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Assignment - I

Q1] Use S3 bucket and Host Video Streaming.

Ans ① Create an S3 bucket →
Sigin to the Aws academy management console & open Amazon S3 console. In left navigation pane, choose buckets → Create Bucket. Enter the bucket name. For Block Public Access settings for this bucket, keep default settings (Block all public access is denied). Choose "Create Bucket."

② Upload a video to S3 bucket →
On the "Objects" tab for your bucket, choose "Upload". On Upload page, under "Files & Folders" choose "Add file". Choose a file to upload & then choose "open". Choose "Upload".

③ Create a CloudFront origin access identity →
In navigation pane to left, under "Security" section, "Choose Origin access". Under "Identities" tab, choose "Create origin access identity". Choose "Create".

④ Create a CloudFront Distribution →
In left navigation pane choose "Distributions". Choose "Create Distributions". In "Origin" section, for "Origin domain" choose domain name for your S3 bucket. For "Origin access", choose "Legacy access identities". Under "Origin access identity", choose origin access identity that you created in 3ʳᵈ step. Under "Bucket Policy", choose "Yes, update bucket policy." In "Default cache behavior" section, under "Viewer protocol policy" choose "Redirect HTTP to HTTPs". At the bottom, choose "Create distribution".

⑤ Access the video through CloudFront →
In "Distributions", under origin domain name & paste it in new browser. Enter a forward slash (/) & write the path to video. Your video is hosted successfully.

Q2] BMW case-study using Aws

Executive Summary :

The BMW group, a global manufacturer of a premium automobiles & motorcycles, migrated its on-premises data lake to Aws to improve scalability, agility & innovation. By leveraging Aws managed services, BMW group created a Cloud Data Hub (CDH) that processes & combines anonymized data from vehicle sensors and other sources, enabling real-time access & analytics.

Background :

BMW group faced challenges with its on-premise data lake, including :-
a) siloed environment
b) Limited scalability
c) Long lead times for new initiatives
d) Inaccessible data for internal stakeholders

Objectives :

a) Develop a scalable & agile data solution
b) Provide a real-time access to vehicle telemetry data
c) Integrate analytics & ML
d) Ensure governance & compilance with privacy & security regulations

Solutions :

BMW group migrated its data lake to Aws, utilizing →

a) Amazon Athena (Serverless Query Service): Enables fast, scalable & secure querying of data in Amazon S3, without requiring complex setup or management

b) Amazon S3 (Object Storage): Provides durable, scalable & secure storage for large amounts of data, ideal for data lakes and analysis

c) Amazon kinesis Data Firehouse (Real-time Data Processing): Captures, transforms & loads data in real-time from various sources into AWS services

d) Aws Glue (Data Integrating & Cataloging): Simplifies data integration, making it easier to discover, prepare & combine data for analysis

e) Aws Lambda (Serverless Computing): Runs code without provisioning or managing servers, scaling automatically to handle overloads, etc.

Architecture →
a) Data Providers — Ingest & transform data
b) Data Consumers — Leverage data for use cases
c) Central API — Controls data sharing
d) Amazon S3 — Stores data layers individually
e) Amazon Glue — Registers schemas.

Benefits →
a) Improved scalability & agility
b) Real-time access to vehicle telemetry data
c) Real-time enhanced analytics & ML
d) Better governance & compilance
e) Millions of connected vehicles.

This case study demonstrates how BMW successfully migrated is datalake to AWS, achieving agility & innovation

Q2] b) Disney⁺ Hotstar case study: Using AWS

Executive Summary →

Hotstar, India's leading video streaming platform, leveraged AWS to build a scalable & reliable infrastructure, Supporting 100 million⁺ daily active users & 10 million + concurrent viewers during peak events

Background →

Hotstar faced challenges with:
a) Scaling infrastructure to meet growing demands
b) Ensuring seamless Streaming experience
c) Managing high traffic during peak events
d) Maintaining content security & compilance

Objectives →

a) Scale infrastructure to support growing user base
b) Ensure high-quality streaming experience
c) Improve latency delay
d) Enhance security & compliance

Solution →

Hotstar leveraged AWS services :-
a) Amazon CloudFront (Content Delivery Network): Accelarated content delivery & reduce latency
b) Amazon S3 (Object Storage): Storage & serving vast libraries of video content
c) Amazon EC2 : Provided scalable computing resources for encoding, transcoding & streaming
d) Amazon Elastic Load Balancer (ELB): Distributed traffic & ensured high availability

e) Aws Elemental MediaPackage → Secured & monetized live & VOD content

Architecture →
a) Content Ingestion - via S3
b) Content Processing - via EC2
c) Content Delivery - Amazon CloudFront distributed content globally
d) Load Balancing - via ELB

Benefits →
a) Scalability : Supported 100 million + active users
b) Performance : Ensured seamless streaming experiences
c) Protected content with Aws ElemantalPackage
d) Cost-Effectiveness : Reduced infrastructure costs by 30%.

Results →
a) 100 million + daily active users
b) 10 million + concurrent viewers during peak events
c) 50% reduction in streaming latency
d) 30% cost savings on infrastructure

Recommendations
a) Leverage cloud-based CDNs for content delivery
b) Utilize scalable computing resources for content processing
c) Implend load balancing & secure content with cloud.

Conclusion : Hotstar's collaboration with Aws enable scalable, secure& high performance streaming solution

Q3] Adidas' Kubernetes Transformation

Adidas, a leading sports apparel brand, faced challenges in its development workflow. Engineers spent more time requesting resources than coding, hindering productivity. To address this, Adidas adopted kubernetes, a cloud-native platform, to improve speed, operability & observability.

Challenges Faced →
a) Slow development process : Requesting resources took hours /days
b) Inefficient provisioning : Multiple approvals delayed machine provisioning
c) Infrequent releases : New features were released every 4-6 weeks
d) Limited scalability : Legacy systems struggled with increasing traffic
e) Poor observability : Difficulty monitoring application performance
f) Inadequate collaboration : Siloed teams hindered innovation.

Solution →
Adidas partnered with Giant Swarm to implement kubernetes :-
a) Containerization : Packaged application for efficient deployment
b) Agile development : Enable rapid iteration & testing.
c) CI/CD

d) cloud-native platform → Integrated Aws, k8s, Prometheus

e) Customized training → Onboarded 300+ engineers

f) Gamification → Devops Cup Competition encouraged adoption

Benefits and Results →

a) Improved speed: Releases increased to 3-4 times a day

b) Enhanced operability: E-commerce site load time reduced by half

c) Increased observability: Real-time monitoring with Prometheus

d) Scalability: 4000 pods, 200 nodes, 80000 builds per month

e) 50% reduction in load time & 25% reduction in infrastructure costs

f) 300% increase in release frequency & 40% of critical systems running on cloud-native platform.

Q3] Advantages of k8s →

a) Scalability → Kubernetes supports a seamless scaling of applications & handle varying levels of traffic & workload without manual intervention

b) Flexibility → It supports wide-range of deployment scenarios including hybrid cloud, multi cloud, etc providing flexibility & portability

c) High availability → K8s automatically distributes workloads across multiple nodes/slaves/worker machines.

d) Resource efficiency → K8's dynamically allocates & manages compute, storage & networking resources based on application demands

e) Ecosystem → k8's has a vibrant ecosystem of tools, plugins & integrations that extend its functionality & support various use cases.

Disadvantages →

a) Complexity → k8's has a steep learning curve & requires expertise in containerization; making challenging for inexperienced users

b) Resource Overhead → It introduces additional resources; due to its control plane components, wh-ich may impact application performance & cost

c) Operational complexity →

d) Security Concerns → k8s introduces new security considerations such as securing container images, network policies & access controls, which require careful configuration & management to mitigate risks

e) Vendor Lock-in → While K8s itself is open-source & vendor neutral, reliance on cloud may lead to vendor lock-in, limiting portability & flexibility.

Q3] Why kubernetes and advantages and disadvantages of kubernates. Explain how adidas uses kubernetes.

Ans ① Kubernetes, often abbreviated as K8s, has emerged as the de facto standard for container orchestration in the modern cloud-native application development

② It offers a powerful platform for automating the deployment, scaling & management of containerized applications across hybrid, multi-cloud & high on-premises environments.

③ Kubernetes is often used for its following features :-

a) Container Orchestration → Kubernetes automates the deployment, scaling & management of containerized applications, ensuring optimal resource utilization & high availability

b) Service Discovery & Load Balancing :- It enables seamless communication between microservices by providing built-in services discovery & load balancing capabilities

c) Self-Healing → It monitors the health of containers & automatically restarts/replaces failed instances, ensuring continuous availability & reliability

d) Horizontal Scaling → k8s allows application to scale horizontally based on resource demand, enabling efficient utilisation of computing resources & improved performance

e) Rollouts and Rollbacks → This enables safely controlled updates to application version without downtime

Q4] What are Nagios and explain how Nagios are used in E-services?

Ans ① Nagios is a powerful monitoring system that enables organizations to identify and resolve IT infrastructure problems before they affect critical buisness processes

② It's an open source IT system monitoring tool which runs periodic checks on critical parameters, on the dashboard.

③ Nagios runs both agent based and agentless configurations (using SNMP, SSH, WMI, etc).

④ Nagios monitors servers, networks, applications & services for potential issues and monitors server health (CPU usage, disk space, memory)

⑤ It sends notifications to admins via email & network monitoring of devices and firewall for connectivity

⑥ It also provides detailed reports on uptime & downtime performance metrics and tracks it response time & errors

⑦ Apart from server & network monitoring, Nagios also offer database monitoring on its performance, query execution times

⑧ Nagios provides proactive issue detection, reduced downtime, improved performance & enhanced security & compilence ; ultimately ensuring high availability, reliability of applications

⑨ These E-services can be practised as

a) Configuring threshold by setting alert thresholds to minimize false positives

b) It can ensure timely issue resolution by implementing escalation feature procedure.

It can define clear roles and communication channels for issue escalation.

c) It regularly review reports for analyzing performance & optimize infrastructure. Nagios schedules regular review sessions to identify trends & area for improvement.

d) It can verify monitoring configuration & alerting and help in testing the monitoring setup by performing routine testing to ensure accuracy & prevent alert fatigue

e) It continuously updates plugins & integrations to ensure compatibility & leverage new features by regularly checking for updates to Nagios APIs, plugins & integrations.