**AWS CLOUD PRACTITIONER (FOUNDATION CERTIFICATION)**

**and**

**GOOGLE CLOUD DIGITAL LEADER (GLOBAL CERTIFICATION)**

A REPORT

submitted by

## ARYAN KUMAR (21BCE1766)

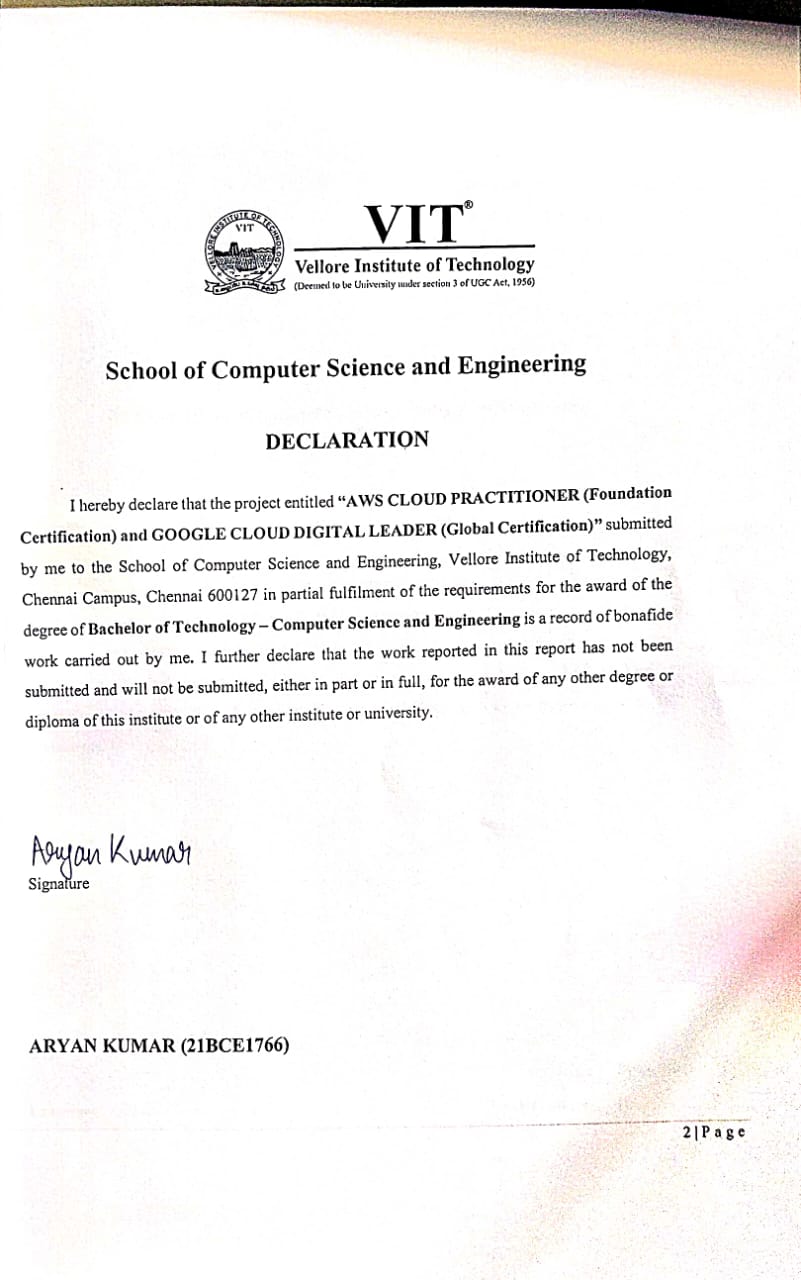
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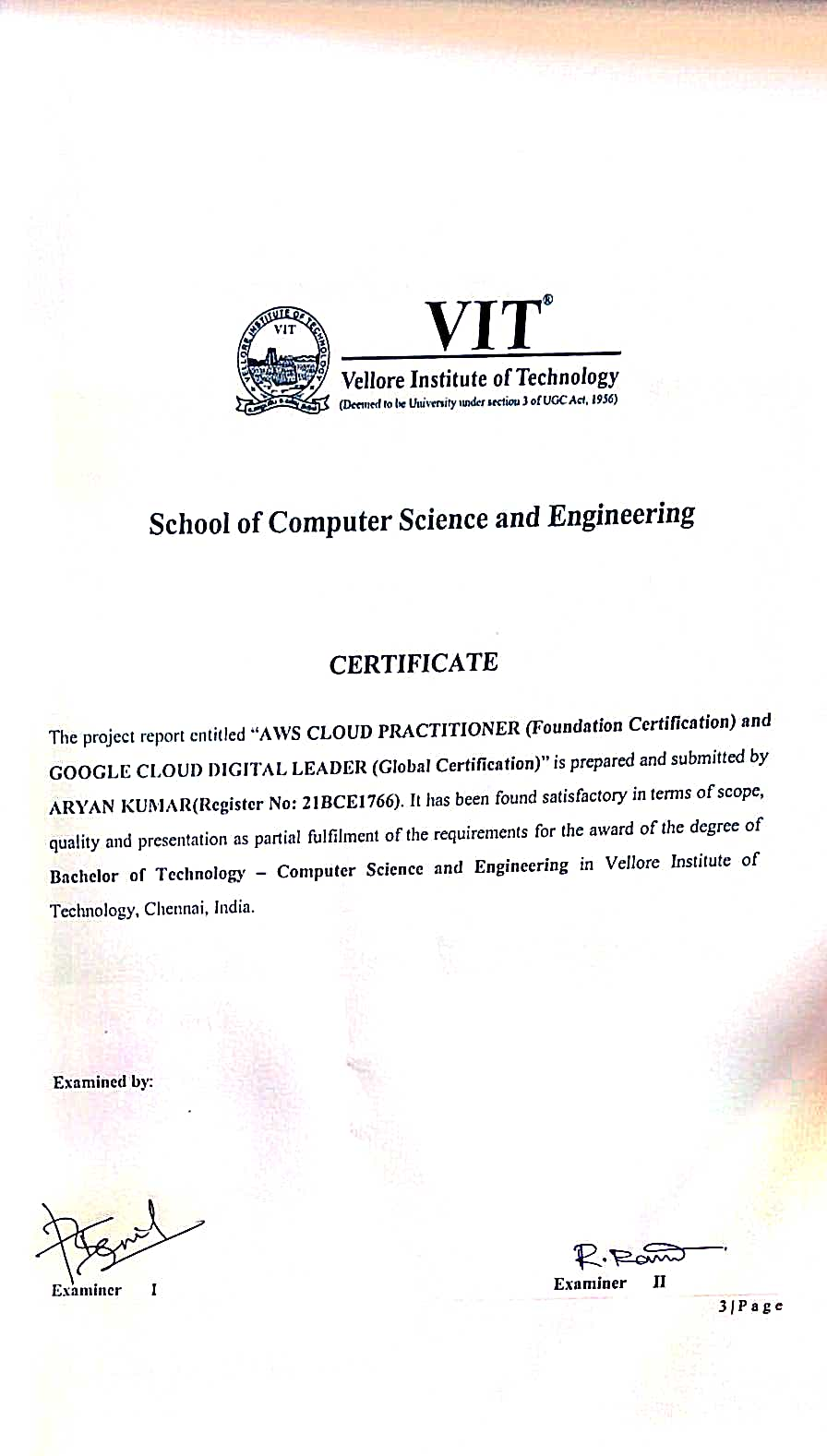
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**FOUNDATION CERTIFICATION**



**GLOBAL CERTIFICATION**



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# LIST OF ABBREVIATIONS

|  |  |
| --- | --- |
| **Abbreviation** | **Expansion** |
| AWS | Amazon Web Services |
| CDS | Cloud Data Services |
| IaaS | Infrastructure as a Service |
| PaaS | Platform as a Service |
| SaaS | Software as a Service |
| CSP | Cloud Service Provider |
| EC2 | Elastic Compute Cloud |
| RDS | Amazon Relational Database |
| S3 | Simple Storage Service |
| IAM | Identity and Assess Management |
| VPC | Virtual Public Cloud |
| ELB | Elastic Load Balancing |
| EKS | Amazon Elastic Kubernetes Service |
| ECS | Amazon Elastic Container Service |
| EFS | Amazon Elastic File System |

**LIST OF ABBREVIATIONS**

## Abbreviation Expansion

GCP Google Cloud Platform

VPC Virtual Private Cloud

GCE Google Compute Engine

GCS Google Cloud Storage

CDN content delivery network

IAM GKE

identity and access management service Google Kubernetes Engine

IaaS Infrastructure as a Service

PaaS Platform as a Service

SaaS Software as a Service

# ABSTRACT

Today, cloud computing is an emerging hub around which the modern technological landscape evolves. It has brought radical shifts to organizations to revolutionize the ways in which IT systems of any organization evolve, innovate, and become digital. Given the sudden demand for cloud expertise, education and certification of the cloud are seen as the only means to unlocking career opportunities and organizational growth. Nevertheless, still there are several barriers that remain in the way of achieving broad access and competence in cloud technologies, particularly in disadvantaged regions or countries.

The most crucial hurdle among all is the cost of certification programs. The fees attached to most cloud certifications, although valuable for individuals, are prohibitively expensive and thereby inaccessible to the majority population across the globe, especially the underprivileged groups. This financial constraint helps create access gaps when it comes to formal education and training that is necessary to acquire the field of cloud computing. For the poor, certification costs form an enormous barrier preventing them from tapping into cloud-related careers that increasingly are in demand. In addition, working professionals and individuals with family responsibilities find it difficult to balance competing time commitments to fulfill the requirements of typical education models, thereby restricting access to cloud certifications.

Additionally, the level and quality of certification programs vary. As cloud computing is growing, one will find hundreds of certifications under the same. Most of them don't hold any value in the industry circles or miss that element which gives depth to them and in return quality for learning and improvement in life. A sea of confusion spreads out among people who are going around distinguishing the good and reliable ones having quality and marketable skills from the bad one. This means career development is impeded, and general integrity to certification is lost, further complicating the process of determining who among the candidates has the right credentials for employers.

It will require focused effort-but advancing on two primary certifications, the AWS Certified Cloud Practitioner and the Google Cloud Digital Leader, makes the path towards cloud competency more accessible and equitable, in that they are globally accepted and offer experience-agnostic foundational training into cloud computing principles, matched to what is relevant for the industry.

The AWS Certified Cloud Practitioner certification is the gateway to cloud computing. A broad compendium of understanding on the services by AWS, the security frameworks, pricing structures, and architecture in clouds, could be obtained with this certification. Being practical in its application is what makes one acquire fundamental cloud concepts, regardless of his previous knowledge base. Such a program as AWS Certified Cloud Practitioner cuts technical entry barriers to empower people in building a solid foundation in cloud technologies, and, for anyone new, it's a great starting ground.

Like this certification, the Google Cloud Digital Leader certification overall sets a perspective on GCP and its digital transformation capabilities. Focusing on strategic leadership, the certification addresses areas such as cloud infrastructure, data analytics, machine learning, and AI. Its unique emphasis on leadership and strategic thinking gives them the capability of taking on those pivotal roles where digital initiatives would be steered in organizations. The Google Cloud Digital Leader certification is empowering professionals to navigate the complex landscape of cloud, while it promotes innovation and business growth on the Google Cloud platform, as the digital economy continues to evolve.

Most of the present challenges in technology education and certification are overcome by completing these certifications. These programs offer globally recognized credentials in cloud computing, equipping them with high-demand skills and speeding up their careers. These certifications are invaluable assets to those wanting to start or advance their careers in cloud computing. This, in turn, will not only be of an added advantage to the individual but also assist in addressing and aligning the talent gap that exists within the tech sector by creating a more diverse and capable workforce that will drive technology innovation.

The immense need for cloud skills requires advocacy in the inclusion, affordability, and excellence in cloud education and certification. It opens doors to a more innovative and equitable future because large segments of underserved communities access these certifications. The right diversity, that is proper and huge pool of cloud- certified professionals, by making the certifications more accessible will fuel industry growth while keeping the potential power of cloud technology and its powerful tools for global progress and digital transformation.

# INTRODUCTION

Cloud computing has been one of the newest aspects that has produced the core of digital transformation in today's fast technology pace. It gives organizations the innovation, growth, and means to stay ahead in this highly connected world. Industry leaders are in high demand, from AWS to Google Cloud. Consequently, the demand for experts who have been trained on these platforms has been at a peak all time. In this regard, credentials like the AWS Certified Cloud Practitioner and the Google Cloud Digital Leader now carry great weight among professionals who want to establish themselves in cloud computing or move further up the career ladder.

The AWS Certified Cloud Practitioner acts as a portal to AWS: it makes anyone proficient with cloud principles and services of AWS. The course is for candidates with little or no experience in any AWS product or service. It includes a comprehensive introduction to AWS cloud architecture, security practices, pricing models, and essential cloud terminology, building a solid base for further specialization and career growth within the AWS ecosystem.

Like Google Cloud Digital Leader, Google Cloud Digital Transformation is accompanied by a strategic approach towards how GCP can be leveraged for innovation and digital transformation. It's designed for business leaders, IT executives, and professionals who shape the organizational strategy. With the acquisition of knowledge and skill development, these individuals can go fully out to utilize Google Cloud's complete stack of technologies. It covers a myriad of topics, from cloud infrastructure to data analytics, machine learning, and application development, thus providing all-round knowledge related to the capabilities of GCP and strategic value it creates for an organization for success.

Certifications don't only prove to be technical experts but also a commitment to continuous learning, professional development, and staying updated with the changing technological front. With an AWS Certified Cloud Practitioner and Google Cloud Digital Leader certification, an individual becomes a trusted advisor and strategic partner, leading digital transformation and shaping the future of cloud computing. The subsequent sections delve deeper into the significance of these certifications in greater detail: curriculum, benefits, and transformative power for individuals and organizations.

# AWS CLOUD CONCEPTS

Amazon Web Services, more commonly referred to as Amazon AWS, is a secure cloud computing platform that provides the greatest flexibility to businesses and organizations to efficiently meet their computing needs. Through the AWS Cloud, users can avail scalable, reliable, and cost-effective solutions for data storage, management, processing, and application deployment.

AWS Global Infrastructure consists of several regions and Availability Zones, thus providing high availability, fault tolerance, and low latency. The underlying infrastructure will be entirely taken care of by AWS while its cloud is used, and users can focus on core business functions. Availability Zones make redundancy and disaster recovery possible, thus allowing users to deploy applications and data across a number of zones for optimal reliability and performance.

The very core of AWS architecture is the principle of Infrastructure as Code (IaC) wherein users define and manage infrastructure with templates, scripts, or configuration files. It thus ensures consistency, automation, and versioning; thereby, simplifying resource deployment, management, and scaling. Additionally, AWS employs the shared responsibility model in which the cloud infrastructure is taken care of by AWS, whereas the users will be accountable for securing their applications, data, and operating systems.

Several key benefits characterize cloud computing:

1. **Scalability**: Resources can be easily scaled up or down to maintain optimal performance and minimize cost.
2. **Cost Efficiency**: Customers only pay for the resources they use, and the upfront hardware costs are minimized.
3. **Reliability and Availability:** With multiple regions and Availability Zones, cloud services ensure that high uptime with minimal latency will provide uninterrupted access to applications and data.
4. **Agility and Flexibility Cloud solutions** provide organizations with the capacity to quickly deploy and iterate through applications, so that they can respond to shifts in market conditions or changes in the demands of their clients.
5. **Maintenance and Management:** AWS takes care of the infrastructure freeing the users to do their business-related work.
6. **Collaboration and Remote Work:** Cloud services enable teams to collaborate with one another and work from remote locations by shared access to a secured resource from any location on the Internet.

Additionally, AWS has numerous services in compute, storage, networking, security, analytics, and AI- all of which can be customized to suit various businesses across all industries.

Besides, AWS Cloud has been established with strict compliance and regulatory standards in the use, hosting, and processing of sensitive data for users. And then, AWS again comes on top with a commitment to sustainability through renewable energy and energy-efficient technologies powering its data centers to reduce the environmental footprint of cloud computing.

In summary, AWS Cloud is an extremely efficient and cutting-edge solution that provides businesses with a vast range of benefits in scalability, cost efficiency, reliability, agility, and collaboration capabilities. Using the comprehensive services and tools within AWS, users can build, deploy, and manage applications and infrastructure efficiently while focusing on security and compliance.

## CLOUD COMPUTING FUNDAMENTALS

Cloud computing has revolutionized the way organizations and individuals consume and deliver computing resources, enabling unparalleled scalability, flexibility, and cost-efficiency. Understanding the fundamental concepts of cloud computing is essential for navigating the complexities of modern IT infrastructure and leveraging cloud services effectively. Here are the key fundamentals of cloud computing:

### Definition of Cloud Computing:

Cloud computing refers to the delivery of computing resources—such as servers, storage, databases, networking, software, and analytics—over the internet, on a pay-as-you-go basis. Rather than owning and maintaining physical infrastructure, users can access resources from cloud service providers on- demand, scaling resources up or down as needed.

### Deployment Models:

Cloud computing offers various deployment models to suit different organizational needs:

Public Cloud: Services are hosted and managed by third-party cloud providers and accessible to the public over the internet.

Private Cloud: Infrastructure is dedicated to a single organization, either hosted on-premises or by a third-party provider, offering greater control and customization.

Hybrid Cloud: Combines public and private cloud environments, allowing data and applications to be shared between them, providing flexibility and scalability.

### Service Models:

Cloud computing services are typically categorized into three main service models:

Infrastructure as a Service (IaaS): Provides virtualized computing resources over the internet, including servers, storage, and networking infrastructure.

Platform as a Service (PaaS): Offers a platform for developing, deploying, and managing applications without the complexity of underlying infrastructure.

Software as a Service (SaaS): Delivers software applications over the internet on a subscription basis, eliminating the need for users to install, manage, or maintain the software locally.

### Key Characteristics:

Cloud computing exhibits several key characteristics that differentiate it from traditional IT infrastructure:

On-Demand Self-Service: Users can provision computing resources as needed without requiring human intervention from the service provider.

Scalability and Elasticity: Cloud resources can be scaled up or down dynamically to meet changing demand, ensuring optimal performance and cost-efficiency.

Resource Pooling: Resources are pooled together and shared among multiple users, allowing for greater efficiency and utilization.

Measured Service: Cloud usage is metered and billed based on actual consumption, providing transparency and cost control for users.

### Benefits of Cloud Computing:

Cloud computing offers numerous benefits to organizations and individuals, including:

Cost Efficiency: Pay only for the resources you use, eliminating the need for upfront capital investment. Scalability: Easily scale resources up or down to accommodate changing business needs.

Flexibility: Access computing resources from anywhere, using any device with an internet connection. Reliability and Availability: Cloud providers offer high availability and redundancy to ensure continuous uptime and data availability.

Innovation: Cloud services enable rapid prototyping, experimentation, and innovation, accelerating time-to-market for new products and services.

Understanding these cloud computing fundamentals is essential for leveraging cloud services effectively. By embracing cloud computing, organizations can unlock new opportunities for growth, agility, and innovation in today's digital economy.

## AWS Global Infrastructure

Amazon Web Services (AWS) boasts one of the most extensive and sophisticated global infrastructures in the cloud computing industry. This infrastructure is meticulously designed to provide customers with high availability, fault tolerance, and low-latency access to AWS services worldwide. Understanding the AWS global infrastructure is crucial for optimizing performance, ensuring reliability, and complying with data residency requirements. Here are the key components of AWS's global infrastructure:

### Regions:

AWS infrastructure is organized into regions, which are geographic locations worldwide where AWS operates data centers. Each region is designed to be isolated from other regions to ensure fault tolerance and minimize the impact of failures. As of 2024, AWS operates over 33 regions globally, with more regions continuously being added to meet the growing demand for cloud services.

### Availability Zones:

Within each region, AWS has multiple Availability Zones (AZs), which are distinct data centers engineered to be isolated from failures in other Availability Zones. Availability Zones are interconnected with high-speed, low-latency links, enabling customers to design highly available and fault-tolerant applications that can withstand failures at the infrastructure level.

### Edge Locations:

In addition to regions and Availability Zones, AWS operates a global network of Edge Locations, which are points of presence located in major cities around the world. Edge Locations are used by AWS's content delivery network (CDN), Amazon CloudFront, to cache content closer to end-users, reducing latency and improving the performance of web applications and content delivery.

### Global Accelerator:

AWS Global Accelerator is a networking service that improves the availability and performance of applications with global users by routing traffic through the AWS global network infrastructure. It uses the AWS global network to optimize the path between the user and the application endpoint, reducing latency and providing a consistent user experience.

### Local Zones and Wavelength Zones:

AWS has introduced Local Zones and Wavelength Zones to bring AWS services closer to end-users in specific metropolitan areas and to support applications that require ultra-low latency connectivity to mobile devices and 5G networks, respectively. These zones provide an extension of AWS infrastructure into locations that were previously underserved by traditional cloud regions.

Understanding the AWS global infrastructure enables customers to design resilient, scalable, and high- performance applications that can serve users worldwide. By leveraging AWS's global footprint, organizations can achieve global reach, ensure data sovereignty, and deliver superior user experiences in today's interconnected world.

## AWS CORE SERVICES

AWS offers a comprehensive suite of core services that form the foundation for building scalable, reliable, and secure cloud-based applications and solutions. These core services cover various aspects of computing, storage, networking, databases, security, and management, providing customers with the flexibility and agility needed to innovate and grow their businesses in the cloud. Here are some of the key AWS core services:

### Amazon EC2 (Elastic Compute Cloud):

Amazon EC2 provides resizable compute capacity in the cloud, allowing users to launch virtual servers (instances) on-demand. EC2 instances can be easily scaled up or down to meet fluctuating workload demands, providing flexibility and cost-efficiency.

### Amazon S3 (Simple Storage Service):

Amazon S3 is an object storage service designed for storing and retrieving any amount of data from anywhere on the web. It offers high durability, availability, and scalability, making it ideal for a wide range of use cases, including data backup, archival, and content distribution.

### Amazon RDS (Relational Database Service):

Amazon RDS is a fully managed relational database service that makes it easy to set up, operate, and scale relational databases in the cloud. It supports multiple database engines such as MySQL, PostgreSQL, SQL Server, and Oracle, offering high availability, security, and performance.

### Amazon VPC (Virtual Private Cloud):

Amazon VPC enables users to create isolated virtual networks within the AWS cloud, complete with their own IP address range, subnets, and routing tables. VPC allows for greater control over network configuration and security, facilitating the deployment of multi-tier applications in a secure and scalable manner.

### Amazon IAM (Identity and Access Management):

Amazon IAM provides centralized control over AWS account users, groups, and permissions. It allows users to manage access to AWS services and resources securely, ensuring that only authorized users have the necessary permissions to perform specific actions.

### Amazon CloudWatch:

Amazon CloudWatch is a monitoring and observability service that provides real-time insights into the performance and health of AWS resources and applications. It collects and tracks metrics, monitors log files, sets alarms, and automatically reacts to changes in AWS resources.

### Amazon CloudFront:

Amazon CloudFront is a content delivery network (CDN) service that accelerates the delivery of content to users worldwide. It caches content at edge locations close to end-users, reducing latency and improving the performance of web applications and media streaming.

### AWS Lambda:

AWS Lambda is a serverless computing service that allows users to run code without provisioning or managing servers. It supports event-driven programming models and automatically scales based on incoming requests, enabling developers to focus on writing code without worrying about infrastructure management.

These core AWS services form the building blocks for a wide range of cloud-based solutions, from simple web applications to complex enterprise architectures. By leveraging these services, organizations can innovate faster, reduce costs, and scale their operations more efficiently in the cloud.

## AWS SECURITY AND COMPLIANCE

**Recognizing the Importance of Cloud Security**:

In the contemporary digital landscape, businesses heavily rely on cloud services for various functions like data storage, processing, and application deployment. Hence, acknowledging the criticality of cloud security becomes paramount. Beyond safeguarding data and resources, cloud security ensures business continuity, fosters customer trust, and ensures compliance with regulatory standards.

AWS places a strong emphasis on security and compliance to ensure the confidentiality, integrity, and availability of customer data and resources in the cloud. With a robust set of security features, controls, and best practices, AWS enables customers to build and maintain secure and compliant environments. Here's an overview of AWS security and compliance offerings:

### Shared Responsibility Model:

AWS operates on a shared responsibility model, where AWS is responsible for the security of the cloud infrastructure (e.g., data centers, network infrastructure), while customers are responsible for securing their data, applications, and configurations within the cloud. This model ensures a collaborative approach to security and compliance.

### Identity and Access Management (IAM):

AWS IAM enables customers to manage access to AWS services and resources securely. IAM allows users to create and manage users, groups, roles, and permissions, providing granular control over who can access specific resources and perform certain actions within an AWS environment.

### Encryption:

AWS offers various encryption options to protect data at rest and in transit. Amazon S3 supports server- side encryption for stored data, while Amazon RDS and Amazon EBS offer encryption for databases and block storage volumes, respectively. AWS Key Management Service (KMS) allows customers to manage encryption keys securely.

### Network Security:

Amazon Virtual Private Cloud (VPC) enables customers to create isolated virtual networks within the AWS cloud, complete with security groups and network access control lists (ACLs) to control inbound and outbound traffic. AWS also offers distributed denial of service (DDoS) protection and web application firewall (WAF) services to safeguard against malicious attacks.

### Compliance Programs:

AWS adheres to various compliance standards and certifications to meet regulatory requirements and industry best practices. These include SOC 1, SOC 2, SOC 3, ISO 27001, PCI DSS, HIPAA, GDPR, and many others. AWS provides customers with compliance resources and documentation to help them achieve and maintain compliance in their AWS environments.

### Security Monitoring and Logging:

AWS CloudTrail provides a comprehensive audit trail of API calls and actions performed within an AWS account, enabling customers to monitor and track user activity for security and compliance purposes. Amazon CloudWatch allows customers to monitor and log system and application-level metrics, set alarms, and respond to security incidents in real-time.

### Incident Response and Forensics:

AWS offers a range of tools and services to help customers prepare for and respond to security incidents effectively. This includes AWS Security Hub for centralized security management, AWS Config for continuous monitoring and compliance checking, and AWS GuardDuty for threat detection and automated incident response.

By leveraging these security and compliance features and best practices, customers can build secure and compliant environments on AWS, mitigating risks and ensuring the protection of their data and resources in the cloud.

# AWS TECHNOLOGY

AWS is one of the most prominent cloud computing companies that offer a platform through which various services support the building, deployment, and management of an organization's or business applications and infrastructure. Some services range from compute to storage, databases, networking, security, analytics, artificial intelligence, and utility services.

### Important AWS Services and Their Applications

I now describe some of the most important AWS services and their primary applications:

* **Amazon Elastic Compute Cloud (EC2):** It provides scalable computing power of the cloud, through which the users can create virtual servers and run applications.
* **Amazon Simple Storage Service (S3):** It offers scalable object storage, which allows the users to store and retrieve any amount of data available anywhere on the web.
* **Amazon Relational Database Service (RDS**): Amazon RDS is a managed database service that supports various relational database engines including MySQL, PostgreSQL, as well as Oracle.
* **Amazon Virtual Private Cloud (VPC):** Allows the flexibility of creating isolated virtual networks in the AWS cloud, in which users may have a specific control over the network configuration.
* **Amazon CloudFront:** A content delivery network which securely delivers data, videos, and applications everywhere in the world with low latency.

### AWS Well-Architected Framework

The AWS Well-Architected Framework consists of five pillars that guide a user in building secure, high-performance, reliable, and cost-effective applications on AWS:

1. **Operational Excellence:** It continually improves the management of applications throughout their

lifecycle.

1. **Security:** It provides assurance that appropriate controls to protect the information and systems are implemented.
2. **Reliability:** It ensures developed systems to be available, stable, and able to recover from failures.
3. **Performance Efficiency:** It ensures optimal use of resources to meet system demand within the best possible cost.
4. **Cost Optimization:** It ensures optimal use of resources both for developing and running applications.

### Core AWS Deployment and Operational Best Practices:

AWS provides the following best practices for deploying and running infrastructure efficiently:

**Infrastructure as Code (IaC):** It allows management and provision of the infrastructure based on code so allows version control, collaboration and automation

**Auto Scaling:** auto-scales resource capacity based on the real-time demand for cost efficiency and optimal performance.

**Elastic Load Balancing (ELB):** distributes the incoming network traffic to several resources for greater availability and fault tolerance.

### AWS Cloud Economics:

AWS Cloud Economics describes how AWS's services are financially charged, for example, billing, pricing models, and cost optimization. Consumers pay solely based on consumption, and a separate pricing model applies to every service. The main themes of AWS Cloud Economics include the following:

**Reserved Instances (RIs):** It offers significant discounts if a customer is willing to commit to using EC2 instances for a specified period.

* **On-Demand Instances:** Users will only be charged for the usage of EC2 instances per hour or second.
* **Savings Plans:** Offers users cost saving through commitment-based as well as usage-based discounts on AWS services.
* **AWS Budgets:** This enables the users to establish custom budgets and also receive alerts when costs exceed the predefined thresholds.

### Key AWS Cloud Services in Compute, Storage, and Networking:

Compute, storage, and networking are the core services in AWS. AWS offers a wide array of services in computing, storage, and networking:

* **Computing:** AWS Lambda, basically a form of serverless computing; Amazon EC2, virtual servers; Amazon ECS and EKS, container orchestration; AWS Batch, for batch computing.
* **Storage:** Amazon S3, object storage; Amazon EBS, block storage for EC2; Amazon Glacier, long- term storage; Amazon FSx, file storage.
* **Networking:** Amazon VPC, virtual private cloud; Amazon Route 53, DNS; AWS Direct Connect, dedicated network connections; AWS Global Accelerator accelerates an application's performance and availability.

AWS has enabled its users to build comprehensive solutions for their organizations that are secure, scalable, and cost-efficient while solving almost every problem many businesses across multiple industries have.

# AWS BILING AND PRICING

AWS offers a flexible and transparent billing model that allows customers to pay only for the resources they use, without any long-term commitments or upfront costs. Understanding AWS billing and pricing is essential for optimizing costs, managing budgets, and maximizing the value of cloud investments. Overview of AWS billing and pricing:

### Pay-as-You-Go Pricing:

AWS operates on a pay-as-you-go pricing model, where customers are charged based on their actual usage of AWS services and resources. There are no minimum fees or long-term contracts, and customers can scale resources up or down as needed, paying only for what they use.

### Usage-Based Pricing:

AWS offers usage-based pricing for most of its services, where customers are billed based on the quantity and duration of resources consumed. This includes compute instances (e.g., Amazon EC2), storage (e.g., Amazon S3), data transfer, and other services.

### Instance Types and Pricing Options:

AWS provides a wide range of instance types with varying compute, memory, and storage configurations to meet different workload requirements. Customers can choose from on-demand instances, reserved instances, spot instances, and savings plans to optimize costs based on their usage patterns and preferences.

### Reserved Instances (RIs):

Reserved Instances enable customers to commit to a specific instance type and region for a one- or three- year term, in exchange for significant discounts compared to on-demand pricing. RIs are ideal for predictable workloads with steady-state usage, providing cost savings over the long term.

### Spot Instances:

Spot Instances allow customers to bid on unused AWS capacity, enabling them to access compute

resources at significantly discounted prices compared to on-demand instances. Spot Instances are well- suited for fault-tolerant and flexible workloads that can tolerate interruptions.

### Savings Plans:

Savings Plans offer customers flexible pricing options with savings of up to 72% compared to on- demand pricing. Customers commit to a specific amount of compute usage (measured in dollars per hour) over a one- or three-year term, with the flexibility to use any instance type in any region.

### Cost Management Tools:

AWS provides a range of cost management tools and services to help customers monitor, analyze, and optimize their AWS spending. This includes AWS Cost Explorer for visualizing usage and costs, AWS Budgets for setting and tracking budgets, and AWS Trusted Advisor for identifying cost optimization opportunities.

### Free Tier:

AWS offers a free tier for new customers, providing limited access to a range of AWS services for a specified period (usually 12 months) at no cost. The free tier allows customers to explore and experiment with AWS services without incurring charges.

By understanding AWS billing and pricing options and leveraging cost management tools effectively, customers can optimize costs, control spending, and maximize the value of their investments in the cloud.

* 1. **AWS SUPPORT PLANS**

AWS offers a range of support plans tailored to meet the diverse needs of customers, from startups and small businesses to enterprises and government organizations. These support plans provide access to technical expertise, resources, and tools to help customers achieve their goals and optimize their AWS environments. The following is an overview of AWS support plans:

### Basic Support:

Basic Support is the default support plan available to all AWS customers at no additional cost. It includes access to AWS documentation, whitepapers, forums, and customer service for account and billing inquiries. Basic Support is suitable for customers with self-service needs and minimal support requirements.

### Developer Support:

Developer Support is designed for individuals and small teams who are building and testing applications on AWS. It includes all features of Basic Support, plus technical support during business hours (12x5), with a response time of up to 12 hours for general guidance and best practices. Developer Support is ideal for developers and startups looking for basic technical assistance and guidance.

### Business Support:

Business Support is tailored for production workloads and business-critical applications running on AWS. It includes all features of Developer Support, plus 24x7 technical support with faster response times (within one hour for urgent issues). Business Support also offers access to AWS Trusted Advisor for cost optimization and performance improvement recommendations.

### Enterprise Support:

Enterprise Support is designed for large enterprises and organizations with complex AWS deployments and mission-critical workloads. It includes all features of Business Support, plus a dedicated Technical Account Manager (TAM) for personalized guidance and assistance, proactive monitoring and optimization, and access to AWS Infrastructure Event Management (IEM) for real-time support during

infrastructure events.

### AWS Trusted Advisor:

AWS Trusted Advisor is a proactive support tool available to all AWS customers, providing best practice recommendations for optimizing AWS environments in areas such as cost optimization, performance, security, and fault tolerance. Trusted Advisor helps customers identify potential cost savings, security vulnerabilities, and performance bottlenecks, enabling them to improve the efficiency and reliability of their AWS deployments.

### AWS Personal Health Dashboard:

The AWS Personal Health Dashboard provides personalized alerts and insights into the health of AWS resources and services that are critical to customers' applications and workloads. It helps customers stay informed about AWS service disruptions, scheduled maintenance, and other events that may impact their environments.

By choosing the appropriate AWS support plan and leveraging the available tools and resources, customers can access the technical expertise and guidance needed to optimize their AWS environments, improve performance, and achieve their business objectives with confidence.

# Digital Transformation with Google Cloud

Today, in the rapidly evolving digital landscape, discussions about cloud technology and digital transformation have finally gathered the momentum. Yet many seek answers to the critical questions of what is cloud technology, what does the term digital transformation fundamentally mean? How can it help an organization move forward through positive change, and where and how should it begin this journey? If you ever pondered these questions, you have come to the right place. This foundation course demystifies cloud technology and digital transformation by giving an all-around overview of the opportunities and related challenges of embarking on such a transformation path.

Key concepts and terminologies related to cloud technology are introduced at the beginning of the course. Participants will be able to make in-depth explorations into the many advantages provided by cloud technology: scalability, flexibility, cost efficiency, and innovation capabilities. All these above advantages are very important for modern organizations that will be quick to respond to the latest demands in the marketplace. The course is also designed to break down differences about various types of cloud infrastructures, including on-premises systems, public clouds, private clouds, hybrid clouds, and multicloud environments, with the aim of helping participants understand which cloud strategies best align with their organization's digital transformation goals, thus giving them the knowledge to drive strategic and informed decisions.

This course will then take participants further in looking into some basic principles of cloud computing and how such principles impact business practices. Such topics include solution versus product, CapEx versus OpEx, options concerning infrastructure, and terms concerning the network. It will thus arm participants with a good foundation in this domain that will then translate to making more informed decisions that might optimize business processes for the benefit of the organization.

Cloud computing service models are one of the most prominent attributes of the course. It discusses: IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and SaaS (Software as a Service). Each service model has distinctive features, strengths, and functionalities for participants to determine which one best suits the organization's specific needs and digital strategy. The cloud shared responsibility model will also be discussed in the course, explaining how responsibility for security and management

is split between the providers of the cloud service and their customers. Knowing this will ensure that whatever cloud-based solution is being offered has the appropriate security measures and falls within standards.

Participants will have by the end of the course a deeper, richer understanding of cloud technology and digital transformation and hence support and know how to guide good transformation programs. Equipped with innovation drivers, operational efficiency improvers, and translators long-term organizational success in this fast-changing digital world, one will be at a great advantage.

# Exploring Data Transformation with Google Cloud

Cloud technology has emerged as an important component of the strategies required by organizations if they are to be innovative and continue keeping themselves at par in this newly branded digital world. Beyond that though, the big upside of cloud technology is that it takes pretty well with data. That unlocks much greater value and enables organizations to create very transformative customer experiences. "Exploring Data Transformation with Google Cloud": A comprehensive course that discusses the potential of data transformation as a determinant of organizational growth and how Google Cloud can be instrumental in capitalizing on and making accessible resources associated with data.

This course is part of the Cloud Digital Leader learning path, carefully designed to equip learners to excel in their roles and make significant contributions toward the future success of their organization. Upon completing the course, learners will gain valuable insights into the transformative role data is taking in digital change but will also receive a badge to signify their acquisition of best practices on the use of Google Cloud for managing and transforming data.

The course begins with an explanation of the basic importance of data in the digital transformation journey for any organization. Participants are shown how data works as a strategic asset to make informed decisions, have personalized customer experiences, and be operationally efficient. Value in data will allow the participant to tap into its potential to drive more organizational growth and competitiveness.

The course then addresses Google Cloud's broad portfolio of products and services for data management. Participants learn how the current offerings of Google Cloud for data management help solve an enormously vast business use case, from real-time analytics to data warehousing, by means of BigQuery, Cloud Datastore, and Cloud Spanner. All this learning helps participants clearly understand which solution best serves an organization's particular use case and goals by learning about the data management ecosystem at Google Cloud.

Furthermore, the course explores strategies for ensuring data not only serves its intended purpose but also remains readily accessible within an organization. The study explores how intelligent analytics tools, business intelligence solutions, and streaming analytics enhance business value through a continuum of business cases-from marketing analytics all the way up to optimizing supply chains. It enables participants to democratize data access in their organizations, enabling decision makers at various levels to extract actionable insights from the data.

In summary, the program offers detailed recapitulations of the main insights gleaned from each module together with recommendations for further steps to be taken towards continuous learning. After completing the course "Exploring Data Transformation with Google Cloud", participants will acquire the appropriate knowledge and competencies to drive data-centric decision-making and to open up the total potential of Google Cloud for organizational prosperity.

# Innovating with Google Cloud Artificial Intelligence

The transformative power of artificial intelligence and machine learning in industries through "Innovating with Google Cloud Artificial Intelligence" is learned. It falls within a learning path of the Cloud Digital Leader, and this course lets participants use AI and ML toward encouraging innovation within their organizations.

Providing that participants successfully complete the course, they can receive a badge attesting their ability to use Google Cloud AI capabilities. With such a structure, the course is designed to holistically transfer the AI and ML basics, Google AI solutions, and other key considerations that prove successful in putting together AI projects.

This course begins with looking into the basics of AI and ML, clarifying their concepts and defining their differences, thus showing how important they are in today's technology. Given the vast domain of AI, which resembles human cognitive functionalities, participants are enlightened on what ML actually is-that it is a subset of AI-and its capabilities to learn or gain knowledge without explicit programming to predict analytics and enable wise decision-making.

The talk underlines the importance of data in training ML models, emphasizing that for the sake of good- quality unbiased data to predict things accurately is the requirement of modern times. Data quality is presented along several dimensions: completeness, uniqueness, timeliness, validity, accuracy, and consistency, all of which are important aspects in developing robust ML models.

The curriculum then discusses the AI solutions in Google Cloud, indicating four roads that lead towards the construction of ML models: BigQuery ML, pre-trained APIs, AutoML, and custom training. BigQuery ML democratizes ML by enabling data analysts to construct and deploy models directly in BigQuery using SQL, thereby simplifying the ML workflow and expediting model deployment.

Pre-trained APIs supply readily available ML models for common tasks, including image and text

analysis. Organization entities that possess less-than-specialized data scientists will find this more beneficial. AutoML helps the user develop custom ML models, and by doing so it does not require any coding for users because it leverages Google Cloud infrastructure to boost automation during the training and optimization of the model.

Vertex AI is Google Cloud's integrated ML platform that offers end-to-end ML capabilities for the development and deployment of custom models. Attendees will examine the capability of Vertex AI to manage and build ML projects-from data ingestion through to model deployment-on a level customized according to specific business requisites.

Participants also learn about ready-made, full-fledged AI solutions from Google Cloud: Contact Center AI, Document AI, Discovery AI for retail, Cloud Talent Solution, and more. These are the solutions dedicated to actual business needs, be it an improvement of customer service or optimizing e-commerce experiences or easing talent acquisition processes.

In summary, the course provides consideration that might be taken when deciding on an AI solution, to include such factors as those of speed, differentiation, expertise required, and the level of effort. With knowledge of how one might actually handle the landscape of AI and drive innovation in their organization using the power of Google Cloud's AI and ML capabilities, the participants are now better placed to do so.

# Modernize Infrastructure and Applications with Google Cloud

The organizations benefits from infrastructure and application modernization with Google Cloud. When a company adopts cloud computing technology, it can optimize its IT infrastructure, improve application development, and enhance innovation.

One of the primary benefits of modernizing infrastructure on a cloud-based facility is cost reduction. For instance, pay-for-use services from Google cloud without any investment in physical infrastructure are very encouraging. With this flexibility, it reduces the cost and allows organizations to allocate resources based on demand, thus optimizing resource and cost-effectiveness. Long-term commitment towards cloud services generates more savings in addition to these benefits.

In cloud computing, scalability is one of the most evident benefits. Companies can scale up quickly in response to surge demand; thus, they are assured of availability and high performance. Both Google and Amazon have business models with intrinsic reliability and uptime because they rely on multiple data centers that proactively monitor and minimize downtime.

Another critical benefit of modernizing infrastructure through Google Cloud is security. Cloud providers offer robust security, such as data encryption, access management, real-time threat detection, and more, to protect sensitive information aside from preventing any form of violation of industry regulation. Through security capabilities available in Google Cloud, organizations have the assurance of their capacity to focus on core business activities while infrastructure security is taken care of.

Additionally, infrastructure modernization through Google Cloud allows an organization to choose individually specific cloud services tailored to professional needs. Google Cloud provides a variety of comprehensive services and tools that can efficiently be integrated into the current infrastructure, promoting innovations and developing organizations to be more competitive within the quite dynamic digital environmental platform.

Infrastructure modernization aside, adopting microservices architecture is important in the

modernization of applications on Google Cloud. This, of course, means replacing the old monolithic applications with modern cloud applications built as a collection of much smaller, independently deployable services, which consequently increases the speed of feature delivery, improves scalability, and makes maintenance more efficient.

Google Cloud provides managed and partly managed services that make the deployment of applications and their management easier. With these services, the organization can focus much on the application development rather than the management of the infrastructure. In addition, with the pay-as-you-go model of the pricing in cloud computing, modern applications are cheap for organizations as they incur cost for only consumed resources.

In order to migrate the legacy application, organizations can choose the rehost migration path, referred to as 'lift and shift'. With this approach, cloud computing benefits like cost savings, scalability, reliability, and security can be harvested by existing applications. However, in this context, it should be acknowledged that rehosting will be rather intricate and entail some degree of risk, including vendor lock-in.

In a nutshell, APIs can be taken as an opportunity for organizations to streamline the process of software development and generate ease in integrating with cloud resources and services. It exposes many APIs on Google Cloud by which functionality and access to data is possible without thorough coding, thus opening new business avenues, enhancing user experience, and fostering collaboration.

Lastly, the "Modernize Infrastructure and Applications with Google Cloud" segment of the Google Cloud Digital Leader course emphasizes the numerous advantages that infrastructures and applications can derive from modernization with Google Cloud. In costing, scalability, improved security and flexibility, Google Cloud is making the necessary means and services to enable organizations to optimize infrastructure, drive innovation, and stay ahead in the current digital climate.

# Trust and Security with Google Cloud

Its trust principles form the basis of Google Cloud's protection towards its commitment to integrity and security of customers' business data. These principles are attached to data ownership, privacy protection, encryption standards, prevention of access by insiders, resistance to government backdoor access, and adherence to audited privacy practices. Through them, Google Cloud allows users to be at full control with their data and is therefore privatized and protected.

Data ownership is, second to the sensitivity of its operation, one of the trust principles of Google Cloud. The users entirely possess their data, and Google Cloud allows them to have various tools by which they have control of the management of their data in the Google Cloud platform. It creates a level of control that businesses require for them to handle their data according to their preferences, as their information is secured and protected.

Another key trust principle is the fact that Google Cloud will never sell customer data to third parties. This commitment ensures that users' data will not be used in marketing or advertising. Not selling customer data makes Google Cloud add additional security and confidentiality while ensuring users' data is kept safe and private.

Google Cloud does not use customer data in targeted ads. This means user data is not used for marketing efforts; thus, the data remains confidential and private. Given great importance to data security and privacy, Google Cloud can assure its users that their platform is trustworthy with sensitive information and that their data would never be used for any advertisement purpose.

The other major trust principle that Google Cloud has is default encryption. All customer data is encrypted by default for all users, and this helps provide protection against unauthorized access. Since encryption is mandatory, Google ensures that the data remains covered at all times; therefore the users need not have any doubts regarding the security of their information.

Moreover, Google Cloud utilizes strict measures to prohibit the entry of internal parties to see the data of customers. Employee access without authorization to customers' data is prevented by stringent security regulations, which ensure only authorized people can access customers' data. This greatly reduces the likelihood of data leakage or unauthorized access. It further adds to greater data security and integrity.

Furthermore, Google Cloud does not provide any government agency with backdoor access to user data without proper authorization. This commitment protects the privacy and security of users' data, ensuring them that their information cannot be accessed by any government entity without adhering to the appropriate legal procedures.

Google Cloud undertakes regular audits to ensure observance of international standards of privacy. Such audits guarantee transparency as well as accountability, giving users confidence regarding privacy practices in Google Cloud. Google Cloud subjects themselves to these audits to ensure they maintain the highest standards in protecting privacy and data.

Data sovereignty and residency Google Cloud addresses the data sovereignty and residency requirements with these trust principles, besides location. In so doing, Google Cloud allows selection of the region thus enabling the users to determine where their data will be physically located. Enhanced data residency and sovereignty are further installed through Google Cloud services such as VPC service controls and Google Cloud Armor. Both services enable the addition of flexibility and control, thus ensuring one meets their specific needs.

Google Cloud maintains a Compliance Resource Center to aid in the organization's compliance efforts. The center has comprehensive details on certification, compliance standards, and control mappings to global standards. Also, important compliance-related resources like ISO/IEC certificates, SOC reports, and self-assessment are available to the users through the Compliance Reports Manager. Such reporting and compliance help the organization achieve regulatory compliance effectively.

# Scaling with Google Cloud Operations

It is an important domain of cloud financial governance to keep an organization's expenditure under proper control and regulation. Companies may enhance predictability and simplify the consumption of cloud resources using optimal strategies and resources from Google Cloud. A very important part of cloud financial governance is creating responsibility culture, ensuring the project owner, and cost insights shared with associated departments. Google Cloud offers policies and permissions in financial governance, thereby allowing an organization to have control over their spending and the ability to determine who can gain access and control costs.

Two other practices that are of great importance involve distinguishing invoices from cost management tools in cloud financial governance. Invoices merely solicit payment for service used, while cost management tools provide illustrative insights and analytics about how to keep and optimize cloud spending. Google Cloud provides a full set of cost management tools with appropriate data, trends analysis, and intelligent recommendations to empower the organizations for a better management and optimization of costs. Also, Google Cloud has reporting features and tools like Google Cloud Pricing Calculator, by which the organization would be able to get visibility into its spending. Reviewing reports and estimates periodically will identify areas of inefficiency and optimize spending.

Balancing Access Control over Cloud Resources with Security and Governance Control The Google Cloud resource hierarchy- Comprising resources, projects, folders, and organization nodes- offers a strong means of control. With this hierarchy, it becomes possible to enforce fine-grained access control, permission inheritance, advanced security controls, and auditing. Using this resource hierarchy, an organization can handle access to all its cloud resources across a number of layers.

The adoption of the DevOps methodology-that primarily revolves around collaboration and communication between development and operations teams-is pivotal in improving speed, efficiency, and reliability in software delivery and operations. Under the DevOps framework, SRE promotes a

marriage of software engineering and operations to design, build, and operate scalable and dependable infrastructure in deploying software systems and services in the cloud.

Monitoring and observability are key factors for the reliability of your product and service. Google Cloud provides all the tools that go into operations suite with integrated observability that collects, analyzes, and visualizes data coming in from multiple sources. Cloud Monitoring gives an integrated view of infrastructure and applications, whereas the logs of application and infrastructure are stored in Cloud Logging. The measurement of resource usage is done through Cloud Profiler, and Cloud Trace helps diagnose performance bottlenecks. These tools would enable organizations to gain insights on the performance and health of their servers, databases, and applications, thereby facilitating efficient monitoring and troubleshooting.

Summary: Organizations can significantly benefit by improving their cloud operations through best practices in cloud financial governance, use of tools and capabilities at Google Cloud, the adoption of the DevOps methodology, and Site Reliability Engineering principles. Through a culture of responsibility, differentiation between invoices and cost management tools, and control over who has access to cloud resources, the organization can reach efficient and dependable software delivery and operations. Moreover, Google's commitment to sustainability as well as its collaborations with a company like Kaluza only call for technology towards a greener future.

# CONCLUSION

The course taught in AWS Certified Cloud Practitioner is a comprehensive study on the principles, services, and best practices of cloud computing from Amazon Web Services. This course will enhance the knowledge and practical skills of participants about cloud computing. It sheds light on how significant AWS services are in today's digital world.

The course discusses various topics - cloud infrastructure and security to the optimization of the cost, allowing one to understand the need to ensure and manage secure and scalable cloud environments. The course elaborates on the various service offerings from AWS on their applicability in addressing diverse business needs.

A prime focus is that of the AWS shared responsibility model - clarifying roles and obligations of both AWS and customers regarding security and compliance in cloud infrastructures. Also, the participants get to work on ways for cost optimization so that they can manage and optimize their costs incurred for the services offered by AWS.

Completing this AWS Certified Cloud Practitioner course gives them a broad and comprehensive foundation in AWS cloud computing. Using this, they learn to maneuver through the AWS ecosystem masterfully, understand core services, and make proper decisions when it comes to architectural and implementation decisions for cloud. The real-world understanding of the application of the services in AWS makes this certified testimony very valuable.

Rather, Google Cloud Digital Leader trains an individual to provide complete examples of what one can offer from Google Cloud, which could help the organization. The course covers various topics such as basic concepts in the cloud, different models of cloud computing, the shared responsibility model present in the cloud, and lastly the importance of data and how Google Cloud came up with solutions to increase the accessibility and utility of data.

Participants learn about the fundaments of AI and ML and how to create and exploit Google Cloud's AI and ML solutions. The course also contains cloud modernization, serverless computing, containers, and APIs with value. It places great importance on trust, security, and compliance in the cloud. In fact, it emphasizes the topic of trust while referring to Google's trusted infrastructure and guiding principles.

Additionally, participants learn the financial governance, cost management, operational excellence, reliability, and sustainability skills using Google Cloud. Overall, the course prepares the individual with the understanding and the use of Google Cloud in making contributory efforts towards digital transformation.

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## GOOGLE CLOUD DIGITAL LEADER

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# APPENDIX I

Amazon SNS (Simple Notification Service): A fully managed pub-sub messaging service for distributing messages to subscribers or other services.

Amazon SQS (Simple Queue Service): A fully managed message queuing service that enables communication between distributed applications and components.

Amazon Lambda: A serverless compute service that lets users run code without provisioning or managing servers. It executes code in response to events and automatically manages the computing resources required by the code.

Amazon DynamoDB: A fully managed, NoSQL database service that provides fast and predictable performance with seamless scalability.

Amazon ECS (Elastic Container Service): A fully managed container orchestration service that helps users to deploy, manage, and scale containerized applications.

Amazon EMR (Elastic MapReduce): A web service that provides a managed Hadoop framework to process vast amounts of data.

Amazon SageMaker: A fully managed service that provides developers and data scientists with the ability to build, train, and deploy machine learning models at scale.

Amazon VPC (Virtual Private Cloud): A logically isolated section of the AWS cloud where users can launch AWS resources in a virtual network.

Amazon CloudFront: A fast content delivery network (CDN) service that securely delivers data, videos, and applications to customers globally with low latency.

AWS Identity and Access Management (IAM): A service that enables users to manage accessto AWS services and resources securely.

AWS Lightsail: A virtual private server service that provides developers and small businessesan easy way to launch and manage websites, web applications, and other workloads.

AWS CloudTrail: A service that records AWS API calls for accountability, security, and compliance purposes.

Amazon EC2 (Elastic Compute Cloud): A web service that provides resizable compute capacity in the cloud. It allows users to rent virtual servers to host their applications. AmazonEC2 offers security, reliability, high performance, and cost-effective infrastructure to meet demanding business needs. It also supports the processing, storage, and transmission of creditcard data by a merchant or service provider and has been validated as being compliant with Payment Card Industry (PCI) Data Security Standard (DSS).

Amazon S3 (Simple Storage Service): A scalable, object-based storage service that allows storing and retrieving data from anywhere on the internet. It provides a complete solution for computing, query processing, and storage across a wide range of applications. Amazon S3 is designed to work fine with other Amazon services like Amazon EC2, Amazon RDS, AmazonDynamoDB, and Amazon SQS

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Amazon RDS (Relational Database Service): A managed service that provides support for setting up, operating, and scaling relational databases in the cloud. It is highly integrated with other AWS services such as Elastic Load Balancing, Amazon S3, and Amazon RDS, making it easy to build and deploy various solutions in the cloud

Compute Engine: A service that offers virtual machines for running large-scale workloads.

Cloud Storage: A scalable and secure object storage service for storing and accessing data from anywhere on the internet.

Cloud SQL: A fully managed relational database service for MySQL, PostgreSQL, and SQL Server.

Pub/Sub: A real-time messaging service that allows users to send and receive messages between independent applications.

Cloud Pub/Sub Lite: A simple, reliable, and scalable messaging service for real-time event ingestion and distribution.

Cloud Functions: A serverless execution environment for building and connecting cloud services.

BigQuery: A serverless, highly scalable, and cost-effective multi-cloud data warehouse designed for business agility.

Cloud Datastore: A highly scalable NoSQL database for web and mobile applications.

Kubernetes Engine: A managed, production-ready environment for deploying containerized applications.

Cloud Dataflow: A fully managed service for stream and batch processing of data.

AI Platform: A unified platform for building, deploying, and managing machine learning models.

Cloud VPC (Virtual Private Cloud): A global virtual network for hosting resources and connecting services.