D.Y.PATIL College of Engineering ,Akurdi ,Pune

DEPARTMENT OF COMPUTER ENGINEERING

Subject : CC **ASSIGNMENT NO – 04** **Unit – IV**

1. Explain Openstack Architecture in details with Diagram.
2. What is AWS? What are the services provided by AWS.
3. Draw and Explain Architecture of Amazon Dynamo.
4. Explain steps to configure server for EC2?
5. Explain the steps to create an Amazon S3 Bucket and managing associated objects?
6. Write a note on Services offered by Amazon ?
7. Write a note on Services offered by Microsoft ?
8. Write Application for Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing.
9. Explain Google App Engine with its installation steps.
10. Explain the Azure Core Concepts?
11. What are AWS load balancing services? Explain the Elastic load Balancer and its types with its advantages.
12. What is an Amazon EBS snapshot? Give steps to create EBS snapshot.

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Answer 1:-

OpenStack is a cloud computing platform that allows users to deploy and manage virtual machines and other cloud resources. Its architecture is designed to be scalable, flexible, and modular, with a number of core components that work together to provide a complete cloud infrastructure.

The basic OpenStack architecture consists of the following core components:

1. Compute (Nova) - responsible for managing and provisioning virtual machines (VMs) and other computing resources. Nova is designed to be highly scalable, and can support a large number of VMs across multiple hosts.

2. Networking (Neutron) - provides network connectivity to VMs and other resources. It is responsible for managing virtual networks, subnets, routers, and other networking components.

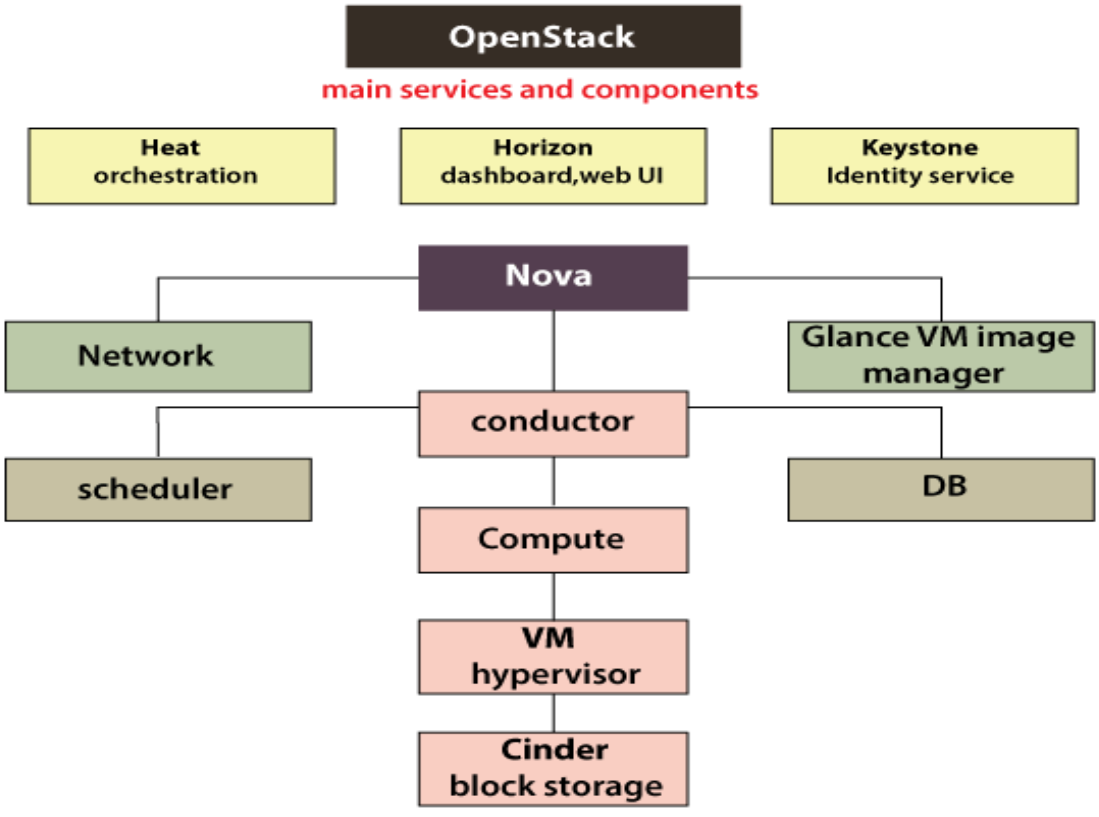
3. Storage (Cinder and Swift) - provides storage services to VMs and other resources. Cinder is used for block storage, while Swift is used for object storage.

4. Identity (Keystone) - provides authentication and authorization services to other OpenStack components. It manages users, roles, and permissions, and provides a single point of entry for users to access OpenStack resources.

5. Dashboard (Horizon) - provides a web-based user interface for managing and provisioning OpenStack resources.

6. Orchestration (Heat) - provides a way to automate the deployment and management of complex applications on OpenStack. It allows users to define a set of resources and their relationships in a template, and then deploys them as a single unit.

Here is a high-level diagram of the OpenStack architecture:



This diagram shows the relationship between the various OpenStack components. The OpenStack API provides a unified interface to all OpenStack services. Horizon is the web-based user interface, which allows users to manage OpenStack resources. Compute, Networking, and Storage are the core components of OpenStack, responsible for managing virtual machines, networking, and storage, respectively. Keystone provides authentication and authorization services, and Heat provides a way to automate the deployment and management of complex applications on OpenStack.

Overall, the OpenStack architecture is designed to be modular and flexible, with a number of core components that can be used together or separately, depending on the needs of the user.

Answer 2:-

AWS stands for Amazon Web Services, which is a cloud computing platform provided by Amazon. It offers a wide range of cloud-based services and solutions to individuals, businesses, and organizations, allowing them to store and process data, build and deploy applications, and host websites and other online services.

AWS offers a vast array of services, which can be broadly categorized into the following categories:

1. Compute Services - These services provide on-demand compute resources, such as virtual machines, containers, and serverless computing. The popular services in this category include Amazon EC2, Amazon Elastic Container Service, and AWS Lambda.

2. Storage and Content Delivery - These services provide storage solutions and content delivery options for websites, applications, and other services. The popular services in this category include Amazon S3, Amazon EBS, and Amazon CloudFront.

3. Database Services - These services provide scalable and flexible database solutions, such as relational databases, NoSQL databases, and in-memory databases. The popular services in this category include Amazon RDS, Amazon DynamoDB, and Amazon ElastiCache.

4. Networking and Content Delivery - These services provide networking solutions and content delivery options for applications and services. The popular services in this category include Amazon VPC, Amazon Route 53, and AWS Direct Connect.

5. Management and Governance - These services provide management and governance solutions to help users manage their AWS resources, monitor their usage, and enforce compliance policies. The popular services in this category include AWS CloudFormation, AWS CloudTrail, and AWS Config.

6. Security, Identity, and Compliance - These services provide security and identity solutions to help users protect their AWS resources, secure their data, and comply with regulations. The popular services in this category include AWS Identity and Access Management, AWS Key Management Service, and AWS Certificate Manager.

7. Analytics - These services provide analytics and business intelligence solutions to help users analyze their data and make informed decisions. The popular services in this category include Amazon Kinesis, Amazon Redshift, and Amazon Elasticsearch Service.

8. Machine Learning - These services provide machine learning solutions to help users build, train, and deploy machine learning models. The popular services in this category include Amazon SageMaker, Amazon Rekognition, and Amazon Comprehend.

9. Internet of Things - These services provide IoT solutions to help users connect, manage, and analyze their IoT devices and data. The popular services in this category include AWS IoT Core, AWS IoT Analytics, and AWS IoT Device Management.

Overall, AWS provides a vast range of cloud-based services and solutions to help users build and deploy scalable and reliable applications and services, while reducing the cost and complexity of traditional on-premises infrastructure.

Answer 3:-

Amazon DynamoDB is a NoSQL database service provided by Amazon Web Services (AWS), which is designed to provide highly scalable, low-latency data storage for applications that require consistent, single-digit millisecond response times.

The architecture of Amazon DynamoDB is based on a distributed data model, which means that data is partitioned and stored across multiple servers, called nodes. The data is replicated across multiple nodes to provide high availability and durability, which ensures that data is available even in the event of a node failure or network disruption.

The core components of the Amazon DynamoDB architecture are as follows:

1. Tables: Amazon DynamoDB stores data in tables, which are similar to tables in a relational database. A table is composed of items, which represent individual records or objects. Each item has a primary key, which uniquely identifies the item within the table.

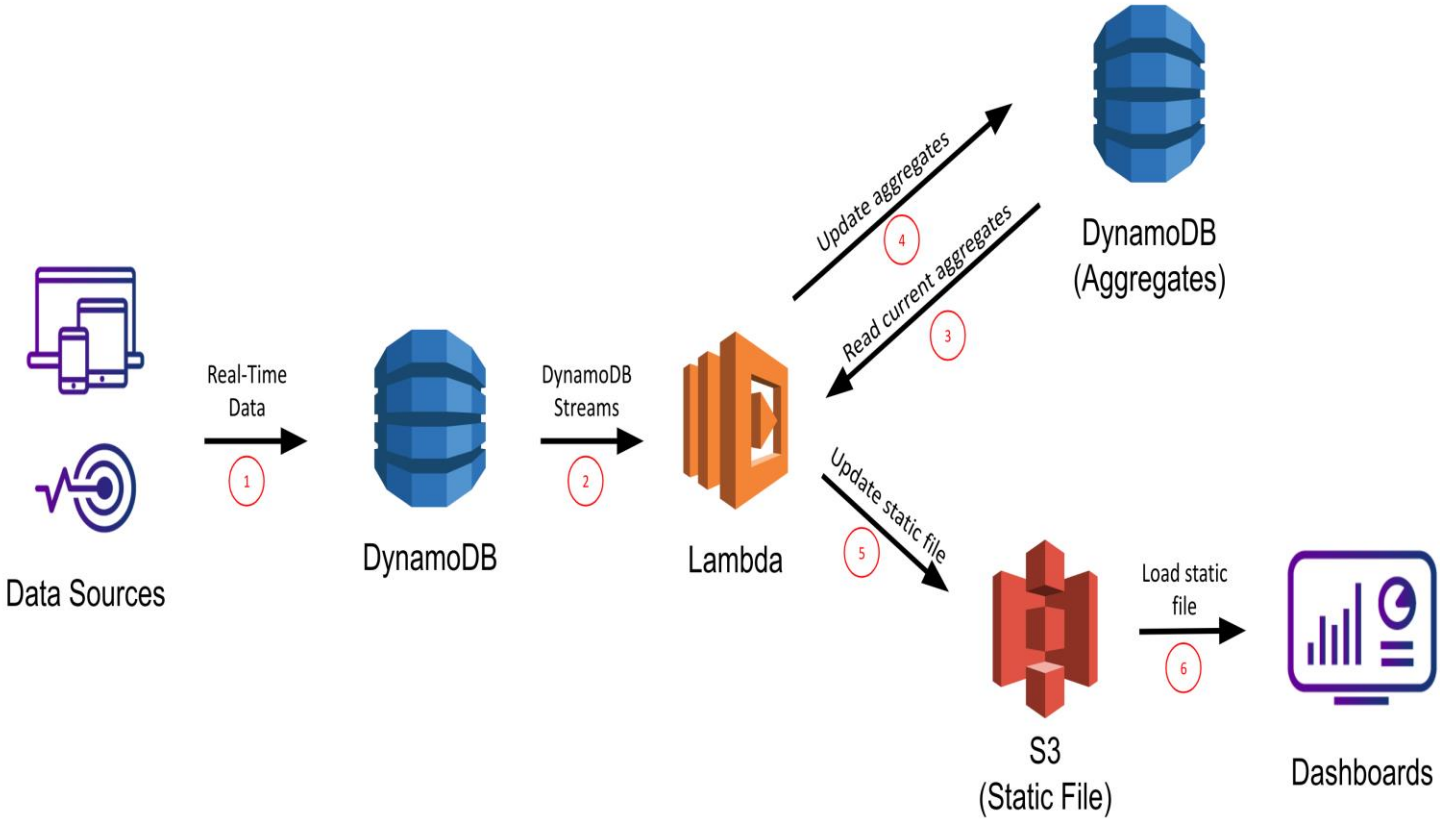
2. Partitions: To support scalability and high availability, Amazon DynamoDB partitions data across multiple servers, called partitions. Each partition is a physical storage unit that contains a subset of the table's data.

3. Replication: Amazon DynamoDB replicates data across multiple partitions to ensure high availability and durability. Data is replicated across three geographically separated Availability Zones to provide fault tolerance and resiliency.

4. Consistency: Amazon DynamoDB supports both strong and eventual consistency models. In the strong consistency model, all read operations return the most recent data. In the eventual consistency model, read operations may return stale data for a short period.

5. API: Amazon DynamoDB provides a simple and flexible API for interacting with the database. The API supports various operations, such as create, read, update, and delete (CRUD) operations, as well as batch operations and transactions.

Overall, the architecture of Amazon DynamoDB is designed to provide highly scalable, low-latency data storage for applications that require consistent, single-digit millisecond response times. With its distributed data model, high availability, and durability, Amazon DynamoDB is an ideal choice for building scalable and reliable applications in the cloud.


Data Sources
Real-Time Data
1
DynamoDB
DynamoDB Streams
2
Lambda
Read current aggregates
3
Update aggregates
4
DynamoDB (Aggregates)
Update static file
5
S3 (Static File)
Load static file
6
Dashboards

Answer 4 :-

To configure a server for EC2, you will need to follow the following steps:

1. Create an AWS account: First, you will need to create an AWS account if you don't already have one. You can create an account by visiting the AWS website and following the instructions.
2. Launch an EC2 instance: Once you have an AWS account, you can launch an EC2 instance by navigating to the EC2 console and selecting the "Launch Instance" button. You will need to select the instance type, the AMI (Amazon Machine Image), and other settings, such as the instance size, network configuration, and security group.
3. Connect to the instance: After launching an EC2 instance, you will need to connect to it. You can connect to the instance using SSH (Secure Shell) or RDP (Remote Desktop Protocol), depending on the operating system and configuration of the instance. You can obtain the necessary credentials and instructions for connecting to the instance from the EC2 console.
4. Configure the server: Once you are connected to the instance, you can configure the server as per your requirements. This may involve installing and configuring applications, setting up the network, creating users, and securing the server.
5. Create and attach storage: To store data and files, you will need to create and attach storage to the instance. You can create and attach storage using Amazon Elastic Block Store (EBS), which provides persistent block-level storage volumes for use with EC2 instances.
6. Configure monitoring and alerts: To ensure that your server is running smoothly and to receive notifications in case of issues, you can configure monitoring and alerts using AWS CloudWatch. You can set up monitoring metrics, alarms, and notifications to track and respond to server performance and health.
7. Backup and disaster recovery: To protect your server from data loss and ensure business continuity, you can set up backup and disaster recovery mechanisms using Amazon S3 or other AWS services. You can create backup schedules, policies, and recovery plans to recover data and services in case of disasters or failures.

Overall, configuring a server for EC2 involves launching an instance, connecting to it, configuring the server, creating and attaching storage, configuring monitoring and alerts, and setting up backup and disaster recovery mechanisms. By following these steps, you can set up a secure, scalable, and reliable server for your application or service.

Answer 5:-

To create an Amazon S3 bucket and manage associated objects, you can follow these steps:

1. Sign up for AWS: If you don't have an AWS account, sign up for one at aws.amazon.com. Once you have an account, sign in to the AWS Management Console.
2. Navigate to S3: Navigate to the S3 service from the AWS Management Console.
3. Create a new bucket: In the S3 console, click the "Create Bucket" button. Provide a name for your bucket and choose the region where you want to create it.
4. Configure bucket properties: In the bucket creation wizard, you can configure various properties of the bucket, such as versioning, logging, and encryption.
5. Create objects: After creating a bucket, you can start uploading objects to it. Objects are files that you want to store in your bucket. You can upload objects using the S3 console, AWS CLI, or programmatically using the AWS SDKs.
6. Manage objects: You can manage objects in your bucket using the S3 console or programmatically using the AWS SDKs. You can perform operations such as deleting objects, copying objects, and setting permissions on objects.
7. Set permissions: You can set permissions on your bucket and objects to control who can access them. You can configure bucket-level permissions and object-level permissions using the S3 console or programmatically using the AWS SDKs.
8. Monitor and analyze bucket usage: You can use Amazon S3 metrics to monitor and analyze the usage of your bucket. You can configure metrics, alarms, and notifications to alert you when certain thresholds are exceeded.
9. Back up and restore objects: You can use Amazon S3 to back up and restore objects in your bucket. You can configure lifecycle policies to automatically move objects to different storage classes or delete them after a certain period.

Overall, creating an Amazon S3 bucket involves creating a bucket, uploading objects, managing objects, setting permissions, monitoring usage, and backing up and restoring objects. By following these steps, you can set up a secure, scalable, and reliable object storage solution for your application or service.

Answer 6:-

Amazon offers a wide range of services that cater to various business needs, from compute and storage to networking, security, analytics, and machine learning. Here are some of the key services offered by Amazon:

1. Amazon EC2: This service provides virtual machines in the cloud, allowing businesses to run applications and workloads without having to invest in physical hardware.
2. Amazon S3: This service provides object storage in the cloud, allowing businesses to store and retrieve data and files from anywhere with high durability, availability, and scalability.
3. Amazon RDS: This service provides managed database services, allowing businesses to set up, operate, and scale databases in the cloud.
4. Amazon CloudFront: This service provides a content delivery network (CDN), allowing businesses to distribute content to users with low latency and high data transfer speeds.
5. Amazon VPC: This service provides a virtual private cloud (VPC), allowing businesses to launch resources in a virtual network that is isolated from other networks.
6. Amazon Route 53: This service provides a domain name system (DNS), allowing businesses to manage domain names and route internet traffic to their resources.
7. Amazon SQS: This service provides message queueing services, allowing businesses to decouple and scale microservices and distributed systems.
8. Amazon SNS: This service provides notification services, allowing businesses to send and receive notifications across different endpoints and protocols.
9. Amazon Kinesis: This service provides real-time streaming data services, allowing businesses to ingest, process, and analyze streaming data at scale.
10. Amazon EMR: This service provides managed big data services, allowing businesses to process and analyze large amounts of data using popular big data frameworks such as Apache Hadoop and Spark.
11. Amazon SageMaker: This service provides managed machine learning services, allowing businesses to build, train, and deploy machine learning models at scale.

Overall, Amazon offers a broad range of services that can help businesses of all sizes and industries to innovate, grow, and succeed in the cloud. By leveraging these services, businesses can reduce costs, increase agility, and focus on their core competencies.

Answer 7 :-

Microsoft offers a diverse range of services that cater to various business needs, from productivity and collaboration to computing, storage, networking, security, and analytics. Here are some of the key services offered by Microsoft:

1. Microsoft 365: This service provides a suite of productivity and collaboration tools, including Office applications, email, calendars, file storage, and communication services.
2. Azure: This service provides cloud computing services, including virtual machines, containers, serverless computing, and data services.
3. Dynamics 365: This service provides a suite of business applications, including customer relationship management (CRM), enterprise resource planning (ERP), and supply chain management.
4. Power Platform: This service provides a low-code platform for building custom business applications, including Power Apps for building mobile and web applications, Power BI for data visualization and analytics, and Power Automate for workflow automation.
5. Windows Virtual Desktop: This service provides virtual desktop infrastructure (VDI), allowing businesses to securely access their desktops and applications from anywhere.
6. Microsoft 365 Defender: This service provides unified endpoint protection, allowing businesses to detect and respond to advanced threats across endpoints, email, and identities.
7. Azure Active Directory: This service provides identity and access management (IAM) services, allowing businesses to manage identities and access to their resources in the cloud and on-premises.
8. Azure DevOps: This service provides a set of DevOps services, including source control, continuous integration and delivery, and project management tools.
9. Azure IoT: This service provides Internet of Things (IoT) services, allowing businesses to connect, monitor, and manage IoT devices and data.
10. Azure Machine Learning: This service provides machine learning services, allowing businesses to build, train, and deploy machine learning models at scale.

Overall, Microsoft offers a broad range of services that can help businesses of all sizes and industries to transform, innovate, and grow. By leveraging these services, businesses can improve productivity, streamline operations, and enhance customer experiences.

Answer 8:-

Healthcare: ECG Analysis in the Cloud

Healthcare is a field or domain or area or a region where the information technology has found many of the applications.

2. These applications are getting involved to help business firms in assisting the scientists to develop solutions to prevent the diseases.

3. Due to the invention of internet or we can say due to the availability of internet cloud computing has came into the picture and represent itself as a attractive option for developing health monitoring system.

4. Example of health monitoring system is ECG machine which is used to measure the Heart-Beat of Human body and the output is get printed on the graph paper.

5. The full form of ECG is Electrocardiogram

Protein structure prediction in Cloud Computing

• Cloud computing is an emerging technology that provides various computing services on demand. It provides convenient access to a shared pool of higher-level services and other system resources. Nowadays, cloud computing has a great significance in the fields of geology, biology, and other scientific research areas.

• Protein structure prediction is the best example in research area that makes use of cloud applications for its computation and storage.

• A protein is composed of long chains of amino acids joined together by peptide bonds. The various structures of protein help in the designing of new drugs and the various sequences of proteins from its threedimensional structure in predictive form is known as a Protein structure prediction

Satellite Image Processing in Cloud Computing

• Satellite Image Processing is an important field in research and development and consists of the images of earth and satellites taken by the means of artificial satellites. Firstly, the photographs are taken in digital form and later are processed by the computers to extract the information. Statistical methods are applied to the digital images and after processing the various discrete surfaces are identified by analyzing the pixel values.

• The satellite imagery is widely used to plan the infrastructures or to monitor the environmental conditions or to detect the responses of upcoming disasters.

• In broader terms we can say that the Satellite Image Processing is a kind of remote sensing which works on pixel resolutions to collect coherent information about the earth surface.

Answer 9:-

Google App Engine is a platform as a service (PaaS) offering from Google that allows developers to build and deploy web applications and services in a fully-managed, serverless environment. It supports several programming languages including Python, Java, Node.js, Go, and PHP.

Here are the steps to install and use Google App Engine:

1. Create a Google Cloud account: If you don't already have a Google Cloud account, create one by visiting the Google Cloud Console and signing up for a free trial.
2. Install the Google Cloud SDK: The Google Cloud SDK includes the command-line tools necessary for interacting with Google Cloud services, including Google App Engine. Download and install the SDK for your operating system.
3. Initialize your App Engine application: In the terminal or command prompt, navigate to the directory where you want to create your App Engine application and run the command **gcloud init**. Follow the prompts to authenticate with your Google Cloud account and create a new App Engine application.
4. Create and deploy your application: Create your web application using your preferred programming language and framework. Then, use the command **gcloud app deploy** to deploy your application to App Engine.
5. Configure your application: You can configure your application's settings, including scaling, environment variables, and security, through the App Engine dashboard in the Google Cloud Console.
6. Monitor and debug your application: Use the App Engine dashboard to monitor and debug your application's performance and errors.

Overall, Google App Engine is a powerful and easy-to-use platform for building and deploying web applications and services. By following these steps, developers can get started with App Engine quickly and easily.

Answer 10:-

Azure is a cloud computing platform from Microsoft that offers a wide range of services for building and deploying cloud-based applications and services. Here are the core concepts of Azure:

1. Azure Resource Manager (ARM): ARM is the infrastructure and deployment management service in Azure that provides a consistent management layer for resources such as virtual machines, storage accounts, and networking resources. With ARM, developers can define their infrastructure and deployment configurations in a declarative manner and manage them as a single unit.
2. Azure Virtual Machines (VMs): Azure VMs are virtual machines running in the cloud that provide the ability to run workloads in a scalable, secure, and cost-effective way. Azure VMs can run a variety of operating systems, including Windows, Linux, and SQL Server.
3. Azure App Service: Azure App Service is a fully managed platform for building, deploying, and scaling web apps and APIs. With App Service, developers can build web apps using popular languages and frameworks such as .NET, Java, Python, and Node.js, and deploy them with ease.
4. Azure Storage: Azure Storage is a fully managed cloud storage service that provides highly available, secure, and scalable storage for data, files, and unstructured data. Azure Storage offers several types of storage, including Blob storage for storing unstructured data, File storage for shared access to files, and Queue storage for reliable messaging between application components.
5. Azure SQL Database: Azure SQL Database is a fully managed relational database service that provides high-performance, scalable, and secure database storage for applications. With Azure SQL Database, developers can build and deploy applications with the confidence that their data is secure and highly available.
6. Azure Cosmos DB: Azure Cosmos DB is a fully managed, globally distributed, multi-model database service that provides high throughput, low latency, and seamless scaling for data-intensive applications. Cosmos DB supports multiple data models, including document, key-value, graph, and column-family, and offers native support for several APIs such as MongoDB, Cassandra, and Gremlin.
7. Azure Functions: Azure Functions is a serverless compute service that enables developers to run code on-demand without having to manage infrastructure. With Functions, developers can write code in a variety of programming languages such as C#, Java, Python, and JavaScript, and deploy them with ease.

Overall, these core concepts of Azure provide developers with the tools and services they need to build, deploy, and manage cloud-based applications and services. With Azure, developers can focus on building applications rather than managing infrastructure and scale their applications to meet the demands of their users.

Answer 11 :-

AWS offers load balancing services that help distribute incoming traffic across multiple instances of an application or service, improving availability, fault tolerance, and scalability. There are three types of load balancers offered by AWS: Classic Load Balancer, Application Load Balancer, and Network Load Balancer.

Elastic Load Balancer (ELB) is a fully managed service provided by AWS that automatically distributes incoming traffic across multiple EC2 instances. ELB offers high availability, scalability, and security for your applications or services.

There are three types of Elastic Load Balancer:

1. Classic Load Balancer: This is the original ELB service that provides basic load balancing across EC2 instances. It operates at the transport layer (TCP/SSL) and can handle both HTTP and HTTPS traffic. It is best suited for applications that have simple load balancing requirements.
2. Application Load Balancer: This is an advanced type of ELB that operates at the application layer (HTTP/HTTPS). It can route traffic based on content-based rules and supports advanced features such as host and path-based routing, SSL offloading, and sticky sessions. It is best suited for applications that require advanced routing and traffic management capabilities.
3. Network Load Balancer: This is a high-performance load balancer that operates at the transport layer (TCP/UDP). It can handle millions of requests per second and is best suited for applications that require ultra-low latency, high throughput, and direct network access.

Advantages of Elastic Load Balancer:

1. High availability: ELB offers automatic failover and redundancy, ensuring that your applications or services are always available even if one of the instances fails.
2. Scalability: ELB can automatically scale up or down depending on the traffic load, ensuring that your applications or services can handle high traffic without any downtime.
3. Security: ELB offers SSL termination and encryption, ensuring that your traffic is secure and protected from unauthorized access.
4. Advanced features: ELB offers advanced features such as content-based routing, sticky sessions, and health checks, providing developers with the flexibility and control they need to manage their traffic.

Overall, Elastic Load Balancer is a powerful and flexible service that helps improve the availability, scalability, and security of your applications or services. With its advanced features and automatic scaling, it is an essential tool for any application or service that requires high availability and scalability.

Answer 12 :-

An Amazon Elastic Block Store (EBS) snapshot is a point-in-time copy of an EBS volume. It captures all the data and configurations of the EBS volume at the time the snapshot is taken and can be used to create new EBS volumes, restore data, or migrate data to another region.

To create an EBS snapshot in AWS, follow these steps:

1. Open the Amazon EC2 console.
2. In the navigation pane, choose "Volumes".
3. Select the EBS volume for which you want to create a snapshot.
4. Choose "Actions", and then choose "Create Snapshot".
5. In the "Create Snapshot" dialog box, enter a name and description for the snapshot.
6. Choose "Create Snapshot".

The EBS snapshot creation process may take some time to complete, depending on the size of the EBS volume. Once the snapshot is created, you can see it in the "Snapshots" section of the EC2 console.

Note that when you create an EBS snapshot, it is stored in Amazon S3, which provides durability and availability for your data. You can also use Amazon S3 lifecycle policies to automatically manage the retention of your EBS snapshots, making it easier to manage and control your storage costs.