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**A Internship Report on
“AMAZON WEB SERVICES”**

Submitted by

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2023-2024

**DEPARTMENT OF ELECTRONICS & COMMUNICATION
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Certified that the Internship entitled “Amazon Web Services” is carried out by Hemanth S bearing USN 1AY21EC041 in the partial fulfillment for the award of degree of Bachelor of Engineering in **Electronics and Communication Engineering of Visvesvaraya Technological University**, Belagavi during the year 2023-2024. It is certified that all corrections/suggestions indicated for the assessment have been incorporated in the report deposited in the departmental library. The Internship Report has been approved as it satisfies the academic requirement in respect of **Innovation/Entrepreneurship/Societal Internship (21INT68)** prescribed for the Bachelor of Engineering Degree.

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Hemanth S

Certificate of Completion for
AWS Academy Graduate - AWS Academy Cloud Foundations

Course hours completed

20 hours

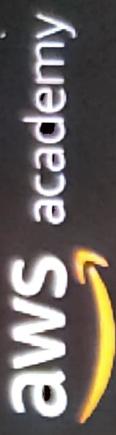
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Cloud Semester 1

Course hours completed

60 hours

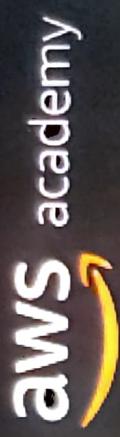
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2023-2024

DECLARATION

I, **Hemanth S, 1AY21EC041**, hereby declare that the Internship work entitled "**Amazon Web Services**" has been independently carried out by me under the supervision of **Dr. Nagapushpa K P, Assistant Prof. Grade-1 ,Department of Electronics and Communication Engineering, Acharya Institute of Technology** in partial fulfilment of the requirement for the award of the degree of **Bachelor of Engineering in Electronics and Communication Engineering** by **Visvesvaraya Technological University, Belagavi** during the year **2023-24**.

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ABSTRACT

The word "cloud" refers to a broad range of advancements and opportunities. It is more of a "practical innovation" than an invention since it builds upon multiple prior inventions to create something fresh and interesting. Applications that were designed to be rich Internet applications that run on the Internet (or "Cloud") are referred to as cloud computing, a term that has gained popularity. Task delegation over a network to a combination of software and services is made possible by cloud computing. Cloud computing already includes high speed networks, virtualization, Web 2.0 interactivity, time sharing, and browser interface.

The way computer resources are provisioned, accessed, and managed has been completely transformed by cloud computing, which has emerged as a paradigm-shifting idea in information technology. The delivery and consumption of IT services have undergone a fundamental shift with the advent of cloud computing. The development of cloud computing—from its theoretical inception to its current position as a key component of contemporary IT infrastructure—is examined in this abstract.

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CHAPTER 1

ABOUT THE COMPANY

1.1 AWS Academy's Origins & History of Establishment

Jeff Bezos launched Amazon on July 5, 1994. Because Microsoft was located in the Seattle area, he chose it because of its extensive technology expertise. When Amazon Web Services (AWS) was first released in 2002, its primary goal was to provide web developers with the APIs they needed to build web applications based on Amazon's e-commerce platform. In 2004, Alexa Web Information Service web crawler data and website popularity statistics were added to AWS. AWS later moved into enterprise services, launching Simple Storage Service (S3) in 2006 and Elastic Compute Cloud (EC2) in 2008, which allowed businesses to rent processing power and storage from Amazon.

Amazon also launched the fulfilment by Amazon program in 2006, which allows individuals and small businesses called "third-party sellers" to ship goods through Amazon's fulfilment centers and warehouses.

The primary goal of Amazon Web Services Academy is to provide colleges with the materials and curriculum needed to successfully teach cloud computing concepts and skills. By combining AWS-authored materials, hands-on labs, and real-world scenarios into academic programs, AWS Academy aims to train students for successful careers in the cloud industry.



Fig 1.1. 1: AWS Academy

1.2 Owners and Visionaries of AWS Academy

The design and implementation of the program was led by top AWS executives, such as Andrew Jassy, CEO of Amazon Web Services at the time of the program's launch. Since founding AWS, Jassy later became the CEO of Amazon.com and was instrumental in the expansion and success of the company. His idea for the AWS Academy was based on the belief that opportunities for democratization and economic development can be achieved through quality education in cloud technology.

Teresa Carlson, former vice president of global public sector at AWS, was instrumental in founding the AWS Academy. Carlson has made significant contributions to advancing cloud education and building alliances between academic institutions and government organizations. His work helped align AWS Academy's goals with broader public sector programs that improved workforce development and technology literacy.

These leaders understood how to combine theoretical knowledge with practical, hands-on training and collaborated with a group of AWS professionals and educators to achieve this goal. Their joint effort has ensured that AWS Academy equips students with the critical thinking and problem-solving skills needed to succeed in a dynamic and fast-paced industry, in addition to the technical skills needed for cloud computing.



Fig 1.2. 1: Andrew Jassy

AWS's customer base spans a number of industries, including technology, healthcare, finance and government. The company has become a trusted partner for companies that want to use cloud technology to achieve their goals due to its commitment to innovation and customer satisfaction.

AWS Academy has greatly expanded its reach by partnering with educational institutions around the world to provide cloud computing tutorials. The program's curriculum is adaptable and customizable, so colleges can seamlessly add AWS Academy courses to their existing curricula. This versatility ensures that students from all educational backgrounds can benefit from the training and resources provided by AWS Academy.

AWS Academy's impact is evident in the success of its students. Many of them went on to work in large IT companies and organizations that rely on cloud technology. AWS Academy differentiates students in the competitive job market by providing access to industry-recognized certifications and hands-on training. In addition, the curriculum creates a community of cloud computing enthusiasts and educators committed to lifelong learning and professional development.

AWS Academy also supports a number of programs aimed at increasing diversity and inclusion in the technology industry. AWS Academy works with organizations that serve marginalized groups to ensure that cloud computing opportunities are open to all. This focus on diversity is an important part of AWS's larger goal of democratizing access to technology and creating positive social impact.



Fig 1.2. 2: AWS Academy Program

CHAPTER 2

INTRODUCTION TO THE DOMAIN OF INTERNSHIP

Amazon provides a complete cloud computing platform called Amazon Web Services (AWS). It offers a large range of cloud services, such as networking capabilities, databases, machine learning tools, processing power, storage options, and more. Without having to buy and maintain physical gear, AWS gives people and enterprises on-demand access to scalable and affordable cloud resources [1].

Here's a quick rundown of some essential AWS services:

- **Compute Services:** AWS provides a range of compute services, including serverless computing with AWS Lambda, scalable compute capacity with Amazon EC2 (Elastic Compute Cloud), and containerised applications with AWS ECS (Elastic Container Service).
- **Storage Services:** AWS offers a variety of storage solutions, such as block storage volumes with Amazon EBS (Elastic Block Store), scalable object storage with Amazon S3 (Simple Storage Service), and long-term data preservation with Amazon Glacier.
- **Database Services:** Relational database services (Amazon RDS), NoSQL database services (Amazon DynamoDB), and data warehousing services (Amazon Redshift) are among the managed database services provided by AWS.
- **Networking:** AWS offers networking services such as DNS administration with Amazon Route 53 and isolated virtual networks with Amazon VPC (Virtual Private Cloud).
- **Analytics and machine learning:** AWS provides services such as AWS Kinesis for real-time data streaming, Amazon Athena for interactive querying, Amazon SageMaker for creating and implementing machine learning models, and Amazon EMR (Elastic MapReduce).

- **Identity and security:** AWS offers services such as AWS CloudTrail, which keeps track of API activity, AWS KMS, which manages encryption keys, and AWS IAM, which controls user and resource access.
- **Developer Tools:** AWS provides tools for developers, including AWS CodeBuild for continuous integration, AWS CodeDeploy for automated deployment, AWS CodeCommit for version control, and AWS CodePipeline for continuous delivery.
- **Management and Monitoring:** AWS offers services such as AWS CloudFormation for infrastructure as code, AWS Config for resource management, and Amazon CloudWatch for monitoring resources and applications.



Fig 2.1. 1: Amazon Web Services

The term "cloud computing" describes the provision of computer services via the internet (also known as "the cloud") in order to provide economies of scale, flexible resources, and quicker innovation. Users can pay-as-you-go access computer resources like as servers, storage, databases, networking, software, and more instead of owning physical gear or data centres [2].

Among the essential features of cloud computing are:

- **On-Demand Self-Service:** Without assistance from the service provider, users can autonomously allocate resources such as server time and storage as needed.

- **Widespread Network Access:** This type of access is made possible by the availability of services across the network that can be accessed using common methods.
- **Resource pooling:** Using resources that are dynamically distributed based on demand, providers serve a number of clients. Although users can designate the region in which their data is located, they usually have no control or awareness over the precise placement of the resources.
- **Quick Elasticity:** Resources can be provisioned and released in a quick and elastic manner. This enables users to scale resources up or down—often automatically—as needed.
- **Measured Service:** By utilizing a metering capability at some point in time, cloud systems automatically regulate and optimize resource utilization.

Advantages of Cloud Computing:

- **Savings on costs:** Minimizes the operating expenses related to monitoring and maintaining physical infrastructure and does away with the requirement for initial hardware investments.
- **Flexibility and Scalability:** Enables businesses to swiftly adjust their resource levels in response to shifting demand patterns or evolving business requirements.
- **Enhanced Efficiency:** Offers access to a variety of technologies and computing services without the hassle of administering and maintaining them locally.
- **Reliability and Availability:** To guarantee high availability and data reliability, cloud services usually provide a strong infrastructure and data redundancy procedures.
- **Global Reach:** Since cloud services are frequently dispersed over several geographical areas, businesses can deploy apps more effectively and reach clients worldwide.

Types of Cloud Services:

- **Infrastructure as a Service (IaaS):** Offers virtualized computer resources, including networking infrastructure, storage, and virtual machines, over the internet. Applications, middleware, and operating systems are all controlled and managed by users.
- **PaaS, or platform as a service:** Provides a platform that spares users from the hassle of creating and maintaining the underlying infrastructure, enabling them to create, execute, and manage applications. Databases, runtime environments, and development frameworks are a few examples.
- **SaaS (software as a service):** Distributes software programs via the internet via a subscription model. Without having to install or maintain software locally, users can access programs through a web browser. CRM programs, email services, and office productivity tools are a few examples.



Fig 2.1. 2: Cloud Computing

CHAPTER 3

TOOLS AND TECHNOLOGIES

In order to address many areas of cloud computing, such as processing power, storage choices, networking, databases, analytics, machine learning, security, and more, Amazon Web Services (AWS) provides an extensive range of tools and technologies [3]. Here is a thorough rundown of several essential AWS technologies and tools:

3.1 Compute:

- **Amazon EC2 (Elastic Compute Cloud):**

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers by offering a wide variety of instance types optimized for different use cases.

Amazon EC2 (Elastic Compute Cloud) is a core component of Amazon Web Services (AWS) that provides scalable computing power in the cloud. It allows users to rent virtual machines (instances) to run applications, offering flexibility in instances, pricing models (on-demand, reserved, on-premise instances) and scalability. EC2 instances can be easily launched, managed and terminated as needed, making it ideal for a wide range of computing tasks, from simple web hosting to complex computing and machine learning applications [4].



Fig 3.1. 1: Amazon EC2

- **AWS Lambda:**

AWS Lambda is a serverless compute service that allows you to run code without provisioning or managing servers. It executes your code only when needed and scales automatically, from a few requests per day to thousands per second [5].

AWS Lambda is central to modern cloud computing, revolutionizing the way developers build and deploy applications. This enables a serverless architecture where developers can upload code snippets, ie. functions, directly to AWS Lambda. These actions can then be triggered by various events, such as HTTP requests through Amazon API Gateway, changes to data stored in Amazon S3 or DynamoDB, or messages from AWS SNS or SQS.



Fig 3.1. 2: AWS Lambda

- **Amazon ECS (Elastic Container Service):**

Amazon Elastic Container Service (Amazon ECS) is a highly scalable and fast container management service that makes it easy to run, stop, and manage docker containers on a cluster of Amazon EC2 instances or using AWS Fargate.



Fig 3.1. 3: Amazon ECS

- **Amazon EKS (Elastic Kubernetes Service):**

Without having to build, administer, and maintain your own Kubernetes control plane or nodes, you can easily run Kubernetes on AWS with the help of Amazon Elastic Kubernetes Service (Amazon EKS), a managed Kubernetes service.



Fig 3.1. 4: Amazon EKS

- **AWS Fargate:**

Working with both Amazon ECS (Elastic Container Service) and Amazon EKS (Elastic Kubernetes Service), AWS Fargate is a serverless computing engine for containers. It frees you from managing the underlying infrastructure so that you may run containers.



Fig 3.1. 5: AWS Fargate

3.2 Storage:

- **Amazon S3 (Simple Storage Service):**

Simple Storage Service, or Amazon S3, is a web-based cloud storage solution that is fast, scalable, and ideal for online data backup and application programme preservation. S3 is a vital component of AWS's cloud computing infrastructure, offering highly scalable, safe, and long-lasting object storage to IT and development teams [6].



Fig 3.2. 1: Amazon S3

- **Amazon Elastic Block Store (Amazon EBS):**

High-performance block storage is offered by Amazon Elastic Block Store (Amazon EBS), which is intended for usage with Amazon EC2 instances. With EC2 instances, EBS offers permanent block-level storage volumes with a range of pricing and performance choices.



Fig 3.2. 2: Amazon EBS

- **Amazon EFS (Elastic File System):**

Designed to offer straightforward, elastic, and scalable file storage for use with AWS Cloud services and on-premises resources, Amazon Elastic File System (Amazon EFS) is a fully managed, scalable cloud file storage solution. Because of its robustness and high availability, EFS can handle a variety of workloads and applications.



Fig 3.2. 3: Amazon EFS

- **Amazon Glacier:**

For data that has to be kept for a long time at a cheap cost but is not regularly accessed, Amazon Glacier is an archival storage solution. It is a component of the Amazon S3 service family and provides reliable and safe storage for backup and preservation of data.

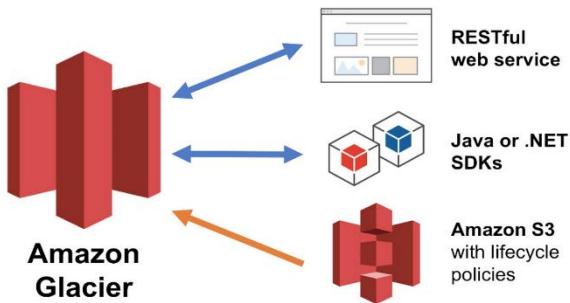


Fig 3.2. 4: Amazon Glacier

3.3 Databases:

- **Amazon RDS (Relational Database Service):**

AWS offers a managed database solution called Amazon Relational Database solution (Amazon RDS) that makes it easier to set up, run, and scale relational databases in the cloud. Many database engines, such as MySQL, PostgreSQL, MariaDB, Oracle Database, and Microsoft SQL Server, are supported by Amazon RDS.



Fig 3.3. 1: Amazon RDS

- **Amazon Aurora:**

Fully managed, MySQL and PostgreSQL compliant, Amazon Aurora is a relational database engine that combines the affordability and ease of use of open-source databases with the power and availability of premium commercial databases. Its goal is to minimise management overhead while delivering great performance, reliability, and scalability.



Fig 3.3. 2: Amazon Aurora

- **Amazon DynamoDB:**

AWS offers a fully managed NoSQL database service called Amazon DynamoDB. It is designed to give smooth and scalable performance for applications that demand low-latency data access with autonomous scaling and high availability [7].



Fig 3.3. 3: Amazon DynamoDB

- **Amazon Redshift:**

AWS offers a fully managed petabyte-scale data warehouse solution called Amazon Redshift. It is made to manage heavy workloads related to data analytics, execute intricate queries, and produce business insights from semi-structured and structured data.



Fig 3.3. 4: Amazon Redshift

- **Amazon Neptune:**

AWS offers a fully managed graph database solution called Amazon Neptune. It is appropriate for applications requiring graph-based data models since it is optimised for storing and retrieving densely linked data with complicated relationships.



Fig 3.3. 5: Amazon Neptune

3.4 Networking:

- **Amazon Virtual Private Cloud (Amazon VPC):**

With the help of the Amazon Virtual Private Cloud (Amazon VPC) service, you may deploy AWS services in a virtual network of your choosing inside a logically isolated area of the AWS Cloud. Your virtual networking environment, including IP address ranges, subnets, routing tables, network gateways, and security settings, are all under your control [8].



Fig 3.4. 1: Amazon VPC

- **AWS Direct Connect:**

An on-premises data centre, office, or colocation environment may easily establish a dedicated, private network connection to AWS with the use of AWS Direct Connect, a cloud service solution. Compared to internet-based connections, this can save network expenses, boost bandwidth throughput, and offer a more reliable network experience.



Fig 3.4. 2: AWS Direct Connect

- **Amazon Route 53:**

Elastic load balancers, Amazon EC2 instances, Amazon S3 buckets, and other AWS-hosted infrastructure may be reached by end users via Amazon redirect 53, a scalable and highly available DNS web service. It can also be used to redirect requests to non-AWS infrastructure.

Additionally, Route 53 uses DNS failover and health checks to make sure your application is always accessible. Amazon Route 53 is a highly scalable and reliable Domain Name System (DNS) web service provided by Amazon Web Services (AWS). It is designed to direct end users to Internet applications and translate human-readable domain names such as www.example.com into IP addresses that computers use to connect to Internet resources.



Fig 3.4. 3: Amazon Route53

- **AWS CloudFront:**

With low latency and fast transfer speeds, Amazon CloudFront is a quick content delivery network (CDN) solution that securely sends data, videos, apps, and APIs to clients all over the world.



Fig 3.4. 4: AWS CloudFront

3.5 Analytics:

- **Amazon EMR (Elastic MapReduce):**

A cloud-based solution called Amazon EMR (Elastic MapReduce) makes it easier to handle big datasets over scalable clusters of Amazon EC2 instances. Using open-source tools like Apache Hadoop, Apache Spark, Apache HBase, Apache Flink, Apache Hudi, and Presto, it is intended to assist users in performing large data analysis [9].



Fig 3.5. 1: Amazon EMR

- **Amazon Kinesis:**

AWS offers a technology called Amazon Kinesis for gathering, handling, and evaluating streaming data in real time. It lets you create apps that can instantly process and continually absorb massive quantities of data.



Fig 3.5. 2: Amazon Kinesis

- **AWS Glue:**

Amazon Web Services (AWS) offers a fully managed extract, transform, and load (ETL) solution called AWS Glue. It is intended to simplify the process for users to prepare and modify data for usage in machine learning and analytics applications.



Fig 3.5. 3: AWS Glue

- **Amazon QuickSight:**

A quick, cloud-based business intelligence (BI) tool, Amazon QuickSight helps companies to create visualisations, do ad hoc analysis, and derive insights from their data. It is made to be affordable, scalable, and simple to use.



Fig 3.5. 4: Amazon QuickSight

3.6 Machine Learning:

- **Amazon SageMaker:**

Data scientists and developers can create, train, deploy, and manage machine learning (ML) models at scale with Amazon SageMaker, an AWS fully managed ML service. It offers a number of tools and features to speed up ML development and streamlines the whole ML workflow, from data preparation to model deployment.



Amazon SageMaker

Fig 3.6. 1: Amazon SageMaker

- **AWS Deep Learning AMIs:**

Deep Learning on AWS Deep learning frameworks and tools are included in AMIs (Amazon Machine Images), which are pre-configured machine learning environments offered by Amazon Web Services (AWS).



Fig 3.6. 2: AWS Deep Learning AMIs

- **Amazon Comprehend:**

AWS offers a natural language processing (NLP) service called Amazon Comprehend, which leverages machine learning to extract relationships and insights

from text. It enables you to do a variety of text data analysis tasks, including language identification, entity recognition, topic modelling, and sentiment analysis.

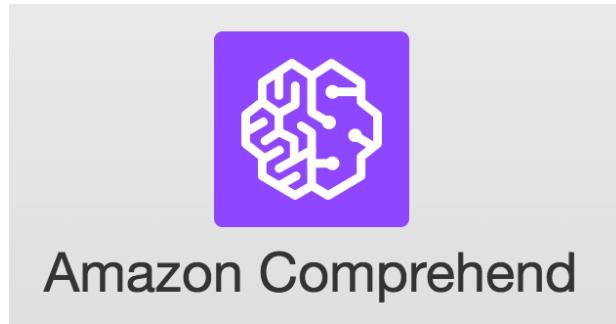


Fig 3.6. 3: Amazon Comprehend

- **Amazon Rekognition:**

AWS offers a fully managed computer vision service called Amazon Rekognition that makes it simple to integrate picture and video analysis into your apps. It recognises persons, objects, and settings; analyses facial expressions; and does a variety of other picture and video analysis tasks using deep learning technology.



Fig 3.6. 4: Amazon Rekognition

3.7 Management and Governance:

- **AWS CloudFormation:**

Amazon With the use of a tool called CloudFormation, you can more efficiently manage your AWS resources and concentrate more of your time on your apps by

modelling and configuring them. Using templates and CloudFormation, you can describe your infrastructure as code.



Fig 3.7. 1: AWS CloudFormation

- **AWS CloudWatch:**

A complete monitoring and management solution for AWS resources, apps, and on-premises infrastructure is provided by Amazon CloudWatch. It offers current information and useful insights to assist you in keeping an eye on and managing the functionality and well-being of your AWS installations.



Fig 3.7. 2: AWS CloudWatch

- **AWS Systems Manager:**

With the aid of AWS Systems Manager, a complete management tool, you can take charge of your AWS infrastructure and obtain operational insights. It automates routine administrative operations across AWS resources, streamlines operational processes, and simplifies resource management.

Automation Using AWS Systems Manager



Fig 3.7. 3: AWS System Manager

- **AWS Config:**

With the help of the service AWS Config, you may examine, verify, and analyse how your AWS resources are configured. It assists you in monitoring resource setups and modifications throughout time to guarantee adherence to company guidelines and accepted industry practices.



Fig 3.7. 4: AWS Config

3.8 Security and Identity:

- **AWS IAM (Identity and Access Management):**

One online service that can assist you in securely managing user access to AWS resources and services is AWS Identity and Access Management (IAM). It gives you control over the authorization and permissions for different AWS resources, guaranteeing safe and precise access management.

With IAM, you can create and manage AWS users and groups, set permissions using policies, and assign roles for cross-account access. This provides fine-grained control over who can access certain resources and operations, helping to ensure the security and compliance of your AWS environment.



Fig 3.8. 1: AWS IAM

CHAPTER 4

LEARNING OUTCOMES

Enrolment was done on the first day of the AWS Academy Cloud Foundations [63293] course. This course consists of ten sessions, each of which ends with an analysis of the content that was covered. The course's first unit is organized as follows: The AWS Cloud Adoption Framework, Cloud Computing 101, Cloud Computing Pros and Cons, and AWS Overview. In the section on AWS Introduction, we went over the fundamentals of software architecture and cloud computing. Attendees learned about a number of cloud service models, including infrastructure, platform, and software, or IaaS, PaaS, and SaaS. Deployment strategies for public, hybrid, and on-premises/private clouds were also covered. In terms of networking, security, and databases.

The section on the advantages of cloud computing covers a number of pricing concepts, such as total cost of ownership, billing and cost management, technical support, and Amazon Web Services (AWS) organizations. The utility-style pricing model of AWS caught my attention; it includes concepts like paying for the services you use, reserving at a discounted cost, paying less as you use more, and paying even less as AWS grows. This section also included a challenge to use the AWS Pricing Calculator to estimate business spending and a lecture presented by the teacher on how to use the AWS billing dashboard. This webinar helped me understand more about AWS's financial advantages and organizational architecture.

The AWS Academy Cloud Foundations course's third module covered AWS services, service classifications, and global infrastructure in great detail. The distinctions between AWS regions, availability zones, and edge locations were covered in this session. These distinctions are important to consider when choosing a region or regions for data storage and AWS service consumption. Delays, expenses, and restrictions on compliance are factors to take into account. Comprehensive explanations of AWS data centres and their specific functions were provided, highlighting how these establishments serve as the foundation for AWS's global infrastructure. AWS offers a wide range of global cloud-based solutions that serve as the foundation for widely utilized cloud systems. Numerous services are included in each of the twenty-three distinct product or service categories, which reflects the breadth of AWS's capabilities.

The service categories include all of AWS's offerings, including storage, computing, database, network, identity, and compliance services; additionally, they include cost, management, and governance services. For example, one of the main services under the Compute category is Amazon Elastic Compute Cloud (Amazon EC2). When a reader clicks on Amazon EC2, a thorough product page with a thorough explanation of all of its features and capabilities is displayed. Customers can select the most appropriate solutions for their business objectives by using this modular approach, which assists them in exploring and comprehending the wide range of services that AWS offers in each category.

The fourth session covers many important topics and focuses on identity management and security within AWS. The shared responsibility paradigm was briefly reviewed at the outset, emphasizing the distinct responsibilities that AWS and its clients play. To create a secure cloud environment, it is essential to comprehend these responsibilities. The lecture also defined the various types of IAM security credentials and covered the administration and identification of IAM (Identity and Access management) roles, groups, and users.

In addition, it described how to create a new AWS account and examined the roles and management of IAM users and groups. It also covered AWS compliance plans, which are designed to help businesses meet security and regulatory requirements, and provided advice on how to protect AWS data. The program contains an educator-led exercise on the AWS shared responsibility model in Section One and a recorded demo on IAM in Section Two to highlight these concepts. In addition, a practical lab at the conclusion of the section gave participants a chance to practice creating IAM roles, groups, and users via the AWS Management Console, providing practical experience with AWS identity and security management.

Three essential AWS services for networking and content delivery are covered in the fifth module of the AWS Academy Cloud Foundations course: Amazon CloudFront, Amazon Route 53, and Amazon Virtual Private Cloud (Amazon VPC). An overview of networking fundamentals was given at the beginning of the webinar, which provided a foundation for understanding Amazon VPC and the associated networking and security features. The intricacy of VPC networking and security was explained to participants, ensuring that they had a thorough understanding of how to safeguard and manage virtual networks.

Participants also looked at AWS's scalable domain name system (DNS) web service, Amazon Route 53, which describes how end users' queries are routed to various AWS services. The ability of Amazon CloudFront, a content delivery network (CDN) service, to provide data, videos, apps, and APIs to users worldwide with low latency and quick transfer speeds was investigated. The session enhanced the understanding of network architecture design by demonstrating how to create a VPC with both public and private subnets using the VPC Wizard. Encouraging the learners, a job was presented to label a network diagram and build a basic VPC design. By using the procedures given, participants learned how to build the VPC architecture, create a customized VPC, and add extra components to create a customized network.

The sixth course provided an overview of compute services with a focus on container services, Amazon EC2, and cost optimization strategies for Amazon EC2. AWS Lambda and Amazon Elastic Beanstalk were covered in the lecture, along with details on their distinct benefits and use cases. A video presentation on Amazon EC2 provided a thorough overview of this important computing service in Section 2. A hands-on lab using the AWS Management Console to construct an EC2 instance gave participants real-world experience installing virtual servers as the program came to a close.

The exercise aimed to raise participants' awareness of AWS database management options by asking them to weigh the benefits and drawbacks of installing databases on Amazon Relational Database Service (RDS) against Amazon EC2. A hands-on AWS Lambda exercise in Section 5 allowed participants to learn about serverless computing, and an Elastic Beanstalk exercise in Section 6 demonstrated how easy it is to install and manage apps in the AWS cloud. In order to ensure that participants had a solid understanding of AWS computing services and their real-world applications, the lecture concluded with a knowledge evaluation designed to test participants' comprehension of the key concepts discussed.

Amazon Elastic Block Store (Amazon EBS), Amazon Simple Storage Service (Amazon S3), Amazon Elastic File System (Amazon EFS), and Amazon Simple Storage Service Glacier are just a few of the crucial storage options covered in the seventh module of the AWS Academy Cloud Foundations course. This lesson comprised four filmed demos, leading learners through the process of developing storage solutions using the AWS Management Console. Through hands-on labs, participants had the chance to construct an Amazon EBS volume and link it to

an Amazon Elastic Compute Cloud (Amazon EC2) instance, nurturing practical skills in storage administration. Moreover, participants participated in a challenge aimed at picking the ideal storage choice for a certain business case, engaging critical thinking and decision-making.

As participants moved on to the eighth topic, participants' attention was drawn to database management systems, which are crucial elements of effective data processing. Cloud databases are a crucial component of modern data management because they offer significant cost advantages over traditional database systems. Participants in this program explored key AWS database services, such as Amazon Relational Database Service (Amazon RDS), Amazon DynamoDB, Amazon Redshift, and Amazon Aurora. In order to encourage hands-on learning and the use of these services, the lesson included two recorded examples that methodically guided participants through the process of utilizing the AWS Management Console to access and interact with Amazon RDS and Amazon DynamoDB. As part of the program's practical lab, participants set up an Amazon RDS database system to gain practical database management skills.

In the ninth module of the course AWS Academy Introduction to Cloud: Semester 1 [63960], participants explored the AWS Trusted Advisor, high availability, dependability, and the AWS Well-Architected Framework. This lesson provided a thorough understanding of the underlying concepts, reinforced by two hands-on activities. In order to enable critical analysis and the application of architectural best practices, one exercise involved examining an architecture and evaluating it using the design principles of the AWS Well-Architected Framework. Examining the architecture's design, looking for any weaknesses, and lining it up with the framework's best practices were the tasks assigned to participants in this exercise. By taking part in this exercise, participants improved their capacity to evaluate cloud systems' scalability and resilience, putting them in a better position to handle and implement cloud infrastructure in real-world scenarios.

During the second exercise, participants gained practical understanding of concepts from AWS Trusted Advisor—a crucial resource for enhancing AWS configurations. Participants improved their capacity to identify areas for improvement and implement best practices to raise the stability, security, and performance of AWS installations by listening to and comprehending recommendations from Trusted Advisors. Through this hands-on activity, participants learned

how to effectively traverse real-world scenarios and make informed decisions to maximize their AWS infrastructure.

Moving on to the tenth module, participants explored essential AWS services for managing compute resources, such as Amazon CloudWatch, Amazon EC2 Auto Scaling, and Elastic Load Balancing. This module included two exercises designed to improve participants' understanding of these services: in one, participants described use cases for elastic load balancing, leading to the development of critical thinking and the application of load balancing concepts. Participants gained knowledge of the various scenarios in which elastic load balancing may improve the availability and scalability of systems hosted on AWS.

In the second exercise, participants discovered instances of Amazon CloudWatch, a sophisticated monitoring tool for AWS resources and applications. By discovering and setting CloudWatch for particular use cases, participants received hands-on expertise in monitoring and controlling AWS systems in real-time. This practical exercise prepared participants with critical abilities in monitoring resource use, issuing alerts, and reacting to performance events, boosting their capacity to manage the health and performance of AWS installations.

In the fourth module, participants were charged with practical activities aimed at familiarizing them with crucial AWS services and deployment methods. One operation entailed constructing an EC2 instance, attaching an access key, and using the command line to access the instances. By completing this work, participants acquired hands-on experience in establishing virtual servers on the AWS platform and accessing them via the command line interface. Another challenge focuses on constructing a static, simple website and hosting it on EC2 instances using Amazon S3 or Amazon Storage Service Bucket.

Moving on to the fifth module, participants will explore the importance of edge location and caching in content delivery networks (CDNs). In this topic, I learnt how to create a CloudFront distribution and connect it to an Amazon S3 bucket that contains an HTML file. By installing CloudFront, participants increased the speed and accessibility of their websites by using edge websites to store and distribute content. Additionally, participants will learn how to attach their own DNS to websites, making them secure and globally accessible. Through these activities, participants gained knowledge about optimizing content delivery and improving user experience in distributed network settings.

In the sixth lesson, I delved into the comparison of Elastic Beanstalk and Amazon S3 as storage options. Through guided laboratory activities, participants will explore many situations in which to choose the right storage space for their company's needs. By learning how to create Elastic Block Store (EBS) volumes and connect them to an EC2 instance, participants gained real-world experience building storage solutions on the AWS platform. These activities empowered me to make informed decisions about storage options and effectively manage data storage in cloud settings.

The seventh module focuses on AWS Identity and Access Management (IAM) cloud security. Participants learnt how to create restrictions for users accessing AWS resources and how IAM works to manage access rights. By exploring topics such as roles, identities and groups in IAM, participants gained insight into the security of AWS systems and compliance with corporate policies. Through hands-on demos and hands-on labs, attendees learned how to configure IAM users, grant permissions, and enforce access controls, increasing their understanding of cloud security best practices.

Additionally, in modules seven and eight, I explored the contrast between the AWS Web Application Firewall (WAF) and AWS Shield, and learnt about Distributed Denial of Service (DDoS) threats and mitigations. By learning the features of AWS Shield Standard and Advanced, attendees gained knowledge on how to protect applications and infrastructure against DDoS attacks. Additionally, participants learnt how AWS WAF works to protect web applications and how AWS Inspector works to monitor and discover vulnerabilities in AWS configurations. Through these classes, students learn critical knowledge and skills to secure their AWS resources and successfully address security risks.

In the ninth module of the AWS Academy course, attendees were introduced to the tools provided by Amazon Web Services for monitoring cloud services. Because of the costs associated with cloud operations, it is important to measure and manage them properly. AWS provides several monitoring tools for this task, including CloudWatch and CloudTrail. Participants learnt how to set up CloudWatch alerts and monitor CloudTrail programs to ensure efficient use of cloud resources. Using these powerful monitoring tools, cloud users can gain critical information about resource usage and performance, helping them effectively manage their cloud settings. CloudWatch provides a complete monitoring tool for AWS resources and

applications, while CloudTrail plays a different role in monitoring API activity and providing audit trails for security and compliance.

Moving on to the tenth module, attendees learn how to store data using Amazon Redshift, Amazon DynamoDB and Amazon Relational Database Service (Amazon RDS). Depending on the exact need of a particular situation, we will learn to recommend an appropriate relational database or non-relational database and build an RDS DB instance accordingly. Since there are many types of databases available, it is important to know how to process the data to find the most suitable database solution. Through hands-on exercises and case studies, attendees gained insight into the various functions of each database service and learned to make informed decisions based on data storage and management needs.

In the eleventh module, attendees focused on developing a web load balancer and learned the concepts of load balancing. Attendees explored the importance of handling read-only data that needs to be delivered quickly to many consumers (such as video streaming). With AWS functions, attendees learned how to properly share data across multiple servers to handle various requirements, ensuring maximum speed and scalability and reducing costs. Through hands-on exercises, we gained hands-on experience designing and using load balancers to increase the availability and performance of web applications hosted on AWS.

Moving on to the twelfth topic, participants covered AWS CloudFormation and Elastic Beanstalk, essential technologies for building and maintaining web applications in the cloud. Attendees learned how to develop CloudFormation templates to automate the provisioning of infrastructure resources and how to use Elastic Beanstalk to easily deploy and scale web applications. Using these usable technologies, attendees have gained experience in delivering and scaling web applications in a variety of programming languages and server infrastructures. CloudFormation gives us a consistent way to configure and back up cloud resources, speed up the deployment process, and maintain consistency across AWS regions and accounts. Through hands-on exercises and demonstrations, participants strengthened the ability to manage cloud infrastructure and efficiently deliver web applications in an AWS environment.

The thirteenth lesson was a case study on the practical use of machine learning. Machine learning can be used to design software that can learn, reason, and even produce innovative solutions to complex problems. Using machine learning and deep learning algorithms,

companies can create new solutions such as self-driving vehicles and advanced economic models. By harnessing the power of machine learning, organizations can future proof their operations and gain a competitive advantage across multiple sectors. In addition, machine learning can improve data analysis, improve security measures and promote more accurate revenue forecasts, offering countless benefits to companies willing to embrace AI technology.

Moving on to Lesson Fourteen, AWS Support Agreements and Financial Management Tools were discussed. The Simple Amazon Web Services Monthly Calculator helps customers estimate their monthly AWS fees based on resource usage. In addition, information was obtained about benefits offered by AWS organizations and unified billing for cloud service organizations. Real-world case studies were used to analyze value propositions and offer AWS support subscriptions tailored to individual business requirements. AWS customers can maximize their resource usage by leveraging comprehensive AWS billing and support solutions that include cost forecasting tools, billing dashboards, and a selection of support subscriptions with varying features and costs. This program provided excellent information on how to minimize AWS consumption and maximize cost efficiency for cloud-based businesses.

Lesson sixteen explored AWS solutions for network management and data security. Learned various services and features provided by AWS to manage network infrastructure and keep data safe in the cloud. Researching AWS network management tools and privacy procedures provided the knowledge needed to design resilient network architectures and protect sensitive data from potential attacks. Through practical exercises and case studies, skills were improved in designing and implementing secure and reliable network infrastructures on the AWS platform, increasing the overall success and sustainability of cloud-based applications and services.

CHAPTER 5

CASE STUDY CARRIED OUT

The AWS Academy Cloud Foundations course provides a complete introduction to cloud computing and AWS services, emphasizing key concepts and practical skills. Participants covered the basics of cloud computing, including service architectures (IaaS, PaaS, SaaS) and deployment options (public, hybrid, private). Key AWS services such as Amazon EC2, S3, RDS and DynamoDB were explored in detail along with critical security features such as IAM and the compliance framework. Hands-on labs and exercises reinforced learning, enabling participants to create and manage cloud resources, minimize costs through AWS pricing models, and ensure a secure and efficient cloud architecture. The holistic approach of the course equips learners with the knowledge and skills needed to effectively use AWS for a variety of business purposes.

In today's digital world, having an Internet presence is crucial for all businesses, including restaurants. A well-designed website can improve customer experience, streamline operations and increase overall efficiency. Aware of this need, we continued to create a static website for the restaurant. The main goal was to develop a simple but effective website that, in addition to presenting the restaurant's menu, also personalizes the user experience by giving visitors the opportunity to see the cars on offer. There were several reasons for choosing to develop a static website. Static websites are often faster, more secure and easier to deploy than dynamic websites. They serve content directly from a content distribution network (CDN), reducing load times and providing a seamless user experience. Additionally, static websites are less prone to security issues because they don't rely on server-side processing.

Our goal was to use modern cloud technologies to host this static website, providing high availability, scalability and security. Amazon Web Services (AWS) was chosen as the cloud service provider due to its strong infrastructure, versatile service offering and proven track record of providing reliable and secure solutions. By adopting AWS, we want to develop a secure and efficient infrastructure that will meet the needs of the restaurant now and in the future.

The website is an interactive and visually interesting platform for the presentation of F1 Motors. It opens with a dramatic headline that is centered at the top and reinforces the car dealership's name in a large, eye-catching font. It sets the tone for a visually appealing layout that combines modern design features with powerful user interaction.

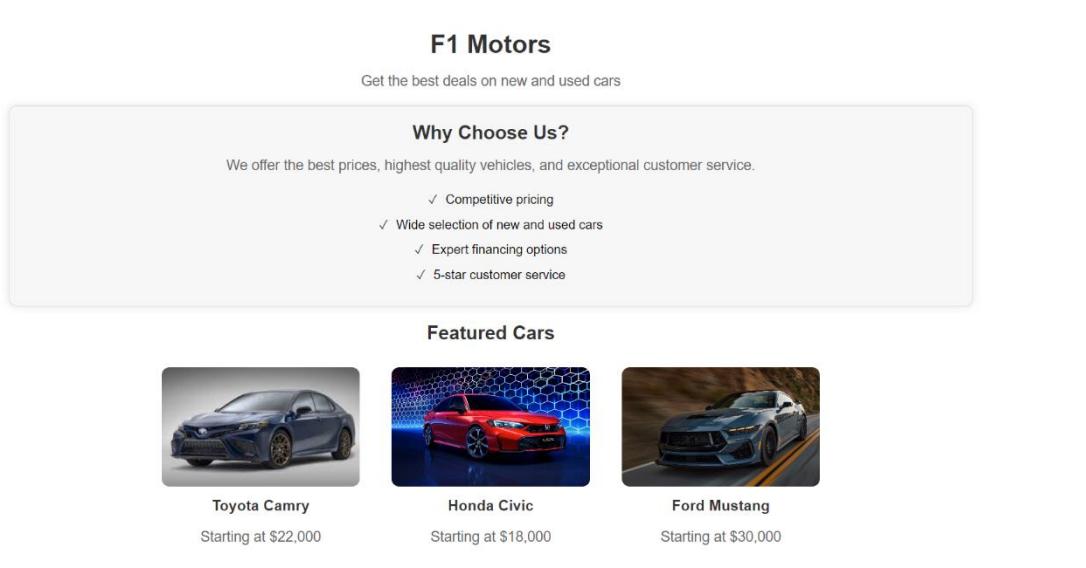


Fig 5.1. 1: Webpage

Technically, the website is designed with responsive principles in mind, using CSS (), which ensures a consistent style across multiple screens and devices. The combination of fonts, colors and layouts provides a cohesive visual identity that reflects the brand and feel of the retailer. The cornerstone of our project was the installation of the necessary infrastructure for Amazon Web Services (AWS). AWS is known for its stability, scalability and wide range of services, making it the best choice to host our static restaurant website. Our first step was to create an AWS account, which provides access to a number of tools and services tailored to help with web development and deployment.

Once the AWS account was set up, we started configuring the Amazon S3 (Simple Storage Service) bucket. Amazon S3 is a highly durable and scalable object storage service that allows customers to store and retrieve unlimited amounts of data from anywhere on the web. The biggest advantage of using S3 is its simplicity and durability, which makes it ideal for hosting static websites. We built a new S3 bucket for our project and set it up as data storage for our website.

Once the S3 bucket was in place, we uploaded our HTML file and all the important photos we needed for the home page. HTML files provided structure and information for the website, while photos added visual appeal and user experience. After making sure all the files were uploaded correctly, we configured the group to allow public access. This step was crucial because it allowed users to access the site from anywhere. By setting the right permissions, we ensured that the site's content was publicly viewable, but maintained the security of the underlying group.

To make it easier to access the site, AWS S3 automatically generated a URL for people to browse. This URL provides a direct link to our static homepage. However, we noticed that although this URL allowed people to access the site, it was not secure by default. To address this issue and ensure that our users' information and communications are protected, we have planned to install additional security measures that leverage AWS CloudFront.

Deploying AWS S3 offers several benefits beyond hosting. The scalability of S3 meant that as the restaurant's web traffic grew, the service could easily handle the increasing load without affecting performance. In addition, the redundancy and durability of S3 has ensured that our data is securely stored in multiple physical locations, providing excellent availability and durability.

Although Amazon S3 provided a stable and efficient way to store our static content, the connection created is not secure by default. In today's digital environment, website security is crucial to protecting user data and creating a reliable user experience. To handle this critical feature, we added AWS CloudFront to our system. CloudFront is a content delivery network (CDN) service designed to securely deliver data, video, applications and APIs to overseas clients with low latency and high transfer speeds.

An important step to increase security was the creation of the CloudFront distribution. This includes allowing CloudFront to load content from our Amazon S3 storage and deliver it to users through its network of edge sites. These edge locations are intentionally placed around the world to keep content closer to consumers, reducing latency and improving load times. This setup not only improved our site's performance, but also provided some protection by keeping user data within the secure confines of the AWS infrastructure.

To protect our website link, we used the capabilities of CloudFront to use the HTTPS protocol, a secure protocol that encrypts the data transferred between the user's browser and the server. By creating an SSL/TLS certificate and integrating it with our CloudFront distribution, we ensured that our website was served over HTTPS. This encryption protected information provided by users, such as their names and phone numbers, from interception by hostile actors.

The process begins by creating a certificate using AWS Certificate Manager (ACM). ACM reduces the complexity of managing SSL/TLS certificates by enabling us to provision, manage, and deploy public and private SSL/TLS certificates for use with AWS services. After issuing the certificate, we added it to our CloudFront distribution. This seamless interface between ACM and CloudFront made it easy to enable HTTPS for our static website.

In addition, CloudFront supports additional security features such as AWS Shield and AWS Web Application Firewall (WAF). AWS Shield provides protection against a DDoS (Distributed Denial of Service) attack and ensures that our website remains available even during malicious traffic. On the other hand, AWS WAF allows us to define rules that block typical network exploits and vulnerabilities, providing another layer of protection for our application.

Once CloudFront was up and running, the last step was to update the DNS settings. By creating a custom domain name and connecting it to our CloudFront distribution, we created a user-friendly URL for our website. This HTTPS protected custom domain added professionalism to our restaurant's online presence while ensuring the security and integrity of user data.

To view the homepage for car dealership, you can follow the link provided below:

<https://d19bybtzdr0dg5.cloudfront.net/>

REFERENCES

- [1] M. Soltys, “Cloudifying the Curriculum with AWS,” pp. 1-12, February 11, 2020.
- [2] E. I. U. Dang Thai Doan, “ACADEMIA-INDUSTRY PARTNERSHIPS TO,” vol. 25, no. 1, 2021.
- [3] A. G. a. R. Pareek, “CLOUD COMPUTING: AN OVERVIEW,” vol. 2, no. 7, pp. 1-3, July 2011.
- [4] G. Juve, E. Deelman, K. Vahi, G. Mehta, B. Berriman, B. P. Berman and P. Maechling, “Scientific workflow applications on Amazon EC2,” in *IEEE*, Oxford, UK, 09-11 December 2009.
- [5] M. Kiran, P. Murphy, I. Monga, J. Dugan and S. S. Baveja, “Lambda architecture for cost-effective batch and speed big data processing,” in *IEEE*, Santa Clara, CA, USA, 29 October 2015 - 01 November 2015.
- [6] V. Persico, A. Montieri and A. Pescapè, “On the Network Performance of Amazon S3 Cloud-Storage Service,” in *IEEE*, Pisa, Italy, 03-05 October 2016.
- [7] S. Kalid, A. Syed, A. Mohammad and M. N. Halgamuge, “Big-data NoSQL databases: A comparison and analysis of “Big-Table”, “DynamoDB”.,” in *IEEE*, Beijing, China, 10-12 March 2017.
- [8] D. k. R. S. A. Dr. Abdul Baril*, “VPC & Public Cloud Optimal Performance in Cloud Environment,” no. Vol. 30 No. 6 (2024), Jun 6, 2024.
- [9] P. Sinha, “Cloud Computing Using AWS: An Analysis,” no. 2020.

