

A Cloud Based Web Application Hosting: A Study on the Deployment of a Laravel Application in Amazon Web Service (AWS)

NAVEEN B, PG Scholar, Master of Computer Applications, Karpagam College of Engineering,

Coimbatore, India, naveenkutty.in@gmail.com

Abstract: The purpose of this project is to give you a clear understanding of how to deploy the Laravel application on AWS. In recent years, many PHP frameworks have been introduced and it is essential for developers to understand their basic functionality and choose the most suitable one for their project. Laravel is a well-known PHP framework used for web application development. It follows the Model-View-Controller (MVC) pattern and has gained a lot of attention in the development community due to its powerful features, ease of use, and scalability. The term cloud computing refers to a type of network that facilitates the sharing of processing, storage, and application resources across multiple remote computer systems. AWS is one of the market-leading cloud service providers, offering a variety of cloud-based services such as storage, data processing, and databases. Deploying Laravel in AWS offers several advantages such as scalability, high availability, and cost-efficiency. This paper will cover the deployment process of Laravel in AWS, starting from creating an AWS account, setting up an EBS instance, installing PHP and other required dependencies, configuring the web server, deploying Laravel application, and securing the environment. It will also discuss the different AWS services that can be used to enhance the performance and security of Laravel application, such as Amazon RDS, Code Pipeline, S3 and AWS Cloud Watch.

Keywords: AWS, PHP, Framework, Laravel, Cloud Compu<mark>ti</mark>ng, Deployment, DevOps.

I. INTRODUCTION

The usage of technology has increased significantly in recent years and with it, the need for web development has also grown rapidly. Developing web applications using core PHP can take a lot of time and resources, which is why PHP frameworks are becoming increasingly popular. Following the Model-View-Controller pattern, Laravel is widely used as one of the most popular PHP frameworks.

The software design pattern of MVC involves dividing an application into three interconnected components, namely Model, View, and Controller. The Model is used to process queries and manipulate data to and from the database^[10]. The View renders the HTML view page, while the Controller is used to implement the logic of the application. The use of this pattern makes development more organized and allows for more efficient coding.

However, just developing a web application is not enough, it needs to be accessible to users around the world at the fraction of a second. This is where cloud computing comes into play. Cloud computing refers to the provision of internet-based computing services such as servers, storage, networks, databases, software, analytics, and intelligence. Amazon Web Services (AWS) is a cloud service provider that offers a variety of cloud-based services such as storage, computing power, and databases.

Deploying a Laravel application on AWS can be a costeffective way to manage your application. AWS provides useful services that can help in deploying and managing Laravel applications. Elastic Beanstalk (EBS) is one such service that makes deploying and scaling web applications much easier^[1]. It automates the deployment, scaling, and monitoring of web applications and provides an easy-touse web interface for managing applications^[12].

Relational Database Service (RDS) is a cloud-based, fully managed service that simplifies setting up, operating, and scaling relational databases and supports a variety of popular database engines such as MySQL, MariaDB, PostgreSQL, and SQL Server. Laravel applications typically use a database to store and retrieve data, and RDS provides an easy and scalable way to manage the database^[2]. Using RDS with Laravel requires configuring the database connection settings in the Laravel configuration file.

Simple Storage Service (S3) is a fully managed object storage service that offers superior scalability, security, data availability, and performance^[4]. Laravel applications often require storing and retrieving files, such as images,



videos, or documents. S3 provides a secure and reliable way to store and retrieve these files, with the ability to scale up or down as required.

Deploying and managing Laravel applications in AWS is an easy task with the use of services such as Elastic Beanstalk, RDS, and S3^[11]. These services provide a scalable, reliable, and cost-effective environment for deploying and managing web applications. By leveraging the power of cloud computing, developers can focus on building great web applications without worrying about the underlying infrastructure. The next section of this paper covers the basics of the Laravel framework and services on AWS, followed by procedure to deploy the laravel web application in AWS.

II. AMAZON WEB SERVICES (AWS)

A. Elastic Beanstalk (EBS)

Elastic Beanstalk is a platform from Amazon We Services that simplifies the deployment process for developers^[1]. By uploading code to Elastic Beanstalk, developers can automatically provision and manage infrastructure. This includes capacity provisioning, load balancing, autoscaling, health monitoring, and security updates. Elastic Beanstalk makes it easy for developers to deploy and run web applications on AWS without worrying about managing the underlying infrastructure.

B. Relational Database Service (RDS)

The RDS Database Preview Environment, provided by AWS, provides an opportunity for developers to test upcoming beta, release candidate, and early production versions of the PostgreSQL engine. This full-featured environment allows developers to quickly and easily try new features in their applications^[2]. The ability to choose the region of a database instance gives developers more flexibility to optimize costs based on usage. The cost per request may vary by region, but the preview environment allows developers to use it efficiently.

C. Simple Storage Service (S3)

Amazon S3 or Simple Storage Service is a secure and highly scalable object storage service provided by Amazon Web Services^[4]. Amazon S3 enables IT teams and developers to store and retrieve any volume of data, at any given time, from anywhere on the web. S3 is designed to be highly durable, with data automatically distributed across multiple locations and protected by advanced security features such as encryption and access controls. It also provides flexible storage options, including standard storage for frequently accessed data.

D. Code Pipeline

AWS CodePipeline is a powerful tool that simplifies the software release modeling process for developers^[3]. CodePipeline makes it easy to connect remote repositories

to his AWS instance, eliminating the need to provision or set up servers. A fully managed continuous delivery service, CodePipeline integrates seamlessly with your existing tools and systems, making it easy for developers to get started. With advanced features, his CodePipeline helps streamline the software release process, allowing teams to focus on building and improving applications instead of worrying about infrastructure management. With CodePipeline, businesses can enjoy the benefits of a reliable and efficient software release process in a hasslefree manner.

III. LARAVEL FRAMEWORK

A. Request Lifecycle

In Laravel, the public/index.php file serves as the entry point for all incoming requests to your application. This important file loads important components such as the autoload definitions generated by Composer and an instance of bootstrap/app.php. Once loaded, requests are passed to the app/HTTP/Kernal.php file. This file contains a list of bootstrappers to initialize and defines the HTTP middleware that all requests must pass through before being processed by the application^[5]. This process also loads all service providers. RouteServiceProvider is he one of the most frequently used providers. This service provider is responsible for loading the appropriate controller or view files to enable efficient and effective request processing.

B. MVC Pattern

Based on the Model-View-Controller (MVC) pattern, Laravel is a PHP web application framework^[5]. The MVC pattern divides your application into three interconnected parts Models, Views, and Controllers^[8]. The model layer in Laravel is responsible for processing queries and handling data manipulation to and from the database, while the view layer is responsible for displaying the HTML view page to the end user. Finally, the controller layer is used to implement the application's logic, handle user requests, and update the model and view layers as needed. Using the MVC pattern in Laravel allows developers to organize their code in a clear and logical way to separate concerns and improve maintainability. Laravel also allows developers to modify application behavior with ease, by altering individual components without affecting the remaining parts of the application. Overall, the MVC pattern is a powerful tool for building robust and scalable web applications using Laravel.

C. Error Handling Techniques

Error handling is an integral part of building any application. Laravel provides a powerful set of tools to help developers manage application errors and exceptions^[7]. In Laravel, errors are managed using exception handling. Whenever an error occurs in your



application, Laravel will automatically generate and throw an exception object that you can catch and handle. Laravel's exception handling system is based on a centralized error handling mechanism^[9]. When an error the exception is occurs, passed to the App\Exceptions\Handler class, which handles the exception based on the type of exception thrown. The Handler class contains several methods for handling different kinds of exceptions. For example, there is a Render method that displays an error page to the user. Developers can customize the behavior of the Handler class by adding their own error handling logic.

IV. PROPOSED METHODOLOGY

A. Initial Setup of AWS

Once an AWS account is created and verified, Laravel users can take advantage of a free tier offer that provides access to AWS services for up to 12 months from the account creation date. However, it's important to carefully monitor the instances used at each stage of development to ensure they stay within the free tier.

By taking advantage of the Free Tier, a Laravel user can gain valuable experience and knowledge of her AWS services at no additional charge. It is important to consider the potential costs associated with using services beyond the free tier. AWS services can grow quickly if not closely monitored.

B. EBS Setup

To create an EBS application on AWS, it's important to select the correct region before proceeding. To do this, select the desired region in the top right of the console or in the URL^[1].

Once the appropriate region is selected, the user can create a new her EBS application by entering the desired application name and selecting PHP as the platform. Then select the sample application as the application code and make sure Single Instance - Free Tier is selected under Configure More Options.

After confirming these settings, the user can continue creating the environment. Please note that this process may take several minutes. By following these steps, a user can successfully create her new EBS application for use with Laravel on her AWS. It will create unique elastic IP address for the application. After completion ensure that application health status is ok.



Fig. 1 Health Status of Initial EBS

Fig. 1 is a visual representation that displays the health status of an Elastic Beanstalk (EBS) instance after its creation.

C. RDS Setup

To create an RDS instance in AWS, users must first select the desired database engine and version^[2]. It is recommended to choose the Free Tier template to avoid any additional charges.

Once the database engine and template have been selected, users can enter the desired master username and password. It is important to choose an appropriate instance type, such as db.t2.micro, and leave all other options at their default settings.

After creating the RDS instance, users can obtain the endpoint and port number by copying the relevant information from the RDS dashboard. By following these steps, users can successfully create an RDS instance in AWS for use with Laravel.

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Fig. 2 Creation of RDS Instance

Fig. 2 is a visual representation that displays the status of RDS and its current activities with configurations.

D. Laravel Application Setup

To set up a Laravel application, you can begin by installing Composer and running the command "composer create-project laravel/laravel [application_name]" in your terminal. This will create a new Laravel application in the directory you specified. After this, you can start building



the application according to your specific requirements in your local development environment.

To properly configure our Laravel application on Elastic Beanstalk, we need to create two folders: .ebextensions and .platform. The .ebextensions folder will contain various .config files, which will define environment values such as APP_URL from EBS, DB_HOST, DB_USERNAME, DB_PASSWORD from our RDS instance, and other necessary credentials.

Additionally, we can use the "container_commands" section to specify commands for installing Composer and running migrations. On the other hand, the .platform folder will include the setup for either the Nginx or Apache server that will serve our application. It's important to ensure that these configurations are properly set up for our Laravel application to function correctly on AWS. This configuration automatically links EBS and RDS instance on the remote server.

Next, clone your Laravel application into any Git repository, such as Bitbucket or GitHub.



Fig. 3 Creation of Laravel Application

E. Code Pipeline Configuration

To establish a connection between your Laravel in Eng repository and the remote environment of Elastic Beanstalk, follow these steps^[3]. First, navigate to the CodePipeline service and select "Create Pipeline." From there, select the service provider listed in the dropdown and configure it with your credentials. Then, choose the corresponding project and repository with the particular branch name. You also need to configure the Elastic Beanstalk instance by selecting the region of the instance and choosing the application. Once the configuration is successful, it may take a few minutes to connect the repository and instance.

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Fig. 4 Configuration of Bitbucket with CodePipeline

F. Final Confirmation

After connecting your Laravel repository to your EBS instance via the CodePipeline service, it's important to ensure that your EBS configuration is set up correctly and your instance is in optimal health. Additionally, it's important to ensure that the RDS instance is available. Once all of these requirements are met, you can access your Laravel application's output by calling a URL. We recommend checking the URL for any errors or issues that may occur during the deployment process.

V. RESULT AND DISCUSSION

This paper focuses on deploying Laravel web applications on AWS. This research includes steps to set up your environment and deploy your application to AWS, as well as challenges encountered during the process.

The results of this study show that AWS provides an easy-to-use interface for deploying web applications. Using AWS Elastic Beanstalk and RDS made it easy to deploy and manage Laravel applications. The research found that the deployment process was straightforward and the application deployed successfully without any major issues. However, the study also identified some challenges during the deployment process. These challenges include configuring environment variables, setting up an RDS instance, and configuring security groups. This research developers recommends that carefully configure environment variables and security groups to avoid potential issues during deployment.



Fig. 5 Initial Page of Web Application



Fig. 5 displays the visual representation of a web page after a successful creation of an EBS instance.

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Fig. 6 Connectivity in RDS

Fig. 6 shows the RDS endpoint and port number, as well as basic information about the RDS instance such as region, status, and network type.

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Fig. 7 CodePipeline Connectivity Page

Fig. 7 indicate the connection status between EBS and Bitbucket Repo. Source refers to a cloud repository and Deployment means an EBS instance.



Fig. 8 Health Page of EBS

Fig. 8 view the health status of the EBS instance after successfully connecting to the remote repository through the code pipeline. Running Version shows the current version of the application.

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Fig. 9 Monitoring Graphs for EBS

Fig. 9 view graphs such as CPU utilization, environmental status, and network maximum input/output status.

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Fig. 10 CloudWatch Graph for RDS

Fig. 10 view graphs of CPU usage, DB connections, memory usage, read/write IOPS, etc.

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Fig. 11 Final Page of Web Application

Fig. 11 is visual representation of the final web page of a web application hosted on AWS Elastic Beanstalk (EBS) using the Laravel framework. This web page is the final result of the deployment process outlined in the study. This includes creating an EBS instance, connecting to your Laravel application via Git, and configuring it to use an RDS database. Once the deployment process was complete and the EBS instance was running, we were able to access the web page through its URL. A visual representation is a screenshot or photograph of the website, illustrating its design and functionality.



Using services that are designed to ensure the security of data can provide a number of benefits to individuals and organizations. Some of the advantages of using secure services include data protection, reduced risk of data breaches.

VI. CONCLUSION

A study of deploying Laravel web applications on Amazon Web Services (AWS) highlights the benefits of using AWS as a cloud hosting solution for web applications. AWS provides reliable and scalable cloud web application hosting solutions that enable businesses and individuals to quickly and easily deploy web applications without the need for extensive hardware and software infrastructure.

One of the main advantages of using AWS to host your web application is using AWS Elastic Beanstalk (EBS). This simplifies and speeds up the deployment process. The study found that EBS makes the deployment process easier and faster, allowing developers to focus on developing web applications instead of managing infrastructure. EBS also provides automatic resource scaling so your web application can handle traffic spikes without manual intervention. Another key piece of AWS infrastructure used in this study is the AWS Relational Database Service (RDS). The study found that using RDS ensures data integrity and security and provides a reliable and secure platform for storing and managing data. RDS also provides automated backups and automated software patching, reducing developer workload and ensuring web application stability and security.

The study also highlights the importance of properly configuring and monitoring EBS and RDS instances to operation of web ensure smooth applications. Configuration and monitoring are critical to maintaining web application performance and security, and this study recommends using tools such as Amazon CloudWatch and AWS Config to monitor your AWS infrastructure. In addition to the benefits of using AWS, the study also highlights the benefits of using Laravel, a popular PHP framework for developing web applications. Laravel provides a robust and flexible platform for web application development with built-in features such as routing, middleware, database management, and more. In our research, we found that Laravel is easy to use and can speed up the web application development process.

Overall, this study shows the effectiveness of AWS and Laravel in hosting and developing web applications. Using AWS Elastic Beanstalk and AWS Relational Database Service provided a reliable, scalable, and secure cloud hosting solution, and Laravel provided a robust and flexible platform for web application development. This research highlights the importance of properly configuring and monitoring your AWS infrastructure to ensure the smooth operation of your web applications, and the benefits of using modern PHP frameworks such as Laravel for web application development.

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