Farhunnisa Pudjiastuti	00016446386415207	P	Ki. Gatot Subroto No. 94, Kendari 17850, Kalteng
Edit Copy Delete	5	Ellis Wahyuni	00016446386412218	P	Jln. Acordion No. 726, Pekanbaru 36315, Lampung
Edit Copy Delete	6	Carla Handayani	00016446386415019	P	Kpg. Lembong No. 765, Tebing Tinggi 43054, Papua
Edit Copy Delete	7	Lukita Utama Prasetya	00016446386417077	L	Ki. Ciwastra No. 554, Banjar 44646, Jateng
Edit Copy Delete	8	Cengkal Hardi Sirait S.IP	00016446386413927	L	Dk. Babadak No. 897, Pontianak 28712, Kaltim
Edit Copy Delete	9	Farhunnisa Ayu Purnawati	00016446386415654	P	Psr. Warga No. 657, Semarang 16553, NTT
Edit Copy Delete	10	Oskar Prasetya	00016446386418352	L	Kpg. Ciumbuleuit No. 345, Administrasi Jakarta Pus...
Edit Copy Delete	11	Saadat Waluyo	00016446386414271	L	Jr. Babakan No. 352, Cirebon 49858, Lampung
Edit Copy Delete	12	Omar Teguh Nababan	00016446386416407	L	Kpg. Bakau No. 773, Denpasar 10059, Gorontalo

Fig. 3. Example of population data

2.2 Design stages

We design a software architecture design, namely an application in the form of a Rest API that provides data in the form of JSON. Rest is an architecture for designing a web service where REST has an accessible URL. Rest will send commands to be executed using the HTTP GET, POST, PUT, and DELETE methods [12]. While JSON (JavaScript Object Notation) is a lightweight semi-structured data format that is widely used based on the JavaScript data type [13]. Below we include a screenshot of the output rendered by the backend of the application which will be used to fulfill the user's request. The output provided is in the form of resident ID data, resident names, resident ID numbers, gender of residents, and complete addresses of residents wrapped in JSON format.

```
{
  "current_page": 1,
  "data": [
    {
      "id": 1,
      "nama": "Darsirah Vega Zulkarnain M.Farm",
      "ktp": "00016446386416504",
      "jenis_kelamin": "L",
      "alamat": "Dk. Panjaitan No. 218, Tarakan 48692, NTB"
    },
    {
      "id": 2,
      "nama": "Uli Dinda Astuti S.E.I",
      "ktp": "00016446386414157",
      "jenis_kelamin": "P",
      "alamat": "Psr. Suniaraja No. 476, Denpasar 49483, Kepri"
    },
    {
      "id": 3,
      "nama": "Ifa Fujiati S.T.",
      "ktp": "00016446386415150",
      "jenis_kelamin": "P",
      "alamat": "Jln. Bak Mandi No. 598, Lubuklinggau 64644, Banten"
    }
  ],
  "first_page_url": "http:\/\/localhost:4444\/contoh_data?page=1",
  "from": 1,
  "last_page": 808,
  "last_page_url": "http:\/\/localhost:4444\/contoh_data?page=808",
  "links": [▶15 items, 1 KB {}, {}, {}, {}, {}, {}, {}, {}, {}, {}, {}, {}, {}, {}, {}],
  "next_page_url": "http:\/\/localhost:4444\/contoh_data?page=2",
  "path": "http:\/\/localhost:4444\/contoh_data",
  "per_page": 3,
  "prev_page_url": null,
  "to": 3,
  "total": 2423
}
```


Fig 4. Example of the given output

In the picture above, we provide 3 examples of population data given, if only 3 programming languages PHP, Python, Java, and C# are strong to manage, but imagine if the data provided is 1000 or even up to 2423 the number of data, maybe one of the four or only a few programming languages that can process that much data. We attach a discussion of this to the implementation sub-chapter.

2.3 Implementation stages

After we collected 2423 population data, now we will perform performance tests on the PHP, Python, Java, and C# programming languages to see which one is suitable for processing that much data. Before that, we explain about each – each of these programming languages.

1. Python

Python is commonly used in web development, artificial intelligence. The advantage of this python is that the writing of code that is simple and easy to read is not verbose, but python is not suitable if used for mobile development.

2. PHP

PHP is mostly used for web development, PHP cannot be used for making mobile or desktop applications. PHP has the advantage of being used by many users so that if we have an error we can immediately find a solution, and PHP has an error handling feature.

3. Java

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Java is mostly used to create desktop and android applications, Java can also be used to create web backends. Java has a lot of open source libraries and a lot of users, but Java has the disadvantage that it takes up a lot of RAM in the compilation process.

4. C#

C# is usually used to create cross-platform applications, games, and backend websites, C# has the advantage of a fast compilation process, but C# has the disadvantage that it takes a lot of time to learn. We have collected data regarding the testing of each of these programming languages, each of which we explain in the testing section.

2.4 Stages of testing

In this testing phase, we have collected and tested the performance of the Python, PHP, Java, and C# programming languages. Look at the diagram below, the programming language whose diagram is getting to the right is the programming language that has the best performance.

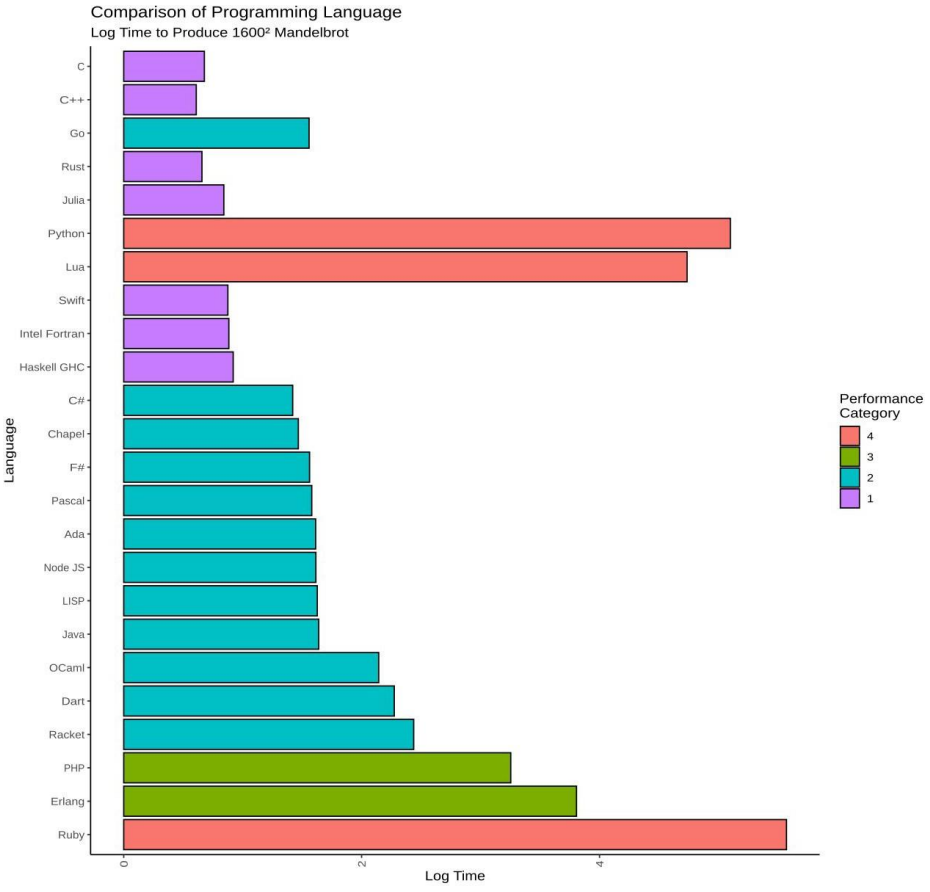

Fig. 5. Programming language performance diagram

We have also proven that Python has a very high performance, has a very concise code structure compared to the PHP, Java, and C# programming languages. Python, PHP, and C# use very little memory during the compilation process if we compare it in terms of memory usage, but if we compare it in terms of code structure, python is still ranked first. Look at the memory usage diagram of each programming language.

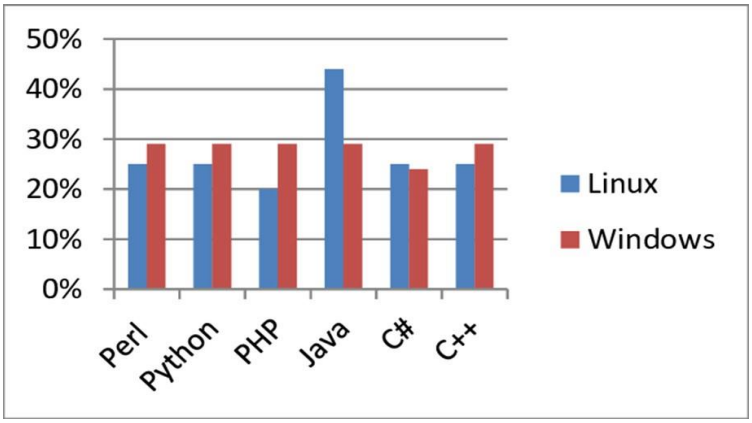

Fig. 6. Programming language performance diagram

From here we can draw a little conclusion that python and PHP are very suitable to be used to create backend web services because they both have good performance and small memory usage, but for a comparison of code structure, it's just the taste of each between PHP and python, because there are different accustomed to using PHP so some say PHP is concise in writing, even though python can be more concise and simpler to write.

2.5 Maintenance stages

At this stage, we have succeeded in determining which programming language we want to use. We will carry out regular maintenance or repair processes so that the code and system can run properly without hampering user activities. Because if we don't do regular maintenance, the code could have an error and will hamper user requests. We will update the system, libraries and monitor everything goes well.

3 Conclusion

This research concludes that each programming language has its advantages and disadvantages. We cannot blame each other because indeed every programming language was created for its purpose. For the creation of this web service backend, we have concluded a little earlier that Python and PHP can be used for making this backend because the code structure is very compact and the memory usage is minimal. But here we return to each user's taste whether you want to use python or PHP to make the backend.

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