CSCI5409 - Project Proposal, Deployment and Delivery Model Critical Analysis and Response

Group Name: Apes Together Strong

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Overview

Travel has become cumbersome in modern times due to a lot of information available on the Internet. Excessive information leads to chaos and affects decision-making while planning a vacation. **TravelMemories** is a web application that helps its users to make their travel decisions better. The application deals with multiple travel destinations and managing the reviews of each of the destinations with the help of comments and ratings. The features of the web application include User Authentication, Posts Management, Security, and Performance. Each of the feature has the tasks given below:

- User Authentication: The User Authentication feature deals with the creation of user profiles (registration), logging in to the user account, logging out of the user account, and deleting user profile in the web application.
- Post Management: The Post Management feature deals with viewing everything posted so far, viewing details of a specific post, viewing the posts created and updated by a specific user account, creating a new post, updating an already existing post, and deleting a post, commenting on posts with the details of the post, and rating the posts. The posts here will be images which will be posted by the users in the web application.
- Security: The web application developed will be deployed taking into the account the security of the data and services being used by the users. The frontend and backend integration will be established via Amazon Virtual Private Cloud ensuring that the connection is made to a private cloud. Moreover, AWS Secret Manager ensures the security and privacy of the application data.
- Performance: The performance of the application is ensured using the Elastic Load Balancing service of AWS. This manages the load of many users on the web application.

The web application will be available for use as a software and hence, the delivery model used will be Software as a Service (SaaS). The users will use the services directly, they will neither have any access to the building blocks of the web application such as the infrastructure components and modules, nor the platform to build the web application.

The AWS services used in the application are Amazon EC2, Docker & Elastic AWS Container service, Amazon S3, Amazon DynamoDB, Elastic Load Balancing, AWS SNS, AWS Secret Manager. Each of these services will be used for building the features of the web application. AWS S3 provides file storage via web interface, Amazon DynamoDB offers document storage via web interface. AWS SNS service is used for notifying the user with any time-critical messages. Elastic Load Balancing is an AWS service for load balancing that ensures that the performance of the web application is not affected by the number of active users using the web application at that moment. AWS Secret Manager will be used to encrypt and thereby protect all the crucial data for the web application. This service will be used in the implementation of User Authentication feature of the application. AWS API Gateway is another service that will be used in the application development that will help the integration of frontend with the backend. The application will be deployed using Heroku and AWS where frontend will be deployed using Heroku and backend will be deployed using AWS for multi-cloud deployment [1].

TravelMemories is a web application that will help people to view any travel destinations of their choice to plan their vacations and travel in a hassle-free manner.

Functionalities

The two primary functionalities of our application are User management and Post management.

User management
The user management module handles numerous activities involving user profile information, such as registration, login, and forget password.

- Registration – When a user accesses an application for the first time, he or she will register through the sign-up page to begin utilizing the application's capabilities.
- Login – After registering, users may log in to the application to use its features such as adding posts, removing posts, and so on by providing their username and password.
- Forget Password – When a user forgets the previous password used to access the application, the forget password option allows them to establish a new password in order to regain access to their account.

Post Management
After successfully logging in, the user will be forwarded to the dashboard landing page. On the dashboard page, all posts will be shown in decreasing order, with the most recent post at the top. The post management tool includes functions such as creating a post, editing a post, deleting a post, rating a post, and commenting on a post.

- Create post – To create a new post, the user can utilize the create post feature. An image, a location, and a description can all be included in a post.
- Edit post – A user can update an existing post by changing the image or description.
- Delete post – If something goes wrong, the post owner has the option to remove their post.
- Rate post – Registered users can rate other users' posts by awarding them stars.
- Comment on the post – Users can also leave comments on other users' postings to share their opinions.

Architecture of TravelMemories

Our application will be a web application with responsiveness for Desktop and Mobile screens. The front-end of the web application will be developed in the React Js with the Heroku deployment. The back end of the application will be developed in Node Js, and it will be deployed on AWS EC2 compute engine. The user authentication will be done using AWS Secrets Manager and AWS Cognito. The backend of the application will be handled using AWS Elastic Load Balancer services. All the user data of users will be stored on AWS's DynamoDB database. In addition, the media files will be stored on the AWS's S3 Bucket instance. Even more, the DynamoDB and S3 Bucket will be configured with AWS Virtual Private Cloud to maintain security and integrity of the application.

Figure 1 displays the architecture of TravelMemories application.

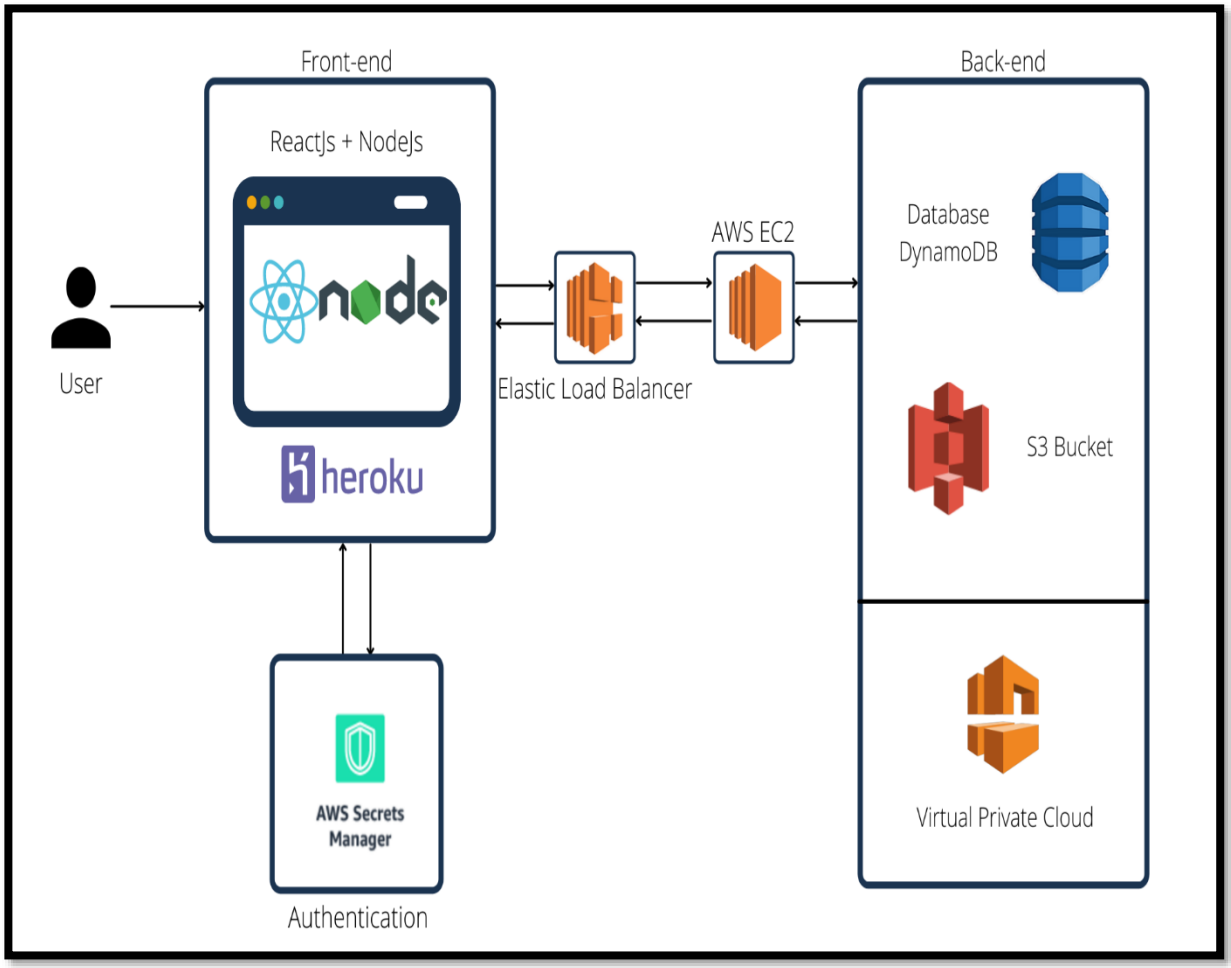

Figure 1: Architecture of TravelMemories [2]

Project Requirements

The Amazon Web Services to be used for the web application development for general, compute, storage, and network mechanisms are listed in this section with details.

Table 1 lists the mechanisms and services planned for the web application.

Table 1: Mechanism and Amazon Web Services planned for the web application

Mechanism	Services
Compute	AWS EC2 Docker & Elastic AWS Container service – ECS
Storage	AWS S3 AWS DynamoDB
Network	AWS Virtual Private Cloud AWS API Gateway
General	AWS SNS AWS Elastic Load Balancing AWS Secrets Manager

COMPUTE

- AWS EC2 - AWS EC2 (Amazon Elastic Computational Cloud) delivers safe and resizable compute power in the cloud, depending on your budget. It is used to run applications on the Amazon Web Services platform.

- Docker & Elastic AWS Container service – ECS – Elastic AWS Container services are lightweight container instances that share and run applications and managed using Docker API.

STORAGE

- AWS S3 – AWS S3 is a NoSQL database object storage service that utilizes key-value pairs to store the application's data, which includes pictures, logs, and more.

- AWS DynamoDB – AWS DynamoDB is also a NoSQL database that holds document structures and key-value pairs.

NETWORK

- AWS Virtual Private Cloud – AWS Virtual Private Cloud is a private cloud computing environment in the public cloud that separates public cloud parts to create a virtual private environment.

- AWS API Gateway – RESTful APIs and WebSocket APIs are created with AWS API Gateway.

GENERAL

- AWS SNS – AWS SNS (Amazon Simple Notification Service) is a messaging service that allows to send messages, emails, and mobile push alerts from one application to another or from application to user.

- AWS Elastic Load Balancing – By directing traffic to various destinations, AWS Elastic Load Balancing makes load balancing easier.

- AWS Secrets Manager – AWS Secrets Manager aids in the protection of application secrets such as database usernames, passwords, API keys, and so on.

Project Plan

The project plan for analysis, designing, development, and delivery of the web application is described below. The project plan is designed using agile methodology.

Figure 2 displays the project plan for **TravelMemories.**

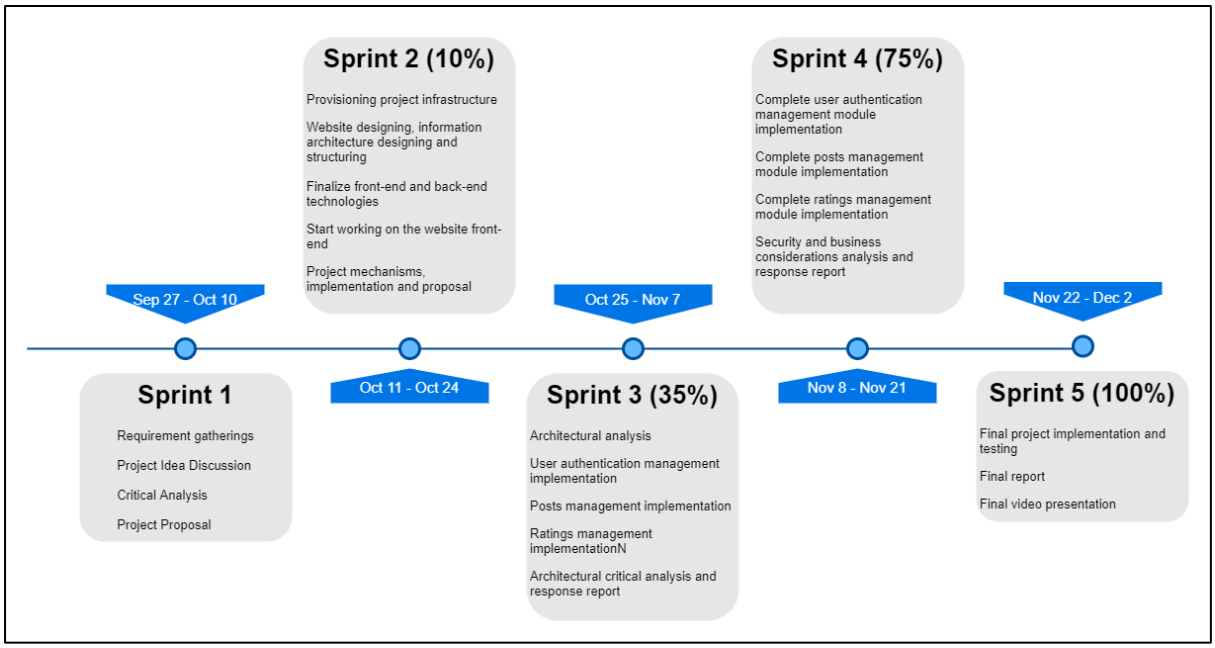

Figure 2 - Project Sprint Plan [2]

Critical Analysis

5.1 Describe the deployment model for the cloud-based software system you intend to build. Why did your group pick this deployment model?
Response: Public Cloud
The most widely used cloud computing paradigm is the public cloud. Cloud service providers utilize the Internet to deliver infrastructure, storage, servers, and other resources to businesses. We may use a web browser to access these services and manage our accounts online. Finally, all customers who wish to utilize a computational resource, such as hardware, operating system, CPU, RAM, and storage, or software such as an application server and database, can subscribe to this sort of cloud deployment model. Third-party suppliers own and run shared physical hardware, which they make available to enterprises on demand. Physical hardware is shared by several firms in the public cloud. The virtualization of resources in a multi-tenant system makes it easier to distribute infrastructure expenses across numerous users. The public cloud is excellent for small and medium-sized businesses because of the cost savings and pay-per-use approach. In theory, insensitive, publicly available online apps that can handle massive traffic can benefit greatly from the public cloud.
Reason: A public cloud provides several advantages for hosting and configuring the TravelMemories website. It delivers efficiency, great scalability, and aids in project implementation at a lower cost.

5.2 What are the benefits of your deployment model?

Response: The benefits of the public cloud are:

- Lower cost: Using the public cloud for project deployment and setup saves money because no hardware or software is required. It also provides services on a pay-as-you-go basis.
- No maintenance: Cloud customers do not need to worry about maintaining their hardware or infrastructure because this is handled by the cloud provider.
- Unlimited Scalability: Users can request resources based on their needs.
- Disaster Recovery: Because many cloud providers have backup infrastructures, there is little danger of data loss on the public cloud.
- No long-term contracts: It operates on a pay-as-you-go basis, with no long-term commitments or contracts necessary.
- High reliability: The cloud architecture is made up of a number of servers. If one of the servers fails, the traffic is routed to the other.

5.3 What are the drawbacks or risks of your deployment model?

Response: The drawbacks of public cloud are:

- Security: The public cloud is shared by numerous users, and customers have no idea where their data is stored or who has access to it. As a consequence, safeguarding sensitive data is always an option.
- No control: Public cloud services are provided by cloud providers. Management and maintenance are entirely taken care by the service providers. Users do not have any control.
- Surprise costs: Although cost savings is one of the advantages of the public cloud, if the instances and hardware are not correctly managed, the cost may increase.
- Performance: The public cloud is open and shared by numerous cloud users, therefore if data transmission is hindered, the response time will be slowed.
- Limited customization: Customization of services, policies, and resources is limited or impossible, and consumers may only pick from those established by cloud providers.

5.4 Describe the delivery model for the cloud-based software system you intend to build. Explain the tradeoffs of this model in comparison to other delivery models (IaaS, FaaS, PaaS, SaaS). For example, how much control do you have over your cloud provided infrastructure?

Response: Software as a Service (SaaS)

The delivery models available for releasing a cloud-based software are Infrastructure as a Service (IaaS), Function as a Service (FaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). IaaS is a cloud-based service that offers several infrastructure resources such as compute engine, storage, network for delivering a cloud-based application. PaaS is a service where a third-party vendor offers the infrastructure and a platform to develop applications. FaaS is a service that provides users with application functionalities and operations without having the users to build the infrastructure of the application. SaaS is a cloud-based service that offers the users directly with the software to be used over the Internet. SaaS is a service that is generally offered via web browsers such as a web application. We plan to use SaaS for delivering our web application as it will allow our users to use the services directly over the Internet. The various metrics against which the delivery models can be compared are given in the table below.

Table 2 shows the comparison between IaaS, PaaS, SaaS, and FaaS.

Table 2: Comparison between IaaS, PaaS, SaaS, and FaaS

Parameter	IaaS	PaaS	SaaS	FaaS
Access Control	Administrator	Developer	User	User
Development Complexity	More	Less	Lesser	Least
Cost	Least	Lesser	Less	More
User Controls	More	Less	Lesser	Least
Usage-friendly	Least	Lesser	More	Most
Flexibility	Most	Less	Lesser	Least

References

[1] "Amazon," Amazon, [Online]. Available: https://docs.aws.amazon.com/index.html?nc2=h_ql_doc_do. [Accessed 09 October 2021].

[2] "Draw.io," Draw.io, [Online]. Available: https://app.diagrams.net/. [Accessed 09 October 2021].