

CLOUD COMPUTING MODULE



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SUKKUR IBA UNIVERSITY

Theory Outline

Cloud Computing

Program: Boot camp	Semester:
Credit Hours:	Instructors: Dr. Gulsher Ali & Engr. Hasnain Hyder
Pre-requisite Courses:	Post-requisite Courses:
Co-requisite Courses: None	e-mail: <u>gulsher@iba-suk.edu.pk &</u> <u>engr.hasnainhyder@gmail.com</u>
Office Hours: 9:00 AM to 5:00 PM	Consulting Hours: Wednesdays 09:00 AM to 11:00 AM Thursdays 09:00 AM to 11:00 AM

EVALUATION

1.	Quiz	10%
2.	Project	20%
3.	Assingment	20%
4.	Mid Term	20%
5.	Final Examination	30%

<u>RECOMMENDED BOOKS</u>:

S. No	Book Name	Author/s Name	Publisher Name & Edition
1.	Cloud Computing	Sandeep Bhowmik	<u>Cambridge</u>
2.	Amazon Web Services in action	<u>Andreas Wittig</u> <u>Michael Wittig</u>	

REFERENCE BOOKS:

1.	Cloud Computing: From Beginning to End	<u>Ray J. Rafaels</u>	
2.	Cloud Computing: Concepts, Technology & Architecture	<u>Thomas Erl.</u>	

Brief Description of the Course:

The Cloud Computing Bootcamp at Sukkur IBA University is designed as an in-depth, engaging educational experience, specifically centered on Amazon Web Services (AWS), the world's most comprehensive and broadly adopted cloud platform. This course is created for those looking to extensively understand cloud technology and build a career in cloud infrastructure, system security, or network architecture.

Starting with the core principles of cloud computing, this program meticulously explains the various service models of cloud computing, including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). Participants will learn about the evolution of cloud computing, its fundamental characteristics, and the significant benefits it offers to businesses, illustrated through real-world case studies and examples from various industries.

As the course progresses, students will understand more about Amazon Web Services, studying its diverse and dynamic range of services such as Amazon EC2 for virtual servers, AWS Lambda for serverless computing, Amazon S3 for scalable storage, Amazon RDS for database management, and Amazon VPC for secure and isolated cloud networking. Each module is designed to build on the previous one, ensuring a consistent and comprehensive understanding of how each AWS service integrates and operates within the cloud ecosystem.

Further into the course, more complex topics are introduced, such as data analytics and big data processing on AWS. Using Amazon Athena, participants will learn how to perform serverless queries on large datasets, and with Amazon Redshift, they will explore data warehousing applications. The course also covers modern containerization technologies, where students learn to use Docker along with Amazon ECS for deploying and managing scalable applications in production environments.

Advanced topics also include detailed strategies for managing and optimizing AWS costs—a critical skill for any cloud professional. Participants will learn to navigate the complex pricing models of AWS services, utilize costmanagement tools like AWS Budgets and Cost Explorer, and implement best practices for reducing expenses while maximizing cloud resource efficiency.

The course is rigorously evaluated through continuous assessments that include quizzes, hands-on assignments, and a comprehensive project that challenges students to design and deploy a full-scale cloud solution using AWS. This project-based approach not only reinforces the learning objectives but also enhances the participants' problemsolving skills and readiness for industry-specific challenges.

Upon completion of the Cloud Computing Bootcamp, participants will possess a thorough understanding of AWS cloud technologies and be well-prepared to take AWS certification exams, paving the way for successful careers in the rapidly evolving domain of cloud computing.

Detailed Course Outline:

Week No.	Topic Name	Assign/Quizzes
Week No. 1	 Introduction to Cloud Computing Definition and Evolution of Cloud Computing Characteristics and Benefits of Cloud Computing Cloud Service Models: IaaS, PaaS, SaaS Major Cloud Service Providers Overview: Amazon Web Services (AWS), Google Cloud, Microsoft Azure etc. Advantages of Cloud Computing for Businesses Case Studies and Real-world Examples Successful Implementations of Cloud Computing in Various Industries Lescope Learned and Best Practices 	
Week No. 2	 Introduction to Amazon AWS History and Growth of AWS AWS Global Infrastructure: Regions, Availability Zones AWS Core Services Overview 	
	 Database Services: Amazon RDS (Relational Database Service): Managed relational databases Amazon DynamoDB: Fully managed NoSQL database service Networking Services: 	

Amazon Elastic Compute Cloud (EC2) • Understanding EC2 Instances: Types, Amazon Machine Image (AMI), and Instance Lifecycle • EC2 Instance Storage Options: EBS and Instance Store • Security Groups and Key Pairs in EC2 Amazon Lambda and Serverless Computing • Introduction to AWS Lambda: Serverless Compute Service • Creating and Deploying Lambda Functions • Event Sources and Triggers for Lambda Functions • Hands-on Lab: Dynamic Image Resizing: Using Node.js, AWS Lambda, and S3 Amazon Simple Storage Service (S3) • Introduction to Amazon S3 • Working with Buckets and Objects • Versioning, Lifecycle Policies, and Encryption in S3 • Overview of Amazon RDS: Managed Relational Database Service • Advantages of using Amazon RDS over traditional self-hosted databases • Use cases for Amazon RDS: Transactional databases, data warehousing, and more • Supported Database Engines • Overview of supported database engines in Amazon RDS: MySQL, PostgreSQL, Oracle, SQL Server, MariaDB, and Amazon Aurora • Week No. 5
 Understanding EC2 Instances: Types, Amazon Machine Image (AMI), and Instance Lifecycle EC2 Instance Storage Options: EBS and Instance Store Security Groups and Key Pairs in EC2 Amazon Lambda and Serverless Computing Introduction to AWS Lambda: Serverless Compute Service Creating and Deploying Lambda Functions Event Sources and Triggers for Lambda Functions Hands-on Lab: Dynamic Image Resizing: Using Node.js, AWS Lambda, and S3 Amazon Simple Storage Service (S3) Introduction to Amazon S3 Working with Buckets and Objects Versioning, Lifecycle Policies, and Encryption in S3 Amazon Relational Database Service (RDS) Overview of Amazon RDS: Managed Relational Database Service Advantages of using Amazon RDS over traditional self-hosted databases Use cases for Amazon RDS: Transactional databases, data warehousing, and more Supported Database Engines Overview of supported database engines in Amazon RDS: MySQL, PostgreSQL, Oracle, SQL Server, MariaDB, and Amazon Aurora Kev features and differences between Quiz Kev features and differences between
Week No. 3- 4 Machine Image (AMI), and Instance Lifecycle • EC2 Instance Storage Options: EBS and Instance Store • Security Groups and Key Pairs in EC2 Amazon Lambda and Serverless Computing • Introduction to AWS Lambda: Serverless Compute Service • Creating and Deploying Lambda Functions • Event Sources and Triggers for Lambda Functions • Hands-on Lab: Dynamic Image Resizing: Using Node.js, AWS Lambda, and S3 Amazon Simple Storage Service (S3) • Introduction to Amazon S3 • Working with Buckets and Objects • Versioning, Lifecycle Policies, and Encryption in S3 • Overview of Amazon RDS: Managed Relational Database Service • Advantages of using Amazon RDS over traditional self-hosted databases • Use cases for Amazon RDS: Transactional databases, data warehousing, and more • Supported Database Engines • Overview of supported database engines in Amazon RDS: MySQL, PostgreSQL, Oracle, SQL Server, MariaDB, and Amazon Aurora Week No. 5
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Week No. 5 PostgreSQL, Oracle, SQL Server, MariaDB, and Amazon Aurora • Key features and differences between Quiz
Week No. 5 MariaDB, and Amazon Aurora Key features and differences between Quiz
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Supported engines
- Factors to consider when choosing a database engine for specific use cases
Introduction to Amazon DynamoDB
Overview of Amazon DynamoDB: Fully
managed NoSOL database service
 Key features and benefits of DynamoDB:
Scalability, high availability, low latency, and
flexible data model
• Use cases for DynamoDB: Real-time analytics
IoT, and more
Amazon Virtual Private Cloud (VPC)
Introduction to Amazon VPC: Networking
Basics
• VPC Components: Subnets, Route Tables.
Internet Gateways
 VPC Peering, VPN Connections, and Direct

	Connect	
	Introduction to Amazon Simple Notification Service	
	(SNS)	
	Overview of Amazon SNS: Fully managed	
	pub/sub messaging service	
	• Use cases for SNS: Push notifications, event-	
	driven architecture, and application-to-	
	application messaging	
	• Features of SNS: Topics, Subscriptions,	
	Publishers, and Subscribers	
	Amazon Identity and Access Management (IAM)	
	Overview of AWS Identity and Access	
	Management (IAM)	
	IAM Users, Groups, Roles, and Policies	
	Best Practices for IAM Security and Access	
	Control	
	Introduction to Amazon CloudWatch	
	Overview of Amazon CloudWatch: Monitoring	
	and observability service for AWS resources and	
	applications	
	• Key features of CloudWatch: Metrics, Alarms,	
	Logs, Events, and Dashboards	
	Benefits of using CloudWatch for monitoring,	
	troubleshooting, and resource optimization	
	CloudWatch Metrics and Alarms	
	• Creating custom metrics and collecting data	
	from EC2 instances, RDS databases, S3 buckets.	
	etc.	
	• CloudWatch Alarms: Setting up notifications	
	and automated actions based on metric	
	thresholds	
	Introduction to AWS CloudTrail	
Week No. 7	Overview of AWS CloudTrail: Logging and	
	auditing service for tracking user activity and	
	API usage across AWS accounts	
	• Use cases for CloudTrail: Security and	
	compliance auditing, troubleshooting, and	
	operational monitoring	
	• Key features of CloudTrail: Trails, Events,	
	Insights, and Integrations	
	Integrating CloudWatch with CloudTrail	
	Using CloudWatch Metrics and Alarms to	
	monitor CloudTrail events and API activity	
	Creating CloudWatch dashboards and	
	visualizations to track CloudTrail log data and	
	metrics	
	Setting up CloudWatch Alarms to detect security	
	incidents and unauthorized access detected by	

	CloudTrail	
	Introduction to Docker	
Week No. 8	 Introduction to Docker Overview of Docker: Containerization platform for building, shipping, and running applications Advantages of containerization: Portability, consistency, scalability, and resource efficiency Key components of Docker: Docker Engine, Docker Images and Containers Docker Images and Containers Docker Images and Containers Docker Images and Containers Docker Images: Immutable templates containing application code, runtime, libraries, and dependencies Docker Containers: Runnable instances of Docker images isolated from the host system and other containers Working with Docker Hub: Discovering, pulling, and pushing Docker images from/to Docker Hub registry Docker Networking: Connecting containers to each other and to external networks using bridge, host, or overlay networks Docker Volumes: Persistent storage for container data and configuration files, ensuring data durability and portability Docker Security and Best Practices Container Security Considerations: Image vulnerabilities, runtime security, and isolation Best Practices for Docker Security: Container image scanning, least 	Quiz 2
	Data Analytics on AWS	
Week No. 9	 Introduction to Data Analytics Overview of Data Analytics: Process of examining data sets to uncover insights, trends, and patterns Importance of data analytics for business decision-making, optimization, and predictive analysis Key components of a data analytics pipeline: Data collection, storage, processing, analysis, and visualization AWS Data Analytics Services Overview Amazon Athena: Serverless query service for analyzing data in Amazon S3 using standard SOL 	Assignment

	o Amazon Padshift: Fully managad data	
	• Amazon Redshift. Fully managed data	
	warehouse service for analytics at	
	scale	
	Data Analysis with Amazon Athena	
	 Querying data in Amazon S3 using 	
	SQL with Amazon Athena	
	\circ Creating tables, partitions, and	
	views in Athena for efficient data	
	analysis	
	 Analyzing large datasets and 	
	optimizing queries for performance	
	and cost	
	AWS EMR and Big Data Processing	
	Introduction to AWS EMR (Elastic	
	MapReduce):	
	• Overview of EMR and its role in big	
	data processing.	
	 Understanding Hadoop and Spark 	
	clusters.	
	AWS EMR Components:	
	• Hadoop, Spark, HBase, Hive, Presto,	
	and other supported frameworks.	
	• Using AWS EMR:	
	• Launching and configuring EMR	
	clusters.	
	• Integrating with Amazon S3 for data	
	storage.	
	• Running Hadoop and Spark jobs.	
	Optimizing Performance:	
Week No. 10	• Best practices for optimizing EMR	
	performance.	
	• Instance types, cluster sizing, and	
	resource allocation.	
	 Monitoring and debugging EMR 	
	clusters.	
	• Network configuration and access	
	controls.	
	• Integration with Other AWS Services:	
	\circ S3 for data storage.	
	• AWS Glue for ETL (Extract,	
	Transform, Load) tasks.	
	 Amazon Redshift for data 	
	warehousing.	
	• Amazon Athena for ad-hoc querying.	
	Hands-on Lab: Configuring AWS EMR	
	• Execute Hadoop and Spark jobs on the	
	EMR clusters, working with sample	
	datasets and analyzing the results.	

	\circ Integrate EMR with other AWS	
	services like S3 Glue and Athena	
	performing tasks such as data	
	ingestion transformation and	
	ingestion, transformation, and	
	allalysis.	
	Amazon QuickSignt and Data visualization	
	Introduction to Amazon QuickSight	
	• Overview of Amazon QuickSight:	
	Fully managed business intelligence	
	(BI) service for data visualization	
	and analytics	
	 Key features of QuickSight: 	
	Interactive dashboards, ad hoc	
	analysis, ML-powered insights, and	
	embedded analytics	
	 Benefits of using QuickSight for 	
	visualizing and exploring data from	
	various sources	
	Data Visualization with Amazon QuickSight	
	 Connecting to data sources: Amazon 	
	S3, Amazon Redshift, Amazon RDS,	
Week No. 11	Amazon Athena, etc.	
	 Building interactive dashboards and 	
	visualizations using drag-and-drop	
	interface	
	\circ Creating charts, graphs, tables, and	
	custom visuals to represent data	
	insights effectively	
	 Advanced Analytics with Amazon 	
	QuickSight	
	 Applying advanced analytics 	
	features: Forecasting, anomaly	
	detection, trend analysis	
	 Using machine learning insights to 	
	automatically discover hidden	
	patterns and outliers in data	
	 Incorporating geospatial analysis 	
	and custom calculations in	
	QuickSight visualizations	
	AWS Cost Management and Optimization	
	 Overview of AWS Pricing Models (On- 	
	Demand, Reserved Instances, Spot	
	Instances)	
Week No. 12	 Understanding AWS Billing and Cost 	
WCCR 100. 12	Management Tools	
	Cost Allocation and Tagging Strategies	
	Cost Optimization Best Practices (Right	
	C' i de la de la Huili d'a Deservad	
	Sizing, Instance Utilization, Reserved	

	 Monitoring and Analyzing AWS Costs with Cost Explorer Budgeting and Forecasting AWS Spending 	
	Advanced Container Orchestration with Amazon	
	ECS and EKS	
	 Introduction to Amazon Elastic Container Service (ECS) and Elastic Kubernetes Service (EKS) 	
	 Container Orchestration Concepts: Task Definitions, Services, Pods, and Deployments 	
	 Container Networking and Service Discovery in ECS and EKS Autoscaling and Load Balancing for 	
	Containers	
	Advanced Container Security Best Practices	
	 Observability and Monitoring for 	
	Containerized Applications	
Week No. 13	Project Submission	Project Presentation

Approvals

Prepared by	Approved by
Dr Gulsher Ali	
Engr. Hasnain Hyder	



Sukkur IBA University

Boot Camp Cloud Computing 2024

LAB MODULE OUTLINE

Prepared by: Dr. Gulsher Baloch

Engr. Hasnain Hyder



Lab Module Description:

In this comprehensive course, students will embark on an immersive journey into the world of Amazon Web Services (AWS), gaining practical, hands-on experience in building, configuring, and managing various AWS services. Through a series of interactive labs, participants will develop a robust understanding of cloud computing principles and AWS infrastructure.

The course begins with an introduction to AWS infrastructure, where students will learn to provision virtual servers (EC2 instances) on AWS using different operating systems. From there, they will explore into data storage and management, mastering the utilization of Amazon S3 for storing and serving website content, as well as exploring advanced functionalities like image recognition and dynamic image resizing.

Networking and security are paramount in any cloud environment, and participants will acquire essential skills in configuring Virtual Private Clouds (VPCs) with public and private subnets, alongside setting up and managing Relational Database Service (RDS) instances for secure database management.

Monitoring and management of AWS resources are critical for ensuring optimal performance and security. Through labs focusing on AWS CloudWatch and CloudTrail, students will gain insights into monitoring, troubleshooting, and auditing AWS environments effectively.

Containerization is the integral parts of modern application development and deployment. Students will receive a comprehensive introduction to Docker containerization technology and learn to deploy Docker containers on AWS EC2 instances for scalable and flexible application deployment.

In the realm of data analytics and visualization, students will build real-time data pipelines using Amazon Kinesis services, enabling them to analyze streaming data effectively. Additionally, they'll harness the power of Amazon QuickSight for creating interactive visualizations and dashboards to derive insights from large datasets.

Throughout the course, participants will engage in hands-on labs, reinforcing theoretical concepts with practical applications. These labs are designed to simulate real-world scenarios, providing learners with invaluable experience and skill development.

At the end of course, students will emerge equipped with the knowledge and proficiency to deploy and manage various AWS services confidently. Whether aspiring cloud engineers, developers, or IT professionals, this course will empower participants to navigate the AWS ecosystem with ease, preparing them for success in the ever-evolving field of cloud computing.

Lab Module Outline:

Lab Module No.	Title
1	Building Windows, Ubuntu, and Linux Infrastructure on AWS EC2
2	Amazon AWS S3 for Website Storage
3	Image Recognition on Images in S3 Using Amazon Rekognition
4	Dynamic Image Resizing: Using Node.js, AWS Lambda, and S3
5	Setting up a VPC with Public and Private Subnets on AWS
6	Hands-On DynamoDB: Table Creation, Data Insertion, Indexing, and Querying
7	Setting Up RDS on Amazon AWS
8	AWS CloudWatch Monitoring Lab
9	Introduction to AWS CloudTrail
10	Introduction to Simple Notification Service (SNS)
11	Introduction to Docker
12	Docker on AWS EC2
13	Docker Custom Images Exploration
14	Docker Custom Images with Online Website Templates
15	Building a Data Pipeline with Amazon Kinesis Streams, Kinesis Data Firehose, and Amazon S3
16	AWS Party Rock Lab
17	Introduction to Amazon QuickSight Visualization
18	Visualizing COVID-19 Data using Amazon QuickSight
19	QuickSight Basic Commands for Data Management
20	Introduction to Amazon EMR Configuration



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Boot Camp

Cloud Computing

2024

Lab Module #1: Building Windows, Ubuntu, and Linux Infrastructure on AWS EC2 Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



Objectives

- To introduce students to Amazon Web Services (AWS) Elastic Compute Cloud (EC2) and its capabilities.
- To familiarize students with the process of provisioning Windows instances on AWS EC2.
- To provide hands-on experience in configuring Windows instances, including network settings, security groups, and storage options.
- To enable students to access and manage Windows instances remotely using Remote Desktop Protocol (RDP).

Pre-requisites

- An active AWS account with appropriate permissions to access EC2 services.
- Basic understanding of cloud computing concepts and AWS services.
- Familiarity with Windows operating system.

Outcomes

After completing this session, student should be able to:

- Practical Skills: Gain hands-on experience in setting up and configuring Windows instances on AWS EC2.
- Cloud Understanding: Deepen comprehension of cloud fundamentals, tailored to Windows environments on AWS.

Introduction

In today's digital landscape, cloud computing has become an integral part of numerous industries, offering scalability, flexibility, and cost-effectiveness. Amazon Web Services (AWS) provides a wide range of services tailored to meet various computing needs. Among these services, Amazon EC2 (Elastic Compute Cloud) stands out as a powerful tool for provisioning virtual servers in the cloud. This lab aims to demonstrate how to set up a Windows instance using Amazon EC2, empowering users to leverage cloud computing for their Windows-based applications and workloads.

Amazon EC2

Amazon EC2 (Elastic Compute Cloud) is a web service provided by Amazon Web Services (AWS) that enables users to rent virtual computers (instances) on which to run their own applications. EC2 provides scalable computing capacity in the cloud, allowing users to quickly scale up or down based on demand.

Key features of EC2 include:

- Scalability: Users can easily increase or decrease the number of instances they are running to match the computing demands of their applications.
- **Flexibility:** EC2 offers a wide selection of instance types with varying CPU, memory, storage, and networking capabilities to accommodate diverse workloads.

- Security: EC2 provides a range of security features, including network isolation, security groups, and encryption options, to ensure the confidentiality and integrity of data.
- **Elasticity:** Users can automatically scale their EC2 instances based on predefined conditions using features such as Auto Scaling, ensuring optimal performance and cost efficiency.
- **Pay-as-you-go Pricing:** EC2 follows a pay-as-you-go pricing model, allowing users to pay only for the compute capacity they consume, without any upfront commitments or long-term contracts.

Steps to Create a Windows EC2 Instance

In this lab, we will establish instances of both Windows and Ubuntu operating systems within the Amazon Web Services (AWS) Elastic Compute Cloud (EC2) environment. This process involves creating virtual machines (instances) running these respective operating systems on AWS infrastructure. Throughout the lab, we'll provide step-by-step instructions to set up and configure these instances effectively. By the end, participants should have a solid understanding of deploying and managing both Windows and Ubuntu instances on AWS EC2.

The following Steps will be taken to create the instances:

Step 1: Sign in to the AWS Management Console:

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Access EC2 Dashboard:

Once logged in, click on search, write "EC2", and select "EC2" section.



• After Clicking Instances (running)

aws	Services	Q See	arch		[Alt+S]	۵	\$ Ø Ø	N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
EC2 D)ashboard	×	*	Instances (1) Info	C	Connect	stance state 🔻	Actions v Launch instances v
EC2 G	olobal View			Q Find Instance by attribute or tag (case-sensitive)			All states 🔻	< 1 > @
Event	s		I.	□ Name 🖉 🔻 Instance ID	Instance state 🛛 🗸	Instance type	▼ Status check	Alarm status Availability Zone
Conso Code	Preview			win2022 i-01fdb877f10e28286	\ominus Stopped 🗨 🝳	t2.micro	-	View alarms + us-east-1a
▼ Instar	nces							
Insta	nces							
Instar	nce Types							
Laund	ch Templates							
Spot	Requests							
Savin	gs Plans							
Reser	ved Instances							
Dedic	ated Hosts							
Capao Reser	vations <u>New</u>							
▼ Image	es			Calastan instance				Activate Windows
AMIs			-	Select an instance				Go to Settings to activate Windows.

• Click on the "Launch Instance" button to initiate the instance creation process.

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EC2 C EC2 C Event Conse Code	Dashboard Global View IS Dle-to- Preview	×	Instances Info C Connect Q. Find Instance by attribute or tag (case-sensitive) Instance state = nunning X Clear filters Instance state = nunning X Clear filters Instance type Name ∠ ▼ Instance ID Instance state ▼ Instance type	Instance state ▼ Actions ▼ Launch instances ▼ All states ▼ All states ▼ Status check Alarm status Availability Zone
▼ Insta	nces		No matching instances found	
Insta	nces		4	•
Insta	nce Types			
Laun	h Templates			
Spot	Requests			
Savin	gs Plans			
Reser	ved Instances			
Dedic	ated Hosts			
Capa Reser	tity vations <u>New</u>			
▼ Imag	es		Calast an Instance	Activate Windows
AMIs			Select an instance	Go to Settings to activate Windows.

• Write the name and tags as (window)

aws	Services Q Search [Alt+5]	אַ 🖓 🔞 N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
=	EC2 > Instances > Launch an instance	• Summary
	Launch an instance info Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.	Number of instances Info
	Name and tags info	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99
	Name e.g. My Web Server Add additional tags	Virtual server type (instance type) t2.micro
	 Application and OS Images (Amazon Machine Image) Info 	New security group Storage (volumes) 1 volume(s) - 8 GiB
	An AMI is a template that contains the software configuration (operating system, applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below	Cancel

- Choose AMI (Amazon Machine Image):
 - In the "Choose an Amazon Machine Image (AMI)" section, select a Windows AMI from the provided list. You can filter the AMIs based on the Windows edition and version you require.

 Application 	on and OS	Images (Am	azon Machir	ne Image)	Info		
							Number of instances Info
AML is a tem	plate that cont	tains the softwa	re configuration	(operating sy	stem applicat	ion server and	1
applications) rec	quired to launo	h your instance	. Search or Brow	/se for AMIs if	you don't see	what you are looking for	
below		-					Software Image (AMI)
							Amazon Linux 2023 AMI 2023.3.2read more
Q Search our	full catalog in	cluding 1000s of	f application and	l OS images			ami-0d7a109b130624c99
							Virtual server type (instance type)
Quick Start							t2.micro
	_						Firewall (security group)
Amazon	macOS	Ubuntu	Windows	Red Hat	SUSE Li	Q	New security group
Linux						Browse more AMIs	
aws						Including AMIs from	Storage (volumes)
<u> </u>	Mac	ubuncu	IVIICIOSOTT	🤏 Red Hat	sus	AWS, Marketplace and	i votume(s) - o dio
						the Community	

- Choose Instance Type:
 - Select an instance type based on your computing requirements. Consider factors such as CPU, memory, storage, and network performance.

Instance type Info Get advice	1		
nstance type t2.micro	Free tier eligible]	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more
Family: t2 1 vCPU 1 GiB Memory Current generation: true On-Demand Windows base pricing: 0.0162 USD per Hour On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand RHEL base pricing: 0.0716 USD per Hour	•	 All generations Compare instance types 	Virtual server type (instance type) t2.micro

- Create Key Pair:
 - If you have not already created a key pair, you will be prompted to create or select an existing key pair. This key pair is essential for securely accessing your Windows instance.

▼ Key pair (login) Info	Number of instances Info
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance. Key pair name - required	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99
Select Create new key pair Create new key pair	Virtual server type (instance type) t2.micro

- Configure Instance:
 - Configure instance details such as the number of instances, network settings, subnet, security groups, etc. Ensure that the configurations align with your requirements.

▼ Network settings Info	▼ Summary
VPC - required Info	Number of instances Info
vpc-04890b2673355c706 (default) T22.31.0.0/16	
Subnet Info	Software Image (AMI)
No preference C Create new subnet C	ami-0d7a109bf30624c99
Auto-assign public IP Info	Virtual server type (instance type)
Enable 🔻	t2.micro
Additional charges apply when outside of free tier allowance	Firewall (security group)
Firewall (security groups) Info	New security group
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.	Storage (volumes)
Create security group Select existing security group	1 volume(s) - 8 GiB
Security group name - required	Cancel Act Laurch instance in a second secon
launch-wizard-4	Go te Settings to activate Win
I Feedback © 2024	Amazon Web Services. Inc. or its affiliates. Privacy Terms Cool

- Add Storage:
 - Specify the storage requirements for your instance. You can add additional volumes if needed. Adjust the size and type of storage based on your application's demands.

aws	Services Q Search [Alt+S]]	ב 🎝 🕐 🎯 N. Virginia ▼ Khawaja Saad	Ahmed Butt 🔻
=				<u>ن</u>
	Configure storage Info	Advanced	Number of instances Info	Θ
	1x 8 GiB gp3 Root volume (Not encrypted)		1	
			Software Image (AMI)	
	③ Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic	ic storage 🗙	ami-0d7a109bf30624c99	
			Virtual server type (instance type)	
	Add new volume		t2.micro	
			Firewall (security group)	
	O Click refresh to view backup information The tags that you assign determine whether the instance will be backed up by any	C	New security group	
	Data Lifecycle Manager policies.		Storage (volumes)	
	0 x Ella sustanza	r dia	1 volume(s) - 8 GiB	
	0 x File systems	Edit		
			Cancel Launch instance	
	Advanced details Info		Review commands Activate Windows	

- Review and Launch:
 - Review all the configurations you have made for your instance. Once verified, click on the "Launch" button.
- Launch Instance:
 - After selecting a key pair, click on the "Launch Instances" button to initiate the instance launch process.
- Accessing the Windows Instance:
 - Once the instance is launched successfully, you can access it using Remote Desktop Protocol (RDP) or other remote access methods. Retrieve the public IP address or

public DNS of the instance from the EC2 dashboard and use it to establish an RDP connection.

nemote Desktop Cor	nnection	_			\times
Remote Conn	e Desktop ection				
Computer: ec2-3-89-6 User name: Administrato You will be asked for crede	4-1.compute-1.amazona r entials when you conne	aws.com ct.	~		
Show Options	1	Connect		He	lp

Final Output

Recycle Bin C EC2 Feedback CC2 Merors			Hostname: EC2AMAZ-GKD3L2D Instance ID: i-01f04877f10e28286 Private IPv4 address: 10.0.8.177 Public IPv4 address: 34,239.44.10 Instance size: 12.micro Availability Zone: us-east-1a Architecture: AMD64 Total memory: 1024 Network: Low to Moderate
		F	
D Type here to search	H 💽 🗮		r d seng 8:01 PM ↓ INTL 3/21/2024
Lab Exercises			

1. Create an Ubuntu and Linux instances on AWS EC2.



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Lab Module #2: Amazon AWS S3 for Website Storage Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



Objectives

- Familiarity with Amazon Simple Storage Service (S3).
- Understand the fundamental concepts of object storage.
- Learn how to create S3 bucket and acquire knowledge on uploading objects to S3.
- Discover various approaches to access S3 objects

Pre-requisites

- An active AWS account with access to the AWS Management Console.
- Basic knowledge of cloud computing concepts.
- Basic understanding of file storage and management.

Outcomes

After completing this session, student should be able to:

- Understand the fundamentals of Amazon S3.
- Be able to create S3 buckets.
- Know how to upload objects to S3.
- Understand and apply S3 permissions.
- Access S3 objects using various methods.

Introduction

Amazon S3 is a widely-used object storage service that offers scalability, durability, and low-latency access to data. It is designed to store and retrieve any amount of data from anywhere on the web. S3 allows you to store and retrieve data through a web interface, APIs, or SDKs, making it suitable for a wide range of use cases, including backup and restore, data archiving, web hosting, and content distribution.

Steps to achieve S3

In this task, we will take a webpage and store it in Amazon AWS S3 using the following steps:

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Navigate to the S3 Console

• Once logged in, search for "S3" in the AWS Management Console search bar or navigate to "Services" and select "S3" under the "Storage" category.

WS Services	Q s3	×	▶ 🗘 ⑦ ⑧ N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
Console Home		Search results for 's3'	Add widgets
myApplications All services	Services (8) Features (31)	Services	See all 8 results > *
	Documentation (24,325) Knowledge Articles (292)	Scalable Storage in the Cloud	plications
	Marketplace (1,597) Blogs (1,369) Events (25)	Archive Storage in the Cloud	< 1 >
	Tutorials (13)	Large Scale Data Transport	
		Hybrid Storage Integration	your application i one place.
		Imports from S3	See all 51 results F
CloudShell			© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preference

Step 3: Create an S3 Bucket

• Click on the "Create bucket" button.



• Enter a unique bucket name and select the region for your bucket.

Services Q Search	[Alt+S]	Þ.	¢	0	0	Global 🔻	Khawaja Saad Ahmed Butt
General configuration							
AWS Region							
US East (N. Virginia) us-east-1	▼						
Bucket type Info							
 General purpose Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple availability Zones. 	 Directory - New Recommended for low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone. 						
Bucket name Info							
myawsbucket							
Bucket name must be unique within the global namespace and follow	v the bucket naming rules. See rules for bucket naming C						
Only the bucket settings in the following configuration are copied.							
Choose bucket							
Format: s5://bucket/prenx							

• Configure additional settings such as versioning, logging, and tags if needed.

aws Se	ervices Q Search		[Alt+S]	Þ.	\$	0	۲	Global 🔻	Khawaja Saad Ahm	ned Butt 🔻
=	objects.									١
Bu Vers ever and	Icket Versioning sloning is a means of keeping multiple variants or ry version of every object stored in your Amazor application failures. <u>Learn more</u>	if an object in the same bucket. You can use version S3 bucket. With versioning, you can easily recove	ining to preserve, retrieve, and restore r from both unintended user actions							9
Buc O	cket Versioning Disable Enable									
Ta	gs – optional (1) can use bucket tags to track storage costs and c	rganize buckets. <u>Learn more</u> 🔀								
Key er	r iviroment Add tag	Value - <i>optional</i> [testing]	Remove							
	Feedback		@ 2024 Ar		. Consister	les esti	e efficience	n Drivenu	Tarma Cashia	

• Click "Create bucket" to create the bucket.

aws	Services	Q Search	[Alt+S]	Þ	ہ	0	() GI	obal 🔻	Khawaja Saad A	hmed But	t 🕶 🌔
= 0	Successfully To upload fil	r created bucket "storing-my-first-image" les and folders, or to configure additional bucket setting	gs, choose View details .						View details	×	()
	 Serve Serve Dual- Secure Bucket K Using an S KMS. Lean Disab Enable 	er-side encryption with Amazon S3 managed keys (SSE- er-side encryption with AWS Key Management Service k Layer server-side encryption with AWS Key Managemen e your objects with two separate layers of encryption. For details on S3 pricing page, 2 (e) (e) S3 Bucket Key for SSE-KMS reduces encryption costs by lowering n more 2 ole le	S3) eys (SSE-KMS) It Service keys (DSSE-KMS) on pricing, see DSSE-KMS pricing on the Storage t on pricing, see DSSE-KMS pricing on the Storage t calls to AWS KMS. S3 Bucket Keys aren't supported	ab of the for DSSE-							9
	Adv After	anced settings	o the bucket, and configure additional bucke Gancel	t settings. nate bucket							
> Clou	dShell Feedba	ack		© 2024, Amazon Wel	b Services,	Inc. or its a	ffiliates.	Privacy	Terms Cook	ie prefere	nces

Step 4: Upload Objects to the Bucket

• Select the bucket you created from the S3 dashboard.

General purpose buckets Direc	tory buckets				
General purpose buckets (1) Buckets are containers for data stored in S3.	Info	C	CD Copy ARN Empt	y Delete	Create bucket
Q Find buckets by name Name	▲ AWS Region マ	Access	▼ Creation date		< 1 > ⊚
O my-first-website-aws	US East (N. Virginia) us-east- 1	Objects can be public	March 26, 2024, 01:16:32	(UTC-07:00)	

• Click on the "Upload" button.

aws	Services	Q Search		[Alt+S]		24	0 4	0	Global 🔻	Khawaja Saad A	hmed Butt 🔻	1
Ξ	storing	my first imago									(0
	storing										C	9
	Objects	Properties Permissions	Metrics Manageme	nt Access Points								
	Objects	(0) Info								_		
	C	다 Copy S3 URI 다 Copy URL	☑ Download	Open 🖸 De	ete Actions •	Cre	eate folder	নি	Upload			
	Objects are t permissions.	the fundamental entities stored in Amazon S3.	You can use Amazon S3 invent	ory 🔽 to get a list of all o	jects in your bucket. For a	others to acce	ss your objects	, you'll nee	d to explicitly	grant them		
	Q Find o	bjects by prefix							<	1 > ©		
	N	ame 🔺 Type	∇	Last modified	⊽ Size		7	7 Sto	orage class	⊽		
				No objects								
			You do	n't have any objects in	his bucket.							
				M Upload								
Clou	dShell Feedbac	k			© 2024, Ama	izon Web Ser	vices, Inc. or its	affiliates.	Privacy	Terms Cook	ie preference	s .

• Choose the file(s) you want to upload from your local machine.

aws	Services	Q Search			[Alt+S]]	D.	¢	0	۲	Global 🔻	Khawaja	Saad Ahme	i Butt 🔻
≡	Amazon S3	> <u>Buckets</u> > my-first	t-website-aws											٩
	my-firs	st-website-a	WS Info											0
	Objects	Properties Po	ermissions	Metrics Manageme	ent Access Po	ints								
	Ohiasta	(1)												
	C	(I) Info	් Copy URL	Download Download	Open 🛛	Delete Actions	· .	Create f	older	A	Upload			
	Objects are permissions	the fundamental entities sto . <u>Learn more</u>	ored in Amazon S3. Y	ou can use <u>Amazon S3 inven</u> t	tory 🔽 to get a list of	all objects in your bucket. For o	thers to a	ccess your	objects, y	ou'll nee	d to explicitly g	rant them		
	Q Find	objects by prefix									<	1 >	۲	
	□ N	ame	▲ Туре	∇	Last modified	⊽ Size			∇	Sto	rage class		▽	
		hasnainhyder.html	html		March 26, 2024 (UTC-07:00)	4, 01:17:14			1.2 KB	Sta	ndard			
▶ Clou	dShell Feedbac	k				© 2024, A	mazon We	eb Service	s, Inc. or i	ts affiliat	es. Privacy	Terms	Cookie pro	eferences

• Configure permissions and metadata for the uploaded objects if necessary.

Permissions Grant public access and access to other AWS accounts.
This bucket has the bucket owner enforced setting applied for Object Ownership. Use bucket policies to control access. Learn more 2
Properties Specify storage class, encryption settings, tags, and more.

• Click "Upload" to upload the file(s) to the bucket.

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=	Nam	10	▼ Folder		T Tune									(j
			• Folder		• Type									0
	Destinatio	DN Info												
	Destination													
	s3://storing-	my-first-image												
	Destinati Bucket sett	ion details tings that impact new objects stored	I in the specified destination											
	 Permissions Grant public address 	ccess and access to other AWS accou	ints.											
	This buck access. Let	ket has the bucket owner enford earn more	ced setting applied for C	bject Ownership. Use	bucket policies t	o control								
	Properties Specify storage	e class, encryption settings, tags, and	d more.				-							
					Cancel	Upload								
>. Cloud	dShell Feedback					© 2024, Ama	zon Web S	iervices, In	c. or its aff	liates. F	Privacy	Terms	Cookie prefere	nces

Step 5: Manage Permissions

• Select the bucket or object for which you want to manage permissions.

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=	⊘ ແ ∨	J pload succee /iew details bo	ded low.																	0
		Summai	у																	
		Destination s3://storing	ı g-my-fir	st-image				Succeed	ed 67.8 KB	(100.00%)			Fail	ed) files, O	B (0%)					
		Files and f	olders	Configu	uration															
		Files and	l folde	rs (1 Tota	l, 67.8	КВ)	_													
		Q Find b	y name															< 1	>	
		Name		Folder	~	Туре	~	Size	~	Status	~	Error							~	
		images123	jpg	-		image/jp	eg	67.8 KB		⊘ Succe	eded	-								
2.0	loudSh	ell Feedbaci	5									© 20	024, Amazon We	b Services	, Inc. or its	s affiliate	s. Privacy	Terms	Cookie pre	ferences

• Click on the "Permissions" tab.

zon S3 > Buckets > my-first-website-aws				
v-first-website-aws				
Objects Properties Permissions Metrics Man	agement Access Points			
bjects (1) Info C Copy S3 URI	Copy URL 🕑 Download	Open 🖸 Delete	Actions v Create folder	🛃 Upload
ojects are the fundamental entities stored in Amazon S3. You can use Amazon S3	inventory 🔀 to get a list of all objects in you	r bucket. For others to access your obje	cts, you'll need to explicitly grant them per	nissions. Learn
Q Find objects by prefix				< 1 > 💿
Name A Type	▼ Last modified	▼ Size	▼ Storage class	∇
	March 26, 2024, 01-17	14 (UTC-		

• Click on edit in bucket policy section.

aws Services Q Search	[Alt+5]	D	¢	0	0	Global 🔻	Khawaja Saad /	Ahmed Butt 🔹	ŕ
Amazon S3 ×	⊘ Successfully edited bucket policy.							×	D
Buckets Access Grants Access Points Object Lambda Access Points	Bucket policy The bucket policy, written in JSON, provides access to the objects stored in the bucket. Bucket policies don't apply to objects owned by other accounts. Learn more	<u>e [2]</u>				Edit	Delete		9
Multi-Region Access Points Batch Operations IAM Access Analyzer for S3	No policy to display.						🗇 Сору		
Block Public Access settings for this account									l
Dashboards Storage Lens groups AWS Organizations settings									
Feature spotlight 7									
AWS Marketplace for S3						//			
EloudShell Feedback	© 2024, Amaz	zon We	b Service	s, Inc. or it	s affiliate	. Privacy	Terms Cool	kie preference	3

• Paste the following command in bucket policy

{
"Version": "2012-10-17",
"Statement": [
{
"Sid": "PublicReadGetObject",
"Effect": "Allow",
"Principal": "*",
"Action": [
"s3:GetObject"
],
"Resource": [
"arn:aws:s3:::Bucket-Name/*"
]
}
]
}

• Change the name of bucket to your give bucket name.



Step 6: Access Objects

• To retrieve the URL link for your object, simply navigate to your bucket, select the desired object, and copy the URL provided, enabling easy sharing or embedding.

aws III Services Q Search	[Alt+5]	🖸 🗛 🧑 🕲 Global 🔻 Khawaja Saad Ahmed Butt 👻
Amazon S3	Amazon S3 > Buckets > my-first-website-aws > hasnainhyder.html	٥
Buckets Access Grants Access Points Object Lambda Access Points Multi-Region Access Points	Properties Permissions Versions	🗂 Copy 53 URI 🔄 Download 🛛 Open 🚺 Object actions 🔻 🏵
Batch Operations IAM Access Analyzer for 53 Block Public Access settions for	Owner saadbutt15	S3 URI S3.URI S3.//my-first-website-aws/hasnainhyder.html
this account	AVS Region US East (N. Virginia) us-east-1 Last modified	Amazon Resource Name (ARN) analytic and the second
Dashboards Storage Lens groups AWS Organizations settings	March 26, 2024, 01:17:14 (UTC-07:00) Size	Entity tag (Etag)
Feature spotlight 🥑	Type html	Thtps://my-first-website-aws-s3.amazonaws.com/hasnainhyder.html
AWS Marketplace for 53	Key 🗇 hasnainhyder.html	

• Paste the URL to any browser



Conclusion

Amazon S3 is a powerful and versatile storage service offered by AWS, suitable for a wide range of use cases. By following the steps outlined in this lab, you should now have a good understanding of how to create S3 buckets, upload objects, manage permissions, and access objects using different methods. Further exploration and experimentation with S3 will deepen your understanding and proficiency with this essential AWS service.

Lab Exercises

Select any webpage and save it to your Amazon AWS S3 storage. Then, access it through any web browser



Sukkur IBA University

Bootcamp

Cloud Computing

2024

Lab Module #3: Image Recognition on Images in S3 Using Amazon Rekognition

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



Objectives

- Understand the basics of image recognition using Amazon Rekognition.
- Learn to integrate Amazon Rekognition with images stored in Amazon S3.
- Label images using Amazon Rekognition and analyze the results.
- Gain familiarity with AWS Cloud9 for development and testing purposes.

Pre-requisites

- An AWS account with access to Amazon Rekognition and S3 services.
- Basic understanding of AWS services.
- Familiarity with Python programming language.
- Basic knowledge of image processing concepts.

Outcomes

After completing this session, student should be able to:

- Ability to label images stored in Amazon S3 using Amazon Rekognition.
- Understanding of how to interpret and analyze the results obtained from image recognition.
- Proficiency in integrating Amazon Rekognition with other AWS services.
- Familiarity with AWS Cloud9 for development and testing purposes.

Introduction

Amazon Rekognition is a deep learning-based image and video analysis service provided by Amazon Web Services. It enables you to identify objects, people, text, scenes, and activities in images and videos, as well as detect any inappropriate content. In this lab, we will focus on utilizing Amazon Rekognition to label images stored in Amazon S3 buckets. We will use AWS Cloud9 as our integrated development environment to execute the necessary code.

Steps to label images using Amazon Rekognition

In this task, we will take a webpage and store it in Amazon AWS S3 using the following steps:

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create an S3 Bucket:

• Once logged in, search for "S3" in the AWS Management Console search bar or navigate to "Services" and select "S3" under the "Storage" category.

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Step 3: Create an S3 Bucket

• Click on the "Create bucket" button.



• Enter a unique bucket name and select the region for your bucket.

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Bucket name Info								
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• Configure additional settings such as versioning, logging, and tags if needed.

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oujetts.						١
Bucket Versioning Versioning is a means of keeping multiple variants of an object in the sam every version of every object stored in your Amazon S3 bucket. With version and application failures, Learn more [2]	ucket. You can use versioning to preserve, retrieve, and restore ng, you can easily recover from both unintended user actions					0
Bucket Versioning Disable Enable 						
Tags - optional (1) You can use bucket tags to track storage costs and organize buckets. Learn	ore 🔀					
Key Value - optional enviroment testing	Remove					
Add tag						

• Click "Create bucket" to create the bucket.

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	► Adva	nced settings										
	After of	creating the bucket, you can uplo	ad files and folders to the bucke	t, and configure addition	nal bucket settings.							
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Step 4: Upload photos to the Bucket

• Select the bucket you created from the S3 dashboard.

Storage lens provides visibility	into storage usage and activity trends. L	earn more 🔀			
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General purpose buck	red in S3.		C D Copy ARN Em	Delete	Create bucket
Q Find buckets by name					< 1 > ©
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• Click on the "Upload" button and choose the photos you want to upload from your local machine.

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Step 5: Set Up AWS Cloud9 Environment

• Navigate to AWS Cloud9 service in the AWS Management Console.

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• Create a new environment or use an existing one.

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• Write environment name.

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	Details				
	Name				
	photo-recognition-enviroment				
	Limit of 60 characters, alphanumeric, and unique per user.				
	Description - optional				
	Limit 200 characters.				
	Environment type Info				
	New EC2 Instance Could create an EC2 Instance in your account. The configuration of your EC2 instance cannot be changed by Cloud9 after creation.	Existing compute You have an existing instance or server that you'd like to use.			
	New EC2 instance				
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• Create environment after necessary configuration.

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• After creating the environment, open it from the Cloud9 dashboard in the AWS Management Console to access the Cloud9 IDE.

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• Click "Open in Cloud9" from the Cloud9 dashboard in the AWS Management Console to access the Cloud9 IDE.

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Step 6: Install Boto3 SDK

• Boto3 is the Amazon Web Services (AWS) SDK for Python. Install it in your Cloud9 environment using pip:

pip install boto3

• To install Python in your Cloud9 environment, run the above command in the terminal:



• Navigate to the "File" menu, select "New From Template," and then click on "Python File" to create a new Python script in your Cloud9 environment.



• Paste the following code in your python file

```
#Copyright 2018 Amazon.com, Inc. or its affiliates. All Rights Reserved.
#PDX-License-Identifier: MIT-0 (For details, see https://github.com/awsdocs/amazon-
rekognition-developer-guide/blob/master/LICENSE-SAMPLECODE.)
import boto3
def detect_labels(photo, bucket):
  client=boto3.client('rekognition')
  response = client.detect_labels(Image={'S3Object':{'Bucket':bucket,'Name':photo}},
    MaxLabels=10)
  print('Detected labels for ' + photo)
  print()
  for label in response['Labels']:
    print ("Label: " + label['Name'])
    print ("Confidence: " + str(label['Confidence']))
    print ("Instances:")
    for instance in label['Instances']:
      print (" Bounding box")
```

```
print (" Top: " + str(instance['BoundingBox']['Top']))
      print (" Left: " + str(instance['BoundingBox']['Left']))
      print (" Width: " + str(instance['BoundingBox']['Width']))
      print (" Height: " + str(instance['BoundingBox']['Height']))
      print (" Confidence: " + str(instance['Confidence']))
      print()
    print ("Parents:")
    for parent in label['Parents']:
      print (" " + parent['Name'])
    print ("-----")
    print ()
  return len(response['Labels'])
def main():
  photo="
  bucket=''
  label_count=detect_labels(photo, bucket)
  print("Labels detected: " + str(label_count))
if __name__ == "__main__":
```

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• Replace the bucket and photo names with those of your own created bucket and the specific photo stored within it.

import boto3			
def detect_labels(photo, bucket):			
client=boto3.client('rekognition')			
response = client.detect_labels(Image={`S3Object`:{`Bucket,'Name`:photo}},			
MaxLabels=10)			
print("Detected labels for ' + photo)			
print()			
for label in response['Labels']:			
print ("Label: " + label['Name'])			
<pre>print ("Confidence: " + str(label['Confidence']))</pre>			
print ("Instances:")			
for instance in label['Instances']:			
print (" Bounding box")			
<pre>print (" Top: "+ str(instance['BoundingBox']['Top']))</pre>	12:1	Python	Spaces: 4

• After replacing the names, save the file, and then click on the "Run" button to execute the script. This will trigger the detection process, where the specified photo in the designated bucket will be analyzed for labels using Amazon Rekognition.

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💵 🔶 ays	 photo-recognition .c9 market README.md 	¢-	<pre>* " #Copyright 2018 Amazon.com, Inc. or its #ffiliates. All Rights Reserved. 2 #POX-License-identifier: MI1-0 (for details, see https://github.com/awsdocs/amazon-rekognition-developer-guide/blob/master/LICENSE-SAWFLECODE.) 3 import boto3 5 def detect_labels(photo, bucket): 7 client-boto3.client('rekognition') 10 response - client.amatect_labels(Image-('530bject';[Bucket':'photos-to-recognise','Name';'Image.jped}))</pre>		ĺ	•
			11 Restables:0) 12 print('Detected labels for '+ photo) 13 print('Labels': ' 14 print('Labels': ' 15 for labels lin response['Labels']: 16 print('Label: '* Label['Name']) 17 print('Confidence: ') 18 print ('Confidence'): 19 for Label: 'n str(label: 'o str(label: '): 10 print('Confidence'): 11 print('Confidence'): 12 print('Confidence'): 13 print('Confidence'): 14 print('Instance'): 15 print('Instance'): 16 print('Instance'): 17 print ('Instance'):	10:105 Python Spaces	40	
Cottol			<pre>cel_use://multiment in the interview in the cell cel_use://multiment interview in</pre>	tivate Windows to Settings to activate Wind	ows.	

Input image



Final Output

			L
💽 Run 🔿	Command:	Untitled1.py	
Detected labels for			
Label: Car			
Confidence: 99.97097778320312			
Instances:			
Bounding box			
Top: 0.21479566395282745			
Left: 0.1404857188463211			
Width: 0.7206546068191528			
Height: 0.5432031154632568			
Confidence: 87.85246276855469			
Parents:			
Transportation			
Vehicle			
Label: Coupe			
Confidence: 99.97097778320312			
Instances:			
Parents:			
Car			
Sports Car			
Transportation			
Vehicle			
Label: Sports Car			
Confidence: 99.97097778320312			
Instances:			
Parents:			
Car			
Transportation			
Vehicle			





Conclusion

In this lab, we have explored image recognition using Amazon Rekognition, specifically the labeling of images in Amazon S3 buckets. AWS Cloud9 served as an integrated development environment, facilitating the creation and testing of AWS-related applications. It is recommended to delve into the various features of Amazon Rekognition to gain a comprehensive understanding of its potential in different scenarios.

Lab Exercises

- 1. Capture differnt photographs and utilize Amazon Rekognition to analyze them and produce results.
- 2. Use Amazon Rekognition SDK to analyze them and produce results



Sukkur IBA University

Bootcamp

Cloud Computing

2024

Lab Module #4 Dynamic Image Resizing: Using Node.js, AWS Lambda, and S3

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name:			

CMS ID: _____



AWS Lambda

Objectives

- Automatically resize images uploaded to an S3 bucket.
- Understand how to set up an AWS Lambda function.
- Integrate AWS Lambda with S3.
- Utilize Node.js to resize images dynamically.

Pre-requisites

- An AWS account with appropriate permissions to create Lambda functions and S3 buckets.
- Basic understanding of Node.js programming language.
- Familiarity with AWS services, particularly Lambda and S3.
- Node.js and npm installed on your local machine.

Outcomes

After completing this session, student should be able to:

- Gain hands-on experience in creating AWS Lambda functions.
- Understand how to integrate AWS Lambda with S3 buckets.
- Learn how to resize images using Node.js libraries within Lambda.

Introduction

AWS Lambda and Amazon S3 are two fundamental services provided by Amazon Web Services (AWS) that offer powerful capabilities for developers and businesses alike. AWS Lambda enables serverless computing, allowing you to execute code in response to various events without the need to provision or manage servers. On the other hand, Amazon S3 is a highly scalable object storage service designed to store and retrieve any amount of data from anywhere on the web.

In this lab, we will use the capabilities of AWS Lambda and Amazon S3 to construct an automated image resizing solution. This solution is particularly useful for scenarios where images need to be optimized for various devices or applications, such as websites, mobile apps, or digital media platforms. By leveraging AWS Lambda functions triggered by S3 events, we can create a seamless workflow where images uploaded to an S3 bucket are automatically resized to specific dimensions, reducing storage costs and improving application performance.

Steps to configure lamda function for automatically image resizing

In this task, we will create a Lambda function that automatically resizes images whenever an event occurs. Using the power of AWS Lambda and S3, we will design a seamless process where image uploads to an S3 bucket trigger our Lambda function. Upon triggering, the Lambda function will dynamically resize the image and store the resized version in another designated S3 bucket. We will follow these steps to accomplish this:



Figure 1 Flow of image resizing using AWS Lambda

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create an S3 Bucket:

• Once logged in, search for "S3" in the AWS Management Console search bar or navigate to "Services" and select "S3" under the "Storage" category.



Step 3: Create an S3 Bucket

• Click on the "Create bucket" button.

aws	Services Q Se	arch	[Alt+S]	D 4 0) 🙆 Global 🔻	Khawaja Saad Ahmed Butt 🔻
Ξ	Storage Am Sto of c Amazon S security, a	azon S3 re and retrieve an data from anywhe B is an object storage service that offers industry-leadir nd performance.	y amount Pre g scalability, data availability,	Create a bucket Every object in S3 is stored in and folders to S3, you'll need the objects will be stored. Create bucket	n a bucket. To upload file d to create a bucket wher	s e
	How	it works		Pricing With S3, there are no minimu what you use. Prices are base S3 bucket. Estimate your monthly bill u Monthly Calculator	um fees. You only pay for ed on the location of your sing the <u>AWS Simple</u>	

• Enter a unique bucket name and select the region for your bucket.

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=	General configuration								() ()
	AWS Region US East (N. Virginia) us-east-1	▼							
	Bucket type info General purpose Recommended for most use cases and access patterns. General purpose buckets are the original S3 bucket type. They allow a mix of storage classes that redundantly store objects across multiple Availability Zones.	O Directory - New Recommended for low-latency use cases. These buckets use only the S3 Express One Zone storage class, which provides faster processing of data within a single Availability Zone.							
	Bucket name info myowsbucket Bucket name must be unique within the global namespace and follow Copy settings from existing bucket - optional Only the bucket settings in the following configuration are copied. Choose bucket Format: s3://bucket/prefix	w the bucket naming rules. See rules for bucket naming 🕻							
	Object Ownership Info								

• Configure additional settings such as versioning, logging, and tags if needed.

aws	Services	Q Search		[Alt+S]		D.	¢	0	0	Global 🔻	Khawaja	Saad Ahmed B	utt 🔻	^
=		ects.											١	
	Bucket Versioning i every versio and applicat	Versioning s a means of keeping multiple variants n of every object stored in your Amaze tion failures. <u>Learn more</u>	of an object in the same bucket. You can us in S3 bucket. With versioning, you can easily	eversioning to preserve, retrieve, recover from both unintended u	and restore er actions								9	
	Bucket Ve Disable	rsioning e												
	Tags - o You can use	ptional (1) bucket tags to track storage costs and	organize buckets. <u>Learn more</u> 🔀											
	Key		Value - optional											
	envirome	ent	testing	Remove										
	Add ta	ıg												
>. Cloud	Shell Feedbac	ik			© 2024, Ama:	zon Web	Services	, Inc. or it	s affiliates	. Privacy	Terms	Cookie prefe	rences	Ŧ

• Click "Create bucket" that will hold original images.

5				[Alt+S]		2	~ •				
	Successfully	created bucket "storing-my-firs	t-image"							View detai	ls 🔅
	Serve	es and folders, or to configure ad	ditional bucket settings, choose View de	etaits.							
	 Serve Serve 	er-side encryption with AM22013	J managed keys (552-55) Management Service keys (SSE-KMS)								
	O Dual-	layer server-side encryption with	AWS Key Management Service keys (DS	SE-KMS)							
	Secure	e your objects with two separate layers on S3 pricing page. 🔀	of encryption. For details on pricing, see DSSE	-KMS pricing on the	Storage tab of the						
	Bucket K	ey									
	Using an S KMS. Lean	53 Bucket Key for SSE-KMS reduces enc n more 🔽	ryption costs by lowering calls to AWS KMS. S3	Bucket Keys aren't	supported for DSSE-						
	 Disab 	le									
	Enabl	le									
	► Adv	anced settings									
	After	r creating the bucket, you can uple	oad files and folders to the bucket, and e	configure addition	nal bucket settings.						
				-							
				Cancel	Create buck	cet					
dSh	hell Feedba	ack			© 2024,	l, Amazon Web	Services, Inc. or	its affiliates.	Privacy	Terms	Cookie pr
	Services	Q Search		[Alt+S]			D 4	0	Global 🔻	Khawaja S	aad Ahme
	Successfully	created bucket "demo-origiona	Limagee"							View detai	le.
) s	Successfully	created bucket "demo-origiona	l-images"							View detai	ls
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• Create another bucket that will hold resized images.

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0	Successful	ly created bucket "resized-origional-	images-bucket"		View details X	6
	Gene	ral purpose buckets (6) Info are containers for data stored in S3.	ional bucket settings, choose view detai t	G	Delete Create bucket	6
	Q Fi	ind buckets by name			< 1 > 💿	
		Name	AWS Region	▼ Access	▼ Creation date ▼	
	0	my-first-website-aws	US East (N. Virginia) us-east-1	A Public	(UTC+05:00)	
	0	my-first-website-page-aws-s3	US East (N. Virginia) us-east-1	A Public	March 27, 2024, 14:33:55 (UTC+05:00)	
	0	my-folder-for-image	US East (N. Virginia) us-east-1	Bucket and	nd objects not public (UTC+05:00)	
	0	photos-to-recognise	US East (N. Virginia) us-east-1	Bucket and	Ad objects not public (UTC+05:00)	
	0	resized-origional-images-bucket	US East (N. Virginia) us-east-1	Bucket and	Ad objects not public (UTC+05:00)	
					Go to Settings to activate Windows	
CloudSł	hell Feed	lback Language			© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie prefere	rences

Step 4: Upload photo to the Bucket that has original image

• Select the bucket you created from the S3 dashboard and upload the image.

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■ ⊘	Successful To upload f	y created bucket "demo-origional-i iles and folders, or to configure addit	mages" ional bucket settings, choose View	details							View details	×	6
	Genera	l purpose buckets Directory b	uckets										
	Gene	ral purpose buckets (5) Info			C	Copy ARN	Emp	oty	Delet	te C	reate bucket		
	Buckets	are containers for data stored in S3.											
	Q Fi	nd buckets by name								<	(1) 6	>	
		Name 🔺	AWS Region	▼	Access	▽	Creation	date				▽	
	0	demo-origional-images	US East (N. Virginia) us-east-1		Bucket and obje	ects not public	March 31	, 2024,	17:51:51	(UTC+05:0	00)		
	0	my-first-website-aws	US East (N. Virginia) us-east-1		A Public		March 26	, 2024,	13:16:32	2 (UTC+05:0	00)		
	0	my-first-website-page-aws-s3	US East (N. Virginia) us-east-1		A Public		March 27	, 2024,	14:33:55	5 (UTC+05:0	00)		
	0	my-folder-for-image	US East (N. Virginia) us-east-1		Bucket and obje	ects not public	March 28	, 2024,	14:49:42	2 (UTC+05:0	00)		
	0	photos-to-recognise	US East (N. Virginia) us-east-1		Bucket and obje	ects not public	March 28	, 2024,	11:28:37	Autic¥05.0 Go to Setti	Windows	- Windows	
													<u> </u>

• Click on the "Upload" button and choose the photo you want to upload from your local machine.

ə u	pload succeeded																
V	iew details below																
	Sammary																
	Destination					Succeeded						Failed					
s3://demo-origional-images			🕑 1 file, 6.6 KB (100.00%)				💬 0 files, 0 B (0%)										
	Files and folde	rs Config	uration														
	Files and fo	lders (1 Tot	al. 6.6 k	(B)													
					_												
	Q Find by no	me													<	1 >	
	Name	Folder	~	Туре	∇	Size	~	Status	∇	Error						~	
1	img13.jpeg	-		image/jpe	9	6.6 KB		⊘ Succe	eeded	-					1		
																	_

Step 5: Create Lambda Function:

• Navigate to AWS lambda service in the AWS Management Console.

aws	Services Q	lambda	🗙 🕞 🧔 🧔 🙆 N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
=	Consol		Search results for 'lambda'
			Services See all 7 results
	Image: Recent Image: State S3	Features (4) Resources New Documentation (10,415)	Image: Second system Lambda ☆ Run code without thinking about servers
	🔍 Amaz	Knowledge Articles (178) Marketplace (762)	Image CodeBuild ☆ Build and Test Code
	ि Route	Blogs (1,057) Events (13) Tutorials (6)	銘 AWS Signer ☆ Ensuring trust and integrity of your code
Cloud:	Shell Feedback	Manager	cost_conurity findings_and matrics all in <u>Actival</u> &999indows Privery o_clamps to a Goode preferences
		C	2024, Amazon Web Services, Inc. or its affiliates.

• Click on create a function.



• Enter a name for your Lambda function.

Services	Q Search	[Alt+S]	⊵	¢	0	0	N. Virginia 🔻	Khawaja Sa	ad Ahmed Butt
Lambda > F	unctions > Create function								
Create	fundational								
Create									
Choose one of	the following options to create your function.								
• Author f	rom scratch a simple Hello World example.	 Use a blueprint Build a Lambda application from sample code and configuration presets for common use cases. 		O Cor Sele	itainer im ct a contail	i age ner imag	e to deploy for y	your function.	
Basic inf	ormation								
Function name	ame • that describes the purpose of your function.				_				
image-res	izer-lamda				ר				
Use only lett	ers, numbers, hyphens, or underscores with no spaces.				-				
Runtime	e code editor supports only Node.js, Python, and Ruby.								
Choose the la	5 5								
Node.js 2	D.x			•	C	ž	Activat	o Windows	
Node.js 2	0.x			•	C	*	Activate Go to Set	e Windows tings to activat	te Windows.

- Choose an existing role or create a new one. This role defines the permissions your Lambda function will have to access other AWS services.
 - By selecting a Create a new role with basic Lambda permissions click on "IAM console"

	Services	Q Search	[A	lt+S]	Σ	¢	0	۲	N. Virginia 🔻	Khawaja S	aad Ahmed
	O arm64										
	Permissions Info By default, Lambda will create an execution role with permissions to upload logs to Amazon CloudWatch Logs. You can customize this default role later when adding triggers.										
	▼ Change default execution role										
	Execution role Choose a role that defines the permissions of your function. To create a custom role, go to the IAM console [2].										
	Create a new role with basic Lambda permissions										
	O Use an existing role										
	Create a new role from AWS policy templates										
	Role creation might take a few minutes. Please do not delete the role or edit the trust or permissions policies in this role.										
	Lambda wi	ll create an execution role named imag	je-resizer-lamda-role-dund24fu, with per	mission to upload logs to Am	iazon (CloudWa	atch Log	s.			
									Activate	Windows	
	Advar	iced settings							Go to Setti	ings to activa	te Windo
oudShell	l Feedbaci	۰ 		© 2024, A	Amazon	Web Ser	vices, Inc.	or its affi	iliates. Privac	y Terms	Cookie pre
										48	R I P

• After selecting IAM console, go to policy.

aws Services Q Search	[Alt+S]	D &	⑦ 🙆 Global ▼ Khawaja Saad Ahmed Butt ▼
Identity and Access ×	⊘ Role imageresizer-lambda-role created.		View role X
Management (IAM)	IAM > Roles		0
Q Search IAM	Roles (7) info An IAM-role is an identity you can create that has specific permissions with credentials that are valid for short dur.	tions. Roles can be assumed by entities that you trust.	C Delete Create role
Dashboard	Q Search		< 1 > 💿
 Access management 		une discretetoria. In terre estatura	
User groups		usted entities Last activity	~
Users	AWS-QuickSetup-StackSet-Local-AdministrationRole AM	VS Service: cloudformation -	
Roles Policies	AWS-QuickSetup-StackSet-Local-ExecutionRole Av		
Identity providers	AWSCloud9SSMAccessRole AI	VS Service: cloud9, and 1 more. 🗹 3 days ago	
Account settings	AWSServiceRoleForAWSCloud9 AV	VS Service: cloud9 (Service-Linked 2 hours ago	
 Access reports 	AWSServiceRoleForSupport AV	VS Service: support (Service-Linker -	
Access Analyzer	AWSServiceRoleForTrustedAdvisor Al	VS Service: trustedadvisor (Service -	
External access	imageresizer-lambda-role Al	VS Service: lambda -	
Unused access			
Analyzer settings			
Credential report	Roles Anywhere Info		Manage
Organization activity	Authenticate your non AWS workloads and securely provide access to AWS services.		Activate windows
Service control policies (SCPs)			Go to settings to activate windows.
CloudShell Feedback		© 2024, Amazon Web Services,	Inc. or its affiliates. Privacy Terms Cookie preferences

• Click on create policy.

aws Services Q Search	[Alt+S]	ג 🎸 🧷 🙆 Global ▾ Khawaja Saad Ahmed Butt ▼
Identity and Access X	Ø Role imageresizer-lambda-role created.	View role × ©
Management (IAM)	IAM > Policies	0
Q Search IAM	Policies (1182) Info A policy is an object in AWS that defines permissions.	C Actions V Delete Create policy
Dashboard	Filter by Type	
 Access management 	Q Search All types	< 1 2 3 4 5 6 7 60 > 🔕
User groups		
Users	Poucy name A Type V Use	d as V Description
Roles	E AccessAnalyzerServiceRolePolicy AWS managed Nor	Allow Access Analyzer to analyze reso
Policies	O Image: AdministratorAccess AWS managed - job function Pere	missions policy (1) Provides full access to AWS services an
Identity providers	Image: AdministratorAccess-Amplify AWS managed Nor	e Grants account administrative permiss
Account settings	AdministratorAccess-AWSElasti AWS managed Nor	e Grants account administrative permiss
▼ Access reports		
Access Analyzer	AlexaForBusinessDeviceSetup AWS managed Nor	Provide device setup access to AlexaFo
External access	○	Grants full access to AlexaForBusiness
Unused access	O AlexaForBusinessGatewayExec AWS managed Nor	Provide gateway execution access to A
Analyzer settings	AlexaEorBusinessLifesizeDeleg AWS managed Nor	Provide across to Lifesize AVS devices
Credential report	Aws managed	Activate Windows
Organization activity		This policy enables Alexa for Business Go to Settings to activate Windows.
Service control policies (SCPS)		

• Click on JSON.

Step 1	Specify permissions			0
Specify permissions	Add permissions by selecting services, actions, resources, and conditions. Build permission statements using the JSON ed	litor.		
Step 2 Review and create	Policy editor	Visua	JSON Actions	• E
	Select a service Specify what actions can be performed on specific resources in a service.			
	Service Choose a service	•		
	+ Add more permissions			
			Car	ncel Next
			Activate Wind	OWS

• Paste the following code into the JSON. Link of code: <u>https://github.com/OneLightWebDev/image-resizer-lambda/blob/main/policy.json</u>

```
{
 "Version": "2012-10-17",
 "Statement": [
  {
   "Effect": "Allow",
   "Action": [
    "logs:PutLogEvents",
    "logs:CreateLogGroup",
    "logs:CreateLogStream"
   ],
   "Resource": "arn:aws:logs:*:*:*"
  },
  {
   "Effect": "Allow",
   "Action": ["s3:GetObject"],
   "Resource": "arn:aws:s3:::BUCKET_NAME/*"
  },
  {
   "Effect": "Allow",
   "Action": ["s3:PutObject"],
   "Resource": "arn:aws:s3:::DEST_BUCKET/*"
  }
 ]
}
```

Step 1 Specify permissions	Specify permissions Info	
Step 2	Add permissions by selecting services, actions, resources, and conditions. Build permission statements using the JSON editor.	
Review and create	Policy editor	Visual JSON Actions v
	<pre>2 * [</pre>	Edit statement Select a statement Select an existing statement in the policy or add a new statement. Add new statement Activate Windows Go to Setting to activate Windows

• After pasting the code click now, click on next.

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			<pre>></pre>	Select a statement Select an existing statement in the policy or add a new statement. + Add new statement
			JSON Ln 24, Col 1	5779 of 6144 characters remaining
			⑦ Security: 0 ⊗ Errors: 0 ▲ Warnings: 0 ♀ Suggestions: 0	
				Activate Windows Cancel Go to Settings to active Next vs.
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• Add the name and click on create policy.

aws	Services Q Search		⑦	Khawaja Saad Ahmed Butt 🔻 🔶
=	IAM > Policies > Create policy			٢
	Step 1 Specify permissions	Review and create Info Review the permissions, specify details, and tags.		0
	Step 2 Review and create	Policy details		
		Policy name Enter a meaningful name to identify this policy.		
		Maximum 128 characters. Use alphanumeric and '+=, @>' characters. Description - optional Add a short optimation for this policy.		
		Maximum 1,000 characters. Use alphanumeric and '+=;,@' characters.		
		Permissions defined in this policy Info Permissions defined in this policy document specify which actions are allowed or denied. To define permissions for an IAM identity (user, user group, or role), attach a policy	cy to it	Edit
		Q, Search Allow (2 of 406 services)	Activate Winc Show remaining Go to Settings to a	IOWS 104 services activate Windows.
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• After creating policy now, click a role and then click on Create role.

aws Services Q Search	[Alt+S]	e 🕹	⑦ ⑧ Global ▼ Khawaja Saad Ahmed Butt ▼
Identity and Access $ imes$ Management (IAM)	IAM > Roles		
Q Search IAM	Roles (7) into An IAM role is an identity you can create that has specific permissions with credentials that are valid for short durations. Roles can be assumed	by entities that you trust.	C Delete Create role
	Q Search		< 1 > 🕲
Dashboard	□ Role name ▲ Trusted entities	Last activity	~
 Access management 	AWS-QuickSetup-StackSet-Local-AdministrationRole AWS Service: cloudformati	ion -	
User groups Users	AWS-QuickSetup-StackSet-Local-ExecutionRole Account: 851725370789	-	
Roles	AWS Cloud 955MAccessRole AWS Service: ec2, and 1 m	ore. 🗹 3 days ago	
Policies	AWSServiceRoleForAWSCloud9 AWS Service: cloud9 (Service)	ce-Linked 3 hours ago	
Account settings	AWSServiceRoleForSupport AWS Service: support (Service)	vice-Linker -	
▼ Access reports	AWSServiceRoleForTrustedAdvisor AWS Service: trustedadvisor	or(Service -	
Access Analyzer	imageresizer-lambda-role AWS Service: lambda	-	
External access			
Analyzer settings	Roles Anywhere Info Authenticate your non AWS workloads and securely provide access to AWS services.		Manage
Credential report			A stimute Minderun
Organization activity Service control policies (SCPs)			Go to Settings to activate Windows.

• Select lambda as service and click next.

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=	Step 2 Add permissions	Trusted entity type		٩
	Step 3 Name, review, and create	AWS service Allow AWS services like EC2, Lambda, or others to perform actions in this account.	Nob identity Allows users federated by the specified external value identity provider to assume this role to perform actions in this efcount:	9
		SAML 20 federation Allow user federated with SAML 2.0 from a coported fetercty to perform actions in this account.		
		Use case Allow an AWS service like EC2, Lambda, or others to perform actions in this account.		
		Service or use case	•	
		Choose a use case for the specified service. Use case Chambda Allows Lambda functions to call AWS services on your behalf.		
			Activate Window Cance Go to Settings to activ	
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• Select the custom created lambda policy and click next.

Services Q Search	[Alt+S] Choose one or more policies to attach to your new role.	2 .	\$ 0 @	Global 🔻 Khawaja Saad Ahmee	d Bu
Step 3 Name, review, and create	Q image	Filter by Type All types 9 matches		< 1 > 🐵	
	Policy name 🛃	Туре	▼ Attach ▼	Description	
		AWS managed	0	Provides full access to all	
	AWSImageBuilderReadOnlyAccess	AWS managed	0	Provides read only access	
	AWSMarketplaceImageBuildFullAccess	AWS managed	0	Provides full access to AW	
	Ec2ImageBuilderCrossAccountDistributionAccess	AWS managed	0	Permissions need by EC2	
	EC2ImageBuilderLifecycleExecutionPolicy	AWS managed	0	The EC2ImageBuilderLife	
	EC2InstanceProfileForImageBuilder	AWS managed	0	EC2 Instance profile for Ir	
	EC2InstanceProfileForImageBuilderECRContainerBui	AWS managed	0	EC2 Instance profile for b	
	imagebucket-policy-lambda	Customer managed	1	-	
	ROSAImageRegistryOperatorPolicy	AWS managed	0	Allows the OpenShift Ima	
	 Set permissions boundary - optional 			,	
			Activat Cancel Go to Se	te Window Previous things to active the Window	VS.
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• Add role name and create role.

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=	Step 2 Add permissions	Role details					©
	Step 3 Name, review, and create	Role name Exter a maxing/ul name to identify this role. I Maximum 64 characters. Use alphanumeric and "+=,@=_" characters. Description Add a bort explanation for this role. Allows Lambda functions to call AWS services on your behalf. Maximum 1000 characters. Use alphanumeric and "+=,@=_" characters.					
		Step 1: Select trusted entities				Edit	
		Trust policy 1 - [()		A	Activate Wind	dows activate Windows.	

• Next, proceed to create a Lambda function and select the option to "Use an existing role." Then, search for the pre-existing role you have previously created and click create function.

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-	Choose the l	anguage to use to write you	ar function. Note that the console co	ode editor supports only	Node.js, Python, and Ruby	6									_
-	Node.js 2	0.×						-	C						S
															0
	Choose the i	'e Info ostruction set ambitecture y	ou want for your function code												
	x86_64														
	O arm64														
	Permissi	ONS Info													
	By default, L	ambda will create an execut	tion role with permissions to upload	d logs to Amazon Cloud	Watch Logs. You can custon	nize this default role later when addir	ng triggers.								
	▼ Change	default execution role													
	Execution	ala													
	Choose a rol	e that defines the permissio	ins of your function. To create a cust	tom role, go to the IAM	console 🔽.										
	O Create	a new role with basic La	mbda permissions												
	🖸 Use an	existing role													
	 Create 	a new role from AWS po	olicy templates												
	Existing ro	e disting role that you've creat	ted to be used with this Lambda fur	oction. The role must be	ve permission to unload lor	ns to Amazon CloudWatch Loos									
									C						
								-	0						
	<u> </u>														
	imageres	izer-lambda-role													
		and services													
											Activ	ate Wind	reate function		
											Go to	Settings to	activate Winde		
Clouds	hell Feedbad						02	024 Amazor	Web Serv	ices, Inc. c	r its affilia	ates. Privacy	Terms Cookie	preferenc	

• Created Lambda function successfully.

mage-resizer-lamda-function	Throttle 🗇 Copy ARN Actions 🔻
▼ Function overview Info	Export to Application Composer Download 🔻
Diagram Template Image-resizer-lamda- function Eavers (0)	Description - Last modified 52 minutes ago Function ARN G arn:awslambdacus-east-1:851725370789:function:image-resizer-la mda-function Function URL Info -
Code Test Monitor Configuration Aliases Versions	Activate Windows

• Go to source code and upload zip file that is provided with the name "Function.zip".

ulty created the function line	e-resizer-lamoa-runction. You can now change its code and configuration. To invoke your function with a test event, choose	lest.					
e Test Monitor	Configuration Allases Versions						
e source Info					Upl	oad from 🔺	
ile Edit Find View Go	Tools Window Test V Deploy				.zip	nie azon S3 location	_
Go to Anything (Ctrl-P)	🖥 index.mjs × Environment Var × 🕑			_			
 image-resizer-lamdi & · index.mjs 	<pre>1 proper costs hadder = async (event) => { // Too bullenet // Too bullenet // too bullenet statusCode: 200, body: 350.string[ty('Hello from Lambda''), }; // too bullenet // too bullenet</pre>						
				Acti	ivate Win	dov	VS

• After choosing zip file click save.

Upload a .zip file	×	
When you upload a new .zip file package, it overwrites the existing code.		
function.zip X 7.91 MB For files larger than 10 MB, consider uploading using Amazon S3.		
	Cancel Save	

• Once you have uploaded the ZIP file, navigate to the "Configuration" tab and go to Environment Variables and then click on Edit.

	agenesizer-tainus-runction.		~
Code Test Monitor	Configuration Aliases Versions		
General configuration	Environment variables	Edit	
Triggers	Q. Find environment variables	< 1 >	
Permissions	No.		
Destinations	key value		
Function URL	No environment variables		
Environment variables	No environment variables associated with th	his function.	
Tags	Edit		
VPC			
RDS databases			
Monitoring and operations tools			
Monitoring and operations tools Concurrency			

• Click on Add environment

aws	Services Q Search [Alt+5]	D	\$ Ø	N. Virginia •	Khawaja Saad Ahmed Butt 🔻
=	Lambda > Functions > image-resizer-lamda-function > Edit environment variables				٩
	Edit environment variables				0
	Environment variables You can define environment variables as key-value pairs that are accessible from your function code. These are useful to store configuration settings without the need to change function code. Learn more 🖸				
	There are no environment variables on this function. Add environment variable				
	Encryption configuration				
	Cancel Save				
			A	Activate Windo	WS tivate Windows.

• Enter "DEST_BUCKET" in the Key field, and in the Value field, input the name of the bucket containing the photos and click on save.

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> Functions > image-resizer-lan	nda-function > Edit environment variables					
environment varia	bles					
nonmont uprichles						
n define environment variables as key-valu as without the need to change function coc	e pairs that are accessible from your function code. These are useful to store configuration fee. Learn more 🗹					
T_BUCKET	Value resized-origional-images-bucket Remove					
dd environment variable						
cryption configuration						
	Cancel					
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(ir n ps	C said C said	c Q south (units) Functions > image-resizer-landa-function > Edit environment variables environment variables onment variables define environment variables as key-value pain that are accessible from your function code. These are useful to store configuration without the need to change function code. Learn more [] Value BUCKET [Carcel Sore	Control of the second sec	Cancel Source Cancel Cancel	c control provide a control of the control of th

• Test using Event JSON.

						ſ
Event	JSON			Forn	nat JSON	
3 - 4 4 5 6 7 7 8 9 • 10 11 12 - 113 - 114 15 - 16 17 16 - 17 18 - 17 18 - 20 22 - 22 2 22 22 22 2 24 - 22 5 26 29 - 20 20 - 20 20 - 20 20 - 20 20 - 20 -	<pre>{ eventVersion: "2.8", "eventVersion: "2.8", "awaRegion: "uness:1", "eventime: 1379-00-0100:00:00.002", "eventime: "1379-00-0100:00:00.002", "eventime: "1370-00-0100:00:00.002", "eventime: "1370-00-0100:00:00:000", "courcelPAddress: "127.0.0.1" "courcelPaddress: "10.0" "courcelPaddress: "10.0"</pre>	jklambdaisawesome∕mnopqrstvvvxy inages″ bcdef″,	CABCDEFGH*			
33						

• Now Click on Add trigger.

⊘ 9	Successfully up	idated the function image-resiz	er-lamda-function.		×
	image-	unctions > image-resizer-lan resizer-lamda-fu	unction		Throttle Copy ARN Actions V
	▼ Funct	ion overview Info			Export to Application Composer Download 🔻
	Diagra + Add	m Template	image-resizer-lamda- function	+ Add destination	Description - Last modified T6 minutes ago Function ARN @ armawisambdaus-east-1:851725370789:function.image-resizer-la mda-function Function URL Info -
	Code	Test Monitor Cont	iguration Aliases Versions		Activate Windows

• In Add trigger search S3.

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=	Lambda > Add trigger					٩
	Add trigger					0
	Trigger configuration Info					
	Select a source	•				
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• In Event type add bucket name that hold original images and click add.

BUCKELTERION: US-BESIC							
Event types Select the events that you want to have tring	er the Lambda function. You can ontionally set up a prefix or suffix for ar	event Howeve	ar for				
each bucket, individual events cannot have m	ultiple configurations with overlapping prefixes or suffixes that could ma	tch the same ob	bject				
	•						
All object create events $ imes$							
Prefix - optional Enter a single optional prefix to limit the not	fications to objects with keys that start with matching characters.						
e.g. images/							
Suffix - optional Enter a single optional suffix to limit the noti	fications to objects with keys that end with matching characters.						
e.gjpg							
Recursive invocation If your function writes objects to an S3 bucke bucket increases the risk of creating a recursi more	t, ensure that you are using different S3 buckets for input and output. W invocation, which can result in increased Lambda usage and increased	iting to the sam costs. Learn	ne				
 I acknowledge that using the same recommended and that this configu Lambda usage, and increased costs 	S3 bucket for both input and output is not iration can cause recursive invocations, increased						
Lambda will add the necessary permiss more 🖸 about the Lambda permission	ions for AWS S3 to invoke your Lambda function from this trig s model.	iger. Learn					
		Cancel	Add		Ac Go	tivate Wind to Settings to	dows activate Windo
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Diagram Template	image-resizer-lamda- function	Description - Last modified
<u>6</u> 83	Layers (0)	22 minutes ago Function ARN III arstination To arrival submitted association and a state of the state of t
+ Add trigger		-
+ Add trigger Code Test Monitor General configuration	Configuration Aliases Versions	-
+ Add trigger Code Test Monitor General configuration Triggers	Configuration Aliases Versions Triggers (1) Info Q. Find triggers Q.	Function DRL Integer C Fix errors Edit Delete Add trigger < 1 >
Add trigger Code Test Monitor General configuration Triggers Permissions Destinations	Configuration Aliases Versions Triggers (1) info	C Fix errors Edit Delete Add trigger < 1 >

• Now, add the original images to one bucket, and the resized images will be stored in another bucket.

Input image



Resized image



Conclusion

In this lab, we successfully created a solution using AWS Lambda and S3 to automatically resize images upon upload. By integrating Lambda with S3 and utilizing Node.js libraries for image processing, we were able to achieve a scalable and cost-effective image resizing solution. This lab provides a foundation for building more complex image processing pipelines using serverless architecture on AWS.



Sukkur IBA University

Bootcamp

Cloud Computing

2024

Lab Module #5 Setting up a VPC with Public and Private Subnets on AWS

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



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Objectives

- Understand the concept of Virtual Private Cloud (VPC) in AWS.
- Create a VPC with public and private subnets.
- Configure internet access for instances in the public subnet.
- Restrict internet access for instances in the private subnet.
- Launch EC2 instances in both public and private subnets.
- Test connectivity between instances.

Pre-requisites

- An AWS account with administrative privileges.
- Basic knowledge of AWS services.
- Access to AWS Management Console.

Outcomes

After completing this session, student should be able to:

- Gain hands-on experience in creating AWS Lambda functions.
- Understand how to integrate AWS Lambda with S3 buckets.
- Learn how to resize images using Node.js libraries within Lambda.

Introduction

Amazon Virtual Private Cloud (VPC) allows you to provision a logically isolated section of the AWS Cloud where you can launch AWS resources in a virtual network. Subnets are segments of a VPC's IP address range where you can place groups of resources. Public subnets are accessible from the internet, while private subnets are not directly accessible. Subnetting is the practice of dividing a network into smaller subnetworks for improved efficiency and security.

What is a VPC?

A Virtual Private Cloud (VPC) is a virtual network dedicated to your AWS account. It enables you to launch AWS resources into a virtual network that you define.

What is a Public Subnet?

A public subnet is a subnet that has an associated route table that directs traffic to the internet gateway. Instances in a public subnet can have public IP addresses and can communicate directly with the internet.

What is a Private Subnet?

A private subnet is a subnet that does not have a direct route to the internet. Instances in a private subnet can communicate with other instances in the VPC and can access the internet via a NAT gateway or NAT instance.

What is Subnetting?

Subnetting is the process of dividing a network into smaller subnetworks. It helps in efficient utilization of IP addresses and improves network security by segregating different types of resources.



Steps to create VPC with Public and Private Subnets to deploy an EC2 instance

The outlined procedure involves setting up both public and private subnets, followed by utilizing these subnets to deploy an EC2 instance.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create a VPC:

• Upon logging in, access the AWS Management Console's search bar, enter "VPC," and click to open the Virtual Private Cloud (VPC) service.



• Go to your VPC.

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▼ Vir You Sub	tual private cloud		VPCs See all regions	US East 2	NAT Gateways See all regions	US East O	Zon Cor	i <u>es</u> isole Exp	periment	5				
Rou	ite tables		Cubacto				Ad	dition	al Info	rmati	on			
Inte	ernet gateways		See all regions	US East 10	Connections	East O	VPC	Docum	entation					
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Car	rier gateways		Route Tables	US East 5	Network ACI s	US Fast 2	Rep	ort an Is	ssue					
DH	CP option sets				See all regions									
Ela	stic IPs		Internet Gateways	US East 2			AN	/S Net	work N	lanag	ler Activate	Windows		
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• Click on create VPC.

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VPC dashboard X	Your VPCs (2) Info C Actions ▼ Create VPC 0 Q. Search < 1 > ⊗
Filter by VPC: Select a VPC	□ Name ▼ VPC ID ▼ State ▼ IPv4 CIDR ▼ II □ project-vpc vpc-0ee3525036155e990 O Available 10.0.0/16 -
 Virtual private cloud Your VPCs 	□ - vpc-04890b2673355c706
Subnets Route tables	
Internet gateways Egress-only internet	ـــــــــــــــــــــــــــــــــــــ
gateways Carrier gateways	Details Resource map CIDRs Flow logs Tags Integrations
DHCP option sets Elastic IPs	Details
Managed prefix lists	VPC ID State DNS hostnames DNS resolution Go to Settings to activate Windows
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• Assign a name tag to your VPC, specify an IPv4 CIDR block, and click Create VPC.

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	tesources to create reate only the VPC res VPC only lame tag - optional reates a tag with a key my-new-vpc Pv4 CIDR block Inf	info source or the VPC and other y of 'Name' and a value that fo	networking resources.]								 (i) (i)
	 IPv4 CIDR manual IPAM-allocated I 	al input IPv4 CIDR block										
	Pv4 CIDR 10.200.0.0/16	e between /16 and /28.		l								
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• Created VPC Successfully.



Step 3: Create Subnets:

• Navigate to the Subnets section in the VPC dashboard.



• Click on "Create subnet".

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VPC dashboard	×	Subnets (1/10) Info C Actions ▼ Create subnet)
EC2 Global View 🖸	1	Q Find resources by attribute or tag C 1 > @ G	3
Filter by VPC:		Name VPC	
Select a VPC	•	□ - <u>subnet-0998eebd548355962</u> ⊘ Available <u>vpc-04890b2673355c706</u>	
 Virtual private clo 	bu	project-subnet-public1-us-east-1a subnet-00cb0c045d584f8d7 🥥 Available vpc-0ee3525036155e990	
Your VPCs		- subnet-0cd99bd6fd0874603 ⊘ Available vpc-04890b2673355c706	
Subnets		4	
Route tables			
Internet gateways		subnet-00cb0c045d584f8d7 / project-subnet-public1-us-east-1a	
Egress-only interno gateways	t	Details Flow logs Route table Network ACL CIDR reservations Sharing Tags	
Carrier gateways		Details	
DHCP option sets		Details	
Elastic IPs		Subnet ID Subnet ARN State IPv4 CIDR +	
Managed prefix lis	s	Activate Windows Go to Settings to activate Windows.	
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• Choose the VPC created in step 2.

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<u>VPC</u> > <u>Subnets</u> > Create subnet				ŝ
Create subnet Info				9
VPC				
VPC ID Create subnets in this VPC.				
vpc-00bd3417430288f48 (my-new-vpc)				
Associated VPC CIDRs				
IPv4 CIDRs 10,200.0.0/16				
Subnet settings				
specify the CIDR blocks and Availability zone for the subnet.			Activate W Go to Setting	/indows s to activate Windows,
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• Add the subnet name, select the availability zone, enter the IPV4 CIDR block for the subnet

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Su	bnet 1 of 1										(i)
	Subnet name Create a tag with a l	key of 'Name' and a value that you specify.									0
	PublicSubnet-A										
	The name can be up	to 256 characters long.									
	Availability Zone Choose the zone in	Info which your subnet will reside, or let Amazon choose one fo	r you.								
	US East (N. Virg	inia) / us-east-1a	•								- 1
	IPv4 VPC CIDR bl Choose the VPC's IP	ock Info v4 CIDR block for the subnet. The subnet's IPv4 CIDR must	lie within this block.								
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• Click on create subnet.

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	Choose the VPC's IP	v4 CIDR block for the subnet. T	he subnet's IPv4 CIDR mi	ust lie within this block.	-								(i)	^
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	Q Name	×	Q PublicSubnet-	а ×	Remo	ove								
	Add new tag													
	You can add 49 mor	re tags.												
	Remove													
	Add new subne	t												
					Cancel	Create sul	onet			Activate	Windows			
										Go to Setti	ngs to activa	te Windows.		÷
Clo	udShell Feedbac	k				© 2024, Amaz	on Web Se	ervices, Inc. o	r its affiliat	es. Privacy	Terms	Cookie prefe	rences	

• Click on "Create subnet" in order to create the private subnet.

aws	Services	Q Sea	rch	[Alt+S] D 🕹	00	N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
VPC di EC2 Gl	ashboard lobal View 🛃	×	Subnets (1/10) Info Q Find resources by attribute or tag		C Actio	Create subnet □
Filter I	by VPC:		■ Name	Subnet ID 🗸	State	▼ VPC
Selec	t a VPC	•	-	subnet-0998eebd548355962	🕑 Available	vpc-04890b2673355c706
▼ Virtua	I private cloud		project-subnet-public1-us-east-1a	subnet-00cb0c045d584f8d7	🕢 Available	vpc-0ee3525036155e990
Your V	/PCs		-	subnet-0cd99bd6fd0874603	🔗 Available	vpc-04890b2673355c706
Subne	ets		4			• • •
Route	tables			=		
Intern	et gateways		subnet-00cb0c045d584f8d7 / project-s	ubnet-public1-us-east-1a		~
Egress gatew	-only internet ays		Details Flow logs Route table	Vetwork ACL CIDR reservations	Sharing	Tags
Carrie	r gateways		Details			
DHCP	option sets		Details			
Elastic	IPs		Subnet ID Subnet ARN	State	1	Pv4 CIDR 🗸
Manag	ged prefix lists		-			Activate windows Go to Settings to activate Windows.
S. Clouds	Shell Feedback			© 2024, Amazon Web Ser	vices, Inc. or its affiliate	s. Privacy Terms Cookie preferences

• Choose the VPC created in step 2.

aws Services Q Search	[Alt+S] D 4	© 0 4	N. Virginia 🔻	Khawaja Saad Ahme	l Butt 🔻
<u>VPC</u> > <u>Subnets</u> > Create subnet					ŝ
Create subnet Info					9
VPC					
VPC ID Create subnets in this VPC.					
vpc-00bd3417430288f48 (my-new-vpc)					
Associated VPC CIDRs					
IPv4 CIDRs 10.200.0.0/16					
Subnet settings					
Specify the CIDR blocks and Availability Zone for the subnet.			Activate \ Go to Setting	Windows gs to activate Windov	/s. 👻
E CloudShell Feedback	© 2024, Amazon Web	Services, Inc. or its affiliat	es. Privacy	Terms Cookie pre	ferences

• Add the subnet name, select the availability zone, enter the IPV4 CIDR block for the subnet

aw	S Services Q Search	[Alt+S]	2	¢	0	0	N. Virginia 🔻	Khawaja	Saad Ahmed E	Butt 🔻
	Subnet 1 of 1								-	(i)
	Subnet name Create a tag with a key of 'Name' and a value that you specify.									G
	PrivateSubnetB									
	Availability Zone Info Choose the zone in which your subnet will reside, or let Amazon choose one for you.									4
	US East (N. Virginia) / us-east-1b	•								- 1
	IPv4 VPC CIDR block Info Choose the VPC's IPv4 CIDR block for the subnet. The subnet's IPv4 CIDR must lie within this	block.								- 1
	10.200.0.0/16	•								- 1
	IPv4 subnet CIDR block									
	10.200.1.0/24 2	56 IPs								
	$\langle \rangle$ \wedge \vee									
	Tags - optional			_			Activate Go to Settin	Windows gs to activa	s te Windows	Ŧ
> (CloudShell Feedback	©:	024, Amazon	Web Serv	vices, Inc. or	its affilia	tes. Privacy	Terms	Cookie prefe	rences

• Click on create subnet.

aws Services Q Search		[Alt+S]	D 4	© ©	N. Virginia 🔻	Khawaja S	aad Ahmed Butt 🔻
Choose the VPC's IPv4 CIDR block for the subnet. The subnet's IPv4 C	DR must lie within this block.						(à) ^
10.200.0.0/16	•						0
IPv4 subnet CIDR block							9
10.200.1.0/24	256 IPs						
$\langle \rangle \land \vee$							
Tags - optional							
Key Value - option	al						
Q Name X Q PrivateSu	ibnetB ×	Remove					
You can add 40 more tags							
Romovo							
Keniove							
Add new subnet							
		Cancel Crea	te subnet	1	Activate	Windows	
					Go to Settin	igs to activat	te Windows. 👻
EloudShell Feedback		© 2024	, Amazon Web	Services, Inc. or its aff	iliates. Privacy	Terms	Cookie preferences

Step 3: Configure Internet Gateway (IGW):

• Navigate to the Internet Gateways section in the VPC dashboard.

aws Services	Q Sea	ch [Alt+S] D 😓 🔗 Ô N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
VPC dashboard EC2 Global View 🔀	×	Route tables (5) info Create route table Q. Find resources by attribute or tag < 1 > (2)
Filter by VPC:		□ Name ▼ Route table ID ▼ Explicit subnet associ ▼ Edge associations ▼
Select a VPC	•	- <u>rtb-04dda1c2175e9c484</u>
 Virtual private cloud 		project-rtb-private2-us-east-1b <u>rtb-039570994d18b6bf8</u> <u>subnet-0eb421b3b6e571</u>
Your VPCs		project-rtb-public rtb-0d770839d67cc7f20 2 subnets -
Subnets		project-rtb-private1-us-east-1a rtb-098cc9c40a4dfba90 subnet-01b8a4fc491fbb2
Route tables		
Internet gateways		
Egress-only internet gateways		Select a route table
Carrier gateways		
DHCP option sets		
Elastic IPs		
Managed prefix lists		Activate Windows Go to Settings to activate Windows.
CloudShell Feedback	< Contract of the second se	© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preference

• Name the name tag and click on create internet getaway.

Services Q Search	ı			[Alt+S]	24	0 4	۲	N. Virginia 🔻	Khawaja Saad	Ahmed Butt
the gateway below.										٤
Internet gateway settin	gs									G
Name tag										
Creates a tag with a key of 'Name' an	d a value that y	/ou specify.								
my-internet-getway										
Tage optional										
A tag is a label that you assign to an	AWS resource.	Each tag consists of a key and an op	tional value. You c	an use tags to search and	l filter					
your resources or track your Aws cos										
Key		Value - optional								
Q Name	×	Q my-internet-getway	×	Remove						
Add new tag										
Very serie and d. 40 means to be										
You can add 49 more tags.										
You can add 49 more tags.										
You can ado 49 more tags.			Cancel	Create internet g	ateway			Activate Go to Setti	Windows	indows.

• Choose the name of the internet getaway you have created and select and Action and click on Attach to VPC.

aws	Services	Q Sear	rch	[Alt+S]	2	Ş	0	۲	N. Virginia 🔻	Khawaja Saad Ahmed B	utt 🔻
VPC	dashboard	×	The following internet gateway was created attach to a VPC to enable the VPC to conduct on the VPC to condu	nted: igw-0d53449530900c9ec - r mmunicate with the internet.	ny-inter	rnet-get	way. You	can now	Att	ach to a VPC X	(i) (s)
Filte	r by VPC:		Internet gateways (1/3) Info			C	Actio	ons 🔺	Create in	ernet gateway	• •
Se	ect a VPC	•	Q Search				View	details		< 1 > ③	
			Name	▼ Internet gateway ID			Attac	h to VPC:		VPC ID	
▼ Virt	ual private cloud			igw-037e78e5abf5d	3 <u>a88</u>		Deta	ch from V	'PC	vpc-04890b267335	
You	VPCs		project-igw	igw-07725fa3ccfd88	635		Mana	ige tags		vpc-0ee352503615	
Sub	nets		✓ my-internet-getway	igw-0d53449530900)c9ec		Delet	e interne	t gateway	-	
Rou	te tables					_					•
Inte	rnet gateways		N								
Egre	ss-only internet ways		igw-0d53449530900c9ec / my-ii	nternet-getway							•
Carr	ier gateways		Details Tags								
DHC	P option sets										
Elas	tic IPs		Details								
Mar	aged prefix lists		•						Activate Go to Settin	Windows	•
S. Clo	ıdShell Feedback	:	Internet astoway ID Stat	© 2024,	Amazon '	Web Ser	vices, Inc. o	or its affilia	tes. Privacy	Terms Cookie prefe	rences

• Choose the VPC you have created from the available VPC and click to attach internet getaway.

aws I III Services Q Search [Al	:+S] 🕑	\$	Ø	٢	N. Virginia 🔻	Khawaja S	iaad Ahmed Bu	itt 🔻
The following internet gateway was created: igw-0d53449530900c9ec - my-internet-getway. You ca communicate with the internet.	n now attach to a	VPC to e	nable th	e VPC to	A A	ttach to a VI	PC X	٩
VPC > Internet gateways > Attach to VPC (igw-0d53449530900c9ec)								0
Attach to VPC (igw-0d53449530900c9ec) Info								
VPC Attach an internet gateway to a VPC to enable the VPC to communicate with the internet. Specify the VPC to attach	below.							
Available VPCs Attach the internet gateway to this VPC.								
Q vpc-00bd3417430288f48								
AWS Command Line Interface command								
Cancel Attac	h internet gate	way						
					Activate Go to Sett	Windows		
CloudShell Feedback	© 2024, Amazo	n Web Ser	vices, Inc. o	or its affil	iates. Privac	/ Terms	Cookie prefer	ences

Step 4: Route table:

• Navigate to the route tables in the VPC dashboard.

aws Services	Q Sear	rch [Alt+S] D 🕹 🤡	(③ N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
VPC dashboard	×	Subnets (12) Info	Create subnet
EC2 Global View 🗹		Q Find resources by attribute or tag	< 1 > © 9
Filter by VPC:		□ Name ▼ Subnet ID ▼ St	ate 🗢 VPC
Select a VPC	•	□ - <u>subnet-0998eebd548355962</u> ⊘	Available vpc-04890b2673355c706
 Virtual private cloud 		project-subnet-public1-us-east-1a subnet-00cb0c045d584f8d7	Available vpc-0ee3525036155e990
Your VPCs		subnet-0cd99bd6fd0874603	Available vpc-04890b2673355c706
Subnets		<u>- subnet-0e016c30a169d3651</u>	Available vpc-04890b2673355c706
Route tables		4	
Internet gateways			
Egress-only internet gateways		Select a subnet	
Carrier gateways			
DHCP option sets			
Elastic IPs			
Managed prefix lists		*	Activate Windows Go to Settings to activate Windows.
➢ CloudShell Feedback	k	© 2024, Amazon Web Services, Ir	nc. or its affiliates. Privacy Terms Cookie preferences

• Click on create route table.

aws	Services	Q Se	arch			[Alt+S]	9 4	© © 4	N. Virginia 🔻	Khawaja Saa	id Ahmed Butt 🔻
VPC dash EC2 Glob	hboard bal View 🔼	×	Ro	oute tables (5) Info Q. Find resources by attribute or tag				C Action	ns 🔻 Cr	eate route tab	ole â
Filter by	VPC:			Name	∇	Route table ID	∇	Explicit subnet as	ssoci 🔻	Edge associat	ions 🔻
Select a	a VPC	•		-		rtb-04dda1c2175e9c484	4	-		-	
▼ Virtual p	private cloud			project-rtb-private2-us-east-1b		rtb-039570994d18b6bf8	8	subnet-0eb421b3	b6e571	-	_
Your VPC	Cs			project-rtb-public		rtb-0d770839d67cc7f20	2	2 subnets		-	
Subnets				project-rtb-private1-us-east-1a		rtb-098cc9c40a4dfba90		subnet-01b8a4fc	491fbb2	-	
Route ta	ables		-								
Internet	gateways										
Egress-o gateways	only internet rs		Sel	lect a route table							
Carrier g	gateways										
DHCP op	ption sets										
Elastic IP	Ps										
Managed	d prefix lists		-						Activate Go to Sett	e Windows ings to activate	Windows.
▶ CloudShe	ell Feedback					© 2024, Ama	azon Web	Services, Inc. or its affil	liates. Privac	/ Terms C	ookie preferences

• Name the route table and select the VPC you have created and click on create route table.

aws Services Q Search [Alt	+S]	¢	?	۲	N. Virginia 🔻	Khawaja Saad Ahm	ed Butt 🔻	-
VPC > Route tables > Create route table							١	^
Create route table Info A route table specifies how packets are forwarded between the subnets within your VPC, the internet, a connection.	nd your VPN						0	l
Route table settings								l
Name - optional Create a tag with a key of 'Name' and a value that you specify.								l
PublicRT-A VPC								l
The VPC to use for this route table. vpc-00bd3417430288f48 (my-new-vpc)								ł
Tags A tag is a label that you assign to an AWS resource. Each tag consists of a key and an optional value. You can use tage your resources or track your AWS costs.	to search and filte	:r'			Activate	Windows	ows.	Ţ
CloudShell Feedback	© 2024, Amazo	n Web Se	rvices, Inc	. or its affi	liates. Privacy	Terms Cookie p	oreference	es

• Now navigate the routes and click on edit routes.

aws	Services	Q Search		[Alt+	s] 🖸 🔶 🤇	D ©	N. Virginia 🔻	Khawaja Saad A	hmed I	Butt 🔻
VPC	dashboard	× Îe	Route table rtb-0f2caacda8c59c56	59 PublicRT-A was created su	ccessfully.				×	(i) ^
EC2	Global View 🗾		Details Info							0
Se	elect a VPC	•	Route table ID	Main D No	Explicit subnet associ –	iations	Edge associatio –	ns		1
▼ Virt	ual private cloud		VPC	Owner ID						
You	ir VPCs		vpc-00bd3417430288f48	851725370789						
Sub	onets		my-new-vpc							
Rou	ite tables		Routes Subnet association	s Edge associations	Route propagation	Tags				
Inte	ernet gateways									
Egr gat	ess-only internet eways		Routes (1)				Both 🔻	Edit routes		
Car	rier gateways		Q Filter routes				<	1 > ©		
DH	CP option sets		Destination ∇	Target	▼ Status	~	Propagated	∇		
Elas	stic IPs		10.200.0.0/16	local	O Active		No			
Mai	naged prefix lists	-					Go to Settin	WINGOWS gs to activate Wi	ndows	
S. Clo	udShell Feedback	<			© 2024, Amazon Web Services,	, Inc. or its affi	iates. Privacy	Terms Cook	ie prefe	erences

• Now click on add routes.

ą	Services Q Search	[Alt+	5] 🕨	\$ Ø Ø	N. Virginia 🔻	Khawaja Saad Ahmed Bu	tt 🔻
	VPC > Route tables > rtb-0f2caacda8c59c569 > Edit Edit routes	routes					0
	Route 1 Destination 10.200.0.0/16	Target local Q local	• ×	Status Ø Active			
	Propagated No						
	Audiouce			Cancel	Préviewate Go to Settir	Wi Save changes	

• Specify the destination and target the internet gateway by selecting the created internet gateway and click on save changes.

aws	Services	Q Search		[Alt+S]	\$	0 (🗿 🛛 N. Virginia 🔻	Khawaja Saad Ahme	d Butt 🔻
	No								© ^
	Route 2								
	Destination		Target		Status				
	Q 0.0.0.0/0	×	Internet Gateway	•	-				
			Q igw-0d53449530900c9ec	×					
	Propagated								
	No								
								Pamaya	
								Remove	
	Add route								
						Cancel	Previewtivate	Save changes	
_							do to setti	ngs to detrate windo	114

• Now navigate Subnet association and click on Edit Subnet Associations.

aws	Services	Search [Alt+S] 🖸 ᡇ Ø Ø N. Virginia ▼ Khawaja Saad Ahmed Bu	tt 🔻
VPC EC2 Filto	C dashboard 2 Global View 🔀 er by VPC:	Updated routes for rtb-0f2caacda8c59c569 / PublicRT-A successfully Details Upc-0obustr174502co140	3) (9)
Se Virt	elect a VPC	Routes Subnet associations Edge associations Route propagation Tags	
You	ır VPCs	Explicit subnet associations (0) Edit subnet associations	- 1
Sub	onets	Q. Find subnet association < 1 > (2)	- 1
Rou Inte	u te tables ernet gateways	Name V Subnet ID V IPv4 CIDR V IPv6 CIDR V	
Egr	ess-only internet eways	No subnet associations You do not have any subnet associations.	
Car	rier gateways		- 1
DH	CP option sets		- 1
Elas	stic IPs	Subnets without explicit associations (2) Edit subnet associations	
Mai	naged prefix lists	The following subnets have not been explicitly associated with any route tables and are therefore associated with the main route tables and are therefore associated with the main route tables are tables are tables are therefore associated with the main route tables are ta	
▶ Clo	oudShell Feedbac	© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie prefere	ences

• Select the public subnet you have created and apply save associations.

aws Services Q Search [A	.[t+S] D 🗘 ⑦ ⑧ N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
Edit subnet associations Change which subnets are associated with this route table.	© 1
Available subnets (1/2)	
Q Filter subnet associations	< 1 > @
■ Name ▼ Subnet ID ▼ IPv4 CIDR	▼ IPv6 CIDR ▼ Route table ID
PublicSubnet-A subnet-05c943a728aefe491 10.200.0.0/24	- <u>Main (rtb-0702876b1a33fdb3</u>
PrivateSubnetB subnet-03d209d0da4215a9b 10.200.1.0/24	- Main (rtb-0702876b1a33fdb3
Selected subnets subnet-05c943a728aefe491 / PublicSubnet-A ★	
	Cancel Act VeSave astociations Go to Settings to activate windows.
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Step 5: Launch EC2 Instances:

• click on search, write "EC2", and select "EC2" section.

aws	Services	Q ec2	× D & Ø © N.VI	rginia ▼ Khawaja Saad Ahmed Butt ▼
=	Consol		Search results for 'ec2'	ets (3
	:: Recen	Services (13) Features (57)	Services See all	13 results ►
	🔁 S3	Resources New Documentation (34,707)	같 Virtual Servers in the Cloud	
	Lamb	Knowledge Articles (612) Marketplace (3,456)	EC2 Image Builder ☆ A managed service to automate build, customize and deploy OS images	
	Cloud	Events (30) Tutorials (21)	Recycle Bin Protect resources from accidental deletion	jina
	👼 Route		Q Amazon Inspector ☆	
	EC2		Continual vulnerability management at scale	Activate Windows
Cloud	Shell Feedback	:	© 2024, Amazon Web Services, Inc. or its affiliates.	Privacy Terms Cookie preferences

• Click on Instances (running)

aws	Services	Q Search		[Alt+S]	D 4	🕜 🧔 N. Virginia 🔻 K	hawaja Saad Ahmed Butt 🔻
EC2	Dashboard Global View	×	Resources	EC2 Global view 🖾	© C	EC2 Free Tier Info Offers for all AWS Regions.	©
Eve	nts		You are using the following Amazon EC2 reso	ources in the US East (N. Virginia) Regi	ion:		
Con	e Preview		Instances (running)	0 Auto Scaling Groups	ο	0 EC2 free tier offers in use	
▼ Inst	ances		Dedicated Hosts	0 Elastic IPs	0	End of month forecast 0 offers forecasted to exceed fre	e tier li
Inst	ances ance Types		Instances	1 Key pairs	3	mit.	
Lau	nch Templates		Load balancers	0 Placement groups	0	Δ 0 offers exceeded and is now pay	y-as-yo
Spo Sav	t Requests ings Plans		Security groups	5 Snapshots	0	u-go pricing. View Global EC2 resources	
Res	erved Instances		Volumes	1			
Dec	licated Hosts						
Cap	acity					View all AWS Free Tier offers	2
Res Tima AMI	ges	•	Launch instance To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.	Service health AWS Health Dashboard		Account attributes Account attributes Go to Settings to a	ove

• Add the name of the instance.

aws	Serv	ices	Q Search	[Alt+S	5]	2	¢	0	۲	N. Virgii	nia 🔻	Khawaja S	aad Ahmed	Butt 🔻	
=	<u>EC2</u> >	Insta	ces > Launch an instance											١	
														9	
	Laui	۱ch	an instance Info												
	Amazon the simp	EC2 a	ows you to create virtual machines, or instances, that run on the AW: s below.	5 Cloud. Quid	kly get s	tarted I	oy follo	wing							
	Nar	1e a	tags Info												
	Nam	a													
	put	licsut	et-instance	A	dd addit	ional ta	gs								
	▼ A	ppli	ation and OS Images (Amazon Machine Image) Info												
	An A	MI is a	emplate that contains the software configuration (operating system	application	server, ar	nd appli	cations)		Act	ivate \	Nindows			
_	requi	red to	aunch your instance. Search or Browse for AMIs if you don't see what	you are lool	king for b	elow				Go 1	o Settin	gs to activa	te Windows	. •	
S. Clou	idShell Fe	edbac			© 2024, A	Amazon N	Web Serv	ices, Inc	. or its affi	liates.	Privacy	Terms	Cookie pref	erences	

• Create key for the instance.

aws	Services	Q Search	[Alt+S]	D \$ 0	🙆 N. Virginia 🔻	Khawaja Saad Ahmed Butt 🔻
≡	On-Demar On-Demar On-Demar	nd SUSE base pricing: 0.0116 USD per Hour nd RHEL base pricing: 0.0716 USD per Hour nd Linux base pricing: 0.0116 USD per Hour	Compa	re instance types		<u>ن</u>
	Additional	costs apply for AMIs with pre-installed software				0
	▼ Key p	bair (login) Info				
	You can us you launch	e a key pair to securely connect to your instance. Ensure t a the instance.	hat you have access to the selec	ted key pair before		
	Key pair na	ame - required				
	publicsul	onetmachine	▼ C Cre	eate new key pair		
	▼ Netw	ork settings Info		Edit		
	Network	Info			Activate Go to Setti	Windows
> Cloud	IShell Feedbac	k	© 202	4, Amazon Web Services, Ir	nc. or its affiliates. Privacy	v Terms Cookie preferences
• Click on edit of the network setting.

aws	Services Q Search		[Alt+S]	0 4 0	🙆 N. Virginia 🔻	Khawaja Saad Ahmed Butt	t -
≡	▼ Network settings Info			Edit		9	D
	Network Info vpc-04890b2673355c706 Subnet Info No preference (Default subnet in any ava	ilability zone)				G	9
	Auto-assign public IP Info						÷,
	Additional charges apply when outside of fi	ree tier allowance					
	A security group is a set of firewall rules that co	ntrol the traffic for your instance. Add rules to	allow specific traffic to reach y	your instance.			
	We'll create a new security group called '	launch-wizard-5' with the following rul	es:				
	Helps you connect to your instance	0.0.0.0/0	@ 2024 Amaz	on Web Services Inc	Activate Go to Settir	Windows ags to activate Windows.	-
Zar Cloud	Shear Feedback		© 2024, Alliaz	on web betvices, mc.	or its annuaces. Privacy	Cookie preferen	iees .

• Ensure that the instance has a public IP address created from VPC.

aws	Services	Q Search		[Alt+S]	Ð	Ş	0	۲	N. Virginia 🔻	Khawaja S	aad Ahmed B	sutt 🔻	
=	▼ Netw	ork settings Info									_	١	•
	VPC - requ	ired Info										0	
	vpc-00bc 10.200.0.0	d3417430288f48 (my-new-vpc))/16	•	C									
	Subnet Info												
	subnet-05c943a728aefe491 PublicSubnet-A VPC: vpc-00bd5417430288f48 Owner: 851725370789 Availability Zone: us-east-1a IP addresses available: 251 CIDR: 10.200.0.0/24) Availability Zone: us-east-1a		С	Create new	subnet	z						l	
	Auto-assig	n public IP Info											Ĩ
	Enable			·									
	Additional	charges apply when outside of free t	er allowance										
	Firewall (security get	ecurity groups) Info roup is a set of firewall rules that control	the traffic for your instance. Add rules to allow s	pecific traf	fic to reach you	ır instance	2.						
	O Crea	te security group	 Select existing security group 										
	Security g	roup name - required							Activate Go to Settir	Windows	e Windows.		+
>. Cloud	IShell Feedbac	k		©	2024, Amazor	Web Serv	vices, Inc	. or its affil	iates. Privacy	Terms	Cookie prefe	rences	

• Select security with your IP.

aws	Services	L Search		[Alt+S]	D 🕹	0	N. Virginia 🔻	Khawaja Saad Ahmee	l Butt 🔻
=	Public Securi	ty Group							á î
	Inbound Sec	urity Group Rules							Θ
	Security gro	oup rule 1 (TCP, 22, 15	4,198.110.156/32)		Remove				
	Type Info		Protocol Info	Port range Info					
	ssh		тср	22					
	Source type	Info	Name Info	Description - option	al Info				
	My IP		Add CIDR, prefix list or security <u>c</u>	e.g. SSH for admin	desktop				
			154.198.110.156/32 🗙						
	Add securi	ity group rule							
	Advanced	network configurati	on						
	T Configu	ro storago luc			1 duan		Activate Go to Settir	Windows ngs to activate Window	/s. 👻
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• Lunch Instance

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=	Number o	f instances Info										3 3
	Storage (v 1 volume) () Fro t2. usa to	Storage (volumes) 1 volume(s) - 8 GiB Image: Storage (volumes) Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in th t2.micro is unavailable) instance usage on free tier AMIs per month, 750 housage per month, 30 GiB of EBS storage, 2 million IOs, 1 GB of snapshots, a to the internet.			h address idwidth	×						
	Cance			R	Launch in Review co	nstance mmand	s		Activate Go to Settir	Windows		
https://us-ea	st-1.console.aws.ama	zon.com/console/home?region=us-east-1		© 2024	4, Amazon	Web Ser	vices, Inc.	. or its affiliate	s. Privacy	Terms	Cookie prefe	erences

• Public Instance Launch Successfully'

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=	EC2 > Insta	nces > Launch an instanc	e								() ()
	Success	fully initiated launch of insta	nce (<u>i-06299826f42f728c2</u>)								
	► Launch log										
	Next St	eps									
	Q What	would you like to do next wi	th this instance, for example "create alarm" o	or "create backup"				<	1 2 3 4	56>	
	Create billing and free tier usage alerts Once your instance is running,			Connect an	RDS da	atabas n	e	Crea poli	ate EBS snap cy	shot	
E Cloud	To manage surprise bi Shell Feedbac	e costs and avoid lls, set up email k	log into it from your local computer.	between an EC database to all © 2024	2 instanc ow traffic , Amazon V	e and a flow Web Servi	ices, Inc. c	Crea the o or its affili	te a policy that a reation, retentio ates. Privacy	ûtomatess ns ân activate Window Terms Cookie pre	s. 👻

• Launch another EC2 instance in the private subnet and ensure that the instance does not have a public IP address.

▼ Network settings Info		▼ Summary				
VPC - required Info		Number of instances Info				
vpc-00bd3417430288f48 (my-new-vpc)	▼ C					
10.200.00/10		Software Image (AMI)				
Subnet Info		Amazon Linux 2023 AMI 2023.4.2read more				
subnet-03d209d0da4215a9b Priv VPC: vpc-00bd3417430288f48 Owner: 851725370789 Availability Zone: us-east-1b IP addresses available: 251 CIDR: 10.200.1.0	vateSubnetB √ C Create new subnet C	Virtual server type (instance type)				
Auto-assign public IP Info		t2.micro Firewall (security group)				
Disable	•					
		New security group				
A security group is a set of firewall rules that control the traffic for your instance.	e. Add rules to allow specific traffic to reach your	Storage (volumes)				
Create security group Select existing set	ecurity group	1 volume(s) - 8 GiB				
Security group name - required		Cancel Arch Launsh instance				
privateSG		Go ta Settings to activate Wir	ndows			
		Review community				

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≡	Private Security Group			▼ Summary
	Inbound Security Group Rule Security group rule 1 (TCP, 22,	s 10.200.0.0/24)	Remove	Number of instances Info
	Type Info ssh	Protocol Info ▼ TCP	Port range Info 22	Software Image (AMI) Amazon Linux 2023 AMI 2023.4.2read more
	Source type Info Custom	Source Info ▼ Q. Add CIDR, prefix list or security	Description - optional Info e.g. SSH for admin desktop	ami-0c10126f147fa7fd Virtual server type (instance type) 12.micro
	 Security group rule 2 (ICMP, All, 	10.200.0.0/24 ×	Remove	Firewall (security group) New security group
	Type Info All ICMP - IPv4	Protocol Info ▼ ICMP	Port range Info	Storage (volumes) 1 volume(s) - 8 GiB
	Source type Info	 Source Info Q Add CIDR, prefix list or security 	Description - optional Info	Free tier: In your first year includes 750 hours of t2.micro (or
		10.200.0.0/24 ×		Cancel Launch instance.ii) at e Windows Review commands ^{to} Settings to activate Windows.
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Step 6: Test Connectivity:

• Click the below link to download PuTTY software, which you can use to access your instance.

Link: https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

• Once you have downloaded the PuTTY software, locate it by searching "PuTTY" in your computer's search bar, and then open the application.



• Open the Ec2 instance that you have created for public subnet and navigate the public IP and copy it.

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EC2 Dashboard	×	EC2 > Instances > i-09879f5f08cdae89d		9
EC2 Global View Events Console-to-Code	riew	Instance summary for i-09879f5f C Connect Instance state Updated less than a minute ago	08cdae89d (Publicsubnet-instance	:) Info
 Instances Instances Instance Types 		Instance ID I-09879f5f08cdae89d (Publicsubnet- instance)	Public IPv4 address Public IPv4 address Public IPv4 address Public IPv4 address	Private IPv4 addresses
Launch Templates Spot Requests		IPv6 address –	Instance state Running	Public IPv4 DNS
Savings Plans Reserved Instances		Hostname type IP name: ip-10-201-0-208.ec2.internal	Private IP DNS name (IPv4 only) ip-10-201-0-208.ec2.internal	
Dedicated Hosts Capacity		Answer private resource DNS name –	Instance type t2.micro	Elastic IP addresses -
Reservations New	-	Auto-assigned IP address 54.80.35.57 [Public IP]	VPC ID vpc-0197a15b90b2ea0ed (my-new- vpc-new)	AWS Compute Optimizer finding Opt-in to AWS Compute Optimizer for r ecommendations.
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• Launch the PuTTY application and paste the public IP address into the "Host Name" field.

🕵 PuTTY Configuration		? ×
Putty Configuration Category:	Basic options for your PuTTY se Specify the destination you want to conner Host Name (or IP address) 54.80.35.57 Connection type: © SSH O Serial O Other: Telm Load, save or delete a stored session Saved Sessions Default Settings Close window on exit:	? ×
About <u>H</u> elp		<u>C</u> ancel

• Next, click on the "SSH" category, followed by "Auth". Then, select "Credentials" and navigate to upload the key associated with your instance and click on open.

RuTTY Configuration		?	Х
Category:			
Keyboard Bell Features Features Window Appearance Behaviour Translation Selection Colours Connection Data Proxy SSH Kex Host keys Cipher Auth GSSAPI TTY X11 X11 X11	Credentials to authenticate with Public-key authentication Private key file for authentication: C:\Users\FPE\Downloads\publicsubnet- Certificate to use with the private key (option) Plugin to provide authentication responses Plugin command to run	th Browse onal): Browse	· · · · · · · · · · · · · · · · · · ·
<u>A</u> bout <u>H</u> e	p <u>O</u> pen	<u>C</u> ance	el

• After adding the credentials, the subsequent screen will appear.

₽ 54.80.35.57 - PuTTY	_	\times
륜 login as:		\sim

• Now, type "ec2-user" to log in as the user in the Linux account.



🗬 ec2-user@ip-10-201-0-208:~	-	. 🗆	×
🛃 login as: ec2-user			~
Authenticating with public key "publicsubnet-instanc #	e"		
~\ Amazon Linux 2023			P
~~ _#####\			
~~ \#### ~~ \#/ https://aws.amazon.com/linux/amazo	n-linux-2023		
~~ V~''->			
~~·_· _/ _/ /m/!-/			
[ec2-user@ip-10-201-0-208 ~]\$			
			\sim
			76 Page

• Now, test if the instance can communicate with Google by typing "ping google.com".

ec2-user@ip-10-201-0-208:~	-	-	×
<pre>~~ \#### ~~ \#/ https://aws.amazon.com/linux/amazon-linux-2023 ~~ V~''-> ~~~ /*/</pre>			^
~~·_· _/ _/_/ _/m/'			
[ec2-user@ip-10-201-0-208 ~]\$ ping google.com			
PING google.com (172.253.63.100) 56(84) bytes of data.			
64 bytes from b1-in-f100.le100.net (1/2.253.63.100): 1cmp_seq=1 tt1=105 time=1.9			
<pre>4 ms 64 bytes from bi-in-fl00.lel00.net (172.253.63.100): icmp seq=2 ttl=105 time=1.8</pre>			
8 ms			
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp_seq=3 ttl=105 time=1.9			
0 ms 64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp_seq=4 ttl=105 time=1.8 8 ms			
64 bytes from bi-in-fl00.le100.net (172.253.63.100): icmp_seq=5 ttl=105 time=1.9 2 ms			
64 bytes from bi-in-fl00.le100.net (172.253.63.100): icmp_seq=6 ttl=105 time=1.9 7 ms			
64 bytes from bi-in-fl00.le100.net (172.253.63.100): icmp seg=7 ttl=105 time=1.90	ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seg=8 ttl=105 time=1.93	ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seq=9 ttl=105 time=1.86	ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seq=10 ttl=105 time=1.95	5 ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seq=11 tt1=105 time=1.94	4 ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seq=12 ttl=105 time=1.92	2 ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp seq=13 ttl=105 time=1.88	8 ms		
64 bytes from bi-in-f100.le100.net (172.253.63.100): icmp_seq=14 ttl=105 time=1.95	5 ms		\checkmark

- Verify if access to the private EC2 instance is possible through PuTTY.
 - Launch PuTTY and enter the private IP address of the EC2 instance. Then, configure authentication by adding the necessary key and click on open.

🕵 PuTTY Configuration		? ×					
Category:							
- Session	Basic options for your PuTTY s	ession					
Logging	- Specify the destination you want to conn	ect to					
	Host Name (or IP address)	Port					
Rell	10.201.1.53	22					
Features	Connection type:						
	● SSH ○ Serial ○ Other: Teln	et ~					
- Behaviour Load, save or delete a stored session							
Iranslation	Translation Saved Sessions						
Colours							
	Default Settings	Load					
···· Data							
Proxy		Save					
Serial		Delete					
Telnet							
···· Rlogin							
SUPDUP	Close window on exit:	oloop ovit					
	Onways Onever Only on	CICOLLEXI					
About Help	Open	Cancel					

₩ 10.201.1.53 - PuTTY		\times
		\sim
PuTTY Fatal Error	\times	
Network error: Connection timed out		
ОК		
		\sim

The above result confirm that connecting directly to a private instance via PuTTY is not feasible. However, it's possible to establish connectivity by implementing modifications such as setting up a VPN, configuring NAT gateway, or utilizing alternative methods.

Local Communication:

Ping the private EC2 instance from Public EC2 instance to test connectivity between them.

• Once logged in to the public instance via PuTTY, execute a ping command using the private IP address of the instance to assess local communication capability.

P ec2-user@ip-10-201-0-208:~	_		×
~~ _#####\ ~~ \### ~~ \#/ https://aws.amazon.com/linux/amazon-linux-2023			^
~~~ ∀~' ' -> ~~~/ //			
Last login: Tue Apr 2 19:47:55 2024 from 154.198.101.156 [ec2-user@ip-10-201-0-208 ~]\$ ping 10.201.1.53			
PING 10.201.1.53 (10.201.1.53) 56(84) bytes of data. 64 bytes from 10.201.1.53: icmp_seq=1 ttl=127 time=1.56 ms			
64 bytes from 10.201.1.53: icmp_seq=2 ttl=127 time=1.08 ms 64 bytes from 10.201.1.53: icmp_seq=3 ttl=127 time=1.09 ms			
64 bytes from 10.201.1.53: icmp_seq=4 ttl=127 time=1.09 ms 64 bytes from 10.201.1.53: icmp_seq=5 ttl=127 time=1.36 ms			
64 bytes from 10.201.1.53: icmp_seq=6 tt1=12/ time=1.09 ms 64 bytes from 10.201.1.53: icmp_seq=7 tt1=127 time=1.15 ms			
64 bytes from 10.201.1.53: icmp_seq=0 tt1=127 time=1.14 ms 64 bytes from 10.201.1.53: icmp_seq=9 tt1=127 time=1.14 ms 64 bytes from 10.201 1 53: icmp_seq=10 tt1=127 time=1 13 ms			
64 bytes from 10.201.1.53: icmp_seq=10 tt1=127 time=1.13 ms 64 bytes from 10.201.1.53: icmp_seq=11 tt1=127 time=1.08 ms 64 bytes from 10.201.1.53: icmp_seq=12 tt1=127 time=1.10 ms			
64 bytes from 10.201.1.53: icmp_seq=13 ttl=127 time=1.16 ms	Pri	vate IP	
Plans Hostienie (pe			51151

The above result confirms successful ping results, indicating that the local machines can indeed communicate with each other.

#### Conclusion

In this lab, we learned how to set up a Virtual Private Cloud (VPC) with public and private subnets on AWS. We configured internet access for instances in the public subnet and restricted internet access for instances in the private subnet. By launching EC2 instances in both subnets and testing connectivity, we verified the functionality of our setup. Understanding VPC, subnets, and proper subnetting practices are essential for designing secure and scalable AWS architectures.

### Exercise

- 1. Create VPC with VPC IP 10.201.0.0/16 then divide this VPC IP into public and private subnets, with each subnet containing 64 IPs. Then, connect these subnets to EC2 instances, one public and one private. Test the instances using PuTTY. Finally, test the local connectivity by pinging each instance from the other.
- 2. Determine a method to enable connectivity for the Private Subnet Instance to access the internet. Implement one approach to achieve this.



## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #6 Hands-On DynamoDB: Table Creation, Data Insertion, Indexing, and Querying

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



## **Objectives**

- Understand the basics of AWS DynamoDB.
- Learn how to create tables, items, and indexes in DynamoDB.
- Gain hands-on experience with inserting data into DynamoDB tables.
- Explore querying data from DynamoDB tables using indexes.

### **Pre-requisites**

- An AWS account with permissions to create and manage DynamoDB resources.
- Basic understanding of AWS services.

## Outcomes

After completing this session, student should be able to:

- Create DynamoDB tables.
- Understand the process of inserting data into DynamoDB tables.
- Learn how to create indexes for efficient querying.
- Gain proficiency in querying data efficiently using indexes.

## Introduction

Amazon DynamoDB is a fully managed NoSQL database service provided by Amazon Web Services (AWS). It is designed to offer high performance and scalability with low latency, making it suitable for a wide range of applications, from small-scale projects to large-scale enterprise systems. DynamoDB is known for its ability to handle large volumes of data while providing consistent and predictable performance.

Key features of DynamoDB include:

- **Fully Managed:** AWS takes care of the infrastructure management, including provisioning, scaling, and maintenance, allowing users to focus on developing applications rather than managing databases.
- **NoSQL Database:** DynamoDB is a NoSQL database, which means it does not require a fixed schema, allowing for flexible data models. It supports key-value and document data structures.
- **Scalability:** DynamoDB can automatically scale to accommodate varying workloads, allowing users to handle high traffic and sudden spikes in demand without manual intervention.
- **Performance:** It offers single-digit millisecond latency for read and write operations, making it suitable for applications that require fast response times.
- Security: It offers robust security features, including encryption at rest and in transit, finegrained access control using AWS Identity and Access Management (IAM), and integration with AWS Key Management Service (KMS).
- **Global Tables:** DynamoDB Global Tables enable users to replicate data across multiple AWS regions for global distribution and disaster recovery purposes.

In this lab, we will explore the process of creating a DynamoDB table, adding items to it, creating indexes for efficient querying, and executing queries.

## Steps to create a DynamoDB table, adding items to it, creating indexes

The outlined procedure involves setting up to create a DynamoDB table, adding items to it, creating indexes for efficient querying, and executing queries.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create a DynamoDB Table:

• Navigate to the DynamoDB service by typing "DynamoDB" in the search bar of the AWS Management Console.



• Click on "Create table".

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DynamoDB ×	DynamoDB > Tables
Dashboard <b>Tables</b>	C     Actions     Delete     Create table       Q. Find tables by table name     Any tag key     Any tag value     <<1>> ©
Explore items PartiQL editor Backups	Na  Stat Partition key Sort key Indexes Deletion protection Read capacity mo
Exports to S3 Imports from S3	You have no tables in this account in this AWS Region. Create table
Reserved capacity Settings	<▶
▼ DAX	
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• Define the table name, primary key and sort key.

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=	DynamoDB > Tables > Create table								٩
	Create table								0
	Table details info           DynamoDB is a schemaless database that requires only a table name and a primary key when you create the table.								
	Table name This will be used to identify your table.								
	Student								
	Between 3 and 255 characters, containing only letters, numbers, underscores (_), hyphens (-), and periods (.).								
	The partition key is part of the table's primary key. It is a hash value that is used to retrieve items from your table and allocate data across hosts for scalability and availability.								
	Student_name String								
	1 to 255 characters and case sensitive.								
	Sort key - optional You can use a sort key as the second part of a table's primary key. The sort key allows you to sort or search among all items sharing the same partition key.								
	Degree String V								
	1 to 255 characters and case sensitive.								
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• Click on "Create table" to create the DynamoDB table.

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=				٩
				9
	+ Add new statement			
	JSON Ln 1, Col 0			
	⑦ Security: 0 ⊗ Errors: 0 🛕 Warnings: 0 ♀ Suggesti	ons: 0 Preview external access		
	Tags			
	Tags are pairs of keys and optional values, that you can assign to AWS resour track your AWS spending.	es. You can use tags to control access to your resources or		
	No tags are associated with the resource.			
	Add new tag			
	You can add 50 more tags.			
		Cancer Create table		
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Step 3: Insert Data into the Table:

• Once the table is created, navigate to it.

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DynamoDB	×	O The Stud	ient table was	created successf	ully.										٩
Dashboard		Dynamo	DB > Tables	5											0
Tables		Tab	les (1) Info					[	C	Actions	•	Delete	Create tab	le	
PartiQL editor		٩	Find tables by	table name			Any tag key	•	Any tag v	alue		7	$\langle 1 \rangle$	۲	
Backups Exports to S3			Na 🔺	Status	Partition key	Sort key	Indexes	Deletion prot	ection	Read cap	acity mo	de V	/rite capacity m	10	
Imports from 53			<u>Student</u>	⊘ Active	Student_name (S)	Degree (S)	0	Ooff		Provision	ed (1)	<u>P</u>	rovisioned (1)		
Reserved capacity		_													
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Parameter groups Events															
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DynamoDB ×	DynamoDB > Tables > Student					٩		
Dashboard	Tables (1) ×	Student		C Acti	ons 🔻 Explore ta	able items		
<b>Tables</b> Explore items PartiQL editor	Any tag key       Any tag value	< Overview Index	es Monitor Globa	al tables Backups	Exports and stream	ms   >		
Backups Exports to S3 Imports from S3 Integrations New Personal converts	<ul> <li>Q. Find tables by table name</li> <li>&lt; 1 &gt; (5)</li> <li>Student</li> </ul>	Protect your DynamoDB table from accidental writes and deletes     When you turn on point-in-time recovery (PITR), DynamoDB backs up your table data     automatically so that you can restore to any given second in the preceding 35 days.     Additional charges apply. Learn more						
Settings		General information	Info					
▼ DAX Clusters Subnet groups Parameter groups Events		Partition key Student_name (String) Alarms Ø No active alarms	Sort key Degree (String) Point-in-time recovery (PITR) Info O Off	Capacity mode Provisioned Resource-based policy Info Not active	Table status			
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• Click on "Explore Table Item".



• Click on "Create item".

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DynamoDB	×	•	0	Student	< 1 >	0	Select a table or index     Select attribute projection       Table - Student     Image: Constraint of the select attribute select attribute projection	(i)
Dashboard				Stadent				Ŭ.
Tables							▶ Filters	
Explore items								- 11
PartiQL editor							Run Reset	
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Integrations New								
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Settings								
							< 1 > @ 53	
▼ DAX								
Clusters							No items	
Subnet groups							No items to display.	
Parameter groups							Create item	
Events								
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• Enter attribute names, values for the item, and click on create item.

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=	DynamoDB > Explore items: Student > Cre	ate item							(	9
	Create item You can add, remove, or edit the attributes of a	n item. You can nest attributes inside other attributes up to 32 levels deep. Learn more 🛂				Form	JSON vi	ew		
	Attributes					Add n	ew attribute 🔻			
	+ Attribute name	Value			Туре					
	Student_name - Partition key	Hasnain			String					
	Degree - Sort key	Masters			String					
	ID	1			Numb	er	Remove			
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		•				Cancel	Create it	em		
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• Data has been entered.

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DynamoDB × Dyna	amoDB > Explore items > Student	٩
Dashboard >	Student	Autopreview View table details
Explore items PartiQL editor Backups	Scan or query items     Expand to query or scan items.	
Exports to S3 Imports from S3	Completed. Read capacity units consumed: 0.5	×
Integrations New Reserved capacity Settings	Items returned (1)	C*         Actions ▼         Create item           < 1 >         ③         ¾
▼ DAX Clusters	Student_name (String)     ▼     Degree (String)     ▼     Batch     ▼       Hasnain     Masters     2016	ID v
Subnet groups Parameter groups Events		
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• Repeat the process to insert more items.

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DynamoDB X	Scan or query items Expand to query or scan items.	
Dashboard Tables	O Completed. Read capacity units consumed: 0.5	×
Explore items PartiQL editor Backups Exports to 53	Items returned (7)	C*     Actions ▼     Create item       < 1     >     ⊗     %
Imports from S3	□ Student_name (String) ▼ Degree (String) ▼ E	Batch 🔻 ID 🔻
Reserved capacity	uzair     Bechelors     2	2015 8
Settings	Imdad Masters 2	2015 7
	Igra Masters 2	2016 6
▼ DAX	Mehtab     Bechelors     2	2015 5
Clusters	murtaza Bechelors 2	2016 3
Parameter groups	□ <u>azhar</u> Masters 2	2016 2
Events	Hasnain Masters 2	2016 1
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Step 4: Search the data-using query:

To locate and retrieve data from your DynamoDB table, proceed to either the Scan or Query functionality. These options enable you to perform searches within your dataset effectively.

• Navigate to the Scan or query items.

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DynamoDB	× Dyn	namoDB > Explore items > S	itudent		(
Dashboard Tables	-	Tables (1) Any tag key	×	Student	Autopreview     View table details
Explore items PartiQL editor	L	Any tag value			
Backups Exports to S3	[	Q Find tables by table name		O Scan	
Imports from S3		< 1 >	0	Select a table or index	Select attribute projection
Integrations New		Student		Table - Student	All attributes
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Settings				Enter partition key value	
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• Select the "Query" option and specify the name of the data you want to search for in the partition key.

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• Click Run to execute the result.

<ul> <li>Completed. Read capacity units consumed: 0.5</li> </ul>	×
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Step 4: Create Indexes:

• In the table overview page, navigate to the "Indexes" tab.

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• Click on "Create index".

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• Define the index key and sort key.

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	Create global secondary Global secondary indexes allow you to perform or global secondary index read and write capacity s cost.	index Info gueries on attributes that are not part of a table's primary key. Note that ettings are separate from those of the table, and they will incur additional	0
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	1 to 255 characters.		
	Sort key - optional	Data type	
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	1 to 255 characters.		
	Index name		
	Batch-Degree-index		
	Between 3 and 255 characters. Only A–Z, a–z, 0–9, underscore characters, hyphens, and periods allowed		
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• Click on "Create index" to create the index.

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=	settings. To learn more, see Amazon DynamoDB pricing 🔀	for provisioned capacity.	0
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	Attribute projections Info		
	Attribute projections		
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	<ul> <li>Only keys         Only the index and primary keys are projected into the index.     </li> </ul>		
	Include     All attributes described in "Only keys" and other non-key attribut	es that you specify.	
	Ouring the backfilling phase, you can delete the index t delete other indexes on the table.	hat is being created. During this phase, you can't add or	
		Cancel Create index	
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Step 5: Query Data using Indexes:

• Go to the "Queries" tab in the table overview page.

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• Select the index you have created.

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• Write the index parameter.

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• Click on Run to execute the query.

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Step 6: Query Data using Indexes:

The PartiQL editor is a feature provided by Amazon DynamoDB that allows users to execute PartiQL queries directly within the DynamoDB console. PartiQL is a SQL-compatible query language

designed to work with semi-structured data formats like JSON, making it well-suited for interacting with NoSQL databases like DynamoDB.



• In the DynamoDB dashboard, locate and select the "PartiQL editor" option.

• Select the ellipsis icon (...) and then choose "Scan Table" from the options provided.

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• Select the command and click on Run to view the table

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## • Execution result

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• Select the ellipsis icon (...) and then choose "Query Table" from the options provided.

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• Write the name you want to search in PartitionKeyValue.

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• Select the command you want to execute and click on Run button.

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## Adding Data into the Table:

• To add data to the table, enter the command "INSERT INTO name_of_table VALUE{}". After entering the data, select the code and execute it by clicking on the "RUN" button.

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• In order to view the inserted data Select "SELECT * FROM "Student"" and click Run



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### Conclusion

This lab has covered the creation of DynamoDB tables, data insertion, index establishment for query efficiency, and the execution of queries utilizing these indexes. DynamoDB offers a scalable, flexible approach to NoSQL data management in the cloud environment.

### Exercise

This exercise comprises four steps outlined as follows:

- 3. Create a DynamoDB table named "Employee" with attributes: EmployeeID (string) as the primary key and Name (string), Age (number), and Department (string) as additional attributes.
- 4. Insert at least three items into the "Employee" table.
- 5. Create a global secondary index on the "Department" attribute.
- 6. Query the "Employee" table using the global secondary index to find all employees in a specific department.



# Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #7 Setting Up RDS on Amazon AWS

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



## **Objectives**

- Understand the concept of Amazon RDS.
- Learn how to create a relational database instance using RDS.
- Gain hands-on experience in managing RDS instances.

## **Pre-requisites**

- Basic understanding of databases and SQL.
- An active Amazon AWS account.
- Access to the AWS Management Console.

## Outcomes

After completing this session, student should be able to:

- Explain the purpose and benefits of using Amazon RDS.
- Create and configure a relational database instance on RDS.
- Connect to the RDS instance from a client application.
- Perform basic management tasks on the RDS instance.

## Introduction

Amazon Relational Database Service (RDS) is a fully managed database service provided by Amazon Web Services (AWS) that simplifies the deployment, management, and scaling of relational databases in the cloud. It enables users to set up, operate, and scale databases with ease, allowing them to focus more on their applications rather than database management tasks.

Key Features:

- Managed Service: With Amazon RDS, AWS handles many of the routine database administration tasks such as provisioning, patching, backup, recovery, and monitoring, allowing users to offload the operational overhead associated with managing databases.
- Multiple Database Engine Support: Amazon RDS supports various popular relational database engines including:
  - MySQL: An open-source relational database management system known for its performance, reliability, and ease of use.
  - PostgreSQL: A powerful and feature-rich open-source relational database system known for its extensibility and standards compliance.
  - Oracle: A robust and scalable enterprise-grade relational database system widely used in businesses for mission-critical applications.
  - SQL Server: A comprehensive database management system developed by Microsoft,

offering features like high availability and disaster recovery.

• Scalability: RDS allows users to easily scale their database instances vertically by adjusting compute and storage resources or horizontally through features like Read Replicas (for read scalability) and Multi-AZ deployments (for high availability and failover).

- High Availability and Reliability: RDS offers Multi-AZ deployments for automatic failover and redundancy, ensuring high availability and data durability. It also provides automated backups, point-in-time recovery, and database snapshots for data protection and disaster recovery.
- Security: Amazon RDS integrates with AWS Identity and Access Management (IAM) for finegrained access control and provides features like encryption at rest and in transit, network isolation through Virtual Private Cloud (VPC), and security group-based firewall rules.
- Monitoring and Metrics: RDS provides built-in monitoring and performance metrics through Amazon CloudWatch, enabling users to monitor database performance, set alarms, and troubleshoot issues proactively.
- Cost-Effective: Amazon RDS offers a pay-as-you-go pricing model with no upfront costs or long-term commitments, allowing users to scale their database resources based on demand and optimize costs effectively.

Use Cases:

- Web Applications: RDS is ideal for powering web applications, providing a reliable and scalable backend database infrastructure.
- **Enterprise Applications:** RDS supports enterprise-grade databases like Oracle and SQL Server, making it suitable for hosting business-critical applications.
- **Dev/Test Environments:** RDS simplifies the setup of development and testing environments, allowing developers to quickly provision and manage database instances.
- Analytics and Reporting: RDS can be used for storing and analyzing large datasets, supporting OLAP (Online Analytical Processing) and data warehousing workloads.

## **Steps to Create Database on RDS:**

The outlined procedure involves setting up to create a Database on RDS.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create a Database on RDS:

In the search bar at the top of the page, type "RDS" and select the "Amazon RDS" service from the search results. Alternatively, you can find RDS under the "Database" category on the console dashboard.



• On the RDS dashboard, click on the "Create database" button to begin setting up a new database instance.

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- You will be prompted to choose a database engine. Select the engine that best fits your requirements from the available options, such as MySQL, PostgreSQL, Oracle, SQL Server, etc.
- Select MySQL

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• After selecting the database engine, you will need to configure the database instance.

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DB instance identifier tote Type a name for your DB instance. The name must be unique across all region. <b>PDS-instance</b> The DB instance identifier in case-insensitive, but its stored as all lower characters or hyphons. First character must be a lister. Card contain to <b>P Condentials Cartions</b>	DB instances owned by your AWS account in the current AWS are (as in "highdinitance"). Constants: 1 to 60 alphanumeric o constantive hyphenic. Carlt and with a hyphen.	MySQL is the most popular open source database in the world. MySQL on RDS offers the rich features of the MySQL community edition with the flexibility to easily scale compute resources or storage capacity for your database.
Master username Info Type a login ID for the master user of your DB instance. admin 1 to 16 alphanumeric characters. The first character must be a letter.		Supports database size up to 64 Til.     Supports General Purpose, Memory Optimized, and Burstable Performance instance
Credentials management You can use AWS Secrets Manager or manage your master user creden Managed in AWS Secrets Manager - most secure RDS generates a password for you and manages it	tak. Self managed Create your own password or have RDS create a password	classes. Supports automated backup and point-in-time recovery. Supports up to 15 Read Replicas ore instance within a circle
Auto generate password     Amazon RDS can generate a password for you, or you can specify y	tiur you manage.	Region or 5 read replicas cross- region.
Master password Info		
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ell Feedback		© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie pre

• Specify instance details including instance type, storage type and capacity, allocated storage size, and network settings such as VPC (Virtual Private Cloud) and subnet group.

I <b>nstance configuration</b> The DB instance configuration options below are limited to those supported by the engine that you
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Orar actual IOPS might vary from the amount instance type: Learn more 2      Storage autoscaling  Connectivity Info	that you provisioned based on your database workload and	Region or 5 read replicas cross region.

• Once you are satisfied with the configuration, click on the "Create database" button to initiate the creation of the RDS instance.



• After the database instance is successfully created, navigate to the RDS dashboard to obtain the connection details.

Amazon RDS       × ^C Introducting Aurora's I/O-Optimized Aurora's I/O-Optimized [2] is a new cluster storage configuration that offers predictable pricing for all applications and improved price-performance, with up to 40% costs savings for I/O-Intersive applications.         Dashboard <b>Dashboard</b> Dashboard <b>Consider creating a Blue/Green Deployment to minimize downtime during upgrades</b> Performance insights <b>Consider creating a Blue/Green Deployment to minimize downtime during upgrades</b> Voury want to consider using Amazon RDS Blue/Green Deployments and minimize your downtime during upgrades. A Blue/Green Deployment provides a staging environment for changes to production         databases. BDS User Guide [2]          Automated backups <b>Databases</b>	×	× 6
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Step 3: Configure Inbound Security for RDS:

• Under the "Connectivity & security" tab for your RDS instance. Go to Security and click on VPC security groups.



• Choose the Virtual Private Cloud (VPC) currently in use, and then navigate to the inbound rules section located at the bottom.

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• In bound security click on "Edit inbound rules"

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• Select the MySQL/Aurora service and TCP protocol for inbound security rules, then proceed to save the changes by clicking on "Save Rules."

Security group rule ID	Type Info	Protocol Info	Port range	Source Info	Description - optional Info	9
sgr-00d5a40ba8999ee3d	MYSQL/Aurora	ТСР	3306	Custom 🔻	Q Delete	
sgr-04aada33497dec63a	All traffic	All	All	Custom 🔻	Q Delete	
-	Custom TCP	ТСР	0	Anyw 🔻	Q. Delete	
Add rule						

Step 4: Connect to the RDS Instance:

• Once the instance is created and available, note down the endpoint, username, and password. You will need these to connect with MySQL Workbench.

aws Services Q Search		[Alt+S]		E	\$ Ø	🛞 N. Virginia 🔻	Khawaja Saad Ahmed Butt 🔻
Amazon RDS ×	RDS > Databases > mysql						9
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Step 4: Download and Install MySQL Workbench:

- Go to the MySQL Workbench website and download the appropriate version for your operating system.
- Link: https://dev.mysql.com/downloads/windows/installer/8.0.html
- Follow the installation instructions to install MySQL Workbench on your computer.

• Open MySQL Workbench after installation.

MySQL Workbench						0	×
	Detabase Incla Scripting E	MySQL Workbench is the offi create and browse your de design and run SQL queries to	to MySQL clal graphical user interface (GUI) tool fo tabase schemas, work with database ob, work with stored data. You can also mig database vendors to your MySQL datab	Workbench r MySQL, it allows you to design, lects and insert data as well as rate schemas and data from other see.			×
	vSOL Connections	Browse Documentation >	Read the Blog >	Discuss on the Forums >			
4 41	ocal instance MySQL80 t root * localhost:3306	mysql # admin # mysql.cbmugisgkijs.us-sast-1,rdt.a.			-		
				Activate Win Go to Settings to	ndows 5 activate Wind	lows.	

• Click on the "+" icon next to "MySQL Connections" to create a new connection.

MySQL Workbench				- 0	$\times$
mysql × File Edit View Database Tools Scripting	Help				
\$\$\$ <	Welcome	to MySQL V	Vorkbench		×
	MySQL Workbench is the of create and browse your o design and run SQL queries t	fficial graphical user interface (GUI) tool for N database schemas, work with database objec to work with stored data. You can also migrat database vendors to your MySQL database	MySQL. It allows you to design, ts and insert data as well as te schemas and data from other e.		
	Browse Documentation >	Read the Blog >	Discuss on the Forums >		
MySQL Connection	ns ⊖⊗		α,		
Local instance MySQL80 # root *27 localhost:3306	0 mysql ± admin ¹²⁴ mysql.cbmugisgkzpx.us-east-1;rds.	ð			

- Enter a connection name.
- Enter the RDS endpoint in the "Hostname" field.
- Enter the username and password you set up for your RDS instance.
- Click "Test Connection" to ensure that MySQL Workbench can connect to your RDS instance successfully.

	······	
Connection Name:	mysql	Type a name for the connection
onnection Method:	Standard (TCP/IP)	Method to use to connect to the RDBMS
Parameters SSL	Advanced	
Hostname:	ugisgkzjx.us-east-1.rds.amazonaws.com Port: 3306	Name or IP address of the server host - and TCP/IP port.
Username:	admin	Name of the user to connect with.
Password:	Store in Vault Clear	The user's password. Will be requested later if it's not set.
Default Schema:		The schema to use as default schema. Leave blank to select it later.

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• Once the connection test is successful, click "OK" to save the connection settings.

Setup New Conr Connection Name: Connection Method: Parameters SSL Hostname: Username: Password: Default Schema:	Advanced admin Store in Va	VySQL Workbench Successfully mad Information related to 1 Host: mysql.cbmugisgl Port: 3306 User: admin SSL: enabled with TLS_J A successful MySQL co the parameters defined	e the MySQL connect this connection: kzjx.us-east-1.rds.amazona AES_128_GCM_SHA256 onnection was made with I for this connection.	tion ws.com	Type a nam Method to u address of the t. e user to conn password. Will a to use as def ect it later.	e for the conn ise to connect e server host - ect with. be requested ault schema. L	ection to the RE - and later if it's .eave	× DBMS
Configure Server	Management			Test Con	nection	Cancel	0	кД

• Execute the following command to create a new database:

CREATE DATABASE my_database;	
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Object Info Session	Activate Windows Go to Settings to activate Windows.
Query Completed	

• Once the database is created, switch to it using the following command:

MySQL Workbench mysql ×						– 0 ×
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USE my_database;

• Now, let's create a table within the database. Execute the following command:





• After creating the table, you can insert some sample data into it. Execute the following command:

INSERT INTO my_table (name, age, email) VALUES ('John Doe', 30, 'john@example.com'), ('Jane Smith', 25, 'jane@example.com'), ('Bob Johnson', 35, 'bob@example.com');

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• You can view the contents of the table by executing a SELECT query. Run the following command:

SELECT * FRO	M my_table;
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	4 22:29:32 INSERT INTO my_table (name, age, email) VALUES (John Doe', 30, John@example.com'), (J	3 row(s) affected Records: 3	Duplicates: 0 Warnings: 0		0.250 sec
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• If you want to extract specific data from the table, you can use the WHERE clause in your SELECT query. For example:



## Conclusion

Amazon RDS offers a convenient way to deploy and manage relational databases in the cloud. By leveraging RDS, you can offload database administration tasks and focus on your application development. In this lab, you learned how to create a relational database instance on RDS and connect to it from a client application.

#### Exercise

 In a company comprising 15 employees, establish a MySQL database utilizing Amazon RDS. Within this database, construct a table encompassing fields for ID, Employee Name, Designation, City, and Address. Afterward, perform a search to identify employees residing in the same city, followed by a search for an individual's name within that city. Finally, the number of employees.


## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #8 AWS CloudWatch Monitoring Lab

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



## **Objectives**

- Understand the basics of AWS CloudWatch.
- Learn how to set up CloudWatch alarms and notifications.
- Gain hands-on experience in monitoring EC2 instances using CloudWatch.
- Practice creating automated actions based on CloudWatch alarms.

#### **Pre-requisites**

- Basic understanding of AWS services.
- An AWS account with appropriate permissions to create resources.
- Familiarity with EC2 instances and their management.

## Outcomes

After completing this session, student should be able to:

- Set up CloudWatch alarms to monitor EC2 instances.
- Understanding of how to configure actions based on CloudWatch alarms.
- Proficiency in using CloudWatch to monitor and manage AWS resources effectively.

## Introduction

Amazon CloudWatch stands as a cornerstone in the AWS ecosystem, offering a robust suite of monitoring and observability tools designed to empower users with deep insights into the operational health and performance of their AWS resources. It allows you to collect and track metrics, collect and monitor log files, set alarms, and automatically react to changes in your AWS resources.

Key Features:

- **Metrics Collection:** CloudWatch acts as a central hub for gathering performance metrics from various AWS services like CPU usage, network traffic, and disk I/O. These metrics offer deep insights into resource utilization and operational trends.
- Log Monitoring: CloudWatch extends its monitoring to include real-time analysis of log files generated by AWS resources. By utilizing CloudWatch Logs, users can easily aggregate, filter, and analyze log data, aiding in troubleshooting and anomaly detection.
- Alarming and Automation: CloudWatch provides robust alarm management, allowing users to set custom thresholds and trigger actions based on specific conditions. This proactive approach helps in identifying deviations from expected states and automating responses, fostering resilience and operational efficiency.
- **Integration and Flexibility:** CloudWatch seamlessly integrates with various AWS services like EC2, S3, Lambda, and RDS, providing comprehensive visibility into interconnected resources. Its flexible architecture also supports integration with third-party tools and custom applications, enhancing its utility for diverse use cases.

## **Steps to Create Database on RDS:**

In this lab, we will use the power of AWS CloudWatch to monitor our EC2 instance. Our objective is to establish a connection between CloudWatch and our EC2 instance. We will configure CloudWatch to send us an email notification whenever the CPU utilization of the EC2 instance exceeds 70%. Additionally, we will implement an action to automatically stop the instance in response to this alert.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create an EC2 Instance:

• Navigate to search bar, write "EC2", and select "EC2".

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	Co Syste	Documentation (34,650) e Knowledge Articles (610) Marketplace (3,441)	EC2 Image Builder☆ A managed service to automate build, customize and d	EC2 Image Builder ☆ A managed service to automate build, customize and deploy OS images			
		Blogs (2,143) Events (30) Tutorials (21)	Recycle Bin Protect resources from accidental deletion		Originatin		
			Q Amazon Inspector ☆ Continual vulnerability management at scale		on cost, security		
	- 1		Features	See all 57 results ▶	•		
					Go to Settings to activate Windows.		
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• Click on the "Launch Instance" button to initiate the instance creation process.

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EC2 Dashboard EC2 Global View Events Console-to- Code <u>Preview</u>	×	Instances Info         Q. Find Instance by attribute or tag (case-sensitive)         Instance state = running       X         Clear filters         Name ∠       ▼         Instance ID	C Connec	t Instance state ♥ All st nce type ▼   Status chee	Actions  Launch i ates	nstances ▼ 1 > ③ Availability Zone
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AMIs	-	Select an instance			Go to Settings to activate	e Windows.
					1	10   P a

• Write the name and tags as



• In the "Choose an Amazon Machine Image (AMI)" section, select a Amazon Linux from the provided list. You can filter the AMIs based on the Windows edition and version you require.

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Application and OS Images (Amazon Machine Image) info	Number of instances Info
An AMI is a template that contains the software configuration (operating system, application server, and	1
applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are loo	oking for
below	Software Image (AMI)
	Amazon Linux 2023 AMI 2023.3.2read more
Q Search our full catalog including 1000s of application and OS images	ami-007a1090150624699
	Virtual server type (instance type)
Quick Start	t2.micro
	Firewall (security group)
Amazon macOS Ubuntu Windows Red Hat SUSE Li Q	New security group
Linux	re AMIs Sterage (velumes)
	Als from 1 walking (c) 0 CiD
UDUNCU"    T Microsoft    C Red Hat    UDUNCU"    C Red Hat    C Red Hat    UDUNCU"    T Microsoft    C Red Hat    C Red H	I VOLUITIE(5) - O OID

• Select an instance type based on your computing requirements. Consider factors such as CPU, memory, storage, and network performance.

Instance type Info   Get advice			1	
tstance type t2.micro Family: t2 1 vCPU 1 GiB Memory Current generation: true On-Demand Windows base pricing: 0.0162 USD per Hour On-Demand SUSE base pricing: 0.0116 USD per Hour	Free tier eligible	All generations	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a 109bf30624c99 Virtual server type (instance type)	
On-Demand RHEL base pricing: 0.0716 USD per Hour On-Demand Linux base pricing: 0.0116 USD per Hour additional costs apply for AMIs with pre-installed software		Compare instance types	t2.micro Firewall (security group)	1

• If you have not already created a key pair, you will be prompted to create or select an existing key pair. This key pair is essential for securely accessing your Windows instance.

▼ Key pair (login) Info	Number of instances Info	
You can use a key pair to securely connect to your instance. Ensure that you have access to the selected key pair before you launch the instance.	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more	
Key pair name - required		
Select  C Create new key pair	Virtual server type (instance type) t2.micro	

• Configure instance details such as the number of instances, network settings, subnet, security groups, etc. Ensure that the Auto assign public IP is **Enable**.

▼ Network settings Info	▼ Summary
VPC - required Info	Number of instances Info
vpc-04890b2673355c706 (default) ▼ C	
Subnet	Software Image (AMI)
No preference  C Crea	Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99
Auto-assign public IP Info	Virtual server type (instance type)
Enable V	t2.micro
Additional charges apply when outside of free tier allowance	Firewall (security group)
Firewall (security groups) Info	New security group
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic instance.	to reach your Storage (volumes)
Create security group     Select existing security group	1 volume(s) - 8 GiB
Security group name - required	Cancel
launch-wizard-4	Go t <u>e Settings to activate</u> Windo
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• Review all the configurations you have made for your instance. Once verified, click on the "Launch" button.

Step 3: Set up CloudWatch Metrics:

• Once the instance is running, navigate to the CloudWatch dashboard.

aws Services	Q cloudwatch	×	ב 🗘 🔗 🕜 🛞 א. Virginia ד Khawaja Saad Ahmed Butt ד
		Search results for 'cloudwatch'	Reset to default layout + Add widgets
	Services (3)	Services	
	Features (42) Resources (New) Documentation (11,372)	CloudWatch ☆ Monitor Resources and Applications	Create application :
	Knowledge Articles (180) Marketplace (1,724) Blogs (591)	Athena ☆ Serverless interactive analytics service	C Find applications     C 1 >
	Events (4) Tutorials (1)	Amazon EventBridge ☆ Serverless service for building event-driven applications.	Description v   Region v   Originating account
		Features See all 42	results > et started by creating an application.
		CloudWatch dashboard Systems Manager feature	Create application
		Create a SFTP server  Create a SFTP server	eo to mykepitcations A
		Data sources a Athena feature	
	get the r	Encryption Configuration nost out of AWS.	Activate Windows Go to Settings to activate Windows.

• Click on "Metrics" in the left-hand navigation pane.



• Select "EC2" from the list of services.

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Network monitoring						
▶ Insights	View automatic dashboard	EBS 13 • View automatic dashboard	EC2 222     View automatic dashboard	View automatic dashboard		
Settings						
Getting Started	View automatic dashboard	Logs 1 • View automatic dashboard	RDS 370 View automatic dashboard	S3 16 • View automatic dashboard		
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	Usage 208 • View automatic dashboard			Activate Windows		
				Go to Settings to activate Windows. 👻		
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• Search the "EC2" instance using EC2 instance ID.

ClodWatch x     Fourities and recents     Dathboards     Almestics     Almestics     Almestics     States     States     Almestics     Almestics     States     States     States     States     States     States     States     States     States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States   States<	aws Services Q Search	[Alt/5]
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• Choose the specific metric you want to monitor (e.g., CPUUtilization).

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Application Signals New	Cloudwatch-instance i-Ocd8d1f944f3eba5c	DiskWriteBytes () No alarms	
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• Click on the "Actions" dropdown and select "Add to dashboard" to create a new dashboard for your metrics.

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• Dashboard is created.

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dShell Feedback						© 2024, Amazon Web S	ervices, Inc	or its affili	ates. Privacy	Terms C	lookie prefe	reng

Step 4: Create CloudWatch Alarm:

• In the CloudWatch dashboard, click on "Alarms" in the left-hand navigation pane.

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CloudWatch ×	CloudWatch     > Dashboards     > EC2-report       EC2-report     ▼ ☆	5 년 1h 3h 12h 1d 3d 1w Custom 🗃 UTC timezone 💌	C	•	Actions ▼	Autosave: Off Save +
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• Click on "Create Alarm".

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CloudWatch ×	CloudWatch > Alarms			Θ
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▼ Alarms ▲ 4 ⊘ 12 ○ 0 In alarm	Name 🗸	State 🛛 🗢 Last state update 🗸	Conditions Actio	ons 🗸
All alarms Billing	TargetTracking-table/Student_data- ProvisionedCapacityHigh-9ec802c6-7cf3-4060-ac6b- 8c750400e1d2	OK 2024-04-05 06:02:22	ProvisionedWriteCapacityUnits > 1 for 3 datapoints within 15 minutes	ctions enabled
⊨ Logs	TargetTracking-table/Student_data- ProvisionedCapacityLow-c0c05206-e698-4038-ab90- cb57a00c64ce	OK 2024-04-05 06:02:09	ProvisionedReadCapacityUnits < 1 for 3	ctions enabled
All metrics Explorer	TargetTracking-table/Student_data- ProvisionedCapacityHigh-55b959d9-bdc1-4187-93b7- 96612829e2c5	OK 2024-04-05 06:01:40	ProvisionedReadCapacityUnits > 1 for 3 O Ad datapoints within 15 minutes	ctions enabled
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<ul> <li>Application Signals</li> <li>Network monitoring</li> </ul>	TargetTracking-table/Student_data-AlarmLow- b1b670f9-83c9-4b86-aa47-405674cd2982	▲ In alarm 2024-04-05 06:00:05	ConsumedReadCapacityUnits < 30 for 15 datapoints within 15 minutes	ctions enabled
▶ Insights	TargetTracking-table/Student_data-AlarmHigh- 0c27de18-660b-4fcf-af34-c2b5bf41f862	OK 2024-04-05 05:52:43	ConsumedWriteCapacityUnits > 42 for 2 datapoints within 2 minutes ⊘ Ad	ctions enabled
Settings Getting Started	TargetTracking-table/Student_data-AlarmHigh- e197579d-9a4f-4fbf-851c-1293d2b621ea	OK 2024-04-05 05:52:30	ConsumedReadCapacityUnits > 42 for 2 datapoints within 2 minutes	citions leaving in clows
What's new	TargetTracking-table/Student-ProvisionedCapacityLow-	0.07 2021.01.01.01.01.01	ProvisionedReadCapacityUnits < 1 for 3 Go t	o Settings to activate Windows.

• Click on Select metric

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Elements of the second seco	Specify metric and conditions								9
Step 2 Configure actions	Metric								
Step 3 Add name and description	Graph Preview of the metric or metric expression and the alarm threshold. Select metric								
Step 4 Preview and create		ancel Next							
	Graph Preview of the metric or metric expression and the alarm threshold. Select metric								
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S CloudShell Feedback			© 2024, Ama	azon Web Ser	rvices, inc. o	or its affiliates.	Privacy	Terms Cookie p	references

• Search the EC2 instance in which you want to set the alarm

Select metric					×				
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DynamoDB	50 FBS	35 FC2	238 Events	1					
Cynamood -					-				
	Cancel Select a single metric to								
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• Select the metric you want to create an alarm for (e.g., CPUUtilization).

	Select	metric				×
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		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	NetworkPacketsOut	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	DiskWriteBytes 🜘	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	CPUUtilization 🕢	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	DiskWriteOps 💽	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	Networkin 🔘	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	CPUCreditBalance	No alarms	
		Cloudwatch-instance	i-Ocd8d1f944f3eba5c	CPUSurplusCreditBalance	No alarms	
	-	Claudentels Instance	: 0:40410447-baEc	CDI IC and a Condition Channel 🧥	Min. al source	
						· · · · · · · · · · · · · · · · · · ·

• Configure the alarm threshold, such as setting it to trigger when CPU utilization is greater than 70%.

□199 9	Instance name Cloudwatch-instance Statistic Q. Average Period 1 minute		×
Conditions			
Threshold type			
Static Use a value as a threshold	Anomaly detection     Use a band as a threshold		
Whenever CPUUtilization is Define the alarm condition.			
C Greater > threshold ○ Greater/Equal >= threshold	C Lower/Equal	C Lower < threshold	
than Define the threshold value.			
70 Must be a number			
<ul> <li>Additional configuration</li> </ul>			
		Cancel	Next

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<u> </u>	III Services	Q simple nouncation(service	^				Kilawaja Saati kilineti butt 🔹
=					Reset to d	efault layout + Add widgets	G
			Services	See all 92 results A			0
		Features (145) Resources New Documentation (494,029)	중 Simple Notification Service ☆ SNS managed message topics for Pub/Sub		ations (0) info S East 04. Virginia)	Create application :	
		Knowledge Articles (1,303) Marketplace (62) Blogs (12,276)	Simple Queue Service ☆ SQS Managed Message Queues		(Current Region) ▼ Q. Find applications ▲   Description ▼   Region ▼   Originating	< 1 >	
		Tutorials (59) Events (300)	Amazon Simple Email Service 会 Email Sending and Receiving Service		No applications Get started by creating an application.		
			Service Catalog A Create, share, organize, and govern your curated infrastructur	e as code (IaC) templa	Create application		
			Features	See all 145 results	Go to myApplications	,	
			Dashboard SWF feature		nd usage into	# I	
			Notification alarms				
			Parameter Store		ſĿ	Activate Windo	MG
				•	Data unavailable	Go to Settings to act	ivate Windows
_			Amazon Ploonint feature		You must have Cost Explorer enabled to view your cost an	nd usage data.	ate mindows.

Open another tab and search Simple Notification Service in the search bar of console.

• Write topic name and click on next.

•

aws	Servi	ces Q Search	[Alt+S]	Þ	<b>\$</b>	0	۲	N. Virginia 🔻	Khawaja	Saad Ahmed Bu	tt 🔻
≡	Amaz	Feature on SNS now support	s in-place message archiving and replay for FIFO topics. Learn more 🖸		C      A      O      N. Virginia      Khaweja Saad Ahmed Butt						
			Application Integration								
			Amazon Simple	Create topic							
			Notification Service Pub/sub messaging for microservices and serverless applications.	Topic name A topic is a message char message to a topic, it far subscribed endpoints. hasnain-sns Next step Start with an overvier	nel. Whe s out the	n you publ message t	iish a o all				
			Amazon SNS is a highly available, durable, secure, fully managed pub/sub messaging service that enables you to decouple microservices, distributed systems, and event-driven serverless applications. Amazon SNS provides topics for high-throughput, push-based, many-to-many messaging.								
				Pricing				Activate W Go to Settings	indows to activat	e Windows	
<b>D</b> C	loudShell Fee	edback		© 2024, Amaz	n Web S	ervices, Inc	. or its af	filiates. Privacy	Terms	Cookie prefere	ences

• After adding Display name click on create

create topic		
Details		
Type Info Topic type cannot be modified after topic is created		
FIFO (first-in, first-out)     Strictly-preserved message ordering     Eastly-one message delivery     High introdypict, or por 5 publishes/second     Subscripton protocols 505	Standard     Best-effort message ordering     Art-stationer message ordering     Solutions     Solutions     Solutions     Solutions     Solutions     Solutions     Solutions     Altrin Sets     email, mobile application endpoints	
Name		
hasnain-sns		
Maximum 256 characters. Can include alphanumeric characters, hypl Display name - optional info To use this topic with SMS subscriptions, enter a display name. Only	tens (-) and underscores (_).	
hasnain-sns		
Maximum 100 characters.		
<ul> <li>Encryption - optional Amazon SNS prevides in-transit encryption by default. Enabling</li> </ul>	server-side encryption adds at-rest encryption to your topic.	
Access policy - optional late		Activate Windows Go to Settings to activate Windows

• Click on create subscription

aws iii Services Q Search	[All+5] [2] 🖧 🕲 N. Virginia +   Rhawaja Saad Ahmed Burt
Amazon SNS ×	hasnain-sns Edit Delete Publish message
Dashboard <b>Topics</b>	Details
Subscriptions Mobile Push notifications Text messaging (SMS) Origination numbers	Name         Display name           hasnain-sins         hasnain-sins           ARN         Topic owner           armawsinnsus-east-1:851725370789:hasnain-sins         851725370789           Type         Standard
	Subscriptions         Access policy         Data protection policy         Delivery policy (HTTP/5)         Delivery status togging         Encryption         Tags         Integrations           Subscriptions (0)         Edit         Delete         Request confirmation         Confirm subscription         Create subscription           Q         Servin           1         Q
	ID <ul> <li>Endpoint</li> <li>V</li> <li>Status</li> <li>V</li> <li>Protocol.</li> <li>V</li> </ul>
	No subscriptions found You don't have any subscriptions to this topic. Create subscription Activate Windows So to Settings to activate Windows

• Click on "Protocol" and select "Email" from the dropdown menu.

	Services Q Search [Alt+S]		1	D   🔶	Ø	•	4. Virginia 🔻 Khawaja S	Saad Ahmed Bu	<b></b>
A	mazon SNS > Subscriptions > Create subscription								ĺ
C	Create subscription								
	Details								
	Topic ARN								
	Q am:aws:sns:us-east-1:851725370789:hasnain-sns X								
	Protocol The type of endpoint to subscribe								
	Select protocol								
	Amazon Kinesis Data Firehose								
	Amazon SQS								
	AWS Lambda								
	Email								
	Email-JSON								
	ЧТТН								
	HTTPS								
	Platform application endpoint								
	SMS								
		Cancel Create subscription				Activate	e Windows		

• Enter the email addresses where you want to receive notifications and click on "Create Alarm".

Services Q Search	[Alt+5]	🔈 😞 🧭 🚳 N. Virginia 🔻 Khawaja Saad Ahmed I
Details		
Topic ARN		
Q arn:aws:sns:us-east-1:851725370789:hasnain-sn	is X	
Protocol The type of endpoint to subscribe		
Email	▼	
Endpoint An email address that can receive notifications from Amazon S	NS.	
engr.hasnainhyder@gmail.com		
After your subscription is created, you must co	offern it. info	
Subscription filter policy - optional Info This policy filters the messages that a subscriber receives.	0	
<ul> <li>Redrive policy (dead-letter queue) - op</li> </ul>	ptional tofo	
Send undeliverable messages to a dead-letter queue.		
Send undeliverable messages to a dead-letter queue.	Cancel Create subscriptio	on Activate Windows Go to Settings to activate Windows

## • Go to your Gmail and click on Confirm Subscription.



• Now to alarm tab and choose "Send notification to an Amazon SNS topic" and select the SNS topic you want to use for email notifications.

NS Services Q Search	[Alt+S]	Ð	¢	0	٢	N. Virginia 🔻	Khawaja Saad Ahme	d Butt
Alarm recommendations available Turn on Recommendations to pre-p	pulate the wizard with the recommended alarms.							0
CloudWatch > Alarms > Create alar Step 1 Specify metric and conditions	^m Configure actions							
Step 2 Configure actions	Notification							
Step 3 Add name and description Step 4 Preview and create	Alm state trigger       Remove         Define the advant state will trigger the scheme.       Image: Compression is writely to advant adv			Act	tivat	e Windov		
				Go t	to Set	tings to acti	vate Windows.	
CloudShell Feedback	¢	2024, Amazon V	Veb Serv	ices, Inc. o	or its affili	ates. Privacy	Terms Cookie pr	eferer

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• Go to EC2 action and click on stop instance in order to step the instance when the CPU utilization will be 70%.

aws III Services Q Search	(Alt+5)	🔁 🔗 🧭 N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
=		© '
	EC2 action	
	Alarm data trigger Under the advance tasks that will trigger this action: I be balarm The rest to see expectation is a soluble if the defined threadwold. I CO II the defined threadwold threadwo	
	In the second s	
	Systems Manager action Info (2	Activate Windows
CloudShell Feedback	The accord will of ease an incluent or opportent in systems manager when the alarm is in <b>alarm</b> state.	Go to Settings to activate Windows.  © 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preferences

• Name the alarm and click on next

aws Services Q Search	[Alt+S]			Ð	<del>ہ</del>	0	O N. Virginia ▼	Khawaja Saad Ahme	d Butt 👻	F
Alarm recommendations available     Turn on Recommendations to pre-populations	late the wizard with the recommended alarms.							×	0	^
CloudWatch > Alarms > Create alarm Step 1 Specify metric and conditions	Add name and description									l
Step 2 Configure actions	Name and description									l
Step 3 Add name and description	Alarm name EC2-Alaram									l
Step 4 Preview and create	Alarm description - optional View formatting guidelines Edit Preview									l
	# This is an H1 **double asterisks will produce strong character** This is (an example](https://example.com/) inline link.									l
	Up to 1024 characters (0/1024)									l
	(a) Markdown formatting is only applied when viewing your alarm in the console. The description plain text in the alarm notifications.	n will remain in								l
	Cancel	Previous	l			Activ Go to	vate Windov Settings to acti	vs vate Windows.		

• Review the alarm and click on create alarm

p 2: Configure actions	Edit
Actions	
Notification	
Vhen In alarm, send a notification to "hasnain-sns"	
C2 action	
When In alarm, stop this instance (Instance ID: i-Ocd8d1f944f3eba5c)	
p 3: Add name and description	Edit
Name and description	
lame	
C2-Alaram	
Description	
C2-Alaram	
O Markdown formatting is only applied when viewing your alarm in the console. The description will remain in plain text in the alarm notifications.	ı
Cancel Previous Creat	e alarm

• Load your EC2 instance using Putty Software.

🕵 PuTTY Configuration		? ×
Category:		
Session	Basic options for your PuTTY se	ssion
Logging	Specify the destination you want to conne	ct to
Ieminal     Keyboard	Host Name (or IP address)	Port
Bell	54.210.20.141	22
Features	Connection type:	
Window	● SSH ○ Serial ○ Other: Telne	t v
Appearance     Behaviour     Translation     Selection     Colours	Load, save or delete a stored session Saved Sessions	]
- Connection	Default Settings	Load
···· Data		
Proxy		Save
⊡- SSH		Delete
- Host kevs		
Cipher		
- Auth	Close window on exit:	ean exit
< >		
About Help	Open	Cancel

 Write the following commands to increase CPU utilization beyond the threshold set in your CloudWatch alarm.

Sudo su	
yes > /dev/null &	
top	

root@ip-172-31-29-123:/home/ec2-user х top - 14:05:40 up 1 min, 2 users, load average: 0.62, 0.23, 0.08 Tasks: 108 total, 2 running, 106 sleeping, 0 stopped, 0 zombie \$Cpu(s): 64.3 us, 35.7 sy, 0.0 ni, 0.0 id, 0.0 wa, 0.0 hi, 0.0 si, 0.0 st 617.0 free, MiB Mem : 949.6 total, 146.5 used, 186.1 buff/cache MiB Swap: 0.0 total, 0.0 free, 0.0 used. 663.5 avail Mem VIRT RES TIME+ COMMAND PID USER PR NI SHR S %CPU %MEM 2307 root 221356 1008 920 R 99.7 0:09.29 yes 20 0 0.1 105016 10144 S 0:00.84 systemd l root 16404 0.0 1.7 20 0 S 0:00.00 kthreadd 2 root 0.0 0 -20 3 root 0 I 0.0 0.0 0:00.00 rcu gp Ι 4 root 0 -20 0.0 0.0 0:00.00 rcu par+ 0 -20 0 I 0:00.00 slub fl+ 5 root 0.0 0.0 0 I 0 -20 0.0 0.0 0:00.00 netns 6 root 0.0 0.0 0:00.00 kworker+ 7 root 0 -20 0 I 0:00.00 kworker+ 0.0 8 root 20 0 0:00.11 kworker+ 0 I 0.0 0.0 0 -20 0 I 0:00.00 mm_perc+ 10 root 0.0 0.0 20 0 0 I 0.0 0:00.00 rcu tas+ 11 root 0.0 0 I 12 root 0.0 0.0 0:00.00 rcu tas+ 0 I 13 root 0.0 0.0 0:00.00 rcu tas+ 0 S 0.0 0.0 0:00.03 ksoftir+ 14 root 0:00.04 rcu pre+ 20 0 I 15 root 0.0 0.0

## • Email Notification

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	ALARM: "EC2-Alaram" in US East (N. Virginia) Inbox ×			Ø	ß
	hasnain-sns <no-reply@sns.amazonaws.com> 6:50 PM (1 minute ago to me 👻</no-reply@sns.amazonaws.com>	) 🕁	٢	←	:
	You are receiving this email because your Amazon CloudWatch Alarm "EC2-Alaram" in the US East (N. Virginia) region has entered the A "Threshold Crossed: 1 out of the last 1 datapoints [99.44193548387098 (13/04/24 13:45:00)] was greater than or equal to the threshold ( for OK -> ALARM transition)." at "Saturday 13 April, 2024 13:50:52 UTC".	LARM sta 70.0) (mini	ate, bec imum 1	ause datapo	pint
	View this alarm in the AWS Management Console: https://us-east-1.console.aws.amazon.com/cloudwatch/deeplink.js?region=us-east-1#alarmsV2:alarm/EC2-Alaram				
	Alarm Details:				
	- Name: EC2-Alaram				
	- Description: EC2-Alaram				
	- State Change: INSUFFICIENT_DATA -> ALARM				
	- Reason for State Change: Threshold Crossed: 1 out of the last 1 datapoints [99.44193548387098 (13/04/24 13:45:00)] was greater th	an or equa	al to the	e thresh	old
	(70.0) (minimum 1 datapoint for OK -> ALARM transition).				
	- Timestamp: Saturday 13 April, 2024 13:50:52 UTC				
	- AWS Account: 851725370789				
	- Alarm Arn: arn:aws:cloudwatch:us-east-1:851725370789:alarm:EC2-Alaram Activ	rate Wi	ndov	NS	
	Go to	Settings †	to acti	vate V	Vindows.
	I nresnoid:				

• Instance stopped after the CPU utilization reached 70%, it indicates that the CloudWatch alarm successfully triggered the action to stop the instance as configured.

nstance summary for i-Ocd8d1f944f3eba5c (Clou odated less than a minute ago	Con	nect Instance state V Actions V	
stance ID 3) i-Ocd8d11944f3eba5c (Cloudwatch-instance)	Public IPv4 address -	Private IPv4 address	es
v6 address	Instance state $\bigcirc$ Stopped	Public IPv4 DNS -	
ostname type ' name: ip-172-31-29-123.ec2.internal	Private IP DNS name (IPv4 only) D ip-172-31-29-123.ec2.internal		
nswer private resource DNS name vv4 (A)	Elastic IP addresses –		
uto-assigned IP address	VPC ID	AWS Compute Optin Opt-in to AWS Co Learn more 🔀	mizer finding ompute Optimizer for recommendations.
IM Role	Subnet ID 🗗 subnet-0a08bc99110b4ec4c 🕻	Auto Scaling Group –	name
IDSv2 equired			
etails Status and alarms <u>New</u> Monitoring See	urity Networking Storage Tags		
Instance details Info			
latform JI Amazon Linux (Inferred)	AMI ID  ami-051f8a213df8bc089	Monitoring disabled	Activate Windows Go to Settings to activate Windows.

## Conclusion

In this lab, we learned how to use AWS CloudWatch for monitoring EC2 instances. By setting up CloudWatch alarms and actions, you can proactively manage your AWS resources and ensure optimal performance and cost efficiency.

### Exercise

Create an AWS CloudWatch alarm for an EC2 instance to enhance monitoring and automation? The requirement are as follows:

- 1. The evaluation period is 5 minutes.
- 2. The CPU Utilization threshold to trigger the alarm at 50.
- 3. The action on alarm trigger to terminate the instance only after five consecutive minutes of persistence.



## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #9 Introduction to AWS CloudTrail

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name:			

CMS ID: _____



## **Objectives**

- Understand the purpose and benefits of AWS CloudTrail.
- Learn how to enable CloudTrail for logging AWS API calls.
- Practice analyzing CloudTrail logs for security and compliance purposes.
- Gain hands-on experience in configuring CloudTrail settings.

### **Pre-requisites**

- An AWS account with administrative access.
- Basic familiarity with AWS services and concepts.
- Access to the AWS Management Console.

## Outcomes

After completing this session, student should be able to:

- Explain the function and significance of AWS CloudTrail.
- Enable CloudTrail logging for an AWS account.
- Interpret CloudTrail logs to identify security events and compliance issues.
- Adjust CloudTrail settings to meet specific logging requirements.

## Introduction

AWS CloudTrail is a service provided by Amazon Web Services (AWS). It is also known as a cloud audit trail, is a record of all activities and events that occur within a AWS computing environment. It provides a detailed history of all user and system interactions, including actions taken, changes made, and resources accessed.



A cloud trail typically includes information such as:

- 1. User identities and roles
- 2. Dates and times of events
- 3. Actions performed (e.g., login, logout, create, update, delete)
- 4. Resources accessed (e.g., files, folders, databases)
- 5. IP addresses and locations

## 6. Success or failure of actions

## **Key Features:**

- **Comprehensive Logging:** CloudTrail captures a wide range of activities that occur within an AWS environment, including actions taken via the AWS Management Console, AWS Command Line Interface (CLI), SDKs, and other AWS services. This encompasses everything from creating, modifying, or deleting AWS resources to changes in security configurations, access controls, and network settings.
- **Event Logging:** Each API call and associated event is recorded as a log entry, containing detailed information such as the timestamp of the action, the identity of the user or service initiating the action, the specific API method invoked, the resources affected by the action, and additional metadata. This granular level of logging allows for comprehensive auditing and analysis of AWS activity.
- Visibility and Transparency: CloudTrail provides organizations with a transparent view of their AWS infrastructure, facilitating visibility into who did what, when, and from where within the AWS environment. This transparency is crucial for maintaining accountability, detecting unauthorized or suspicious activity, and ensuring compliance with regulatory requirements and internal security policies.
- Security Monitoring: By monitoring and analyzing CloudTrail logs, organizations can detect security incidents, identify potential vulnerabilities, and proactively mitigate risks. Security-relevant events, such as unauthorized access attempts, changes to IAM policies, or modifications to critical resources, are captured in CloudTrail logs, enabling timely incident response and remediation.
- **Compliance and Governance:** CloudTrail supports compliance efforts by providing auditable records of AWS activity, which can be used to demonstrate adherence to regulatory standards, industry best practices, and internal governance policies. The ability to retain and archive CloudTrail logs facilitates compliance reporting, forensic investigations, and regulatory audits.
- **Operational Insights:** Beyond security and compliance, CloudTrail logs can also yield valuable operational insights, helping organizations optimize resource utilization, troubleshoot operational issues, and streamline cloud management processes. By analyzing patterns and trends in CloudTrail data, organizations can identify inefficiencies, improve performance, and enhance operational resilience.
- Integration and Automation: CloudTrail integrates seamlessly with other AWS services, allowing organizations to automate workflows, trigger alerts, and respond to events based on CloudTrail logs. Integration with services like Amazon CloudWatch enables real-time monitoring and alerting, while integration with AWS Lambda enables automated responses to specific events or conditions.

## **Steps to Create CloudTrail:**

This lab will guide you through the process of setting up and utilizing CloudTrail to record the activities, enhance security, compliance, and operational troubleshooting within your AWS environment.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Enable CloudTrail:

• Navigate to the CloudTrail service in the AWS Management Console.

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=	Consol		Search results for 'cloudtrail'		Add widgets
	∷ Recen	Services (3) Features (7) Resources (New)	CloudTrail ☆		e application :
	Cloud Cloud	Documentation (2,618) Knowledge Articles (21) Marketplace (198) Bloce (146)	Active security and the sage		< 1 >
	Cloud	Events (1)	Othena ☆ Serverless interactive analytics service		Originating a
	Cloud		Features		
	Simpl		Create a SFTP server ൽ AWS Transfer Family feature		• Activate Windows
https://us-e	east-1.console.aws.an	nazon.com/console/home?region=us-east-1		© 2024, Amazon Web Services, Inc. or its affili	iates. Privacy Terms Cookie preferences

• Click on "Create a Trail".

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= (	<ol> <li>We're continui</li> </ol>	ng to improve the CloudTrail Lake console experience to make it easier to use. Let us know what ye	ou think.							Θ
		anagement & Governance								- 1
		AWS CloudTrail	Create a	trail w	ith AW	S Clou	ıdTrail			
	(	Continuously log your AWS Get started with AWS Cloud Trail by creating a trail to log				9				
	ĩ	account activity	Create a trail							
		as close hun to meet your governance, compliance, and additing needs for your news accounts.								
			Pricing 🗹	1				_		
	ŀ	low it works								
			Pricing 🗹				Activate V	Vindov	/s	
D. Clo	udShell Feedbac		© 2024, Amazo	in Web Se	rvices, Inc	or its affi	Go to Setting Illiates. Privacy	s to activ	Cookie prefere	ences 🖕

• Again Click on "Create trail".

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≡ 💿 we	e're continui	ng to improve the CloudTrail Lake console e	xperience to make it easier to use. <u>Let us</u>	know what you think.					٩
Clo	oudTrail >	Quick trail create							9
Q	Quick t	rail create							
	Trail det Start logging choose a diff A trail create	ails management events by creating a trail with simpli rent bucket or additional events, go to the fui of in the console is a multi-region trail. Learn more	fied settings. Logs are sent to an 53 bucket we sate traill <mark>v</mark> orkflow.	create on your behalf. To					
	Trail name Enter a displ	iy name for your trail.							
	managem	ent-events							
	3-128 charao	ters. Only letters, numbers, periods, underscores, a	nd dashes are allowed.						
	Trail log bu	cket and folder							
	aws-cloud	trail-logs-851725370789-c09ce401							
	Logs will be	tored in aws-cloudtrail-logs-851725370789-c09ce	401/AWSLogs/851725370789				Activate Go to Settin	Windows gs to activate Windov	
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• Provide trail name and storage location.

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We're continuing to improve the C	oudTrail Lake console experience to make it easier to use. Let us know what	you think.						×	٤
<u>CloudTrail</u> > Create trail									0
Step 1 Choose trail attributes	Choose trail attributes								
Step 2 Choose log events	General details A trail created in the console is a multi-region trail. Learn more 🔀								
Step 3 Review and create	Trail name Enter a display name for your trail.								
	Cloud-trail-demo	is are allowed							
	Enable for all accounts in my organization To review accounts in your organization, open AWS Organizations. See a	II accounts 🗹							
	Storage location Info								
	<ul> <li>Create new S3 bucket Create a bucket to store logs for the trail.</li> </ul>	<ul> <li>Use existing \$3 bucket</li> <li>Choose an existing bucket to store logs for this trail.</li> </ul>							
	Trail log bucket and folder Enter a new 53 bucket name and folder (prefix) to store your logs. Bucke	t names must be globally unique.							
	cloudtrail-blucket								
	Logs will be stored in cloudtrail-bucket/AWSLogs/851725370789 Log file SSE-KMS encryption Info					Act Go to	ivate Win Settings to	d <mark>ows</mark> activate Windows.	

• Specify settings such as log file encryption, SNS notification.

aws	Services	Q Search	[Alt+S]	Σ.	¢	0	۲	N. Virginia 🔻	Khawaja Saad Ahmed But	t 🔻 🥤
=			Enter a new 55 bucket name and folder (prefix) to store your logs. Bucket names must be globally unique.							٩
			cloudtrail-bucket Logs will be stored in cloudtrail-bucket/AWSLogs/851725370789							0
			Log file SEE KMC execution							G
			Enabled							
			▼ Additional settings							- 1
			Log file validation Info							- 1
			Z Enabled							- 1
			SNS notification delivery Info							- 1
			Z Enabled							
			Create a new SNS topic							
			New							
										- 1
			SNS topic							
			Q cloudwatch X							
			CloudWatch Logs - optional							
			Configure CloudWatch Logs to monitor your trail logs and notify you when specific activity occurs. Standard CloudWatch and CloudWatch Logs charges apply. Learn more [							
			CloudWatch Logs Info				Acti	vate Wind	lows	
			Enabled				Go to	o Settings to	activate Windows.	_
Eloud	fShell Feedbad	k	©2	024, Amazor	n Web Se	rvices, Inc	or its affi	iliates. Privacy	Terms Cookie preferer	nces 🚽

• Specify the CloudWatch Settings.

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			C
	CloudWatch Logs - optional Configure CouldWatch togs to movine your trail logs and notify you when specific activity occurs. Standard CloudWatch and CloudWatch Logs dwarps apply. Learn more C		G
	CloudWatch Logs   Infe Enabled Log group Infe		
	New     Existing		
	Log group name		
	1-512 characters. Only letters, numbers dishes underscores, forward slashes and periods are allowed		
	IAM Role Info AWS CloudTrail assumes this role to send CloudTrail events to your CloudWatch Logs log group.  New New Constitution		
	C Existing		
	Demo-cloudwatch-trail		
	Policy document		
	Tags - optional Into	Activate Wi Go to Settings	ndows to activate Windows.
ClaudChall Facilitati	Mar an add an a man tan ta bala na managa and an man an anno an anno an dudina taile.	an Mich Comisso Inc. or its officiates Date	

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• Click on "Next"

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=			Log group name							٤
			aws-cloudtrail-logs-851725370789-0f48d900							~
			1-512 characters. Only letters, numbers, dashes, underscores, forward slashes, and periods are allowed.							Θ
			IAM Role Info							
			Aws Cloud rail assumes this role to send Cloud rail events to your Cloud watch Logs log group.							
			Role name							
			Demo-cloudwatch-trai							
			Policy document							
			Tags - optional Info							
			You can add one or more tags to help you manage and organize your resources, including trails.							
										- 1
			Key Value - optional							
			Enter key Enter value Remove							
			Add tag							
			You can add 49 more tags							
							Acti	vate Wind	lows	
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S. Clou	iShell Feedbac	*	© 20.	24, Amazon	Web Ser	vices, Inc.	or its affi	liates. Privacy	Terms Cookie prefere	nces

• Select Event Type, API activity, and click on next.

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=	Step 3 Review and create	Event type Choose the tope of events that you want to loo.						() ()
		Management events     Capture management operations performed on your AWS resources.     Data events     tog the resource operations performed on or within a resource.						
		Insigns events Insigns Insig						
		Management events show information about management operations performed on resources in your AWS account.           ③ No additional charges apply to log management events on this trail because this is your first copy of						
		API activity Choose the activities you want to log.						
		Read     Write     Exclude AWS KMS events     Exclude Amizon RDS Data API events						
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• Review and confirm your trail configuration before creating it.

Current Q control         Stars 1         Stars 2         Table 2         Table 2         Table 2         Multi-region trait         Vers 3         Apply Table 1         Table 2	We're continuing to improve the C	oudTrail Lake console experience to make it easier	o use. Let us know what you think.						٩	
Starp 3 Review and create       General details         Tail anne Cloud-trail-demo Audit-reijon trail Nati -region tra	CloudTrail > Create trail Step 1 Choose trail attributes Step 2 Choose log events	Review and create Step 1: Choose trail attributes		Edit					0	
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Colto Cattinos te estivate Mindour		Log group aws-cloudtrail-logs-851725370789-0	IAM Role 148d900 Demo-cloudwatd	n-trail		,	Activate Wir	ndows		

• Click on "Create Trail".

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S. Clou	dShell Feedbac	ck				© 2024, Ama	on Web Serv	lces, Inc. or It	s affiliates. Privac	Terms Cookie prefere	ences	ļ

• Trail is successfully created.

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= 0	) We're continuing to improv	ve the CloudTrail Lake console o	xperience to make it easier to	use. Let us know what y	ou think.								× ©
ତ	) Trail successfully created												× ©
	CloudTrail > Trails												
	Trails						Copy ev	ents to L	ake	C	Delete	Create trail	
	Name	▲ Home region	♥ Multi-region trail	▼ Insights	♥ Organization	trail v S3 bucket	▼ Log file prefix	~	CloudW log grou	atch Logs p	▼ Statu	s 🔻	
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• Verification Email for trail creation.

CloudTrail validation message.					
-					
If you wish to stop receiving notifications from this topic, please click or visit the link below t	to unsubscribe:				
https://sns.us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscribe.html?SubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws.com/unsubscriptionArn=arn:aws:sns:us-east-1.amazonaws	east-1:851725370789:Clou	dwatch	:68bca	<u>4d1-0c9</u>	0-
460b-bff9-b7c95dbfaaa8&Endpoint=engr.hasnainhyder@gmail.com					
Please do not reply directly to this email. If you have any questions or comments regarding	this email, please contact	us at			
https://aws.amazon.com/support					
Cloudwatch <no-reply@sns.amazonaws.com></no-reply@sns.amazonaws.com>	11:11PM (3 minutes ago)	☆	Û	Ś	:
to me 👻					
/"s3Bucket"·"cloudtrail.bucket_11222" "s3ObjectKey/"·["AW/SLogs/851725370789/CloudTrail	l/us_east_1/2024/04/18/				
	1/13-013(-1/2024/04/10/				
051720570705_000011aii_05-cast-1_20240410110102_NW5IIINAAIIIDIGBAINA.jS01.g2 ]}					

## Step 2: Explore CloudTrail Logs:

• Go to cloudWatch

aws	Services	Q cloudwatch	×	D & Ø Ø	N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
Clou	dWatch		Search results for 'cloudwa'		Í
Favor	ites and recents		Services	See all 53 results 🕨 📤	Contraction (Characteristic)
Dasht <b>Alarn</b> In ala	00ards ns 🛕 4 ⊘ 12 🤆 rm	Features (73) Resources <b>New</b> Documentation (25,957)	CloudWatch ☆ Monitor Resources and Applications		oatterns [2] Display ▼ ③
All ala Billing	arms 9	Knowledge Articles (816) Blogs (7,150) Events (312)	Q Athena ☆ Serverless interactive analytics service		
▼ Logs Log g Log A	roups	Tutorials (29)	Marazon EventBridge ☆ Serverless service for building event-driven applications.		: "AROA4MTWJYWSUCSI4CZ6Z:Au
Live T Logs I	ail Insights		▲ Cloud9 ☆ A Cloud IDE for Writing, Running, and Debugging Code		pScaling-RetrieveCurrentCapacit
▼ Metri	cs		Features	See all 73 results ►	
All me	etrics		principaira - Anovenino-Indocarector J		Activate Windows
Explo	rer IShell Feedback		"ana": "anaisuriasioE177E278780;sala/sur canida nola/dur © 2024, A	mazon Web Services, Inc. or its affiliat	tes. Privacy Terms Cookie preferences

• Click on Log group and navigate to cloud trail you have created.

aws	Services	Q cloudwatch		×	<b>&gt;</b>	Ø N. Virginia ▼	Khawaja Saad Ahmed Butt 🔻
Clou	dWatch	×	CloudWatch > Log groups				9 Î
Favor	ites and recents	- F					
Dasht	boards		Log groups (4) By default, we only load up to 10000 log groups.	G Actions V	iew in Logs Insights Star	Create lo	og group
▼ Alarn In ala	ns <u>A</u> 4 🥑 12 🤆 rm	∋1	Q Filter log groups or try prefix search		E	xact match < 1	> ©
All ala	arms		Log group	⊽ Log	class 🗢 Anomaly d	▼   Da ▼   Se.	▼   Rete
Billing	9		/aws/lambda/image-resizer-lamd	a-function Star	idard Configure		Neve
▼ Logs			/aws/lambda/image-resizing-buke	cet-function Star	idard Configure		Neve
Log g	iroups		/aws/lambda/image-resizing-func	tion-for-images Star	dard Configure		Neve
Log A	nomalies		aws-cloudtrail-logs-85172537078	9-0f48d900 Star	idard Configure		Neve
Logs	Insights		4				•
▼ Metri	ics						
All m	etrics	_				Activate Wi	ndows to activate Windows.
Explo Cloud	iShell Feedback	:			© 2024, Amazon Web Services, Inc. o	r its affiliates. Privacy	Terms Cookie preferences

• Go to log stream and open any of the log stream.

<	Log streams Tags Anomaly detection	Metric filters         Subscription filters         Contributor Insights         Data pro
Log :	streams (4)	C     Delete     Create log stream     Search all log streams       Exact match     Show expired     Info     1     >     Image: Stream
	Log stream	▼     Last event time
	851725370789_CloudTrail_us-east-1_4	2024-04-18 23:24:12 (UTC+05:00)
	851725370789_CloudTrail_us-east-1	2024-04-18 23:22:09 (UTC+05:00)
	851725370789_CloudTrail_us-east-1_3	2024-04-18 23:17:08 (UTC+05:00)
	851725370789_CloudTrail_us-east-1_2	2024-04-18 23:08:47 (UTC+05:00) Activate Windows

• You will be given multiple log events. select the log event you want to see.

aws	Services	Q cloudwatch			×	2	\$	0		. Virginia 🔻	Khawaja Saad Ahmed Butt	•
Cloud	Watch	×	► Timesta	mp	Message							*
Favorit	es and recents				No older events at this moment. <u>Retry</u>							
Dashbo	ards	-	▶ 2024-04-	18T23:10:48.535+05:00	{"eventVersion":"1.08","userIdentity"	:{"type	':"AWSSe	rvice","i	nvokedBy"	:"cloudtrai	.amazonaws.com"}	
Alarms	s ∧ 4 ⊘ 12 G	0.1	▶ 2024-04-	18T23:10:48.535+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	":"Assum	edRole","	principal	Id":"AROA4M	WJYWSYFZRQV37K:C	
In alarr	n		▶ 2024-04-	18T23:10:48.535+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	':"AWSSe	rvice","i	vokedBy"	:"cloudtrai	.amazonaws.com"}	
All alar	ms		▶ 2024-04-	18T23:10:48.535+05:00	{"eventVersion":"1.08","userIdentity"	:{"type	':"AWSSe	rvice","i	nvokedBy"	:"rds.amazo	naws.com"},"event	
Billing			▶ 2024-04-	18T23:10:48.535+05:00	<pre>("eventVersion":"1.08","userIdentity"</pre>	:{"type	':"AWSSe	rvice","i	vokedBy"	:"rds.amazo	naws.com"},"event	
▼ Logs			▶ 2024-04-	18T23:10:48.535+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	':"AWSSe	rvice","i	vokedBy"	:"cloudtrai	.amazonaws.com"}	
Log gro	oups		▶ 2024-04-	18T23:20:30.157+05:00	{"eventVersion":"1.08","userIdentity"	:{"type	":"Assum	edRole","	principal	Id":"AROA4M	WJYWSUCSI4CZ6Z:A	
Log An	omalies		▶ 2024-04-	18723:24:12.215+05:00	{"eventVersion":"1.08","userIdentity"	:{"type	":"Root"	,"principa	alId":"85	1725370789"	"arn":"arn:aws:i…	
Live Ta	il		▶ 2024-04-	18T23:24:12.215+05:00	{"eventVersion":"1.08","userIdentity"	:{"type	":"Root"	,"principa	alId":"85	1725370789"	"arn":"arn:aws:i…	
Logs In	isignts		▶ 2024-04-	18T23:24:12.215+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	":"Root"	,"principa	1Id":"85	1725370789"	"arn":"arn:aws:i…	
Metrics	s		▶ 2024-04-	18T23:24:12.215+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	":"Root"	,"principa	1Id":"85	1725370789"	"arn":"arn:aws:i…	
All met	rics	-	▶ 2024-04-	18T23:24:12.215+05:00	{"eventVersion":"1.09","userIdentity"	:{"type	":"Root"	,"principa	A (	tivate W 1725370789"	to activate windows.	+
CloudS	hell Feedback	:			© 2024, An	nazon We	b Service	s, Inc. or its	affiliates.	Privacy	Terms Cookie preferen	ces

## • Example log that shows the previously table creation

"accessKeyId": "ASIA4MTWJYWSWKVZPIAS",	▲ ▲
"sessionContext": {	
"sessionIssuer": {	
"type": "Role",	
"principalId": "AROA4MTWJYWSUCSI4CZ6Z",	
<pre>"arn": "arn:aws:iam::851725370789:role/aws-service-role/dynamodb.application-</pre>	
autoscaling.amazonaws.com/AWSServiceRoleForApplicationAutoScaling_DynamoDBTable",	
"accountId": "851725370789",	
"userName": "AWSServiceRoleForApplicationAutoScaling_DynamoDBTable"	
},	
"attributes": {	
"creationDate": "2024-04-18T18:18:04Z",	
"mfaAuthenticated": "false"	
}	
},	
"invokedBy" "dynamodb_application_autoscaling.amazonaws.com"	
),	
"eventTime": "2024-04-18T18:18:04Z",	
"eventSource": "dynamodb.amazonaws.com",	
eventwame : Describerable ,	
"awsRegion": "us-east-1",	
"sourceIPAddress": "dynamodb.application-autoscaling.amazonaws.com",	
"userAgent": "dynamodb.application-autoscaling.amazonaws.com",	
"re	
"tableName": "Student_data"	
},	
"responseElements": null,	
"requestID": "N04BB9PRQACGKLQQUNVM90NN8RVV4KQNS05AEMVJF66Q9ASUAAJG",	
"eventID": "6fb19495-0675-42bc-a0bd-06b68a9cbc62",	
"readonly": true,	
"resources": [	
{	
"accountId": "851725370789",	
"type": "AWS::DynamoDB::Table",	
"ARN": "arn:aws:dynamodb:us-east-1:851725370789:table/Student_data"	Activate Window Rack to top
	Go to Sottings to activite Mindows
, i	So to settings to activate windows.

• Another Example.

	{"eventVersion":"1.09","userIdentity":{"type":"Root","principalId":"85172537078	89","arn":"arn:aws:iam::851725370789:root","accountId":"851725370789","
<pre>1024-04-1012312412.134+05100 "eventVersion": "3.00", "useridentity": [     "sype": "Root",     "strate="initial-rate",     "print="color:",     "strate="initial-rate",     "accountid": "051725370707 "accessionContext"; [     "arcountid": "051725370707",     "accessionContext"; [     "arcountid": "20.     "arcountid": "20.</pre>	("eventversion':1.00", useridentity":{"type::/koot", principalid::s31/253/070 9", 370789:root", SYNACSSNV", 24-04-18708:16:302", "false"	69 , "ann" ! "anni aws i 1 as : ! 851725370789 ! "ac. Copy
" ventTime": "2024-04-38T18122: "eventSource": "31.mszonat "assRagion": "us-GSISI "assRagion": "us-GSISI "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "assRagion": "39.01.138.1 "responseElements": "10.01.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.05.050.0 "cipherSuite": "15.050.050.0 "cipherSuite": "15.050.000.0 "cipherSuite": "15.050.000.0 "cipherSuite": "15.050.000.0 "cipherSuite": "15.050.000.0 "cipherSuite": "15.050.000.0 "cipherSuite": "15.050.000.000.000.0 "cipherSuite": "15.050.000.000.000.000.000.000.000.000.0	982", "", 19", us-internal/3 awa-tak-java/1,12,488 Linux/5,10,210-178,855,amzn2int.x86_64 OpenJOK_e "BOOK/SEADBFO] ; 	64-81t_Server_VM/25,372-b08 jsvs/1.8.0_372

Go the S3 bucket you have created for cloud trail to review the stored AWS logs.

aws III Services Q Search		[Alt+S]		D 🗘	N. Virgi	nia 👻 Khawaja Saad Ahmed Butt 🖣
Amazon S3 ×	Objects Properties					¢
Buckets Access Grants Access Points Object Lambda Access Points Multi-Borian Access Points	Objects (48) Info Objects are the fundamental entities stored in A Q. Find objects by prefix	Copy S3	URI Copy URL Download Open C	Delete Actio	ions  Create folde idity grant them permissions. Lea	r 🕞 Upload mmore ⊘ < 1 > ⊚
Batch Operations	Name	▲ Туре	▼   Last modified ▼   Size	$\nabla$	Storage class	~
IAM Access Analyzer for S3 Block Public Access settings for this account	east- 1_20240418T18102_Kw3mNAx nnDIGBxnN.json.gz	gz	April 18, 2024, 23:11:47 (UTC+05:00)	550.0 B	Standard	
Storage Lens Dashboards Storage Lens groups	851725370789_CloudTrail_us- east- 1_20240418118152_D3cE2K1M q86hcctF.json.gz	gz	April 18, 2024, 23:18:20 (UTC+05:00)	1.3 KB	Standard	
AWS Organizations settings Feature spotlight 2	B51725370789_CloudTrail_us- east- 1_20240418118152_Vm4qAZjq mh2t8Vis_json.gz	92	April 18, 2024, 23:13:59 (UTC+05:00)	5.7 KB	Standard	
AWS Marketplace for S3	B     851725370789_CloudTrail_us-     east-     1_20240418T18152_WepXGzjiC     eSwr2cW.json.gz	gz	April 18, 2024, 23:16:29 (UTC+05:00)	882.0 B	Standice tivate W Go to Settings	<b>/indows</b> s to activate Windows.

- Create EC2 instance and check whether the records is added on log or not.
- Go to Event logs in CloudTrail.

Even Event h	<b>It history (50+) Info</b> listory shows you the last 90 days o	f management events.			C	Download events 🔻 Create Athena table
Read	l-only	▼ Q, false			×	te and time < 1 2 > (6)
	Event name	Event time	User name	Event source	Resource type	Resource name
	RegisterManagedInst	April 19, 2024, 00:12:42 (UTC+0	i-0f2b1bbd7e9523	ssm.amazonaws.com	-	-
	SharedSnapshotVolu	April 19, 2024, 00:12:09 (UTC+0	-	ec2.amazonaws.com	-	-
	RunInstances	April 19, 2024, 00:12:07 (UTC+0	root	ec2.amazonaws.com	AWS::EC2::VPC, AWS::E	vpc-04890b2673355c706, ami-04e5276ebb845144
	AuthorizeSecurityGro	April 19, 2024, 00:12:03 (UTC+0	root	ec2.amazonaws.com	AWS::EC2::SecurityGroup	sg-03a1e8aa69840deb1
	CreateSecurityGroup	April 19, 2024, 00:12:02 (UTC+0	root	ec2.amazonaws.com	AWS::EC2::VPC, AWS::E	vpc-04890b2673355c706, sg-03a1e8aa69840deb1,
	CreateLogStream	April 18, 2024, 23:17:09 (UTC+0	CLOUDWATCH_LO	logs.amazonaws.com	-	-
	CreateLogStream	April 18, 2024, 23:10:48 (UTC+0	CLOUDWATCH_LO	logs.amazonaws.com	-	-
	CreateLogStream	April 18, 2024, 23:08:47 (UTC+0	CLOUDWATCH_LO	logs.amazonaws.com	-	-
	UpdateTrail	April 18, 2024, 23:04:55 (UTC+0	root	cloudtrail.amazonaws.c om	AWS::CloudTrail::Trail,	Cloud-trail-demo, arn:aws:cloudtrail:us-east-1:8517

### The same can be verified from the cloud trail s3 bucket

851725370789_CloudTrail_us-east-1_20240418T1920Z_cFJFitVanm9xmxRW.json - Notepad X File Edit Format View Help {"Records":[{"eventVersion":"1.09","userIdentity":{"type":"Root","principalId":"851725370789","arn":"arn:aws:iam::851725370 / ntProvidedHostHeader":"<mark>ec2.us-east-1.amazona</mark>ws.com"},"sessionCredentialFromConsole":"true"},{"eventVersion":"1.09","userIde 

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100% Windows (CRLF) UTF-8

## Conclusion

In this lab, we use AWS CloudTrail to monitor and audit activity within your AWS environment. By leveraging CloudTrail logs, you can enhance your organization's security posture, streamline compliance efforts, and gain valuable insights into operational workflows.

## Exercise

- 1. Identify and document at least three events from the CloudTrail logs provided. Include details such as the event type, timestamp, and details.
- 2. Using cloudtrail generate alarm on EC2 instance termination.



## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #10 Introduction to Simple Notification Service (SNS)

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



## **Objectives**

- Understand the fundamentals of Simple Notification Service (SNS).
- Learn how to create topics and subscribe endpoints.
- Practice sending notifications through SNS.
- Gain familiarity with SNS features and capabilities.

### **Pre-requisites**

- Basic understanding of AWS (Amazon Web Services) console.
- An AWS account with permissions to access SNS.
- Familiarity with basic concepts of messaging services.

## Outcomes

After completing this session, student should be able to:

- Create an SNS topic.
- Subscribe endpoints (e.g., email, SMS) to the SNS topic.
- Publish messages to the SNS topic.
- Understand the use cases and benefits of SNS in real-world applications.

## Introduction

Simple Notification Service (SNS) is a fully managed messaging service provided by AWS. It enables you to send notifications to a variety of endpoints, including email, SMS, HTTP/S, AWS Lambda, and more. SNS follows a publish-subscribe model, where messages are published to topics and delivered to subscribed endpoints.



### Steps to create SNS service:

This lab will guide you through the process of create Simple Notification Service (SNS) service. SNS is a tool from AWS that lets you send messages to different places, like emails or text messages. It is easy to use and helps keep people informed about important things.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Creating an SNS Topic:

• Navigate Simple Notification Service in the search bar of console.

aws	Services	Q simple notification service	×			D. 🗘 Ø 🚳 N. Virginia ▼	Khawaja Saad Ahmed Butt 🔻
=						Reset to default layout	0
			Services	See all 92 results 🕨 🔺			Θ
		Features (145) Resources <b>New</b> Documentation (494,029)	Simple Notification Service SNS managed message topics for Pub.	ት /Sub	<b>:ations (</b> 0) Info IS East (K. Virginia)	Create application :	
		Knowledge Articles (1,303) Marketplace (62) Blogs (12,276)	Simple Queue Service 🏫 SQS Managed Message Queues		(Current Region) ▼ Q Find applications ▲   Description ▼   Region ▼   O	< 1 >	
		Tutorials (59) Events (300)	Amazon Simple Email Service Email Sending and Receiving Service	: <b>☆</b>	No applications Get started by creating an app	lication.	
			Service Catalog 🏠 Create, share, organize, and govern yo	our curated infrastructure as code (IaC) templa	Create application		
			Features	See all 145 results >			
			Dashboard SWF feature		Go to myApplications nd usage info		
			Notification alarms				
			Parameter Store			A stinute Minder	
		Discours new AWE	Amazon Pinpoint SMS	•	Data unavailable You must have Cost Explorer enabled to view y	ACTIVATE WINDO Go to Settings to acti pur cost and usage data.	WS vate Windows.

• Write topic name and click on next.

aws	Services Q Search	[Alt+S]	Þ	- <del>\$</del>	0	۲	N. Virginia 🔻	Khawaja Saad Ahmed Bu	utt 🔻 🕯
≡	Amazon SNS now supports	s in-place message archiving and replay for FIFO topics. Learn more 🛛						×	0
		Application Integration							
		Amazon Simple	Create topic						1.1
		Notification Service Pub/sub messaging for microservices and serverless applications.	Topic name A topic is a message chan- message to a topic, it fan subscribed endpoints. hasnain-snq Next step Start with an overview	nel. When out the n	you publi	ish a o all			
		that enables you to decouple microservices, distributed systems, and event-driven servertess applications. Amazon SNS provides topics for high-throughput, push-based, many-to-many messaging.	Pricing				∆ctivate Wi	ndows	
P C	oudShell Feedback		© 2024, Amazo	n Web Sei	vices, Inc.	. or its affi	So to Settings liates. Privacy	to activate Windows. Terms Cookie prefere	ences

• After adding Display name click on create

Create topic		
Details		
Details		
Type Info Topic type cannot be modified after topic is created		
FIFO (first-in, first-out)  Stotty-preserved nessage ordering Existy-none message delony (staty-none message delony) (staty-none)mess use 200 publishes/second Subscription protocols: SQS	Standard  Rest-affort message ordering  Highest throughput is publication Highest throughput is publication of Highest throughput is publication of Highest throughput is publication of Highest throughput is publication endpoints	
Name		
hasnain-sns		
Maximum 256 characters. Can include alphanumeric characters, h Display name - optional info To use this topic with SMS subscriptions, enter a display name. Or	piblens (-) and underscores (_).	
hasnain-sns		
Maximum 100 characters.		
<ul> <li>Encryption - optional Amazon SNS provides in-transit encryption by default. Enablis</li> </ul>	ig server-side encryption adds at-rest encryption to your topic.	
		Activate Windows

• Click on create subscription

aws Services Q Search	[Alt+S]		と 🕹 🕜 🕥 N. Virginia	🔻 Khawaja Saad Ahmed Butt 👻
Amazon SNS ×	hasnain-sns		Edit Delete	Publish message
Dashboard <b>Topics</b> Subscriptions	Details	Display name		©
<ul> <li>Mobile</li> <li>Push notifications</li> <li>Text messaging (SMS)</li> <li>Origination numbers</li> </ul>	SNS     X     hasnain-sns     Edit     Deter     Publish message       15     Name     Display name     Isavain-sns       ations     Name     Basaain-sns     Isavain-sns       ations     ARN     Topic owner       Bissini-sns     Status     Detexter       Subscriptions     Access policy     Data protection policy     Delivery solicy (HTTP/S)       Delete     Request confirmation     Confirm subscriptions     Create subscription       Q     Search     Image: Create subscription     Create subscription       D     Endpoint     Vu dort have subscription     Create subscription       Vu dort have subscription     Create subscription     Activate Windows       Co to Settings to activate Windows     Create subscription     Activate Windows			
	Subscriptions         Access policy         Data protection policy	Delivery policy (HTTP/S) Delivery status logging Encryption	Tags Integrations	
	Q Search	Edit Delete Request confirmat	ion Confirm subscription Crea	< 1 > 💿
	ID   ID  ID	t 🔻 Status	▼ Protocol	~
		No subscriptions found You don't have any subscriptions to this topic. Create subscription	Activate Wir	ndows
> CloudShell Feedback		© 20	024, Amazon Web Services, Inc. or its affiliates. Pri	wacy Terms Cookle preferences

• Click on "Protocol" and select "Email" from the dropdown menu.

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≡	Amazon SNS > Subscription	s > Create subscription									٩
	Create subscrip	tion									9
	Details										
	Topic ARN										
	Q, arn:aws:sns:us-east-1	851725370789:hasnain-sns		×							
	Protocol The type of endpoint to subscri	be									
	Select protocol			▲							
	Amazon Kinesis Data Fire	lose									
	Amazon SQS										
	AWS Lambda										
	Email										
	Email-JSON										
	HTTP										
	- HTTPS										
	Platform application end	point									
	SMS										
				Cancel	Create subscription			Activat Go to Se	te Windo ttings to ad	OWS ctivate Windows.	
S. Clou	dShell Feedback					© 2024, Amazon	Web Services,	nc. or its affilia	ites. Privacy	Terms Cookie prefer	ences

• Enter the email addresses where you want to receive notifications and click on "Create Alarm".

Services Q Search		[Alt+S]			Ð	\$ Ø	۲	N. Virginia 🔻	Khawaja Saad Ah
Details									
Topic ARN									
Q, arm:aws:sns:us-east-1:8	1725370789:hasnain-sns		×						
Protocol The type of endpoint to subscribe									
Email			•						
Endpoint An email address that can receive	notifications from Amazon SNS.								
engr.hasnainhyder@gmail.c	m								
After your subscriptio	i is created, you must confirm it. Inf	0							
Subscription filter	olicy - optional Info								
This policy ritters the message	that a subscriber receives.								
<ul> <li>Redrive policy (dea Send undeliverable messages</li> </ul>	<b>i-letter queue) - optional n</b> 10 a dead-letter queue.	fo							
			Cancel	Create subscription			Activ Go to S	ate Wind Settings to a	OWS ctivate Windo
						_			

• Go to your Gmail and click on Confirm Subscription.

AWS Notification - Subscription Confirmation Inbox ×				¢	Ø
hasnain-sns <no-reply@sns.amazonaws.com> to me ▼</no-reply@sns.amazonaws.com>	6:24 PM (0 minutes ago)	☆	٢	¢	:
You have chosen to subscribe to the topic: arn:aws:sns:us-east-1:851725370789:hasnain-sns To confirm this subscription, click or visit the link below (If this was in error no action is necessary): <u>Confirm subscription</u>					
Please do not reply directly to this email. If you wish to remove yourself from receiving all future SNS subscription confirmation requests	s please send an email to <u>sns-op</u>	<u>t-out</u>			
← Reply → Forward ⊕					



Simple Notification Service

## Subscription confirmed!

You have successfully subscribed.

```
Your subscription's id is:
arn:aws:sns:us-east-1:851725370789:hasnain-sns:d231a737-b95b-4df5-bd7b-
3983e83d8487
```

If it was not your intention to subscribe, <u>click here to unsubscribe</u>.

• Go to the SNS topic you have created and click on publish message.



• Write the subject of the email and message you want to publish.

aws	Services	Q Search	[Alt+S]		Þ	\$	0	0	N. Virginia 🔻	Khawaja Saad Ahmed B	utt 🔻
=											٤
	Topic ARN										0
	am:aws:sns	us-east-1:851725370789:hasnain-sns:									
	Subject - o	otional									
	Noticatio										
	Maximum 10	u printable ASCII characters									
	Time to Liv This setting a	e (TTL) - optional Info pplies only to mobile application endpoints. The number of secon	nds that the push notification service has to deliver the message	to the endpoint.							
	Morrage	body									
	Message	body									
	Message st	ructure									
	O Ident	ical payload for all delivery protocols.	Custom payload for each delivery protocol.								
	The s topic,	me payload is sent to endpoints subscribed to the regardless of their delivery protocol.	Different payloads are sent to endpoints subscribed to the topic, based on their delivery protocol.								
		· · · · · · · · · · · · · · · · · · ·		1							
	Message be	dy to send to the endpoint									
	2	w are you:									
	3 This	is example message.						Artic	ata Minal		
				1				Go to S	ate vvinde Settings to a	ows ctivate Windows	
S CloudSt	hell Feedback			n	2024 Amazor	n Web Sen	ices Inc.	or its affiliat	tes Privary	Terms Cookie prefer	rences

• Click on "publish Message".

pe Select attribute type	Name	Value	Remove	
Add another attribute				

#### • Notification Result.



## Step 3: Notification using SMS service:

• Go to the SNS topic and Click on "Create Subscription."

Subscriptions Access policy	y Data protection policy Deli	very policy (HTTP/S) Delivery status logging	Encryption Tags Integra	tions
Subscriptions (1)		Edit Delete Request confirmati	on Confirm subscription	Create subscription
ID	Endpoint	⊽ Status	▼ Protocol	⊽
O ff2b21e8-9596-4896-bd	92-01434d625 engr.hasnainhyder	@gmail.com 📀 Confirmed	<b>™A</b> ctivate	Windows
			Go to Sett	ings to activate Wind

• Select the protocol and number, which you want to publish message.

#### Create subscription

opic ARN	
Q arn:aws:sns:us-east-1:851725370789:hasnain-sns	×
Protocol The type of endpoint to subscribe	
SMS	•
Use: "+923130318351"	
Use: "+923130318351"	
When in the sandbox, you can only deliver SMS to the sandbox destination phone numbers you have verified. Learn more 2	

• Go to text messaging and click on publish text message

C Search	[Alt+S]	> 🗘 (?) (?) N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
Amazon SNS X	Important changes for sending text messages (SMS) to US destinations     Effective August 31, 2023, a dedicated registered origination ID, such as a 10DLC number, short     to the United States and its territories (Puerto Rico, Guam, American Samoa Islands and the US	code, or a Toll-Free number, is required to send SMS text messages Virgin Islands). Unregistered long codes are no longer permitted to
Dashboard Topics	be used to send SMS messages to mobile phones in the United States and its territories. Learn	more Z
Subscriptions	New Feature     Amazon SNS now supports in-place message archiving and replay for FIFO topics. Learn more	z ×
Push notifications Text messaging (SMS)	Amazon SNS > Text messaging (SMS)	
Origination numbers	Mobile text messaging (SMS)	View origination numbers Subscribe number to topic Publish text message
	▼ Overview	
	Amazon SNS lets you send SMS text messages to any phone number. Learn more 🕑	Patho test mesugo Patho test mesugo Wer down Storage
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• Write the number and message you want to publish and then click on "publish message".

Details			
Vessage type Vhile promotional messages are non-critical, transact	ional messages are sent with high priority.		
Promotional		•	
Destination phone number The phone number to which to send the message.			
Q +923130318351		×	
Sandbox destination phone numbe When in the sandbox, you can only d have verified. Learn more [2] Add phone number	rs eliver SMS to the sandbox destination phone numbers	You	
Sandbox destination phone numbe When in the sandbox, you can only d have verified. Learn more C Add phone number	rs eliver SMS to the sandbox destination phone numbers as multiple messages.	you	
Sandbox destination phone numbe When in the sandbox, you can only d have verified. Learn more [2] Add phone number Message SMS messages longer than 160 characters are treated H How are You	rs eliver SMS to the sandbox destination phone numbers as multiple messages.	/ou	

Successful Compilation

⑦ The SMS message to +923130318351 is accepted. For delivery status, check the delivery log.
Message "ID": dd68c404-d005-5342-928d-9aa4de35dae9
Request "ID": 9535545f-3fc5-593b-b41c-0aff31f5a090

## Conclusion

In this lab, Now that we have explored the functionality of SNS, we have established a topic, subscribed to notifications, and sent messages. Consider the real-world applications of this tool, such as employing it for timely alerts or updates within your projects. SNS offers a versatile platform for keeping stakeholders informed and connected, ensuring crucial information reaches them promptly. Experimenting further with its capabilities can unveil innovative ways to enhance communication and streamline processes in various contexts.

## Exercise

- 1. Try linking SNS with other AWS tools, like Lambda, to automate responses.
- 2. Experiment with customizing messages using SNS attributes.


## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #11 Introduction to Docker

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name:			

CMS ID: _____



#### **Objectives**

- Introduce students to Docker, a popular containerization platform.
- Provide hands-on experience in creating and managing Docker containers.
- Foster a fundamental understanding of Docker concepts.
- Enable students to work with Docker containers effectively by the end of the lab.

#### **Pre-requisites**

- Basic familiarity with the command line interface (CLI).
- Understanding of basic software development concepts.
- A computer with Docker installed. Installation instructions can be found on the official Docker website (https://docs.docker.com/get-docker/).

#### Outcomes

After completing this session, student should be able to:

- Understand the concept of containerization and its advantages.
- Learn about Docker images, containers, and the Dockerfile.
- Gain proficiency in creating, running, and managing Docker containers.
- Appreciate the importance of Docker in modern software development and deployment practices.

### Introduction

Docker is a platform for developing, shipping, and running applications inside containers. Containers are lightweight, portable, and self-sufficient environments that contain everything needed to run an application, including code, runtime, libraries, and dependencies. Docker simplifies the process of packaging and deploying applications, making them more consistent and easier to manage across different environments.



## **Docker Image:**

- An image in Docker is a lightweight, standalone, and executable package that contains everything needed to run a piece of software, including the code, runtime, libraries, dependencies, and other files.
- Images are built from a set of read-only layers that are stacked on top of each other. Each layer represents a specific instruction in the image's Dockerfile.
- Images are immutable, meaning they cannot be changed or modified once created. However, they can be used to create one or more containers.
- Docker images are typically stored and shared using Docker registries, such as Docker Hub, which serves as a centralized repository for Docker images.

## **Docker Container:**

- A container in Docker is a runtime instance of a Docker image. It encapsulates the application along with its dependencies and provides an isolated environment for running and executing the application.
- Containers are lightweight, portable, and can be run consistently across different environments, ensuring that the application behaves the same way regardless of where it is deployed.
- Containers are ephemeral, meaning they can be created, started, stopped, and destroyed as needed. This makes them ideal for applications that need to scale dynamically or be deployed and redeployed frequently.
- Each container runs in its own isolated environment, with its own filesystem, network, and process space, ensuring that it does not interfere with other containers running on the same host.

## **Advantages of Docker:**

- **Portability:** Docker containers can run on any system that supports Docker, regardless of the underlying infrastructure.
- **Isolation:** Containers provide process isolation, ensuring that applications run independently without interfering with each other.
- Efficiency: Docker containers share the host OS kernel, resulting in faster startup times and lower resource overhead compared to virtual machines.
- **Consistency:** Docker ensures consistency between development, testing, and production environments, reducing the risk of "it works on my machine" issues.

### **Steps to use Docker:**

This lab will guide you through the process of setting up and utilizing CloudTrail to record the activities, enhance security, compliance, and operational troubleshooting within your AWS environment.

Step 1: Installing Docker:

- Follow the installation instructions provided on the Docker website for your operating system. Link: <u>https://docs.docker.com/get-docker/</u>
- Verify the installation by running docker --version in the terminal or command prompt.



Step 2: Running Your First Container:

• Pull a Docker image from Docker Hub using the command "docker pull image_name". For example, docker pull hello-world.



• Run the container using the command docker run <image_name>. For example, docker run hello-world.



147 | Page

Step 3: Working with Docker Images:

• List available Docker images using "docker images".

C:\Windows	\system32\cmd	l.exe		
<b>-</b>				
https://doc	mpies and s docker c	ideas, visit:		
neeps.//uoc	s.uocker.c	.om/get-starteu/		
C:\Users\FPE	>docker im	lages		
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
ubuntu	latest	7af9ba4f0a47	11 days ago	77.9MB
hello-world	latest	d2c94e258dcb	11 months ago	13.3kB

• Checking the images in Docker Desktop

<del> <b>docker</b> desktop</del>		Q. Search for images, containe	ers, volume Ctrl+K 🗢 🔹	) 🗢 💷 🧧	Sign in 🛛 — 🗆 🖂
Containers	Containers Give feedback				
😌 Images					
Columes	Container CPU usage		Container memory usage		Show charts
🔧 Builds	No containers are running.		No containers are running.		
Dev Environments BETA	Q Search	Only show ru	unning containers		
💽 Docker Scout	Name	Image Status	CPU (%) Port(s)	Last started	Actions
Extensions	a9b54bf21dc-	hello-world Exited	N/A	2 minutes ago	► E   II
Add Extensions					
					Showing 1 item
	Walkthroughs				$\times$
	Multi-conta	iner applications	Contair	nerize your applica	ation
	8 mins		\$ docker init 3 mins		
	View more in the Learning center				
🐡 Engine running 🛛 🕨 🔢	RAM 1.77 GB CPU 3.04% 🛚 💘 Not signe	ed in		0	New version available  🔔

• Pull additional images from Docker Hub using "docker pull image_name". For example, docker pull ubantu.



• Run the Ubuntu container using the command "docker run –it –d ubuntu".



Step 4: Interact with a Running Container:

• Execute a command within a running container using "docker exec". For example, "docker exec -it container_id bash" to start a bash shell inside the container.

C:\Users\FPE>docker exec -it d65b4b13473b bash root@d65b4b13473b:/#

• write the command "echo hello" to print the name in command line.

root@d65b4b13473b:/# echo hello hello root@d65b4b13473b:/#

Step 5: Managing Docker Containers:

• Stop a running container using command "docker stop container_id".

C:\Users\FPE≻docker stop d65b4b13473b d65b4b13473b

• View the current running containers.

C:\Users\FPE>d	ocker ps					
CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES
C:\Users\FPE>						

The above result shows that the container with id "d65b4b13473b" is stopped now.

• Creating new image on a local machine. Use the command "docker commit container-id name/ubuntu". Then write command "docker images" to check total images.

C:\Users\FPE>doo sha256:42623a680	ker commi ac555e637	t d65b4b13473b   4db5e07db08efcd2	hasnain/ubuntu 23c2227934e3b9bfe	8e12f927e2d6ef
C:\Users\FPE>dod	ker image	s		
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
hasnain/ubuntu	latest	42623a680ac5	30 seconds ago	77.9MB
ubuntu	latest	7af9ba4f0a47	11 days ago	77.9MB
hello-world	latest	d2c94e258dcb	11 months ago	13.3kB
C:\Users\FPE>				

• Deleting the docker container by using command "docker rm container-id"

```
C:\Users\FPE>docker rm d65b4b13473b
d65b4b13473b
C:\Users\FPE>docker ps -a
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
a9b54bf21dc4 hello-world "/hello" About an hour ago Exited (0) About an hour ago cool_kapitsa
C:\Users\FPE>
```

• Deleting the docker images by using command "docker rmi repository-name"

C:\Users\FPE>d REPOSITORY hasnain/ubuntu ubuntu hello-world	locker imag TAG I latest latest latest	es IMAGE ID 42623a680ac 7af9ba4f0a4 d2c94e258dc	:5 17 :b	CREATED 20 minutes a 11 days ago 11 months ag	ago go	SIZE 77.9MB 77.9MB 13.3kB			
C:\Users\FPE>d Untagged: hasn Deleted: sha25	locker rmi ain/ubuntu 6:42623a68	hasnain/ubuntu :latest 0ac555e6374db5	ı 5e07o	db08efcd23c22	227934	4e3b9bfe	8e12f92	27e2d6ef	
C:\Users\FPE≻d REPOSITORY ubuntu hello-world	locker imag TAG latest latest	es IMAGE ID 7af9ba4f0a47 d2c94e258dcb	CRI 11 11	EATED days ago months ago	SIZ 77.9 13.3	E 9MB 3kB			
C:\Users\FPE>									

#### Conclusion

In this lab, students been introduced to Docker and learned about its key concepts, including images, containers, and the Dockerfile. Through hands-on experience, the simplicity and efficiency inherent in working with Docker containers have become evident. Docker's ability to streamline the development, testing, and deployment processes makes it an essential tool for modern software development teams.

## Exercise

- > Pull Docker Images:
  - a. Use the docker pull command to fetch two Docker images from Docker Hub.
- Run Docker Containers:
  - b. Execute the docker run command to start containers from the pulled images.
- > Delete Containers:
  - c. Utilize the docker rm command to remove the containers after they have been used.



# Sukkur IBA University

## Bootcamp

**Cloud Computing** 

2024

## Lab Module #12 Docker on AWS EC2

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name:			

CMS ID: _____



#### **Objectives**

- Introduce Docker, a containerization platform.
- Guide through the process of installing Docker on an AWS EC2 instance.
- Learn basic Docker commands.
- Understand how to create custom Docker images.

#### **Pre-requisites**

- Basic understanding of Linux command-line interface.
- An AWS account with access to EC2 instances.

### Outcomes

After completing this session, student should be able to:

- Understand the concept of Docker and its advantages.
- Install Docker on an Ubuntu-based AWS EC2 instance.
- Execute basic Docker commands to manage containers.
- Create custom Docker images.

### Introduction

Docker is a containerization platform that allows developers to package their applications along with all its dependencies into a container. These containers can be deployed across different environments without worrying about compatibility issues.



## **Docker Image:**

• An image in Docker is a lightweight, standalone, and executable package that contains everything needed to run a piece of software, including the code, runtime, libraries, dependencies, and other files.

- Images are built from a set of read-only layers that are stacked on top of each other. Each layer represents a specific instruction in the image's Dockerfile.
- Images are immutable, meaning they cannot be changed or modified once created. However, they can be used to create one or more containers.
- Docker images are typically stored and shared using Docker registries, such as Docker Hub, which serves as a centralized repository for Docker images.

## **Docker Container:**

- A container in Docker is a runtime instance of a Docker image. It encapsulates the application along with its dependencies and provides an isolated environment for running and executing the application.
- Containers are lightweight, portable, and can be run consistently across different environments, ensuring that the application behaves the same way regardless of where it is deployed.
- Containers are ephemeral, meaning they can be created, started, stopped, and destroyed as needed. This makes them ideal for applications that need to scale dynamically or be deployed and redeployed frequently.
- Each container runs in its own isolated environment, with its own filesystem, network, and process space, ensuring that it does not interfere with other containers running on the same host.

## Advantages of Docker:

- **Portability:** Docker containers can run on any system that supports Docker, regardless of the underlying infrastructure.
- **Isolation:** Containers provide process isolation, ensuring that applications run independently without interfering with each other.
- Efficiency: Docker containers share the host OS kernel, resulting in faster startup times and lower resource overhead compared to virtual machines.
- **Consistency:** Docker ensures consistency between development, testing, and production environments, reducing the risk of "it works on my machine" issues.

## Steps to install and use Docker in ubuntu:

In this lab, we will explore how to install docker on an EC2 instance. Then, we will explore the fundamental commands used in docker. Finally, we will wrap up by crafting our very own personalized Docker image.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

	Search results for 'EC2'	\$ Ø @	N. Virginia V Khawaja Saad Ahmed Butt V
Services (13) :: Recen Features (57) Resources New C EC2 Documentation (34,650) Syste Knowledge Articles (610) Marketplace (3,441) Blogs (2,143)	Services  EC2 ☆ Virtual Servers in the Cloud  EC2 Image Builder ☆ A managed service to automate build, customize and deploy OS im	See all 13 results >	te application     t
Events (30) Tutorials (21)	<ul> <li>☑ Recycle Bin Protect resources from accidental deletion</li> <li>☑ Amazon Inspector ☆ Continual vulnerability management at scale</li> </ul>		Originatin
	Features	See all 57 results ►	• Activate Windows # Go to Settings to activate Windows

Step 2: Once logged in, click on search, write "EC2", and select "EC2" section.

• Click on Instances (running)

aws	Services	Q Se	arch			[Alt+S]	D	¢	0	۲	N. Virginia 🔻	Khawaja Saad Ahmed	Butt 🔻
EC2	Dashboard Global View	×	Î	Resources		EC2 Global view 🖄 🔘	C		EC2 I Offers f	Free Ti	<b>er Info</b> S Regions.		<u>۹</u>
Ever	its			You are using the following Amazon EC2	resource	es in the US East (N. Virginia) Region:							- 1
Con	sole-to- Preview			Instances (running)	0	Auto Scaling Groups	0		0 EC2	2 free t	tier offers in	use	
▼ Insta	ances			Dedicated Hosts	0	Elastic IPs	0		End of	month ffers for	torecast ecasted to excee	ed free tier li	- 1
Insta	ances				_		_		mit.				
Insta	ance Types			Instances		Key pairs	5		Exceed	ls free ti	er		
Laur	nch Templates			Load balancers	0	Placement groups	0		<u>∧</u> 0 o	ffers exc	eeded and is no	w pay-as-yo	
Spot	Requests			Security around	_	Spanshotz	0		u-go p	ricing.			
Savi	ngs Plans			Security groups		Shapshots	•		View 0	ilobal EO	2 resources		
Rese	erved Instances			Volumes	1								
Dedi	icated Hosts												
Capa	acity								`	/iew all	AWS Free Tier o	ffers 🖸	
Rese	ervations New			Launch instance		Service health							
▼ Imag	ges			To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.		AWS Health Dashboard 🖸			Acco	unt at	<b>tributes</b> te M	/indov <b>S</b>	
AMI	5		-								Go to Settings	s to activate Windows,	-

• Click on the "Launch Instance" button to initiate the instance creation process.

aws Serv	vices	<b>λ</b> Sear	[Al	+S] D D Ø Ø N. Virginia ▼ Khawaja Saad Ahmed Butt ▼
EC2 Dashboard EC2 Global Viev	w	×	Q. Find Instance by attribute or tag (case-sensitive)	C Connect Instance state V Actions V Launch instances V
Events Console-to-			Instance state = running X Clear filters	A 1 > O
▼ Instances				No matching instances found
Instances		- 1	•	•
Instance Types		- 1		
Launch Templa	tes			
Spot Requests				
Savings Plans				
Reserved Instan	nces			
Dedicated Host	s			
Capacity Reservations	lew			
Images				Activate Windows
AMIs		-	Select an instance	Go to Settings to activate Windows.
				155   P a g e

#### • Write the name and tags



• In the "Choose an Amazon Machine Image (AMI)" section, select a linux AMI from the provided list.

			▼ Summary
Application and OS Images (Amazon Machine	e Image) Info		Number of instances Info
n AMI is a template that contains the software configuration (	operating system, applicat	tion server, and	1
oplications) required to launch your instance. Search or Brows	e for AMIs if you don't see	what you are looking for	
elow			Software Image (AMI)
			Amazon Linux 2023 AMI 2023.3.2read more
Q Search our full catalog including 1000s of application and 0	OS images		ami-0d7a109bf30624c99
			Virtual server type (instance type)
Quick Start			t2.micro
			Firewall (security group)
Amazon macOS Ubuntu Windows	Red Hat SUSE Li	Q	New security group
Linux		Browse more AMIs	Storage (volumes)
aws ubuntu [®] Microsoft	Red Hat SUS	Including AMIs from AWS, Marketplace and the Community	1 volume(s) - 8 GiB
			Cancel August Instance
mazon Machine Image (AMI)			

• Select an instance type based on your computing requirements. Consider factors such as CPU, memory, storage, and network performance.

Instance type Info   Get advice			1
Instance type t2.micro Family t2 1 vCPU 1 GiB Memory Current generation: true On-Demand Windows base pricing: 0.0162 USD per Hour On-Demand SUSE base pricing: 0.0116 USD per Hour On-Demand Linus base pricing: 0.0116 USD per Hour On-Demand Linus base pricing: 0.0116 USD per Hour Additional costs apply for AMIs with pre-installed software	Free tier eligible	<ul> <li>All generations</li> <li>Compare instance types</li> </ul>	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99 Virtual server type (instance type) t2.micro Firewall (security group) New security group

• If you have not already created a key pair, you will be prompted to create or select an existing key pair. This key pair is essential for securely accessing your Windows instance.

▼ Key pair (login) Info	Number of instances Info		
You can use a key pair to securely connect to your instance. Ensure that you have acc before you launch the instance.	Software Image (AMI) Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99	•	
Select	C Create new key pair	Virtual server type (instance type)	
		t2.micro	

• Configure instance details such as the number of instances, network settings, subnet, security groups, etc. Ensure that the configurations align with your requirements.

VPC - required Info	Number of instances Info
vpc-04890b2673355c706 (default) ▼ C	
Cubant Inf	Software Image (AMI)
No preference C Create new subnet C	Amazon Linux 2023 AMI 2023.3.2read more ami-0d7a109bf30624c99
Auto-assign public IP Info	Virtual server type (instance type)
Enable V	t2.micro
Additional charges apply when outside of free tier allowance	Firewall (security group)
Firewall (security groups) Info	New security group
A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.	Storage (volumes)
Create security group     Select existing security group	1 volume(s) - 8 GiB
Security group name - required	Cancel
launch-wizard-4	Go to Sattings to activate

## • Allow HTTPS and HTTP traffic from the internet

no preference (berdate babilet in any av	the preference (bendure subject in any avanability zone)						
Auto-assign public IP Info							
Enable							
Additional charges apply when outside of	free tier allowance						
Firewall (security groups) Info A security group is a set of firewall rules that control the traffic for your instance. Add rules to allow specific traffic to reach your instance.							
• Create security group	<ul> <li>Select existing security group</li> </ul>						
We'll create a new security group called	'launch-wizard-10' with the following rules:						
Allow SSH traffic from Helps you connect to your instance	<ul> <li>✓ Allow SSH traffic from Helps you connect to your instance</li> <li>Anywhere 0.0.0.0/0</li> </ul>						
Allow HTTPS traffic from the internet To set up an endpoint, for example when creating a web server							
<ul> <li>Allow HTTP traffic from the internet</li> <li>To set up an endpoint, for example when creating a web server</li> </ul>							
▲ Rules with source of 0.0.0.0/0 allow all IP addresses to access your instance. We recommend setting × security group rules to allow access from known IP addresses only.							

• Specify the storage requirements for your instance. You can add additional volumes if needed. Adjust the size and type of storage based on your application's demands.

aws	Services Q Search	[Alt+S]	🕞 🔶 🥝 🙆 N. Virginia 🔻 Khawaja Saad Ahmed B	utt 🔻
=	▼ Configure storage Info	Advanced	Number of instances Info	() ()
	1x 8 GiB gp3 V Ro	ot volume (Not encrypted)	Software Image (AMI)	
	<ul> <li>Free tier eligible customers can get up to 30 GB of</li> <li>Add new volume</li> </ul>	EBS General Purpose (SSD) or Magnetic storage 🛛 🗙	Aniazon Enrox 2023 Anii 2023.5.21640 Inore ami-0471400815054269 Virtual server type (instance type) t2.micro	
	Click refresh to view backup information The tags that you assign determine whether the instance of Data Lifecycle Manager policies.	will be backed up by any	Firewall (security group) New security group Storage (volumes)	
	0 x File systems	Edit	1 volume(s) - 8 GiB	
	► Advanced details Info		Cancel Launch instance Review commands Activate Windows	

• Review all the configurations you have made for your instance. Once verified, click on the "Launch" button.

Step 3: Installing Docker on Ubuntu EC2 Instance:

• SSH into your Ubuntu EC2 instance.



• Update the machine by using command "sudo yum update -y".



• Install Docker using command "sudo yum install docker -y"

ec2-user@ip-172-31-17-64 ~]\$ sudo yum install docker -y .ast metadata expiration check: 0:06:05 ago on Mon Apr 22 19:56:09 2024. ependencies resolved.								
Package	Architecture	Version	Repository	Size				
Installing:								
docker	x86_64	25.0.3-1.amzn2023.0.1	amazonlinux	44 M				
Installing dependencies:								
containerd	x86_64	1.7.11-1.amzn2023.0.1	amazonlinux	35 M				
iptables-libs	x86_64	1.8.8-3.amzn2023.0.2	amazonlinux	401 k				
iptables-nft	x86 64	1.8.8-3.amzn2023.0.2	amazonlinux	183 k				
libegroup	x86_64	3.0-1.amzn2023.0.1	amazonlinux	75 k				
libnetfilter conntrack	x86 64	1.0.8-2.amzn2023.0.2	amazonlinux	58 k				
libnfnetlink	x86 64	1.0.1-19.amzn2023.0.2	amazonlinux	30 k				
libnftnl	x86 64	1.2.2-2.amzn2023.0.2	amazonlinux	84 k				
pigz	x86 64	2.5-1.amzn2023.0.3	amazonlinux	83 k				
runc	x86_64	1.1.11-1.amzn2023.0.1	amazonlinux	3.0 M				

• Starting docker service using command "sudo service docker start".



• Convert into root user by using command "sudo su".

```
[ec2-user@ip-172-31-17-64 ~]$ sudo su
[root@ip-172-31-17-64 ec2-user]#
```

• Verify the installation by running "docker version" in the command prompt.

OS/Arch:	linux/amd64
Context:	default
Server:	
Engine:	
Version:	25.0.3
API version:	1.44 (minimum version 1.24)
Go version:	go1.20.12
Git commit:	£417435
Built:	Mon Feb 12 00:00:00 2024
OS/Arch:	linux/amd64
Experimental:	false
containerd:	
Version:	1.7.11
GitCommit:	64b8a811b07ba6288238eefc14d898ee0b5b99ba
runc:	
Version:	1.1.11
GitCommit:	4bccb38cc9cf198d52bebf2b3a90cd14e7af8c06
docker-init:	
Version:	0.19.0
GitCommit:	de40ad0
[root@ip-172-31-17-0	64 ec2-user]#

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• Pull a Docker image from Docker Hub using the command "docker pull image_name". For example, docker pull hello-world.

```
[root@ip-172-31-17-64 ec2-user]# docker pull hello-world
Using default tag: latest
latest: Pulling from library/hello-world
c1ec31eb5944: Pull complete
Digest: sha256:a26bff933ddc26d5cdf7faa98b4ae1e3ec20c4985e6f87ac0973052224d24302
Status: Downloaded newer image for hello-world:latest
docker.io/library/hello-world:latest
[root@ip-172-31-17-64 ec2-user]#
```

• Run the container using the command docker run <image_name>. For example, docker run hello-world.

```
Hello from Docker!
This message shows that your installation appears to be working correctly.
To generate this message, Docker took the following steps:
1. The Docker client contacted the Docker daemon.
2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (amd64)
3. The Docker daemon created a new container from that image which runs the
   executable that produces the output you are currently reading.
4. The Docker daemon streamed that output to the Docker client, which sent it
   to your terminal.
To try something more ambitious, you can run an Ubuntu container with:
$ docker run -it ubuntu bash
Share images, automate workflows, and more with a free Docker ID:
https://hub.docker.com/
For more examples and ideas, visit:
https://docs.docker.com/get-started/
[root@ip-172-31-17-64 ec2-user]#
```

Step 4: Working with Docker Images:

• List available Docker images using "docker images".

```
[root@ip-172-31-17-64 ec2-user]# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
hello-world latest d2c94e258dcb 11 months ago 13.3kB
[root@ip-172-31-17-64 ec2-user]#
```

• Pull additional images from Docker Hub using "docker pull image_name". For example, docker pull ubantu.

```
[root@ip-172-31-17-64 ec2-user]# docker pull ubuntu
Using default tag: latest
latest: Pulling from library/ubuntu
3c645031de29: Pull complete
Digest: sha256:1b8d8ff4777f36f19bfe73ee4df61e3a0b789caeff29caa019539ec7c9a57f95
Status: Downloaded newer image for ubuntu:latest
docker.io/library/ubuntu:latest
[root@ip-172-31-17-64 ec2-user]#
```

• Run the Ubuntu container using the command "docker run –it –d ubuntu".

```
[root@ip-172-31-17-64 ec2-user]# docker run -it -d ubuntu
6a41b85e26ea95bdda7e43d65f265e1faeab1fd7be7ec3fb7d955e6b76369d17
[root@ip-172-31-17-64 ec2-user]#
```

• View total containers using command "docker ps -a".

[root@ip-172-31-17-64 ec2-user]‡ docker ps -a								
CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES		
6a41b85e26ea	ubuntu	"/bin/bash"	36 seconds ago	Up 35 seconds		inspiring_heyrovsky		
c886860ce338	hello-world	"/hello"	4 minutes ago	Exited (0) 3 minutes ago		sweet_raman		
[root@ip-172-31	L-17-64 ec2-use	er]#						

• View running containers using comman "docker ps".

root@ip-172-31-17-64 ec2-user]‡ docker ps								
CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS	NAMES		
6a41b85e26ea	ubuntu	"/bin/bash"	About a minute ago	Up About a minute		inspiring_heyrovsky		
[root@ip-172-3]	L-17-64 e	c2-user]#						

Step 4: Interact with a Running Container:

• Execute a command within a running container using "docker exec". For example, "docker exec -it container_id bash" to start a bash shell inside the container.

```
[root@ip-172-31-17-64 ec2-user]# docker exec -it 6a41b85e26ea bash
root@6a41b85e26ea:/#
```

• write the command "echo hello" to print the name in command line.

root@6a41b85e26ea:/#	echo	hello-world
hello-world		
root@6a41b85e26ea:/#		

Step 5: Managing Docker Containers:

• Stop a running container using command "docker stop container id".

```
[root@ip-172-31-17-64 ec2-user]# docker stop 6a41b85e26ea
6a41b85e26ea
[root@ip-172-31-17-64 ec2-user]#
```

• View the current running containers.



The above result shows that the container with id "da41b85e26ea" is stopped now.

• Creating new image on a local machine. Use the command "docker commit container-id name/ubuntu". Then write command "docker images" to check total images.

```
[root@ip-172-31-17-64 ec2-user]# docker commit 6a41b85e26ea hasain/ubuntu
sha256:0ad3c5461ef8c2e0b4459c04791ee58d7f92445af5bdf7dc51b51b9a673544ce
[root@ip-172-31-17-64 ec2-user]#
```

• Deleting the docker container by using command "docker rm container-id"

[root@ip-172-31-17-64	ec2-user]#	docker	rm	c886860ce338
c886860ce338				
[root@ip-172-31-17-64	ec2-user]#			

• Deleting the docker images by using command "docker rmi repository-name"

[root@ip-172-31-17-64 ec2-user]# docker images								
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE				
hasain/ubuntu	latest	0ad3c5461ef8	2 minutes ago	77.9мв				
ubuntu	latest	7af9ba4f0a47	12 days ago	77.9мв				
hello-world	latest	d2c94e258dcb	11 months ago	13.3kB				
[root@ip-172-31	l-17-64 ec2-	-user]# docker	rmi Oad3c5461ef	8				
Untagged: hasai	in/ubuntu:la	itest						
Deleted: sha256	5:0ad3c5461e	ef8c2e0b4459c0	4791ee58d7f92445	af5bdf7dc51b51b9a673544ce				
Deleted: sha256	5:36910db93d	15f8f96e3062a5	b79da72d38a790b0	b0f4a0cfe54d437a2e02f8aa4				
[root@ip-172-31	l-17-64 ec2-	-user]# docker	images					
REPOSITORY	IAG IN	AGE ID	CREATED	SIZE				
ubuntu l	latest 7a	af9ba4f0a47	12 days ago	77.9МВ				
hello-world l	latest d2	2c94e258dcb	11 months ago	13.3kB				
[root@ip-172-31	L-17-64 ec2-	-user]#						

Step 6: Creating Custom Docker Image:

• Create a Dockerfile in your project directory.



• Creating file using command "touch filename". For example, touch dockerfile.

[ec2-user@ip-172-31-17-64 demo]\$ touch dockerfile
[ec2-user@ip-172-31-17-64 demo]\$ [

• Now, open the docker file using the command "nano file_name". for example, nano dockerfile.

GNU nano 5.8					dockerfile	9				
					( Dead () lines	1				
^G Help ^X Exit	^C Write Out ^R Read File	^₩ Where Is ^\ Replace	^X Cut ^U Paste	^T Execute ^J Justify	^C Location M-U Unde ^/ Go To Line M-E Rede	M-A Set Mark M-6 Copy	M-] To Bracket ^C Where Was	M-C Previous M-W Next	^B Back ^F Forward	A Prev Word

• Write what you want to insert in dockerfile.

GNU mano 5.8 FROM ubuntu					d	dockerfile					Modified
CMD ["echo", "hel]	o-world"]										
^G Help ^% Exit	^C Write Out ^F Read File	^N Where Is ^\ Replace	^E Cut ^U Paste	^T Execute ^J Justify	^C Location ^/ Go To Line	M-U Undo M-E Redo	M-A Set Mark M-6 Copy	M-] To Bracket	M-Q Previous M-W Next	^B Back ^F Forward	^ Prev Word ^ Next Word

- Save the file by using command "ctrl + o" and "ctrl + x".
- Now, Build the dockerfile by using the command "sudo docker build –t file_name". For example, "sudo docker build –t dockerfile".



• To check the total images in our local host by using command "sudo docker images".

[ec2-user@ip-	172-31-17	-64 demo]\$ sudo	docker images	
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
ubuntu	latest	7af9ba4f0a47	12 days ago	77.9MB
dockerfile	latest	3a93c208c423	12 days ago	77.9MB
dockerfiled	latest	3a93c208c423	12 days ago	77.9MB
mydocker	latest	3a93c208c423	12 days ago	77.9MB
hello-world	latest	d2c94e258dcb	11 months ago	13.3kB
[ec2-user@ip-	172-31-17	-64 demo]\$		

• Now run the docker images by using the command "sudo docker run dockerfile".

[ec2-user@ip-172-31-17-64 demo]\$ sudo docker run dockerfile hello-world [ec2-user@ip-172-31-17-64 demo]\$

### Conclusion

In this lab, we learned the basics of Docker, including installation on an Ubuntu-based AWS EC2 instance, basic Docker commands, and creating custom Docker images. Docker provides a powerful toolset for containerizing applications, improving portability, scalability, and consistency across different environments.

### Exercise

- Pull Docker Images:
  - Use the docker pull command to fetch two Docker images from Docker Hub.
- Run Docker Containers:
  - Execute the docker run command to start containers from the pulled images.
- Delete Containers:
  - Utilize the docker rm command to remove the containers after they have been used.
- Create custom docker image.



## Sukkur IBA University

## Bootcamp

**Cloud Computing** 

2024

Lab Module #13 Docker Custom Images Exploration

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

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CMS ID: _____



#### **Objectives**

- Understand the concept of Docker images and containers.
- Learn to create Docker images from scratch.
- Gain hands-on experience in containerizing web applications.
- Practice deploying Docker containers with custom configurations.

#### **Pre-requisites**

- Basic understanding of Linux command line.
- Familiarity with HTML and web development.
- Docker installed on the local machine.

#### Outcomes

After completing this session, student should be able to:

- Ability to create custom Docker images.
- Proficiency in deploying Docker containers.
- Understanding of containerized web application deployment.
- Practical experience in managing Docker environments.

#### Introduction

Docker is a containerization platform that allows developers to package their applications along with all its dependencies into a container. These containers can be deployed across different environments without worrying about compatibility issues.



## **Docker Image:**

• An image in Docker is a lightweight, standalone, and executable package that contains everything needed to run a piece of software, including the code, runtime, libraries, dependencies, and other files.

- Images are built from a set of read-only layers that are stacked on top of each other. Each layer represents a specific instruction in the image's Dockerfile.
- Images are immutable, meaning they cannot be changed or modified once created. However, they can be used to create one or more containers.
- Docker images are typically stored and shared using Docker registries, such as Docker Hub, which serves as a centralized repository for Docker images.

## **Docker Container:**

- A container in Docker is a runtime instance of a Docker image. It encapsulates the application along with its dependencies and provides an isolated environment for running and executing the application.
- Containers are lightweight, portable, and can be run consistently across different environments, ensuring that the application behaves the same way regardless of where it is deployed.
- Containers are ephemeral, meaning they can be created, started, stopped, and destroyed as needed. This makes them ideal for applications that need to scale dynamically or be deployed and redeployed frequently.
- Each container runs in its own isolated environment, with its own filesystem, network, and process space, ensuring that it does not interfere with other containers running on the same host.

## Advantages of Docker:

- **Portability:** Docker containers can run on any system that supports Docker, regardless of the underlying infrastructure.
- **Isolation:** Containers provide process isolation, ensuring that applications run independently without interfering with each other.
- Efficiency: Docker containers share the host OS kernel, resulting in faster startup times and lower resource overhead compared to virtual machines.
- **Consistency:** Docker ensures consistency between development, testing, and production environments, reducing the risk of "it works on my machine" issues.

## Steps to create custom Docker images:

In this lab, you will delve into the world of Docker containerization by creating custom Docker images and deploying web applications within containers. You will learn how to build Docker images from scratch, containerize web applications, and deploy them with custom configurations. By the end of this lab, you will have a solid understanding of Docker fundamentals and hands-on experience in containerized application deployment.

Step 1: Sign in to the AWS Management Console

• Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).

• Sign in using your AWS account credentials.

Step 2: Once logged in, click on search, write "EC2", and select "EC2" section.

aws	Services	Q EC2	×	D 4 0 0	N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
=	Consol		Search results for 'EC2'		Add widgets
	Image: Recent     Image: Decomposition     Image: Decomposition	Services (13) Features (57) Resources New Documentation (34,650) Knowledge Articles (610) Marketplace (3,441) Blogs (2,143) Events (30) Tutorials (21)	Services         I C C ☆         Virtual Servers in the Cloud         I EC2 Image Builder ☆         A managed service to automate build, customize and deploy         I Recycle Bin         Protect resources from accidental deletion         I Amazon Inspector ☆         Continual vulnerability management at scale	See all 13 results i	e application : < 1 > Originatin
			Features	See all 57 results I	Activate Windows
>. Cloud	IShell Feedback		© 2024, Ar	mazon Web Services, Inc. or its at	filiates. Privacy Terms Cookie preferences

• Start the instance by Click on the "Instance" button to start machine.

Instan	ces (10) Info		C	Connect	Instance state 🔻	Actions <b>v</b>	Launch instances	•
Q Find	d Instance by attribute or tag	(case-sensitive)		All states	•		< 1 >	۲
1	Name 🗡	▼ Instance ID	Instance state 🛛 🔻	Instance type	▼ Status check			Alarr
L F	oublic-subnet-instance	i-0083e06e3293d8473	\ominus Stopped   Q	t2.micro	-			View
	docker-demo	i-0da2a643e9ae106a2	🕑 Running 🔍 Q	t2.micro	<ol> <li>Initializing</li> </ol>			View
🗌 r	newPubliccsubnet-instance	i-0707cc04b9c077b8a	\ominus Stopped   Q	t2.micro	-			View
. L	updatenewpublicinstance	i-078830e9f3f77e60c	⊖ Stopped 🍳 🤤	t2.micro	-			View
- F	private-cloud-instance	i-0a01eec7473e1e630	\ominus Stopped 😟 🝳	t2.micro	-			View
E F	RDS-instance	i-02ab89e1c2d33e4b2	\ominus Stopped   Q	t2.micro	-			View
🗌 r	new-privateeinstance	i-0cf10489f296b4634	⊖ Stopped 🍳 🤤	t2.micro	-			View
🗌 r	newnweprivateinstance	i-06c8f016ee12743d1	\ominus Stopped 🔍 Q	t2.micro	-			View
	cloudwatch-service	i-07fcac9ff16b3abc8	\ominus Stopped 🔍 Q	t2.micro	-			View
a	aws-cloud9-photo-recog-en.	i-015fbcbf38c97b872	igodot Stopped $igodot$ $igodot$	t2.micro	-			View

Step 3: Installing Docker on Ubuntu EC2 Instance:

• SSH into your Ubuntu EC2 instance.

aws Services	<b>Q</b> Search	[Alt+S]
, <u>#_</u> ~\ <u>####</u> _ ~~ _ <u>#####</u> \	Amazon Linux 2023	
~~ \###  ~~ \#/ ~~ \\#/	https://aws.amazon.com/linux/amazon-linux-2023	
~~~ / ~~·/ _/m/'-		
[ec2-user@ip-172-31	-17-64 ~]\$	

• Update the machine by using command "sudo yum update -y".

```
[ec2-user@ip-172-31-17-64 ~]$ sudo yum update -y
Last metadata expiration check: 0:03:40 ago on Mon Apr 22 19:56:09 2024.
Dependencies resolved.
Nothing to do.
Complete!
[ec2-user@ip-172-31-17-64 ~]$
```

• Install Docker using command "sudo yum install docker -y"

Package	Architecture	Version	Repository	Size
Installing:				
docker	x86_64	25.0.3-1.amzn2023.0.1	amazonlinux	44 M
Installing dependencies:				
containerd	x86_64	1.7.11-1.amzn2023.0.1	amazonlinux	35 M
iptables-libs	x86_64	1.8.8-3.amzn2023.0.2	amazonlinux	401 k
iptables-nft	x86 64	1.8.8-3.amzn2023.0.2	amazonlinux	183 k
libegroup	x86 64	3.0-1.amzn2023.0.1	amazonlinux	75 k
libnetfilter conntrack	x86 64	1.0.8-2.amzn2023.0.2	amazonlinux	58 k
libnfnetlink	x86 64	1.0.1-19.amzn2023.0.2	amazonlinux	30 k
libnftnl	x86 64	1.2.2-2.amzn2023.0.2	amazonlinux	84 k
pigz	x86 64	2.5-1.amzn2023.0.3	amazonlinux	83 k
runc	x86 64	1.1.11-1.amzn2023.0.1	amazonlinux	3.0 M

• Starting docker service using command "sudo service docker start".

```
[ec2-user@ip-172-31-17-64 ~]$ sudo service docker start
Redirecting to /bin/systemctl start docker.service
[ec2-user@ip-172-31-17-64 ~]$
```

• Check the status of docker by using command "sudo service docker status".



• Convert into root user by using command "sudo su".

[ec2-user@ip-172-31-17-64 ~]\$ sudo su [root@ip-172-31-17-64 ec2-user]# • Verify the installation by running "docker version" in the command prompt.

OS/Arch:	linux/amd64
Context:	default
Server:	
Engine:	
Version:	25.0.3
API version:	1.44 (minimum version 1.24)
Go version:	go1.20.12
Git commit:	£417435
Built:	Mon Feb 12 00:00:00 2024
OS/Arch:	linux/amd64
Experimental:	false
containerd:	
Version:	1.7.11
GitCommit:	64b8a811b07ba6288238eefc14d898ee0b5b99ba
runc:	
Version:	1.1.11
GitCommit:	4bccb38cc9cf198d52bebf2b3a90cd14e7af8c06
docker-init:	
Version:	0.19.0
GitCommit:	de40ad0
[root@ip-172-31-17-	64 ec2-user]#

Step 4: Creating Custom Docker Image:

• Create a Dockerfile in your project directory.

```
[ec2-user@ip-172-31-17-64 ~]$ mkdir demo
[ec2-user@ip-172-31-17-64 ~]$ cd demo
[ec2-user@ip-172-31-17-64 demo]$
```

• Creating file using command "touch filename". For example, touch dockerfile.

[ec2-user@ip-172-31-17-64 demo]\$ touch dockerfile
[ec2-user@ip-172-31-17-64 demo]\$ []

• Now, open the docker file using the command "nano file_name". for example, nano Dockerfile.



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• Write what you want to insert in Dockerfile.

GNU mano 5.8	dockerfile			Modified
FROM ubuntu CMD ["echo", "hello-world"]				
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A LAIC A Read File Replace "O Paste "O Justity	/ CONTONINATE DI-E REGO	C where was	S TOINALD	- HEAD MORE

- Save the file by using command "ctrl + o" and "ctrl + x".
- Now, Build the dockerfile by using the command "sudo docker build –t file_name". For example, "sudo docker build –t dockerfile".



• To check the total images in our local host by using command "sudo docker images".

[ec2-user@ip-	172-31-17-	64 demo]\$ sudo	docker images				
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE			
ubuntu	latest	7af9ba4f0a47	12 days ago	77.9MB			
dockerfile	latest	3a93c208c423	12 days ago	77.9MB			
dockerfiled	latest	3a93c208c423	12 days ago	77.9MB			
mydocker	latest	3a93c208c423	12 days ago	77.9MB			
hello-world	latest	d2c94e258dcb	11 months ago	13.3kB			
ec2-user@ip-172-31-17-64 demo]\$							

• Now run the docker images by using the command "sudo docker run dockerfile".

```
[ec2-user@ip-172-31-17-64 demo]$ sudo docker run dockerfile
hello-world
[ec2-user@ip-172-31-17-64 demo]$
```

• Create a project directory and go to the directly.



• Create a HTML file by using command touch file_name.

```
[ec2-user@ip-172-31-17-64 website-demo]$ touch demo.html
[ec2-user@ip-172-31-17-64 website-demo]$
```

• Open the HTML file by using command vi demo.html



• Create Docker file by using the command "touch Dockerfile".

```
[ec2-user@ip-172-31-17-64 website-demo]$ touch Dockerfile
[ec2-user@ip-172-31-17-64 website-demo]$
```

• Open the Dockerfile by executing the command "vi Dockerfile". Inside the Dockerfile, incorporate instructions to include the Nginx web server. Additionally, ensure to copy the HTML page you have created into the Docker image. Modify the Dockerfile as needed to achieve this.

FROM nginx

COPY static-html-directory /usr/share/nginx/html

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FROM ng	inx							
COPY der	no.html /usi	/share/nginx/html						G
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• Next, initiate the Docker build process by executing the command "sudo docker build -t latest-website ."



• Verify whether the Docker image has been generated correctly by running the command "sudo docker images" to display a list of available images.

[ec2-user@ip-172-31-17-64 website-demo]\$ sudo docker images								
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE				
latest-website	latest	2c4737465b87	2 minutes ago	188MB				
mynewswebsite-demo	latest	8096753b1857	2 days ago	188MB				
website	latest	f92706c48ab0	2 days ago	188MB				
my-website	latest	2320b4441913	2 days ago	150MB				
myapp	latest	c9f692cba178	2 days ago	188MB				
myfile	latest	a6476b080d6a	2 weeks ago	77.9MB				
dockerfile	latest	3a93c208c423	2 weeks ago	77.9MB				
dockerfiled	latest	3a93c208c423	2 weeks ago	77.9MB				
ubuntu	latest	7af9ba4f0a47	2 weeks ago	77.9MB				
docker-new-file	latest	b7c548e315a8	2 weeks ago	77.9MB				
mydocker	latest	fcaf88f3b098	2 weeks ago	77.9MB				
hello-world	latest	d2c94e258dcb	12 months ago	13.3kB				
[ec2-user@ip-172-31-17-64 website-demo]\$								

• Execute the command "sudo docker run -d -p 80:80 latest-website" to launch the Docker image in detached mode, mapping port 80 of the container to port 80 of the host.

[ec2-user@ip-172-31-17-64	website-demo]\$	sudo docker	run -d	-p 80:80	latest-website
1b194e6e1ca3cd80288699601c	19db388e16537be:	ff5eebce5887	03f3e0d	b9265	

• Copy the public IP address of your EC2 instance and paste into any browser.

Jpdated 6 minutes ago		
nstance ID 🗗 i-0da2a643e9ae106a2 (docker-demo)	Public IPv4 address D 52.23.238.58 open address Z	Private IPv4 addresses D 172.31.17.64
Pv6 address -	Instance state	Public IPv4 DNS D ec2-52-23-238-58.compute-1.amazonaws.com open address
Hostname type P name: ip-172-31-17-64.ec2.internal	Private IP DNS name (IPv4 only)	
Answer private resource DNS name Pv4 (A)	Instance type t2.micro	Elastic IP addresses –
Auto-assigned IP address 🗗 52.23.238.58 [Public IP]	VPC ID 🗗 vpc-04890b2673355c706 🗹	AWS Compute Optimizer finding (i) Opt-in to AWS Compute Optimizer for recommendations. Activate Windows

hellow world

Conclusion

Through this lab, you have gained practical experience in creating custom Docker images, containerizing web applications, and deploying them using Docker containers. Docker provides a powerful platform for building, shipping, and running applications in a consistent and efficient manner. By mastering Docker fundamentals, you are equipped to tackle more complex containerization tasks and streamline your development and deployment workflows.

Exercise

Create an HTML page containing the message "I am enrolled in a cloud computing course." Convert this HTML page into a Docker image, then instantiate a container using this image and run it on port 80:80.Utilize the docker rm command to remove the containers after they have been used.



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2024

Lab Module #14 Docker Custom Images with Online Website Templates

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



Objectives

- Learn to create custom Docker images.
- Understand the process of containerizing applications with Docker.
- Practice deploying HTML templates into Docker containers.
- Gain experience in building Docker images from online web pages.

Pre-requisites

- Basic understanding of Docker concepts.
- Familiarity with HTML/CSS.

Outcomes

After completing this session, student should be able to:

- Ability to create Docker images and containers.
- Proficiency in containerizing HTML templates.
- Skill in converting online web pages into Docker images.

Introduction

Docker is a containerization platform that allows developers to package their applications along with all its dependencies into a container. These containers can be deployed across different environments without worrying about compatibility issues.



Docker Image:

• An image in Docker is a lightweight, standalone, and executable package that contains everything needed to run a piece of software, including the code, runtime, libraries, dependencies, and other files.

- Images are built from a set of read-only layers that are stacked on top of each other. Each layer represents a specific instruction in the image's Dockerfile.
- Images are immutable, meaning they cannot be changed or modified once created. However, they can be used to create one or more containers.
- Docker images are typically stored and shared using Docker registries, such as Docker Hub, which serves as a centralized repository for Docker images.

Docker Container:

- A container in Docker is a runtime instance of a Docker image. It encapsulates the application along with its dependencies and provides an isolated environment for running and executing the application.
- Containers are lightweight, portable, and can be run consistently across different environments, ensuring that the application behaves the same way regardless of where it is deployed.
- Containers are ephemeral, meaning they can be created, started, stopped, and destroyed as needed. This makes them ideal for applications that need to scale dynamically or be deployed and redeployed frequently.
- Each container runs in its own isolated environment, with its own filesystem, network, and process space, ensuring that it does not interfere with other containers running on the same host.

Advantages of Docker:

- **Portability:** Docker containers can run on any system that supports Docker, regardless of the underlying infrastructure.
- **Isolation:** Containers provide process isolation, ensuring that applications run independently without interfering with each other.
- Efficiency: Docker containers share the host OS kernel, resulting in faster startup times and lower resource overhead compared to virtual machines.
- **Consistency:** Docker ensures consistency between development, testing, and production environments, reducing the risk of "it works on my machine" issues.

Steps to create custom Docker images:

In this lab, you will dive into the world of Docker custom images by containerizing online website templates. We will start by creating Docker images and containers, then move on to deploying HTML templates into Docker containers. Finally, we will explore the process of building Docker images from online web pages.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Consol		Search results for 'EC2'	2 4 0 9	N. Virginia Khawaja Saad Ahmed Bu	••• •
Services (13) :: Recen Features (57) Resources New C EC2 Documentation (34,650) C Syste Knowledge Articles (610) Marketplace (3,441) Blogs (2,143) Events (30) Tutorials (21)		Services EC2 ☆ Virtual Servers in the Cloud EC2 Image Builder ☆ A managed service to automate build, customize and deploy C Recycle Bin Protect resources from accidental deletion Amazon Inspector ☆	See all 13 results >	<pre> application :</pre>	0
		Continual vulnerability management at scale Features	See all 57 results ►	• Activate Windows //	5.

Step 2: Once logged in, click on search, write "EC2", and select "EC2" section.

• Start the instance by Click on the "Instance" button to start machine.

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	public-subnet-instance	i-0083e06e3293d8473	\ominus Stopped Q	t2.micro	-			View
	docker-demo	i-0da2a643e9ae106a2	🕑 Running 🔍 Q	t2.micro	 Initializing 			View
	newPubliccsubnet-instance	i-0707cc04b9c077b8a	\ominus Stopped Q	t2.micro	-			View
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	private-cloud-instance	i-0a01eec7473e1e630	⊖ Stopped	t2.micro	-			View
	RDS-instance	i-02ab89e1c2d33e4b2	🕞 Stopped Q	t2.micro	-			View
	new-privateeinstance	i-0cf10489f296b4634	🕞 Stopped Q	t2.micro	-			View
	newnweprivateinstance	i-06c8f016ee12743d1	🕞 Stopped Q	t2.micro	-			View
	cloudwatch-service	i-07fcac9ff16b3abc8	⊖ Stopped Q	t2.micro	-			View
	aws-cloud9-photo-recog-en	. i-015fbcbf38c97b872	⊖ Stopped	t2.micro	-			View

Step 3: Installing Docker on Ubuntu EC2 Instance:

• SSH into your Ubuntu EC2 instance.

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~~~·_/ // // // // // // // // // // // // /		
_/ m/ [ec2-user@ip-172-3]	1-17-64 ~]\$	
		1 <b>79  </b> P a
• Verify the installation by running "docker version" in the command prompt.

OS/Arch:	linux/amd64
Context:	default
Server:	
Engine:	
Version:	25.0.3
API version:	1.44 (minimum version 1.24)
Go version:	go1.20.12
Git commit:	£417435
Built:	Mon Feb 12 00:00:00 2024
OS/Arch:	linux/amd64
Experimental:	false
containerd:	
Version:	1.7.11
GitCommit:	64b8a811b07ba6288238eefc14d898ee0b5b99ba
runc:	
Version:	1.1.11
GitCommit:	4bccb38cc9cf198d52bebf2b3a90cd14e7af8c06
docker-init:	
Version:	0.19.0
GitCommit:	de40ad0
[root@ip-172-31-17-	64 ec2-user]#

Step 4: Containerizing an HTML Template:

• Create a Dockerfile in your project directory.



• Go to the website to load the online template. Link: <u>https://www.free-css.com/</u>

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LATEST FREE CSS TEMPLATE	S		- 1
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• Select any website you prefer to containerize, then right-click to copy its address.

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	Open link in new window Open link in incognito window		ative Commons
	Open link as	>	October 2023
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	« Neogym Template   Tem	plates	] -

• Access the terminal and utilize the command "wget [link address]" to retrieve the website template onto your EC2 instance.



• Use the command "ls" to display the documents within the folder.



• Extract the file by executing the command "unzip filename".

```
[ec2-user@ip-172-31-17-64 template-website]$ unzip oxer.zip
Archive: oxer.zip
    creating: oxer-html/
    inflating: oxer-html/about.html
    inflating: oxer-html/blog.html
    inflating: oxer-html/class.html
    creating: oxer-html/class.html
    creating: oxer-html/css/
    inflating: oxer-html/css/bootstrap.css
    inflating: oxer-html/css/responsive.css
```

• To display the documents within the folder use the command "ls".

[ec2-user@ip-172-31-17-64 template-website]\$ ls
oxer-html oxer.zip
[ec2-user@ip-172-31-17-64 template-website]\$

• Navigate into the extracted folder by using command "cd folder_name".

[ec2-user@ip-172-31-17-64 template-website]\$ cd oxer-html
[ec2-user@ip-172-31-17-64 oxer-html]\$

• Now, move all the contents of the folder into a previous directory folder using the command "cp –R * ../.".

[ec2-user@ip-172-31-17-64 oxer-html]\$ cp -R * ../. [ec2-user@ip-172-31-17-64 oxer-html]\$

• Go back to one folder previous by using command "cd ..." and list the files in the folder by using command "ls".

[ec2-user@ip-172-31-17-64 oxer-html]\$ cd ..
[ec2-user@ip-172-31-17-64 template-website]\$ ls
about.html blog.html class.html css images index.html js oxer-html oxer.zip

• Next, delete both the zip file and the folder by executing the command "rm -rf name_of_file_1 name_of_file_2".

```
[ec2-user@ip-172-31-17-64 template-website]$ rm -rf oxer-html oxer.zip
[ec2-user@ip-172-31-17-64 template-website]$
```

• To display the documents within the folder use the command "ls".

```
[ec2-user@ip-172-31-17-64 template-website]$ ls
about.html blog.html class.html css images index.html js
[ec2-user@ip-172-31-17-64 template-website]$
```

• Navigate to the Docker image repository and search for "httpd". And check how to use httpd.

🐡 docker hub	Q httpd	× ? 🗰 Sign In Sign up
<u>xplore</u> / <u>Official Images</u> / httpd		
httpd         Q Docker Official In           The Apache HTTP Server Project           Overview         Tags	Phub       Phup         Ificial Images / httpd         Ificial Images / httpd         Image: Phup         Im	docker pull httpd Copy
Quick reference		Recent Tags
Maintained by:		2.4-bookworm 2.4 2-bookworm 2 alpine3.19 alpine
the Docker Community		

• Create a Dockerfile by executing the command "touch Dockerfile".

[ec2-user@ip-172-31-17-64 template-website]\$ touch Dockerfile
[ec2-user@ip-172-31-17-64 template-website]\$

• Open the file using the command "nano Dockerfile", then write the following commands, and finally, save and close the file.

Help Write out Where Is of Cut of Execute of Location with Undo Set Mark Mol To Bracket

• Build the Dockerfile by executing the command "sudo docker build . -t image-name".

[ec2-user@ip-172-31-17-64 template-website]\$ sudo docker buildt updated-website	
[+] Building 0.5s (7/7) FINISHED	docker:default
$\left[ e^{2} - u e^{2} \right]$	

• Verify whether the Docker image has been generated correctly by running the command "sudo docker images" to display a list of available images.

[ec2-user@ip-172-31-	-17-64 tem	plate-website]\$	sudo docker imag	jes
REPOSITORY	TAG	IMAGE ID	CREATED	SIZE
updated-website	latest	e47a2b671014	8 minutes ago	150MB
latest-website	latest	2c4737465b87	8 hours ago	188MB
mynewswebsite-demo	latest	8096753b1857	2 days ago	188MB
website	latest	f92706c48ab0	2 days ago	188MB
my-website	latest	2320b4441913	2 days ago	150MB
myapp	latest	c9f692cba178	3 days ago	188MB
ubuntu	latest	7af9ba4f0a47	2 weeks ago	77.9MB
myfile	latest	a6476b080d6a	2 weeks ago	77.9MB
docker-new-file	latest	b7c548e315a8	2 weeks ago	77.9MB
mydocker	latest	fcaf88f3b098	2 weeks ago	77.9MB
dockerfile	latest	3a93c208c423	2 weeks ago	77.9MB
dockerfiled	latest	3a93c208c423	2 weeks ago	77.9MB
hello-world	latest	d2c94e258dcb	12 months ago	13.3kB

• Execute the command "sudo docker run -d -p 80:80 latest-website" to launch the Docker image in detached mode, mapping port 80 of the container to port 80 of the host.

```
[ec2-user@ip-172-31-17-64 template-website]$ sudo docker run -d -p 80:80 updated-website
6b7ddbb83386d3f3c671331d1b4b26a90641ef5f0d4e8565cec551cb4917087c
[ec2-user@ip-172-31-17-64 template-website]$
```

• Copy the public IP address of your EC2 instance and paste into any browser.



### • Result



### Conclusion

In this lab, we have learned the fundamentals of Docker custom images and containerization. You have successfully created Docker images from scratch, containerized HTML templates, assigned ports for access, and Dockerized online web pages. These skills are essential for modern software development and deployment.

### Exercise

Choose different HTML templates. Then, deploy them onto your EC2 instance. Create an image and containerize it, and finally, run it on port 80:80.



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## Lab Module #15 Building a Data Pipeline with Amazon Kinesis Streams, Kinesis Data Firehose, and Amazon S3

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____





### **Objectives**

- Understand the architecture and components of Amazon Kinesis Streams, Kinesis Data Firehose, and Amazon S3.
- Learn how to create a real-time data processing pipeline using these services.
- Gain hands-on experience in setting up and configuring Kinesis Streams, Firehose delivery streams, and S3 buckets.
- Implement data ingestion, transformation, and storage using AWS services.
- Analyze the effectiveness and scalability of the data pipeline.

### **Pre-requisites**

- An active AWS account with appropriate permissions to create and manage Kinesis streams, Firehose delivery streams, and S3 buckets.
- Basic understanding of AWS services and concepts like IAM roles, S3 buckets, and data streaming.

### Outcomes

After completing this session, student should be able to:

- Have a functioning data pipeline that ingests, processes, and stores real-time data.
- Understand how to monitor and troubleshoot issues within the pipeline.
- Be equipped to scale the pipeline according to data volume and processing requirements.

### Introduction

Amazon Kinesis is a platform provided by Amazon Web Services (AWS) for real-time processing of streaming data at scale. It enables developers to collect, process, and analyze large volumes of data streams in real-time. The platform offers several services, each tailored to specific use cases:

- 1. **Amazon Kinesis Data Streams:** This service allows you to build custom applications that process or analyze streaming data in real-time. Data is partitioned into shards, which determine the throughput capacity of the stream. Applications can read data from streams and process it using frameworks like Apache Spark, Apache Flink, or AWS Lambda.
- 2. Amazon Kinesis Data Firehose: Kinesis Data Firehose is a fully managed service that ingests streaming data and automatically delivers it to destinations such as Amazon S3, Amazon Redshift, Amazon Elasticsearch Service, and Splunk. It simplifies the process of loading streaming data into data lakes, data warehouses, and analytics services without the need for manual intervention.
- 3. **Amazon Kinesis Data Analytics:** This service enables you to process and analyze streaming data using standard SQL queries. You can extract insights, run real-time analytics, and generate alerts or notifications based on the streaming data. Kinesis Data Analytics integrates with Kinesis Data Streams and other AWS services for seamless data processing.

### Steps to create custom Docker images:

In this lab, you will build a data pipeline using Amazon Kinesis Streams, Kinesis Data Firehose, and Amazon S3. Amazon Kinesis is a platform for streaming data on AWS, allowing you to collect, process, and analyze large streams of data in real-time. Kinesis Data Firehose provides a fully managed service for delivering real-time streaming data to destinations like S3, Redshift, and Elasticsearch. Amazon S3 is an object storage service that offers scalability, durability, and low latency for storing and retrieving data.



Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Create an Amazon Kinesis Stream:

• Navigate to the Kinesis console in the AWS Management Console.

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Ξ	Consol		Search results for 'amazon kinesis service'			Add widgets
	# Recen	Services (182) Features (429) Resources New	Services Finesis ☆ Work with Real-Time Streaming Data	See all 182 re	esults ► 4	e application :
	Kines EC2 Billin	Documentation (507,571) Knowledge Articles (2,923) Marketplace (107)	★ Kinesis Analytics			< 1 >
	Dyna 🚯 Amaz	Blogs (27,119) Tutorials (240) Events (892)	Amazon OpenSearch Service ☆     Run open-source OpenSearch or Elasticsearch using Mana	aged Clusters or Serverles	s	Originating a
	🥳 Simp		Amazon Location Service      Constraints     Securely and easily add location data to applications.     Top features     Mans Place indexes Route calculators Geofence collection			
			Features	See all 429 re	esults ► 🔻	Activate Windows 🖌

• Click on "Create data stream".



• Specify the stream name and the number of shards.

aws	Services	tes Q. Scarch [Alt+S] Q. © N. Virginia • Khawaja Saad Ahmed Butt •   Kinesis > Data streams > Create data stream Ite data stream info a stream configuration stream name esis-stream table characters are uppercase and lowercase letters, numbers, underscores, hyphens and periods. On-demand On-demand Use this mode On-demand Use provisioned mode when you can reliably estimate throughput requirements of your data stream's capacity scales Condemand when your data stream's capacity scales Condemand stream's capacity scales Condematically. Condematically. Lab 15-cloue/-computing doc - Word ^{Its affiliates} Privacy Terms Cookle preferences and liber Privacy Terms Cookle preferences of the stream's capacity scales Cookle preferences of the stream's capacity scales Cookle preferences of the stream's capacity scales Lab 15-cloue/-computing doc - Word ^{Its affiliates} Privacy Terms Cookle preferences of the stream's capacity scales Lab 15-cloue/-computing doc - Word ^{Its affiliates} Privacy Terms Cookle preferences of the stream's capacity scales Cookle preferences of the stream's capacity scales Cookle preferences of the stream's capacity scales Lab 15-cloue/-computing doc - Word ^{Its affiliates} Privacy Terms Cookle preferences of the stream's capacity scales Cookle preferences o	[Alt+S]	۶.	0					
=	Amazon Kines	sis > Data streams > Create data stream								١
	Create	data stream Info								۲
	Data str	eam configuration								
	Data strea	m name								- 1
	kinesis-st	ream								
	Acceptable of	characters are uppercase and lowercase letters, numbers,	underscores, hyphens and periods.							
	Data str	eam capacity Info node demand	O Provisioned							
	Use t requi dema autor	his mode when your data stream's throughput rements are unpredictable and variable. With on- ind mode, your data stream's capacity scales natically.	Use provisioned mode when you can reliably estimate throughput requirements of your data stream. With provisioned mode, your data stream's capacity is fixed.					Activate Go to Settin	Windows gs to activate Windows	s.
S Cloud	dShell Feedbac	k	Lab 15-c	loud-co	mputing.d	ocx - Wor	d its affi	iliates. Privacy	Terms Cookie prefer	rences

• Click on create stream.

					9
Data stream settings You can edit the settings after the data stream I	nas been created and is in the active st	atus.			
Setting	Value	Editable after creation			
Capacity mode	On-demand	⊘ Yes			
Data retention period	1 day	⊘ Yes			
Server-side encryption	Disabled	⊘ Yes			
Monitoring enhanced metrics	Disabled	⊘ Yes			
Tags	-	⊘ Yes			
Data stream sharing policy	No policy	⊘ Yes			
		Canada Canada data data		Activata Mina	

Step 3: Set up a Kinesis Data Firehose Delivery Stream:

• Go to the Kinesis Firehose console.

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A	nazon Kinesis		Search results for 'data'			>	< (i)
Da	shboard	Services (65) Features (105)	Services	See all 65 results I	Î	Delete	9
Da	ta streams	Resources New Documentation (114,951)	Orchestration for Data-Driven Workflows				
An Ma	nazon Data Firehose naged Apache Flin	Knowledge Articles (580) Marketplace (16,453)	副 AWS Data Exchange ☆ Easily find, subscribe to, and use third-party data				
▼ Re	sources	Blogs (9,307)	len Amazon Data Firehose ☆		time 2024 a	at 01:13 GMT+5	
AV	/S Glue Schema Re	Tutorials (70)	Real-time streaming delivery for any data, at any scale, at low-co				
			AWS B2B Data Interchange ☆ Build and run EDI-based workflows at cloud scale				
			Features	See all 105 results	Activate	Windows	
<b>).</b> CI	oudShell Feedback	- Froduce	© 2024, Amazo	on img 3.PNG - Paint rits at	GO to Settin filiates. Privacy	gs to activate Windo Terms Cookie pre	ows. eferences

• Click on "Create firehose stream"

aws	Services	Q Search [Alt+S]		Þ	¢	0	۲	N. Virginia 🔻	Khawaja Saad Ahmed B	utt 🔻
= (	Amazon Data Firehose now	Firehose now supports Snowflake as a destination provides real-time, cost-effective delivery to Snowflake within seconds. Learn more 🔀								١
			~							0
		analytics								
	2	Amazon Data Firehose	Г	Getting sta	arted					
		Real-time streaming delivery		Create a Fireh streaming dat	ose stre a to des	am that tination	process s.	es and delivers		
		for any data, at any scale, and		Create Fir	ehose s	tream				
	i	at low-cost.					_			
	2 L	mazon Data Firehose provides the easiest way to reliably ingest, transform, and deliver streaming data into data ikes, data warehouses, and analytics services.								
								Activate	Windows	
E Clou	udShell Feedba	<b>k</b>	(	0 2024, Amazon	Web Serv	ices, Inc.	or its affi	Go to Settin liates. Privacy	gs to activate Window Terms Cookie prefe	rences .

• Choose a source (Kinesis stream), a destination (S3 bucket)

aws	Services Q Search		[Alt+S]	Ð	♦	0	۲	N. Virginia 🔻	Khawaja Saad Ahm	ed Butt 🔻
=	Amazon Data Firehose > Fireho	ose streams > Create Firehose stream								١
	Create Firehose	stream Info								0
	Amazon Data Fireho	se: How it works								
	Choose source and des Specify the source and the destinat once it has been created.	tination don for your Firehose stream. You cannot change	the source and destination of your Firehos	se stream						
	Source Info									
	Amazon Kinesis Data Stream	s	▼							
	Destination Info									
	Amazon S3		•							
	Source settings							Activate Go to Settir	Windows ngs to activate Wind	
▶ Cloud	IShell Feedback			© 2024, Amazo	on Web Ser	vices, Inc.	or its affi	liates. Privacy	Terms Cookie p	oreferences

• In source setting select your customized data stream by clicking on browse and choose firehose stream name

= Source settings		0
		<b>U</b>
Kinesis data stream am:aws:kinesis:us-east-1:851725370789:stream/kinesis-stream12 Format: am:aws:kinesis:[Region]:[Accountid]:stream/[StreamName]		0
Firehose stream name		
Firehose stream name		
kinesis-fh  Acceptable characters are uppercase and lowercase letters, numbers, underscores, hyphens, and periods.		
Transform and convert records - optional Configure Amazon Data Firehose to transform and convert your record data.		
Transform source records with AWS Lambda Info Amazon Data Firehose can invoke an AWS Lambda function to transform, filter, decompress, convert and process your source data records. The specified AWS Lambda function can also be used to provide data partitioning keys for the incoming source data before its delivery to	Activate Windows Go to Settings to activate Wind	ows.

• Specify the S3 bucket as the destination.

aws	Services	Q Search	[Alt+S]	٥.	\$ Ø	0	N. Virginia 🔻	Khawaja Saad /	Ahmed Butt 🔻	^
=	Turn or	a decompression							٩	
									9	
	Destinat	tion settings Info								
	Specify the	destination settings for your Firehose stream.								
	S3 bucket									
	s3://fire	nose-bucket-new12	Browse Create 🖸	1						ų,
	Format: s3:/	/bucket		_						
	New line d	elimiter Gaure your Firehose stream to add a new line delimiter between records in objects	that are delivered to Amazon S3.							
	O Not en	abled								1
	Enable	d								
	Dynamic p	artitioning Info	ta based on partitioning keys. You can							
	partition you you create a	r source data with inline parsing and/or the specified AWS Lambda function. You on new Firehose stream, You cannot enable dynamic partitioning for an existing Firehose stream.	an enable dynamic partitioning only when tose stream. Enabling dynamic partitioning							
	incurs additi	onal costs per GIB of partitioned data. For more information, see Amazon Data Fire	those pricing 🛃.							
	<ul> <li>Enable</li> </ul>	d					Activate	Windows		
							Go to Settin	gs to activate V	Vindows.	
2- Cloue	Shell Feedbac	K	© 2024, A	mazon V	Veb Services, Inc.	or its affil	liates. Privacy	Terms Cool	kie preferences	÷.

• Select the dynamic partitioning as enabled.

#### Dynamic partitioning Info

Dynamic partitioning enables you to create targeted data sets by partitioning streaming S3 data based on partitioning keys. You can partition your source data with inline parsing and/or the specified AWS Lambda function. You can enable dynamic partitioning only when you create a new Firehose stream. You cannot enable dynamic partitioning for an existing Firehose stream. Enabling dynamic partitioning incurs additional costs per GiB of partitioned data. For more information, see Amazon Data Firehose pricing C1.

$\bigcirc$	Not enabled	
0	Enabled	

③ You are choosing to enable dynamic partitioning for this Firehose stream. Once this Firehose stream is created, you will not be able to disable dynamic partitioning for this Firehose stream. Dynamic partitioning can result in additional costs.

#### Multi record deaggregation

Data deaggregation is the process of parsing through the records in a Firehose stream and separating the records based either on valid JSON or on the specified delimiter. If your data is aggregated, dynamic partitioning can be applied only after data deaggregation is performed. So if you enable dynamic partitioning to your aggregated data, you must enable multi record deaggregation.



• Keep the inline parsing as also enabled.

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=	performed.	So if you enable dynamic partition	ing to your aggregated data, you	must enable multi record deaggregation.	gation is							٤
	O Not en	abled										
	Enable	d										0
	Multi recor	rd deaggregation type										
	O JSON											
	O Delimit	ted										
	To partition	source data with inline parsing. vo	u must specify data record param	eters to be used as dynamic partitioning ke	2V5.							
	O Not en	abled										
	Enable	d										
												- 1
	🛈 Wh	en inline parsing is enabled, y	ou must specify valid JQ exp	ressions and use the specified dynam	nic							- 1
	par	titioning keys in the Amazon	S3 bucket prefix in order to c	reate a successful Firehose stream.								
												- 8
	Example	e record										
	Use the d	example below to define the dyna	nic partitioning keys and key valu	es.								
	Dynamic p	artitioning keys		and a solution in the second Data Similar					Activate	Windows		
	expressions	in JQ 1.6.	arg expressions to be used as dyna	anne partitioning keys. Amazon Data Fireno	se only supports				Go to Settin	gs to activate	e Windows.	
Cloud	Shell Feedbac	k			© 2024, Ama	zon Web Ser	vices, Inc. o	r its affilia	ites. Privacy	Terms G	ookie preferen	ces ,

• Provide key name and JQ expression.

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=	Example record Use the example below to define the dynamic partition	ning keys and key values.							٩
									$\odot$
	Dynamic partitioning keys Use the fields below to specify key names and JQ express expressions in JQ 1.6.	ions to be used as dynamic partitioning keys. Amazon Data Firehose only support:	s						
	Key name JQ	expression							
	sensor_id .s	ensor_id							
	Add dynamic partitioning key								
	Dynamic partitioning keys must be unique. You can add 4	9 more dynamic partitioning key values.							
	S3 bucket prefix For dynamic partitioning, you must use the following exp be either partitionKeyFromQuery or partitionKeyFromLar your source data, you must specify an S3 bucket prefix va (partitionKeyFromQueryKeyID)'. If you are usins of express specify an S5 bucket prefix value that consists of express	ression format in your S3 bucket prefic: [[namespace:value], where namespace can nbda, or both. If you are using inline parsing to create the partitioning keys for lue that consists of expressions specified in the following format: " Lambda function to create partitioning keys for your source data, you must on specified in the following format: "[[partitionkeyFromLambdaexyID]".	n						
	Enter partitionKeyFromLambda:keyID and/or par	titionKeyFromQuery:keyID							
	Apply dynamic partitioning keys						Activate Go to Settin	Windows gs to activate Windows.	
>. Cloud	IShell Feedback	© 2024, A	Amazon	Web Serv	vices, Inc.	or its aff	iliates. Privacy	Terms Cookie prefere	nces

• Click on apply dynamic partitioning keys to add partition key in the S3 bucket.

Add dynamic partitioning key		Ð
Dynamic partitioning keys must be unique. You can add 49 more dynamic partitioning key values.		Э
S3 bucket prefix For dynamic partitioning, you must use the following expression format in your S3 bucket prefix: I{namespacevalue}, where nan be either partitionkeyFromQuery or partitionKeyFromLambda, or both. If you are using inline parsing to create the partitioning your source data, you must specify an S3 bucket prefix value that consists of expressions specified in the following format: " (partitionKeyFromQueryKeyID): If you are using an AWS Lambda function to create partitioning format: "(partitionKeyFromLambda.keyI) specify an S3 bucket prefix value that consists of expressions specified in the following format: "(partitionKeyFromLambda.keyI)	nespace can keys for must 	
!{partitionKeyFromQuery:sensor_id}/		
Apply dynamic partitioning keys You can repeat the same keys in your S3 bucket prefix. Maximum S3 bucket prefix characters: 1024.		
S3 bucket error output prefix You can specify an S3 bucket error output prefix to be used in error conditions. This prefix can include expressions for Amazon D Firehose to evaluate at runtime.	ata	
Enter a prefix	Activate Windows	
SZ bucket and SZ error output profix time zone linfe	Go to Settings to activate Windows.	
hell Feedback	© 2024, Amazon Web Services, Inc. or its affiliates. Privacy Terms Cookie preference	s

• Choose the desired S3 error logging option.

If partitionKeyFromQuery:sensor_id)/         Apply dynamic partitioning keys         You can repeat the same keys in your S3 bucket prefix. Maximum S3 bucket prefix characters: 1024.         S3 bucket error output prefix         You can prefix of yan S3 bucket error output prefix to be used in error conditions. This prefix can include expressions for Amazon Data Firehose to evaluate at runtime.         err         S3 bucket and S3 error output prefix time zone         Info         Choose a time zone that you want to use for date and time in S3 prefixes         UTC         Retry duration         Specify the retry duration to send partitioned data to S3.         300       seconds         Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 500 seconds.	specity an 35 bucket prenk valu	e that consists of expressions specified in the following format. ApartitionReyFormLambua.ReyFor	
Apply dynamic partitioning keys         You can repeat the same keys in your S3 bucket prefix. Maximum S3 bucket prefix characters: 1024.         S3 bucket error output prefix         Privatese to evaluate a truntime.         err         S3 bucket and S3 error output prefix time zone         LTC         Retry duration         Speifly the retry duration to send partitioned data to S3.         300       seconds         Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds.	{partitionKeyFromQuery:	isensor_id}/	
You can repeat the same keys in your S3 bucket prefix. Maximum S3 bucket prefix characters: 1024.         S3 bucket error output prefix         You can specify an S3 bucket error output prefix to be used in error conditions. This prefix can include expressions for Amazon Data Firehose to evaluate at runtime.         err         S3 bucket and S3 error output prefix time zone         Info         Choose a time zone that you want to use for date and time in S3 prefixes         UTC         Retry duration         Specify the retry duration to send partitioned data to S3.         300       seconds         Minimum: 0 seconds, maximum; 7200 seconds. Recommended: 300 seconds.	Apply dynamic partiti	oning keys	
S3 bucket error output prefix         You can specify an S3 bucket error output prefix to be used in error conditions. This prefix can include expressions for Amazon Data Firehose to evaluate at runtime.         err         S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S3 bucket and S3 error output prefix time zone         Image: S4 bucket and S3 error output prefix time zone         Image: S4 bucket and S3 error output prefix time zone         Image: S4 bucket and S3 error output prefix time in S3 prefixes         Image: S4 bucket and S3 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket and S4 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket and S4 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket and S4 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket and S4 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket and S4 error output prefix to a set of a date and time in S3 prefixes         Image: S4 bucket	You can repeat the same keys in	n your S3 bucket prefix. Maximum S3 bucket prefix characters: 1024.	
err  S3 bucket and S3 error output prefix time zone info Choose a time zone that you want to use for date and time in S3 prefixes UTC  Retry duration Specify the retry duration to send partitioned data to S3. S00 Soconds Minimum: 0 seconds. Recommended: 300 seconds. Control of the seconds definition of the second of the seco	S3 bucket error output pres You can specify an S3 bucket er Firehose to evaluate at runtime	fix ror output prefix to be used in error conditions. This prefix can include expressions for Amazon Data b.	
S3 bucket and S3 error output prefix time zone info       Info         Choose a time zone that you want to use for date and time in S3 prefixes       Image: Choose a time zone that you want to use for date and time in S3 prefixes         UTC       Image: Choose a time zone that you want to use for date and time in S3 prefixes       Image: Choose a time zone that you want to use for date and time in S3 prefixes         Retry duration       Image: Choose a time zone that you want to use for date to S3.       Image: Choose a time zone that you want to use for date and time in S3 prefixes         300       seconds       Activate W         Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds.       Go to Settings	err		
UTC <ul> <li>Retry duration</li> <li>Specify the retry duration to send partitioned data to \$3.</li> <li>300 seconds</li> <li>Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds.</li> </ul> Activate W <ul> <li>Go to Settings</li> <li>Go to Settings</li> </ul>	S3 bucket and S3 error out Choose a time zone that you wa	put prefix time zone Info ant to use for date and time in \$3 prefixes	
Retry duration       Specify the retry duration to send partitioned data to S3.       Activate W         300       seconds       Activate W         Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds.       Go to Settings	UTC	▼	
300         seconds         Activate W           Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds.         Go to Settings	Retry duration Specify the retry duration to se	nd partitioned data to 53.	
Minimum: 0 seconds, maximum: 7200 seconds. Recommended: 300 seconds. Go to Settings	300	seconds	Activate W
	Minimum: 0 seconds, maximum	1: 7200 seconds. Recommended: 300 seconds.	Go to Settings

• Go to buffer section and choose the buffer interval as 60 seconds.

#### S3 buffer hints

Amazon Data Firehose buffers either of the specified bufferin	incoming records before delivering them to your S3 bucket. Record delivery is triggered once the value of g hints is reached.
<ul> <li>For Firehose stream optimized processing</li> </ul>	as with dynamic partitioning enabled, we recommend a buffer size of 128 MiB for and the second s
Buffer size The higher buffer size may be l latency.	ower in cost with higher latency. The lower buffer size will be faster in delivery with higher cost and less
128	MiB
Minimum: 64 MiB, maximum: 1	28 MiB. Recommended: 128 MiB.
Buffer interval The higher interval allows more and may be more advantageout	e time to collect data and the size of data may be bigger. The lower interval sends the data more frequently s when looking at shorter cycles of data activity.
60	seconds
Minimum: 0 seconds, maximun	n: 900 seconds. Recommended: 300 seconds.

### • Click on create Fire horse stream.

▲ If you specify a file extension, it will override the default file extension that Amazon Data Firehose adds when data format conversion or compression is enabled.

#### Encryption for data records

 Record gets encrypted in the S3 bucket using an AWS Key Management Service (KMS) key.
 Use the encryption setting of the S3 bucket Default encryption for S3 bucket is server-side encryption with Amazon S3 managed keys (SSE-S3). See S3: Protecting data with server-side encryption 2 for other encryption options.
 Use SSE-KMS

Server-side encryption with AWS Key Management Service (KMS) keys.

(i) You must specify a valid S3 bucket URI before enabling the encryption for data records.

#### Advanced settings

Server-side encryption not enabled; error logging enabled; IAM role KinesisFirehoseServiceRole-kinesis-fh-us-east-1-1714422466210; no tags.

Cancel

Create Firehose stream

### Step 4: Amazon Kinesis Data Generator

• Navigate to the Kinesis Data Generator web page. Link: <u>https://awslabs.github.io/amazon-kinesis-data-generator/web/help.html</u>

Overview The Amazon Kinesis Data Generator (KDG) makes it easy to send data to Kinesis Streams or Kinesis Firehose. Learn how to use the tool and create templates for your records. Configure Your AWS Account NoTE: Setting up the Kinesis Data Generator (KDG) in an AWS account will create a set of Cognito credentials. Users who can	
The Amazon Kinesis Data Generator (KDG) makes it easy to send data to Kinesis Streams or Kinesis Firehose. Learn how to use the tool and create templates for your records. Configure Your AWS Account NoTE: Setting up the Kinesis Data Generator (KDG) in an AWS account will create a set of Cognito credentials. Users who can	
Configure Your AWS Account	
NOTE: Setting up the Kinesis Data Generator (KDG) in an AWS account will create a set of Cognito credentials. Users who can	
authenticate with those credentials will be able to publish to all Kinesis Data Streams and Kinesis Data Firehoses in the account. After executing the setup below, you may change the IAM roles that are created to restrict permissions to publish to specific streams or firehoses.	
Create an Amazon Cognito User	
Before you can send data to Kinesis, you must first create an Amazon Cognito user in your AWS account with permissions to access Amazon Kinesis. To simplify this process, an Amazon Lambda function and an Amazon CloudFormation template are provided to create the user and assign just enough permissions to use the KDG.	
Because Amazon Cognito is not supported by CloudFormation, much of the setup is done in a Lambda function. The source code for the function can be downloaded from here.	
The CloudFormation template will create the following resources in your AWS account: Activate Wir	ndows
An IAM role that gives the Lambda function permission to create Cognito resources.     Go to Settings to     Settings to     Go to Settings to     Settin	to activate Win

ap-southeast-2 (Sydney)
 ca-central-1 (Canada Central)
 eu-west-1 (Ireland)
 eu-west-1 (Ireland)
 eu-west-2 (London)
 eu-vest-2 (London)
 us-east-2 (Oregon)
 us-east-2 (Oregon)
 Create a Cognito User with CloudFormation
In addition to the above regions, GovCloud is also supported by manually importing the CloudFormation template in the following regions:
 us-gov-west-1 (Portland/PDT)

For manually installing KDG by CloudFormation: • download the template from here. and launch CloudFormation to Create stack and Upload a template with the downloaded file.

Activate W Go to Settings

Access the KDG

• Choose the AWS region where your Kinesis stream is located.

Step 1 Create stack	Create stack	
Step 2 Specify stack details	Prerequisite - Prepare template	
Step 3 Configure stack options Step 4	Prepare template Every stack is based on a template. A template is a JSON or YAML file that contains configuration information about the AWS resources you want to include in the stack.  O Choose an existing template Upload or choose an existing template. Choose from our sample template Choose from our sample templat	
Review and create	library.	
	Specify template A template is a JSON or YAML file that describes your stack's resources and properties.	
	A template is a JSON or YAML file that describes your stack's resources and properties.	

### • Click on next.

Amazon S3 URL  Provide an Amazon S3 URL to your template.  Amazon S3 URL	O Upload a template file Upload your template directly to the console.	Sync from Git - new Sync a template from your Git repository.
https://aws-kdg-tools.s3.us-west-2.amaz	onaws.com/cognito-setup.yaml	
https://aws-kdg-tools.s3.us-west-2.amaz Amazon S3 template URL	zonaws.com/cognito-setup.yaml	

• Add username and password for cognito User for Kinesis Data Generator.

Parameters Parameters are defined in your template and allow you to input custom values when you create or update a stack.	
Cognito User for Kinesis Data Generator Username The username of the user you want to create in Amazon Cognito.	
hasnainhyder1996	
Password The password of the user you want to create in Amazon Cognito.	
Optional / Advanced Parameters (OK to ignore) PermissionsBoundaryArn OPTIONAL - IAM Permissions Boundary Policy ARN to attach to new IAM Roles	
Enter String	
Cancel	Acti <b>9tevioW</b> /ind <mark>byNext</mark> Go to Settings to activate Wind

• Select acknowledge and click on submit.

Timeout -	
Termination protection Deactivated	
Quick-create link	
Capabilities	
The following resource(s) require capabilities: [AWS::IAM::Role] This template contains Identity and Access Management (IAM) resources that might provide entities access to make changes to your AWS account. Check that you want to create each of these resources and that they have the minimum required permissions. Learn more	
✓ I acknowledge that AWS CloudFormation might create IAM resources.	
Create change set Cancel Activities Wind Submit Go to Settings to activate Wind	dows.

• After successful creation of data generator.

ws	Services Q Search	[Alt+S] 💫 🗘 🔞 N. Virginia 🔻 Khawaja Saad Ahmed But
•	CloudFormation > Stacks > Kinesis-Data-Generator-Cognito-User	Kinesis-Data-Generator-Cognito-User $\odot$ ×
	Stacks (2)  Filter status	Delete     Update     Stack actions     ▼     Create stack     ▼       <
	View nested	Events (1) Detect root cause C Q. Search events
	Stacks	Timestamp 🔻 Logical ID Status Detailed
	Kinesis-Data-Generator-Cognito-User           •         2024-04-30 09-36:18 UTC+0500           •         •           •         CREATE_IN_PROGRESS	2024-04-30 09:36:18 Kinesis-Data-Generator- UTC+0500 Cognito-User S
	aws-cloud9-photo-recog-enviroment1- 45f9b39b62154f02ab3a6a49a4bd57ea 2024-04-18 14:59:09 UTC+0500	Activate Windows Go to Settings to activate Windows

• Now go to the output and click on data generator URL.

aws	Services Q Search	[Alt+S]		D A	🕜 🙆 N. Virginia 🔻 Khawaja Saad Ahmed Butt 🔻
=	CloudFormation > Stacks > Kinesis-Data-Generator-Co	ognito-User		Delete Update	Stack actions v Create stack v
	E Stacks (2)	C		< Stack info Events Resources	Outputs Parameters Temple >
	Q     Filter by stack name	status		Outputs (2)	C
		< 1 >		Q Search outputs	
	Stacks				< 1 > @
	Kinesis-Data-Generator-Cognito-User		п	Key 🔺 Value	▼ Description ▼ Expo
	CREATE_COMPLETE			arn:aws:secretsn us-east-	manager: We saved your Cognito
	aws-cloud9-photo-recog-enviroment1-45f9b39l 2024-04-18 14:59:09 UTC+0500 CREATE COMPLETE	b62154f02ab3a6a49a4bd57ea		gnitoUser 1:85172537078 KinesisDataGene er-oXXvjQ	19:secret: user/password in AWS - eratorUs Secrets
				https://awslabs. /amazon-kinesi generator/xwb/ html?uid=uus- I.RiQam2ELE&i east-1:7z=5ab50;	.githubio sciata- forcoducer assi: telt7ze: Data Generator, InClows Data Generator, InClows Col o Settings to activate Windows.
5. Cloud	dShell Feedback			© 2024, Amazon Web	Services, Inc. or its affiliates. Privacy Terms Cookie preferences

• Add the username and password and click on sign in.

Amazon Kinesis Data Generator		Configure	🛿 Help	hasnainhyder1996		Sign In
Amazon Kii The KDG makes it simple to send	nesis test data to your	Data r Amazon Kir	a G	enerato	<b>) [</b> s Firehose delivery str	• ream.
Sign in to get started. If you haver	i't configured an	Amazon Cog	gnito user	, choose Help.		
					Activate Wir Go to Settings to	ndows o activate Windows.

• Paste the following code into the record template section.

```
{
    "sensor_id": {{random.number(50)}},
    "current_temperature": {{random.number(
        {
            "min":10,
            "max":150
        }
    )}},
    "status": "{{random.arrayElement(
            ["OK","FAIL","WARN"]
    )}}",
    "event_time": "{{date.now("YYYY-MM-DDTHH:mm:ss")}}"
}
```

Record	temp	late	8
			~

Template 1

Template 2 Template e Template e
----------------------------------

<pre>"sensor_id": {{random.number(50)}},</pre>	
"current_temperature": {{random.number(	
{	
"min":10,	
"max":150	
}	
)}},	
"status": "{{random.arrayElement(	
["OK","FAIL","WARN"]	
)}}",	
"event_time": "{{date.now("YYYY-MM-DDTHH:mm:ss")}}"	
}	
}	
}	
}	
}	
}	
}	08
}	

• Click on send data in order to send the data to the kinesis

Amazon Kinesis Data Generator & Configure @ Help @ Log Out	IR III Elements Console Sources Network >> ■ 2 🕄 I ×	
Temple Sending Data to Kinesis	● ⊘   ▼ Q   □ Preserve log   □ Disable cache No throttling ▼ ¬¬   ⑧ ± ±	í.
Templa () 1200 records sent to Kinesis.	Filter Invert Hide data URLs Hide extension URLs	
	Blocked response cookies Blocked requests Blocked requests	
Stop Sending Data to Kinesis	1 2000 ms 4000 ms 6000 ms 10000 ms 1200	ć
( "min":10, "max":150	Name Stat Type Initiator Size Time Waterfall	
· · · · · · · · · · · · · · · · · · ·	kinesis.us-east-1 200 xhr avvs-sclk-2.0 2.5 1.35 s	
"status": "{{random.arrayElement(	kinesis.us-east-1 200 xhr aws-sdk-2.6 2.5 667	
["OK", "FAIL", "WARN"]	□ kinesis.us-east-1 200 xhr <u>avvs-sdk-2.6</u> 2.5 355	
<pre>&gt;&gt;&gt;" "event time": "{(date.pow("YYYY-M1-DDTH1:mm)ss"))}"</pre>	kinesis.us-east-1 200 xhr <u>avxa-sgk-2.6</u> 2.5 316	
}	D kinesis.us.east-1	
	D kinesis useast 1	
	kinesis.us-east-1 200 xhr avs-sdk-2.6 2.5 302	
	kinesis.us-east-1 200 xhr aws-sck-2.6 2.5 287	
	□ kinesis.us-east-1 200 xhr aws-sclk-2.6 2.5 269	
	□ kinesis.us-east-1 200 xhr <u>aws-sclk-2.€</u> 2.5 291	
Send data Test template	kinesis.us-east-1 200 xhr <u>avor.sdk-2.f</u> 2.5 269 Activate Windows	
	Go to Settings to activate Windows.	

• As the data generator sends data to the Kinesis stream, you can monitor the flow of data using the AWS Management Console. Navigate to the Kinesis Streams console and select your stream to view metrics, such as incoming data records and shard metrics.

hard	Star	rting position Info		Start date	Start time	
shardId-000000000000	▼ At	timestamp	•	2024/04/30	10:30:00	Get records
Records (50)						Next records
Shard: shardId-00000	0000001 Starting po	osition: At timestamp T	Timestamp: Ap	ril 30, 2024 at 10:30:00 (	GMT+5	
Q Find records						< 1 > ③
Partition key 🗢	Data		Approxim	ate arrival timestamp	Sequence n	umber s
7928589620	{ "sensor_id": 3, "curre	ent_temperature": 1	April 30, 2	024 at 10:39:06 GMT+5	496515833	7096669230539971498975
7928589620 7494333784	{ "sensor_id": 3, "curn { "sensor_id": 36, "cur	rent_temperature": 1	April 30, 2 April 30, 2	024 at 10:39:06 GMT+5 024 at 10:39:06 GMT+5	496515833 496515833	7096669230539971498975 7096669230539971498975
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• View from monitoring.

etRecords - sum (MB/s)	X (i) :	GetRecords iterator age - maximum (Milliseconds)	<u>ن</u> :
0		Milliseconds 1 0.5 0	
03:00 04:00 05:00 Maximum GetRecords Limit GetRecords - sum (MB/s)	h	03:00 04:00 05:00 GetRecords.IteratorAgeMilliseconds	
tRecords latency - average (Milliseconds)	á i	GetRecords - sum (Count)	<u>ن</u> :
liseconds		Count	
0.5		3.80k	
26		1.90k	
03:00 04:00 05:00		0 03:00 04:00 05:00 GetRecords	
GetRecords.Latency			

Step 5: Verify Data in S3 Bucket:

• After data is processed by the Kinesis Data Firehose delivery stream and stored in the S3 bucket, navigate to the S3 console and select your bucket. You should see objects stored in the bucket

Amazon S3 > Buckets > firehose-bucket-new12 >	errmetadata-extraction-failed/ > 2024/ > 04/ > 30/	> 05/
05/		🗗 Copy S3 URI
Objects Properties		
Objects (1) Info C C C C C C C C C C C C C C C C C C C	Download Open I Delete Act	tions  Create folder Ret. For others to access your objects, you'll need to explicitly
Name     Type	マ Last modified マ Size	<ul> <li>&lt; 1 &gt; (2)</li> <li>▼ Storage class ▼</li> </ul>
<ul> <li>▶ kinesis-fh12-1-2024-</li> <li>04-30-05-39-06-</li> <li>4bff327c-14a2-3b3b-</li> <li>802b-a67706abe090</li> </ul>	April 30, 2024, 10:40:51 (UTC+05:00)	1.4 MB Standard
		Activate Windows

### Conclusion

We have successfully built a data pipeline using Amazon Kinesis Streams, Kinesis Data Firehose, and Amazon S3. We have learned how to ingest, process, and store real-time data efficiently on AWS. This pipeline can be further expanded and customized to suit various use cases and business needs.

### Exercise

Enhance the data pipeline by adding data transformation capabilities using AWS Lambda functions.



# Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Module #16 AWS Party Rock Lab

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name:	 	
CMS ID:		



### **Objectives**

- Understand the concept and potential of Party Rock as a no-code development platform.
- Create an interactive experience using Party Rock's intuitive interface.
- Host and share your Party Rock experience with others.
- Explore additional features and customization options offered by Party Rock.

### **Pre-requisites**

- Basic familiarity with using a computer and internet browser.
- An account on the Party Rock platform (Sign up at Party Rock website).

### Outcomes

After completing this session, student should be able to:

- Create an interactive experience on Party Rock without writing any code.
- Host and share your Party Rock creation with friends or a wider audience.
- Appreciate the versatility and ease of use of Party Rock for creating various types of interactive content.

### Introduction

PartyRock is a groundbreaking platform developed by Amazon Bedrock that democratizes the use of generative AI for application development. It allows users, regardless of their coding proficiency, to harness the capabilities of AI to create innovative and personalized applications. One standout feature is its ability to understand users music preferences without requiring any coding skills. In essence, PartyRock empowers individuals to unleash their creativity and build unique experiences with the aid of AI, opening up new possibilities in the realm of application development.

### • How Does It Work

PartyRock uses foundation models from Amazon Bedrock to turn all your ideas and imaginations into amazing apps without coding and effort.

### • You can build three types of apps from the partyrock.

- 1. Text Generation
- 2. Chatbot
- 3. Image Generation

### • Features:

PartyRock has a playground-like interface where you can build your app using various widgets and it provides the following features:

- Drag-and-drop functionality
- > Pre-built widgets like "User Input" and "Placeholder"

- Access cutting-edge AI models like Claude
- Discover and remix existing PartyRock apps
- > Generate text formats like poems, scripts, musical pieces, emails, and more
- Share your creations with others

### Steps to create application using PartyRock:

In this lab, we will build a generative AI app just by describing what we want PartyRock to create. PartyRock offers an app builder feature that takes your idea and automatically creates an app from it. You can then either run it as-is, customize it in the app editor, or delete it. we will build an image generation app and content summarizer application that allows you to specify a painting subject, style and content summrization.

Step 1: Register and Login

• Go to <u>https://partyrock.aws</u>

PartyRocl	<	Everyone Al apps	e can build	(Bign in
Haiku Creator Weird Tour Guide Podcast Generator Build your own app	App builder Generato a 5-7-5 syllabi Image based on user inp	e halku poem and e vitual ut.	User Input winter Generated Haiku CLC Here is a 0-7-0 syllable haiku posm about winter: Showflakes falling deam Blanketing the ground in white Winter's cold embre	

- Select the Sign in link and choose either Google, Apple, or Amazon to log in.
  - (For internal Amazonians: "Amazon" in this case refers to the public Amazon.com website)



• Review the signed-in version of the PartyRock website.

PartyRock		Everyone can build Al apps	
Haiku Creator Weird Tour Guide Podcast Generator Build your own app	App builder Generate a 5-7-5 syllable Imge based on user inp	User input # winter Deb halku poem and a visual Deb halku poem and a visual Cenerated Halku CCO Here is a 5-7-6 syllable User Jake Alalia Control of the syllable Disprise Alalia Control of the syllable Disp	

• Select the Build your own app button.



- Specify what you want to build.
  - Copy the following prompt and paste it into the app description box: A painting generator that lets you choose a subject and style for the painting
  - Click the Generate app button

App builder	$\times$
A painting generator that lets you choose a subject and style for the painting	
Generate	арр
Start from an empt	y app

• Review the generated app.

Editing app	×
PaintBrush	+ Add widget
	Your app is 🛐 private.
Painting Generator	<del>2</del>
This playground allows you to generate a unique painting by pro chosen subject and style using an Al image model.	iding a subject and style. The generated image will combine your
Painting Subject 🌫	ی Painting Style 🏾 🖈
⇒ Enter the subject for your painting (e.g. a sunset, a landscape, a portrait)	$\Rightarrow$ Enter the style for your painting (e.g. impressionist, abstract, realistic)
Generated Painting	<u>⇒</u>
Generating as soon as <mark>Painting Style</mark> and <mark>Painting Subject</mark> are filled.	

• Try using your app. In the example below, we set Painting Subject to The Grand Canyon and Painting Style to Dadaist. Your app may work differently, and that is OK!

Editing app	×
PaintBrush	+ Add widget) ③ Remix My snapshots → Make public and share Your app is 分 private.
Painting Generator	
This playground allows you to generate a unique painting by pr chosen subject and style using an Al image model.	oviding a subject and style. The generated image will combine your
Painting Subject a	≥ Painting Style 😪
The Grand Canyon	Dadaist
Generated Painting (LLM) (PROMPT)	는 탄 중

• Select the Make public and share button to share your app. You can now share your app with friends and colleagues.



Step 3: Building a Content summarizer app

• Select the Build your own app button, then select Start from an empty app.

App builder	$\times$
ightarrow Describe what you would like your app to do	
	Generate app
	Start from an empty app

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• Review your empty app, including its placeholder title.

Editing app	×
new-app-G9KTPc8Ue	+ Add widget O Remix Wy snapshots A Make public and share
<ul> <li>Replace the placeholder title with Content Summar</li> </ul>	vour sop is ⊕ nrivate.
Editing app	×
Content Summarizer	+ Add widget

• Select the + Add widget button, then select Static Text

Editing app		×
Content S	Summarizer	(+ Add widget) (○) Remix (My anapshots) → Make public and share Your app is (↑) private.
User Input Static Text AI-powered Text Generation Image Generation Chatbot	Title Placeholder text Add static text to your App.	

- Set Widget title to Welcome
- Set Content to:

Instructions:	
1. Paste your content	
2. Get your summaries!	
## WARNING: Never share sensitive information when build PartyRock app. This includes personal information and intern information.	ding or using a nal company

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- Adjust the height of the widget by dragging the resize handle in its lower right corner (make sure all content is visible on screen by default)
- Select the Save button

Editing app			$\times$
Content Summariz + Add widget @ Reals Wy snapshots -> Make public and share		Edit widget0	>
		Widget title	
		Welcome	
widgetO	-0-	Content	
Static Content		# Welcome to the Content <u>Summarizer</u> application!	
Edit your static content in the Edit view.		Instructions:	
		<ol> <li>Paste your content</li> <li>Get your summaries!</li> </ol>	
Editing			
		Delete widget Cancel Sav	/e

• Select the + Add widget button, then select User Input

Editing app		×
Content S	Summarizer	(+ Add widget)
Welcome		*
Welcome to the	e Content Summarizer application!	
Instructions:		
1. Paste your content 2. Get your summaries!		
User Input		
Static Text	Title	
AI-powered	→ Placeholder text	
Text Generation		
Image Generation		
Chatbot	Allow your users to enter text input in the App.	

- Set the User Input widget's properties.
  - Set Widget title to Paste your content here
  - Set Placeholder to Content to summarize (NO SENSITIVE CONTENT)
  - Select the Save button

Editing app	×
Content Summariz + Add widget @ Remix My snapshots > Make public and share	Edit widget1 >
	Widget title Paste your content here
Welcome 🕫	Placeholder
Welcome to the Content Summarizer application!	Content to summarize
Instructions:	
1. Paste your content 2. Get your summaries!	Delete widget Cancel Save
widget1 22	
7	
Editing	

• Select the + Add widget button, then select Text Generation

2. Get your summaries!	
Paste your content here	20
ightarrow Content to summarize	
	•
User Input	
Static Text	Title
AI-powered	Some AI Generated content.
Text Generation	
Image Generation	
Chatbot	
	Generates text content based on inputs.

- Set the Text Generation widget's properties.
  - Set Widget title to Detailed summary
  - Set Model to Command
  - In the Prompt field, enter Write a detailed summary based on this content: , then enter the @ symbol to select the Paste your content here box as a source of content.
  - Select the Save button

Editing app			X
Welcome a	E	dit widget2	>
		Widget title	
Welcome to the Content Summarizer application!		Detailed summary	
Instructions:		Model	٩
1. Paste your content		Command	•
2. Get your summaries!		Prompt	٤
Paste your content here	:	Press 🕘 to reference another w	idget.
→ Content to summarize	_	Write a detailed summar his content: Paste your content here	y based on t
widget2 🕫	: )	Advanced settings	١
Generating as soon as Paste your content here is filled.		Delete widget	Cancel Save
Editing	L		

• Adjust the width of the Detailed summary panel by dragging the resize handle in its lower right corner.

Paste your content here		
Content to commente		
Content to summarize		
tailed summary	2	
correct sometry		
pherating as soon as Paste your content here is filled		
enerating as soon as <mark>Paste your content here</mark> is filled.		
enerating as soon as <mark>Paste your content here</mark> is filled.		
enerating as soon as <mark>Paste your content here</mark> is filled.		
enerating as soon as $\ensuremath{\underline{P}}\xspace{aste}$ your content here is filled.		
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
merating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
nnerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
merating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
Generating as soon as <del>Paste your content here</del> is filled.	Create Widget	
Generating as soon as <del>Paste your content here</del> is filled.	Create Widget	
enerating as soon as <mark>Paste your content here</mark> is filled.	Create Widget	
Generating as soon as <del>Paste your content here</del> is filled.	Create Widget	

• Add a new Text Generation widget.

Detailed summary 😴		User Input		
Generating as soon as Paste your content here is filled.		Static Text		Title
		AI-powered		Some AI Generated content.
		Text Generation		
		Image Generation		
		Chatbot		
د	J		(	Generates text content based on inputs.

- Set the Text Generation widget's properties.
  - Set Widget title to One-line summary
  - Set Model to Claude 3 Sonnet
  - In the Prompt field, enter Write a one-line summary based on this content: , then enter the @ symbol to select the Paste your content here box as a source of content.
  - Expand the Advanced settings section and set the Temperature field to 0.5. This will let the model generate a random response each time it is run.
  - Select the Save button

eastering opp		~
Content Summariz + Add widget @ Remix Hy snapshots > Make public and share	Edit widget3	>
the off of the second sec	Widget title	
	One-line summary	
Welcome	Model	
Welcome to the Content Summarizer application!	Claude 3 Sonnet	•
	Prompt	(1)
Instructions:	Press 0 to reference another widget.	
1. Paste your content 2. Get your summaries!	Write a one-line summary based o his content:	nt
Paste your content here	Paste your content here	
→ Content to summarize		
	▼Advanced settings	
	Temperature	0.5
Detailed summary 22 wideet2	•	
	Top P	
Generating as soon as Paste your content here is filled. Generating as soon as Paste your content here is filled.	Delete widget Cancel	Save
Edition		

J.

• Copy the following text and paste it into the Paste your content here box.

PartyRock, an Amazon Bedrock playground, is a shareable generative AI app building playground. Experiment with prompt engineering in a hands-on and fun way. In a short time, you can build, share, and remix apps, to get inspired while playing with generative AI. For example, you can:

Build an app to generate dad jokes on the topic of your choice.

Create the perfect playlist based on your musical tastes.

Recommend what to serve based on ingredients in your pantry.

Create and play a virtual trivia game online with friends from around the world.

Create an AI storyteller to guide your next fantasy -playing campaign.

By building and playing with PartyRock apps, you learn about the fundamental techniques and capabilities needed to get started with generative AI, including understanding how a foundation model responds to a given prompt, experimenting with different text-based prompts, and chaining prompts together. Anyone can access PartyRock through its intuitive web-based UI. For anyone interested in learning the fundamental skills needed to harness the power of generative AI, PartyRock uses Amazon Bedrock to create an accessible environment for experimentation with powerful foundational models (FMs). The tool builds confidence by providing new PartyRock users with free trial use for a limited time, and the PartyRock Guide helps learners extend their knowledge. Builders who are ready to move into production can proceed to the Bedrock console using the basic prompts and skills developed in PartyRock.

Any builder can experiment with PartyRock by creating a profile using a social login from amazon.com, Apple, or Google. PartyRock is separate from the AWS console and does not require an AWS account to get started.

PartyRock is for EVERYONE. It has been designed in a way that is friendly and accessible to builders of all skill levels, particularly those who have limited experience with generative AI. Even if you have no coding experience, you can use text-based prompts to experiment with foundation models and create your own generative AI-powered apps. Developers can explore model capabilities and refine prompt engineering techniques in PartyRock without managing API calls.

### **Output:**

Editing app	×
Content Summarizer	+ Add widget ) 🛛 Remix My snapshots 🥱 Make public and share
Content Summarzer	Your app is 🔄 private.
Welcome	*
Welcome to the Content Summarizer application!	
Instructions:	
1. Paste your content	
2. Get your summaries!	د
Paste your content here	*
By building and playing with PartyRock apps, you learn about the fundamental techniques and capabilities no prompt, experimenting with different text-based prompts, and chaining prompts together. Anyone can accest needed to harness the power of generative AL PartyRock uses Amazon Bedrock to create an accessible envir new PartyRock users with free trial use for a limited time, and the PartyRock Guide helps learners extend their basic prompts and skills developed in PartyRock. Any builder can experiment with PartyRock by creating a profile using a social login from amazon.com, Apple, PartyRock is for EVERVONE. It has been designed in a way that is friendly and accessible to builders of all skill experience, you can use text-based prompts to experiment with foundation models and create your own gen techniques in <u>PartyRock</u> without managing API calls.	sded to get started with generative AI, including understanding how a foundation model responds to a given s PartyRock through its intuitive web-based UI. For anyone interested in learning the fundamental skills mment for experimentation with powerful foundational models (FMs). The too builds confidence by providing knowledge. Builders who are ready to move into production can proceed to the Bedrock console using the or Google. <u>PartyRock</u> is separate from the AWS console and does not require an AWS account to get started. levels, particularly those who have limited experience with generative AI. Even if you have no coding erative AI-powered apps. Developers can explore model capabilities and refine prompt engineering
Detailed summary (LLM)	One-line summary 💷
PartyRock is a generative AI app building playground that allows users to create and share apps that utilize the power of generative AI. Here are the key details from the content:	PartyRock is a shareable generative AI app building playground that allows users to experiment with prompt engineering and create various AI-powered apps through an intuitive web interface, fostering accessible learning and exploration of generative AI capabilities.
<ol> <li>What is PartyRock?</li> <li>PartyRock is a web-based user interface provided by Amazon that allows users to</li> </ol>	
raitywork is a web-based user interface provided by Amazon that allows users to experiment with generative AI and prompt engineering in a hands-on and social way. It is a playground for people to build, share, and remix apps that utilize the power of generative AI.	
2. What can you do with PartyRock?	
Users can create generative AI-powered apps that can generate content such as jokes, playlists, recipe recommendations, and even virtual trivia games. These apps can be shared with others to inspire and educate others about generative AI.	
3. How does PartyRock work?	
PartyRock uses Amazon Bedrock, which provides access to foundational models (FMs)	

### Conclusion

PartyRock's innovative app builder feature allows users to effortlessly create functional applications using generative AI, without requiring any coding skills. Whether generating images or summarizing content, PartyRock opens up a world of possibilities for creativity and innovation in app development.

### Exercise

Use PartyRock to develop an innovative book recommendation system



## Sukkur IBA University

# Bootcamp

**Cloud Computing** 

2024

## Lab Handout #17 Introduction to Amazon QuickSight Visualization

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



### **Objectives**

- Understand the basics of Amazon QuickSight.
- Learn how to create visualizations using different data sources.
- Gain hands-on experience in building interactive dashboards.
- Explore advanced visualization techniques.

### **Pre-requisites**

- An AWS account with access to Amazon QuickSight.
- Basic understanding of data visualization concepts.
- Familiarity with navigating AWS Management Console.

### Outcomes

After completing this session, student should be able to:

- Create various types of visualizations including charts, graphs, and dashboards.
- Gain insights into their data through interactive exploration.
- Understand how to share and collaborate on visualizations within their organization.

### Introduction

Amazon QuickSight is a cloud-powered business intelligence (BI) service provided by Amazon Web Services (AWS). It enables users to analyze and visualize data quickly, regardless of their technical expertise. QuickSight allows users to easily connect to various data sources, including AWS services like Amazon Redshift, Amazon RDS, Amazon S3, as well as third-party sources like Salesforce, Snowflake, and others.

Key features of Amazon QuickSight include:

- **Easy Data Visualization:** QuickSight provides a user-friendly interface for creating interactive visualizations such as charts, graphs, and maps.
- Integration with AWS Services: Users can seamlessly connect QuickSight to their existing AWS data sources, making it easy to analyze data stored in various AWS services.
- Machine Learning Insights: QuickSight includes machine learning-powered insights that automatically identify trends, outliers, and other patterns in the data.
- **Embedding and Sharing:** Users can embed QuickSight dashboards into their applications or websites and securely share them with others within or outside their organization.

### Steps to visualize the data using Quick Sight:

In this lab, our initial step involves loading the Amazon best seller data into an S3 bucket. Once the data is stored in the bucket, we will provide the data into Amazon QuickSight for visualization purposes. This process allows us to use the power of QuickSight's analytical tools to gain insights and create meaningful visual representations of the data.

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Load Data into S3 Bucket

- Prepare or load your data: Ensure that your data is in a suitable format for uploading to S3, such as CSV, or Excel.
- Click on link to download the data: <u>https://github.com/techwithlucy/youtube/tree/main/2-s3-quicksight</u>

Product × Solutions × Open Source × Pricing			
F techwithlucy / youtube Public		69 Fork 101 \\\Chi Star 89 \\+	
<> Code 💿 Issues 2 👬 Pull requ	uests 🚯 📀 Actions 🖽 Projects 🕕 Security	n 🗠 Insights	
Files	youtube / 2-s3-quicksight / 🖸		
	techwithlucy Add files via upload		1b557ea · last year 🕚 History
Q Go to file  I-static-website-on-aws	Name	Last commit message	Last commit date
∨ 盲 2-s3-quicksight	<b>B</b>		
Amazon-Bestseller-Dataset.csv	Amazon-Bestseller-Dataset.csv	Add files via upload	last year
<ul> <li>manifest.json</li> <li>5-mini-aws-projects.md</li> </ul>	🗋 manifest.json	Add files via upload	last year
L' README.md			Activate Windows Go to Settings to activate Windows.

• Search for "S3" in the AWS Management Console search bar.

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Console Home		Search results for 's3'		Add widgets
myApplications All services	Services (8) Features (31) Resources New Documentation (24,325) Knowledge Articles (292) Marketplace (1,597) Blogs (1,369) Events (25) Tutorials (13)	Services S3 ☆ Scalable Storage in the Cloud % S3 Glacier ☆ Archive Storage in the Cloud AWS Snow Family ☆ Large Scale Data Transport Mybrid Storage Integration	See all 8 results >	e application : plications < 1 > Region ▼   your application o one place.
CloudShell		Features	See all 31 results ►	Privacy Terms Cookie preferences

- Create a Bucket (if needed): The following step helps to create new bucket.
- Click on the "Create bucket" button.

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Ξ	2	Rorage Amazon S3 Store and retrieve any a of data from anywhere Amazon S3 is an object storage service that offers industry-leading scalable ecurity, and performance.	mount lity, data availability,	Create a bucket Every object in S3 is stored in a bucket. To upload files and folders to S3, you'll need to create a bucket where the objects will be stored. Create bucket	0
	I	How it works		Pricing         With S3, there are no minimum fees. You only pay for what you use. Prices are based on the location of your S3 bucket.         Estimate your monthly bill using the <u>AWS Simple Monthly Calculator</u>	
				View pricing details 🖸	

• Enter a unique bucket name and select the region for your bucket.

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=	General configuration								©
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	Bucket name Info								
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	Only the bucket settings in the following configuration are copied.  Choose bucket								
	Format: s3://bucket/prefix								
	Object Ownership Info								

• Configure additional settings such as versioning, logging, and tags if needed.

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	Bucket Versioning Versioning is a means of keeping multiple variants of an object in every version of every object stored in your Amazon S3 bucket. We and application failures. Learn more [2]	he same bucket. You can use versioning to preserve, retri th versioning, you can easily recover from both unintende	eve, and restore d user actions								Э
	Bucket Versioning Disable Enable										
	Tags - optional (1) You can use bucket tags to track storage costs and organize bucke	ts. <u>Learn more</u>									
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										215	Ра
• Click "Create bucket" to create the bucket.

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=	Succes Succes	<b>isfully c</b> i oad files	reated bucket "storing-my-first-image" and folders, or to configure additional bucket settings, c	hoose <b>View details</b> .						View details	×	©
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	•	Advar	read settings	e bucket, and configure additional bucket set	tings. bucket							
D. Clo	oudShell	Feedback		œ	2024, Amazon V	Veb Service	s, Inc. or i	ts affiliate	s. Privacy	Terms Co	okie prefer	ences

• Open to the "manifest.json" file you have downloaded and change the bucket name with one you have created.

🗐 manifest.json - Notepad	—	$\times$
File Edit Format View Help		
<pre>{     "fileLocations": [         {             "URIs": [                 "URIs": [                 "Is3://quick-sight/lumazon-Bestseller-Dataset.csv"              ]         }     } }</pre>		~
<pre>"globalUploadSettings": {     "format": "CSV",     "delimiter": ",",     "textqualifier": "\"",     "containsHeader": "true"   } }</pre>		

Use the "Upload" button to select your Amazon best seller data and manifest.json file from your local machine and upload it to your bucket.

Amazon S3 > Buckets > quick-sight		
quick-sight տ		
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Q Find objects by prefix		< 1 > ©
□ Name ▲ Type ▼	Last modified 🛛 🔻 Size	▼ Storage class ▼
Amazon-Bestseller- Dataset.csv csv	May 1, 2024, 17:21:50 (UTC+05:00)	14.1 MB Standard
🗋 🎦 manifest.json json	May 1, 2024, 17:21:56 (UTC+05:00)	293.0 B Standard

Step 3: Connect S3 Bucket to Amazon QuickSight

• Go to the AWS Management Console and search the QuickSight service.



• Click on create sign up quick sight.



• Provide your email.



• Add the quick sight account name.

Authenticate with Active Directory credentials		
QuickSight region		
Select a region	θ	
US East (N. Virginia)	$\sim$	
Account info		
QuickSight account name You will need this for you and others to sign in	0	
hasnainhyder1996		
QuickSight access to AWS services		
Make your existing AWS data and users available in Q	QuickSight. Learn more	
IAM Role		
<ul> <li>Use QuickSight-managed role (default)</li> </ul>		
O Use an existing role		Activate Windows Go to Settings to activate Windows.
Allow access and autodiscovery for these resources	s	

• Click on select S3 bucket.

		-
IAN	Role	
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	📦 Amazon S3 Storage Analytics	
	💋 AWS IoT Analytics	
	🔃 Amazon OpenSearch Service	
	🚯 Amazon SageMaker	
	🛃 Amazon Timestream	Activate Windows
	AWS SecretsManager Select secrets	Go to Settings to activate Windows.

• Choose the bucket the who hold the data and click on finish.

Sele	ct Amazon S3 buckets	×
	S3 Buckets Linked To QuickSight Account	S3 Buckets You Can Access Across AWS
Select	the buckets that you want QuickSight to be able to access. ed buckets have read only permissions by default. However, sect all	you must give write permissions for Athena Workgroup feature.
	S3 Bucket	Write permission for Athena Workgroup
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• Click on finish to create the quick sight account.

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	Create, schedule, and share operational reports and data exports from a single fully-managed busin Learn more	ness intelligence (BI) cloud solution.	
*A un **Firs	ique report unit la defined to be up to 100 pages long (PDP) or 100MB in size (CSV/East). For example, a 200-page rep t month changes and usage are provated. Annual plan is available after sign up from the "Manage Subscriptions" page. Finish	ort constitutes 2 unique report units.	
	aws		Activate Windows Go to Settings to activate Windows.

• Go to the datasets and click on "New dataset"

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<b>53</b>	4thena	RDS	
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• Go to the bucket and copy the URL of manifest.json file.

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Amazon S3 ×	Amazon S3 > Buckets > quick-sight > manifest.json	٥
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Access Points Object Lambda Access Points	Properties Permissions Versions	
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Feature spotlight 7	Type json	https://quick-sight.s3.amazonaws.com/manifest.jsonte Windows Go to Settings to activate Windows.

• Write the URL name, paste the link, and click on connect.

New S3 data source	×
Data source name	
amazon-best-seller	
Upload a manifest file	● URL ○ Upload
s3://quick-sight/manifest.json	
	Connect

Once configured, click "Create dataset" to import your data into QuickSight.

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### Conclusion

Amazon QuickSight provides a powerful platform for data visualization and analytics. By following the steps outlined in this lab, we should now have a solid understanding of how to use QuickSight to gain insights from your data and create compelling visualizations.

#### Exercise

- Load a sample dataset into Amazon QuickSight.
- Create at least three different types of visualizations using the dataset.
- Build a dashboard that combines these visualizations into a cohesive layout.
- Share the dashboard with a colleague or friend and gather feedback on the clarity and effectiveness of the visualizations.



# Sukkur IBA University

Bootcamp

**Cloud Computing** 

2024

## Lab Module #18 Visualizing COVID-19 Data using Amazon QuickSight

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



#### **Objectives**

- Understand the basics of Amazon QuickSight.
- Learn how to import data into Amazon QuickSight.
- Create various visualizations (graphs) using COVID-19 dataset.
- Generate a dashboard to visualize multiple graphs.
- Share the dashboard with others.

#### **Pre-requisites**

- An AWS account with access to Amazon QuickSight.
- Basic understanding of data visualization concepts.
- Familiarity with COVID-19 dataset (provided).

#### Outcomes

After completing this session, student should be able to:

- Import a dataset into Amazon QuickSight.
- Create different types of visualizations to analyze COVID-19 data.
- Build a dashboard consisting of multiple graphs.
- Share the dashboard with others for collaborative analysis.

#### Introduction

Amazon QuickSight is a cloud-powered business intelligence (BI) service provided by Amazon Web Services (AWS). It enables users to analyze and visualize data quickly, regardless of their technical expertise. QuickSight allows users to easily connect to various data sources, including AWS services like Amazon Redshift, Amazon RDS, Amazon S3, as well as third-party sources like Salesforce, Snowflake, and others.

Key features of Amazon QuickSight include:

- **Easy Data Visualization:** QuickSight provides a user-friendly interface for creating interactive visualizations such as charts, graphs, and maps.
- Integration with AWS Services: Users can seamlessly connect QuickSight to their existing AWS data sources, making it easy to analyze data stored in various AWS services.
- Machine Learning Insights: QuickSight includes machine learning-powered insights that automatically identify trends, outliers, and other patterns in the data.
- **Embedding and Sharing:** Users can embed QuickSight dashboards into their applications or websites and securely share them with others within or outside their organization.

#### Steps to visualize the data using Quick Sight:

In this lab, we will utilize Amazon QuickSight to analyze COVID-19 data, revealing essential insights into the pandemic's progression. We will learn to create various graphs that provide distinct viewpoints on the data's trends and anomalies. Furthermore, we will delve into the complexities of building dashboards, skillfully integrating multiple graphs to tell a unified story.

Lastly, we will cover the crucial process of distributing these dashboards, facilitating effective communication and information sharing with colleagues and interested parties.

Step 1: Importing COVID-19 Dataset:

Download the COVID-19 dataset from kaggle website. • Link: https://www.kaggle.com/datasets/imdevskp/corona-virus-report Q Search DEVAKUMAR K. P. · UPDATED 4 YEARS . 2299 New Notebook AGO COVID-19 Dataset Number of Confirmed, Death and Recovered cases every day across the globe Suggestions (0) Data Card Code (685) Discussion (38) Usability 0 About Dataset 10.00 License Other (specified in description) MADE WITH PYTHON Expected update frequency

Step 2: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.
- Go to the AWS Management Console and search the QuickSight service.



• Click on create sign up quick sight.



• Provide your email.

QuickSight	O 🖶
Sign up for QuickSight	
Contact information	
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• Choose the bucket the who hold the data and click on finish.

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	origional-images-with-full-size	
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	photos-to-recognise	
	quick-sight	
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	resized-images-with-less-dimenssion	

• Click on finish to create the quick sight account.

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• Go to the datasets and click on "New dataset"

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• Choose "upload a file" as the data source.

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MySQL	PostgreSQL	ORACLE	SQL Server	
Aurora	A MariaDB	Presto	spark Spark	
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• Choose the dataset, which you want to load.

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Russia	Europe	145940924	871894		1460
South Africa	Africa	59381566	538184		9604

• Explore the imported dataset to understand its structure and variables.



- Create various visualizations such as line charts, bar charts, pie charts, etc., to analyze different aspects of COVID-19 data.
- Verify the total population count by accessing the population column. Simply drag the population column onto the graph to automatically compute the sum of the entire population.



• Adjust the number format to display in millions. This modification will provide a clearer representation of the population figures, facilitating easier comprehension and analysis.

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• Go to units and select million.



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• Now, check the total COVID cases, simply drag the Total cases column onto the graph to automatically compute the sum of the total COVID cases.



• Create some other graph to shows meaningful information.

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Step 3: Building a Dashboard:

• Select the most relevant visualizations and arrange them on a dashboard canvas.



• Click on Publish.

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• Add the name you want to publish the dashboard.

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• Select the "Share this view" or "Share dashboard" option to initiate the sharing process for the dashboard. This action enables seamless dissemination of the dashboard with intended collaborators or stakeholders.



### Conclusion

In this lab, we understand how to use Amazon QuickSight to visualize COVID-19 data effectively. By creating various graphs and combining them into a dashboard, we gained valuable insights into the pandemic's trends and patterns. Sharing the dashboard with others enables collaborative analysis and decision-making based on the visualized data.

#### Exercise

- Explore additional visualizations that can provide deeper insights into COVID-19 data (e.g., trend analysis, demographic breakdowns, etc.).
- Experiment with different visualization settings and formats to improve clarity and understanding.
- Collaborate with a partner or group to analyze the shared dashboard.



# Sukkur IBA University

Bootcamp

**Cloud Computing** 

2024

## Lab Module #19 QuickSight Basic Commands for Data Management

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

CMS ID: _____



## Objectives

- Learn fundamental QuickSight commands for data management.
- Understand how to manipulate data using QuickSight.
- Gain hands-on experience in executing basic data management tasks in QuickSight.

#### **Pre-requisites**

- Basic understanding of data visualization concepts.
- Access to an AWS account with QuickSight service enabled.
- Basic knowledge of navigating the QuickSight interface.

#### **Outcomes**

After completing this session, student should be able to:

- Execute basic data management tasks in QuickSight.
- Apply QuickSight commands to manipulate and analyze data effectively.
- Create insightful visualizations based on manipulated data.

#### Introduction

Amazon QuickSight is a cloud-powered business intelligence (BI) service provided by Amazon Web Services (AWS). It enables users to analyze and visualize data quickly, regardless of their technical expertise. QuickSight allows users to easily connect to various data sources, including AWS services like Amazon Redshift, Amazon RDS, Amazon S3, as well as third-party sources like Salesforce, Snowflake, and others.

Key features of Amazon QuickSight include:

- **Easy Data Visualization:** QuickSight provides a user-friendly interface for creating interactive visualizations such as charts, graphs, and maps.
- **Integration with AWS Services:** Users can seamlessly connect QuickSight to their existing AWS data sources, making it easy to analyze data stored in various AWS services.
- Machine Learning Insights: QuickSight includes machine learning-powered insights that automatically identify trends, outliers, and other patterns in the data.
- **Embedding and Sharing:** Users can embed QuickSight dashboards into their applications or websites and securely share them with others within or outside their organization.

#### Commands to visualize the data using Quick Sight:

In this lab, we will focus on learning basic commands for data management within QuickSight. These commands enable users to perform various data manipulation tasks, such as filtering, aggregating, and transforming data, to derive meaningful insights.Step 1: Importing COVID-19 Dataset:



Download the COVID-19 dataset from kaggle website.

•

Step 2: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.
- Go to the AWS Management Console and search the QuickSight service.



• Go to the datasets and click on "New dataset"

QuickSight				o   0	^
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• Choose the dataset, which you want to load.

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India	Asia	1381344997	2025409		4163
Russia	Europe	145940924	871894		1460
South Africa	Africa	59381566	538184		9604

• Explore the imported dataset to understand its structure and variables.



Data Management:

• Calculate the total number of Death reported using the sum function.



• To calculate the sum of a specific field, utilize the "SUM" function. First, select the field you wish to perform the calculation on. Then, save the result.

för calculated field		×
Total-Death-cases /		Cancel Save
	Fields	~
1 sum(TotalDeaths)	Parameters	~
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• To display the result, click on the newly created field.



• Count of Countries by using count function



Edit calculated field

count1 🦉

1 COUNT("Country/Region")

• To display the result, click on the Count1 newly created field.

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• To display the result, click on the avf-total-cases newly created field.

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= count = count1							
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# Deaths/1M pop							
= distict-count							
= maximum-death							
# NewCases							

• Maximum number of deaths using max function.

<pre>max(TotalDeaths)</pre>
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Add calculated field

Maximum-deaths /



• To display the result, click on the maximum-death newly created field.

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# NewDeaths	ADD DATA				
# NewRecovered	Add a dimension or measure				
= ratio	VALUE				
# Serious,Critical	(maximum-death (Custom)				

• Minimum number of active cases by using min function.



1 min(ActiveCases)

• To display the result, click on the min-active-cases newly created field.

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# Population	VALUE					
= ratio	min-activate-cases (Cu	ustom) :				
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• List of Unique Continents by using distinct function.

distinct_count(Continent)

Edit calculated field

distinct-continets 🥒

```
1 distinct_count(Continent)
2
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• To display the result, click on the distinct-continents newly created field.

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# NewCases					•						
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• Total deaths by continent.

<pre>sum(TotalDeaths,[Continent])</pre>	

#### Add calculated field

Continent-wise-death /

```
1 sum(TotalDeaths,[Continent])
2
```

To show the result create a table that has only one column that is continent and then add the field you have created in the values.

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• Ratio to total deaths to total cases.

TotalDeaths/TotalCases

Edit calculated field

ratio-death 🥒

1 TotalDeaths/TotalCases

• To show the result place the field you have created into the table values.

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# NewCases # NewDeaths				South America 154,885 37.03%	0
# NewRecovered # Population					
= ratio					
# Serious,Critical # Tests/1M pop					
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### Conclusion

In this lab, we explored the fundamental commands for data management in QuickSight. By using these commands, users can effectively manipulate and analyze data to uncover valuable insights. QuickSight's intuitive interface and powerful features make it a valuable tool for data visualization and analysis in various business scenarios.

#### Exercise

- Upload a sample data set of your choice into QuickSight.
- Apply all the same command to manage the data.



# Sukkur IBA University

Bootcamp

**Cloud Computing** 

2024

## Lab Module #20 Introduction to Amazon EMR Configuration

Course Instructor: Dr. Gulsher Baloch

Engr. Hasnain Hyder

Name: _____

CMS ID: _____



#### **Objectives**

- Understand the basics of Amazon EMR and its use cases.
- Learn how to set up and configure an EMR cluster.
- Gain hands-on experience with running big data processing tasks on EMR.
- Explore advanced features and optimizations available in Amazon EMR.

#### **Pre-requisites**

- Basic understanding of cloud computing concepts.
- Familiarity with AWS services, particularly EC2 and S3.
- Basic knowledge of big data processing frameworks like Apache Hadoop and Apache Spark.

#### Outcomes

After completing this session, student should be able to:

- Set up an Amazon EMR cluster.
- Launch and monitor big data processing jobs on EMR.
- Understand how to optimize EMR clusters for performance and cost-efficiency.
- Interpret the results of big data processing tasks executed on EMR.

### Introduction

Amazon EMR (Elastic MapReduce) is a cloud-based big data platform provided by Amazon Web Services (AWS). It allows users to process and analyze large amounts of data using popular opensource frameworks such as Apache Hadoop, Apache Spark, Apache HBase, Apache Flink, and Presto. EMR simplifies the deployment, management, and scaling of these frameworks by providing a managed environment in which users can run their big data processing tasks.



## Key features of Amazon EMR include:

- Managed Clusters: EMR automatically provisions and configures the underlying infrastructure needed to run big data frameworks. Users can easily create, resize, and terminate clusters as needed.
- Flexible Pricing: EMR offers flexible pricing options, including on-demand pricing, reserved instances, and spot instances, allowing users to optimize costs based on their usage patterns.
- Integration with AWS Services: EMR seamlessly integrates with other AWS services such as Amazon S3 for data storage, Amazon EC2 for compute resources, and AWS Glue for data cataloging and ETL (Extract, Transform, Load) operations.
- Security and Access Control: EMR provides built-in security features such as encryption at rest and in transit, IAM (Identity and Access Management) integration for fine-grained access control, and VPC (Virtual Private Cloud) isolation for enhanced security.
- Monitoring and Management: EMR offers monitoring and management capabilities through the AWS Management Console, allowing users to monitor cluster performance, track job progress, and troubleshoot issues.

### Step to create AWS EMR:

In this lab, we will focus on learning basic commands for data management within QuickSight. These commands enable users to perform various data manipulation tasks, such as filtering, aggregating, and transforming data, to derive meaningful insights.Step 1: Importing COVID-19 Dataset:

Step 1: Sign in to the AWS Management Console

- Open your web browser and navigate to the AWS Management Console (https://aws.amazon.com/console/).
- Sign in using your AWS account credentials.

Step 2: Setting up an EMR Cluster:

• In the AWS Management Console, search for "EMR" in the search bar at the top.

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• In the Amazon EMR console, click on the "Create cluster" button to start the cluster creation process.

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• Select the software applications you want to include in your cluster. You can choose from popular frameworks like Hadoop, Spark, and others. I have selected Spark.

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<ul> <li>HCatalog 3.</li> </ul>	1.3	🔽 Ha	doop 3.3.6		Hive 3.1.3		
Hue 4.11.0	<ul> <li>Hue 4.11.0</li> <li>Livy 0.8.0</li> <li>Phoenix 5.1.3</li> <li>Spark 3.5.0</li> </ul>		oyterEnterprise(	Sateway 2.6.0	<ul> <li>JupyterHub 1.5.0</li> <li>Oozie 5.2.1</li> <li>Presto 0.284</li> <li>TensorFlow 2.11.0</li> </ul>		
Livy 0.8.0			(Net 1.9.1				
Phoenix 5.1			0.17.0				
Spark 3.5.0			oop 1.4.7				
Tez 0.10.2		Tri	no 435		Zeppelin 0.	.10.1	
ZooKeeper	3.9.1						
AWS Glue Data	Catalog setting	s					
Use the AWS Glue	Data Catalog to p	rovide an extern	al metastore for yo	our application.			
<ul> <li>Use for Hive</li> </ul>	e table metadata	3					
Use for Spar	rk table metada	ta					

• Configure the number of instances and instance types based on your workload and performance requirements.

#### Uniform instance groups

#### Primary

Choose EC2 instance type



#### Use high availability

Launch highly available, more resilient cluster with three primary nodes on On-Demand Instances. This configuration applies for the lifetime of your cluster. Learn more 🔀

Node configuration - optional

#### Core

#### Choose EC2 instance type

m5.xlarge		Actions 🔻
4 vCore 16 GiB memory EBS only storage On-Demand price: \$0.192 per instance/hour Lowest Spot price: \$0.080 (us-east-1f)	•	

- Node configuration optional
- Define core nodes you want to add in your task.



• Define network area which you want to create your cluster.

<ul> <li>Networking - required Info</li> <li>Choose the network settings that determine how you and other</li> </ul>	entities communicate with your cluster.
Virtual private cloud (VPC) Info vpc-04890b2673355c706	Browse Create VPC 🔀
Subnet Info subnet-028173db6a502e32f	Browse Create subnet 🔀
EC2 security groups (firewall)	

• Click on create key pair.

<ul> <li>Security configuration and EC2 key pair Info Choose a security configuration or create a new one that you can reuse with other clusters.</li> </ul>
Security configuration Select your cluster encryption, authentication, authorization, and instance metadata service settings.
Q Choose a security configuration       C       Browse 🔄       Create security configuration 🖸
Amazon EC2 key pair for SSH to the cluster Info
Q Enter a key name or choose Browse to select an Amazon EC Browse Create key pair 🔀
You haven't entered an EC2 key. If you're outside a VPN and want to enable SSH or use Hue SQL assistant with this cluster, you must enter an EC2 key.

• Add the name of the cluster and choose the private key format and then click on create key pair.

## Create key pair Info

Key pair A key pair, consisting of a private key and a public k an instance.	ey, is a set of security credentials that you use to p	rove your identi	ty when connecting to
Name			
new-pair-cluster The name can include up to 255 ASCII characters. It	can't include leading or trailing spaces.		
Key pair type Info			
• RSA	O ED25519		
Private key file format			
		Cancel	Create key pair
			<b>250</b>   P a g

• Click on browse and select the key pair.

<ul> <li>Security configuration and EC2 key pair info</li> <li>Choose a security configuration or create a new one that you can reuse with other clusters.</li> </ul>
Security configuration Select your cluster encryption, authentication, authorization, and instance metadata service settings.
Q     Choose a security configuration       C     Browse       C     Create security configuration
Amazon EC2 key pair for SSH to the cluster Info
Q new-pair-cluster X Browse Create key pair 🔀
Choose an existing service role     Select a default service role or a custom role with IAM     policies attached so that your cluster can interact with     other AWS services.     Create a service role     Let Amazon EMR create a new service role so that you     can grant and restrict access to resources in other AWS     services.
Networking resources We've already added the resources that you configured in the Networking section. Choose the VPC, subnet, and security groups that service role can access.
Choose one or more VPCs
- × vpc-04890b2673355c706
Subnet
Choose one or more subnets
- X subnet-028173db6a502e32f
Security group
Choose one or more security groups
ElasticMapReduce-Core X ElasticMapReduce-Primary X so-02fdacf2e9103bfe4 so-0c1ff11910ca5dbcd

## • Now, click on "Create an instance profile".

#### EC2 instance profile for Amazon EMR

The instance profile assigns a role to every EC2 instance in a cluster. The instance profile must specify a role that can access the

resources for your steps and bo	ootstrap actions.			
<ul> <li>Choose an existing in</li> </ul>	nstance profile	<ul> <li>Create an instance profile</li> </ul>	2	
Select a default role or a	a custom instance profile with	Let Amazon EMR create a new	Let Amazon EMR create a new instance profile so that	
IAM policies attached so	that your cluster can interact	you can specify a custom set of resources for it to access		
with your resources in A	mazon 55.	in Amazon 55.		
S3 bucket access Info				
Specific S3 buckets or provide the second	prefixes in your account Info	0		
Choose the buckets or pref	fixes that you want this instance	profile to access.		
<ul> <li>All S3 buckets in this a</li> </ul>	ccount with read and write a	access		
Grant the instance profile a	access to all buckets that have re	and write access enabled in your accourt	nt.	
S3 buckets				
We've already added the resou	rces that you configured in the C	Cluster logs section. Choose the S3 buckets	and bucket prefixes where	
you store logs and data for you	ur cluster, bootstrap actions, and	steps.		
S3 URI				
Q s3://bucket/prefix/ob	ject	View 🖸 Browse	S3 Add	
S3 bucket	Prefix	Permission		
aws-logs-85172537 Inherited from Cluster logs	elasticmapreduce	Read and write	Edit	
• Select the S3 bucket where you want to store the EMR logs.

## S3 buckets

We've already added the resources that you configured in the Cluster logs section. Choose the S3 buckets and bucket prefixes where you store logs and data for your cluster, bootstrap actions, and steps.

S3 URI					
Q s3://my-folder-for-image		$\times$	View 🛽	Browse S3	Add
S3 bucket	Prefix		Permission		
aws-logs-85172537 Inherited from Cluster logs	elasticmapreduce		Read and write		Edit

• Once you are satisfied with the settings, click on the "Create cluster" button to launch the "MyEMRCluster".

Summary Info	
Name and applications - required	•
Name updated	L
Amazon EMR release emr-7.1.0	L
Application bundle Spark Interactive (Hadoop 3.3.6, Hive 3.1.3, JupyterEnterpriseGateway 2.6.0, Livy 0.8.0, Spark 3.5)	
Cluster configuration - required	
Uniform instance groups Primary (m5.xlarge), Core (m5.xlarge)	
Cluster scaling and provisioning - required	
Provisioning configuration Core size: 2 instances	Ŧ
Cancel Create clus	ter

• Cluster is created successfully.

Summary		Opuaced tess than a minute ago	
Cluster info	Applications	Cluster management	Status and time
Cluster ID j-30DOOEBEKC95	Amazon EMR version emr-7.1.0	Log destination in Amazon S3 aws-logs-851725370789-us-east-1/elasticmapreduce	Status Ø Waiting
Cluster configuration Instance groups	Installed applications Hadoop 3.3.6, Hive 3.1.3, JupyterEnterpriseGateway 2.6.0,	Persistent application Uls Spark History Server 🛃	Creation time May 08, 2024, 20:58 (UTC+05:00)
Capacity 1 Primary 2 Core 0 Task	Livy 0.8.0, Spark 3.5.0	YARN timeline server 🖸 Tez UI 🚺	Elapsed time 15 minutes, 51 seconds
		Primary node public DNS  ec2-44-203-32-234.compute-1.amazonaws.com	
		Connect to the Primary node using SSH Connect to the Primary node using SSM 🔀	

- Configure Security Group:
  - Go back to the EC2 dashboard.
  - Select the EC2 instance you want to enable SSH from.
  - In the details pane at the bottom, find the "Security groups" section and click on the security group associated with your EC2 instance.
  - In the security group settings, click on the "Inbound rules" tab.
  - Click on "Edit inbound rules" to modify the rules.
  - Click on "Add rule".
  - For the type, select "SSH".
  - In the "Source" field, specify the IP address range or the security group of your EMR cluster master node. You can also use the Public DNS of the EMR master node if it has a static IP address.
- In cluster management click on connect to the primary node cluster using SSH.

Cluster management
Log destination in Amazon S3 aws-logs-851725370789-us-east-1/elasticmapreduce
Persistent application UIs Spark History Server 🔼
YARN timeline server 🖸
Tez UI 🔼
Primary node public DNS Discrete Compute-1.amazonaws.com
Connect to the Primary node using SSH
Connect to the Primary node using SSM 🛂

• From windows copy the host name.

Connect to the primary node using SSH				
You can connect to the Amazon EMR primary node using SSH to perform actions like running interactive queries, examining log files, submit Linux commands, and view web interfaces hosted on Amazon EMR clusters. Learn more 🔀				
Windows Mac/Linux				
<ol> <li>Download PuTTY.exe to your computer from: https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html </li> <li>Start PuTTY.</li> <li>In the Category list, choose Session.</li> </ol>				
<ol> <li>A. In the Host Name field, enter hadoop@ec2-44-203-32-234.compute-1.amazonaws.com</li> <li>In the Category list, expand Connection &gt; SSH, and then choose Auth.</li> <li>For Private key file for authentication, choose Browse and select the private key file (hasnainhyder121212.ppk)</li> </ol>				
that you used to launch the cluster. 7. Select Open. 8. Select Yes to dismiss the security alert				
8. Select Yes to dismiss the security alert.				
Close				

• Open PuTTY paste the host name.

🕵 PuTTY Configuration	? ×			
Category:				
<ul> <li>Session</li> <li>Logging</li> <li>Terminal</li> <li>Keyboard</li> <li>Bell</li> <li>Features</li> <li>Window</li> <li>Appearance</li> <li>Behaviour</li> <li>Translation</li> <li>Selection</li> <li>Colours</li> <li>Connection</li> <li>Proxy</li> <li>SSH</li> <li>Serial</li> <li>Telnet</li> <li>Rlogin</li> </ul>	Basic options for your PuTTY session         Specify the destination you want to connect to         Host Name (or IP address)       Port         -203-32-234.compute-1.amazonaws.com       22         Connection type:       Other:         Image: SSH       Serial       Other:         Telnet       V         Load, save or delete a stored session       Saved Sessions         Default Settings       Load         Save       Delete			
SUPDUP	Close window on exit: Always Never Only on clean exit			
About Help	Open Cancel			

• Load the private key associated with your EMR for authentication.



• Click on open you will connect to the EMR.

Andoop@ip-172-31-11-18	32:~			_	×
~~ \###  ~~ \#/ ~~ \\>	https://aws.am	azon.com/linux	k/amazon-1	inux-2023	$\sim$
~~~/ _//					-
Last login: Wed May	8 16:36:33 202	4			
EFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFFF	MMMMMMM	MMMMMMM	RRRRRRRR	RRRRRR	
E::::::::::::::::::::::E	M::::::M	M::::::M	R::::::::	:::::R	
EE::::EEEEEEEE:::E	M::::::M	M::::::M	R::::RRR	RRR::::R	
E::::E EEEEE	M:::::::M	M::::::::M	RR::::R	R::::R	
E::::E	M:::::M:::M	M::::M:::::M	R:::R	R::::R	
E::::EEEEEEEEE	M:::::M M:::M	M:::M M::::M	R:::RRR	RRR::::R	
E:::::::::::E	M:::::M M:::M	::::M M:::::M	R::::::	::::RR	
E::::EEEEEEEEE	M:::::M M:::	::M M:::::M	R:::RRR	RRR::::R	
E::::E	M:::::M M::	:M M:::::M	R:::R	R::::R	
E::::E EEEEE	M:::::M MM	M M:::::M	R:::R	R::::R	
EE::::EEEEEEE:::E	M::::M	M:::::M	R:::R	R::::R	
E::::::::::::::::E	M::::M	M:::::M	RR::::R	R::::R	
EEEEEEEEEEEEEEEEE	MMMMMMM	MMMMMMM	RRRRRR	RRRRRR	
[hadconfin_172_21_1]	19216				
[nadoop@ip-1/2-31-11-	-102 ~]\$				× 1

Conclusion

Amazon EMR offers a powerful platform for processing big data workloads in the cloud. By leveraging its managed infrastructure and integration with popular big data frameworks, users can efficiently analyze large datasets without the overhead of managing underlying infrastructure. Through this lab, participants have gained practical experience in setting up, configuring, and optimizing EMR clusters, enabling them to tackle real-world big data challenges more effectively.

Exercise

- Launch an Amazon EMR cluster with the following specifications:
- Instance type: m5.xlarge
- Software configuration: Apache Spark
- Input data: Sample dataset stored in an Amazon S3 bucket
- Submit a Spark job to process the input data and calculate basic statistics (e.g., count, average, etc.).
- Monitor the job execution through the EMR console and analyze the output results.

Future Recommendation of Course:

The course should introduce a dedicated module on machine learning in the cloud, where students learn to apply and deploy advanced machine learning algorithms using AWS services like Amazon SageMaker. This module would cover various aspects of machine learning from data preprocessing and model training to deployment and scalability, providing hands-on experience with real-world datasets and scenarios.

Furthermore, to ensure that students are equipped with the latest skills and knowledge, the course should continuously incorporate emerging technologies and frameworks that are gaining importance within the tech community. By doing so, the program will not only enhance its relevance but also increase the employability of its graduates in a competitive job market.

This approach ensures that students not only understand the infrastructure aspects of cloud computing but also are proficient in using these platforms for developing sophisticated machine learning models, thus aligning the course with the latest industry trends and technological advancements.