

Module No. 01

Write Up Name: Introduction on DevOps on Cloud .

Theory:

1. What are the different types of cloud, cloud services and cloud providers available?

Ans :

- Cloud technologies have transformed how organizations procure and manage infrastructure. ExitCertified has partnered with all of the major players in public cloud training, including AWS, Microsoft Azure, Google Cloud, IBM, and Oracle. We also support private and hybrid cloud training on tools and frameworks like VMware,
- Cloud Foundry, OpenShift, and OpenStack. Cloud technologies have transformed how organizations procure and manage infrastructure. ExitCertified has partnered with all of the major players in public cloud training, including AWS, Microsoft Azure, Google Cloud, IBM, and Oracle. We also support private and hybrid cloud training on tools and frameworks like VMware, Cloud Foundry, OpenShift, and OpenStack.
- There are 4 main types of cloud computing:
 - Private clouds.
 - Public clouds.
 - Hybrid clouds.
 - Multiclouds.

Private Clouds :

Private clouds usually reside behind a firewall and are utilized by a single organization. A completely on-premises cloud may be the preferred solution for businesses with very tight regulatory requirements, though private clouds implemented through a colocation provider are gaining in popularity. Authorized users can access, utilize, and store data in the private cloud from anywhere, just like they could with a public cloud. The difference is that no one else can access or utilize those computing resources.

Public Clouds :

Some public cloud examples include those offered by Amazon, Microsoft, or Google. These companies provide both services and infrastructure, which are shared by all customers. Public clouds typically have massive amounts of available space, which translates into easy scalability. A public cloud is often recommended for software development and collaborative projects. Companies can design their applications to be portable, so that a project that's tested in the public cloud can be moved to the private cloud for production. Most cloud providers package their computing resources as part of a service. Public cloud examples range from access to a completely virtualized infrastructure that provides little more than raw processing

power and storage (Infrastructure as a Service, or IaaS) to specialized software programs that are easy to implement and use (Software as a Service, or SaaS).

Hybrid Clouds :

Hybrid cloud is a seemingly single IT environment created from multiple environments connected through local area networks (LANs), wide area networks (WANs), virtual private networks (VPNs), and/or APIs. The characteristics of hybrid clouds are complex and the requirements can differ, depending on whom you ask. For example, a hybrid cloud may need to include:

- At least 1 private cloud and at least 1 public cloud
- 2 or more private clouds
- 2 or more public clouds

Multi Clouds :

Multi Clouds are a cloud approach made up of more than 1 cloud service, from more than 1 cloud vendor public or private. All hybrid clouds are multiclouds, but not all multiclouds are hybrid clouds. Multiclouds become hybrid clouds when multiple clouds are connected by some form of integration or orchestration.

- There are 3 types of cloud services:
 - IaaS
 - PaaS
 - SaaS

IaaS

IaaS means a cloud service provider manages the infrastructure for you the actual servers, network, virtualization, and data storage through an internet connection. The user has access through an API or dashboard, and essentially rents the infrastructure.

PaaS

PaaS means the hardware and an application-software platform are provided and managed by an outside cloud service provider, but the user handles the apps running on top of the platform and the data the app relies on.

SaaS

SaaS is a service that delivers a software application which the cloud service provider manages to its users. Typically, SaaS apps are web applications or mobile apps that users can access via a web browser.

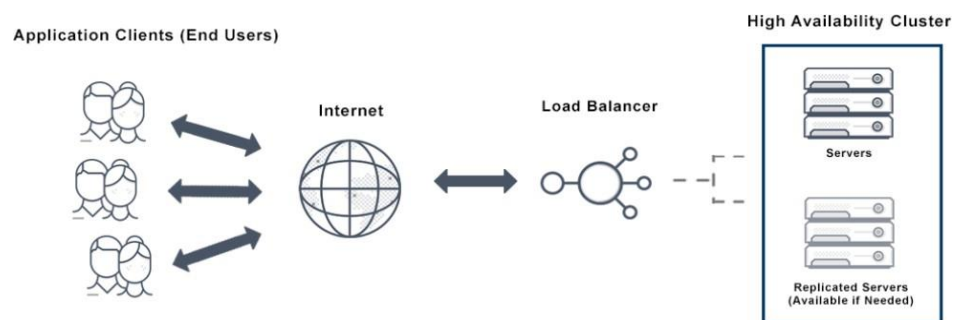
- Types of cloud providers are:
 - Alibaba Cloud
 - Amazon Web Services (AWS)
 - Google Cloud
 - IBM Cloud
 - Microsoft Azure.

2. What is the high availability architecture and auto scaling aspect of DevOps on the cloud?

Ans :

High Availability :

- High availability protects companies from lost revenue when access to their data resources and critical business applications is disrupted. What kind of outage is your business trying to protect itself against? Planned outages such as backup windows, maintenance and unplanned outages should be considered when planning high availability in the cloud.
- Planned outages are the primary reason to have high availability in the cloud. These outages are needed to take systems or data offline to facilitate maintenance tasks, such as the deployment of new hardware or software upgrades.



- High availability can only be achieved with comprehensive planning and careful system design. And it can be a complex undertaking with far-reaching and operational implications. You can oversee high availability planning at two levels: Capacity and redundancy level.

Auto scaling:

- Auto Scaling allows your application to always have the compute capacity needed and reduces the need to manually monitor server capacity. You can autoscale based on incoming requests (front-end) or number of jobs in the queue and how long jobs have been in the queue (back-end).
- The benefits of Auto Scaling:
 - Responsive server usage based on traffic load
 - Handle unexpected traffic spikes and avoid downtime
 - Plan scaling activities if you have predictable load changes
 - Uncover and replace faulty instances and unhealthy applications automatically

3. What are the benefits of cloud infrastructure?

Ans :

Cloud computing benefits

1. High Speed – Quick Deployment :

The ability to spin up new cloud computing instances in a matter of seconds reshaped the agility and speed of software development. Developers can easily test new ideas and design application architecture without the dependency on on-site hardware limitations or slow procurement processes.

2. Automatic Software Updates and Integration :

Continuous Integration and Continuous Delivery rely on the fact that new software versions can be easily tested and deployed in the cloud environment, which allows for higher velocity of product innovation, releasing more and more features to the end-users on a monthly, weekly and in some cases even daily basis. Cloud environments also integrates with common DevOps tools and logging systems which makes it easier to monitor and detect issues in production.

3. Efficiency and Cost Reduction :

By using cloud infrastructure, you don't have to spend huge amounts of money on purchasing and maintaining equipment. This drastically reduces CAPEX costs and Total Cost of Ownership (TCO). You don't have to invest in hardware, facilities, utilities, or building out a large data center to grow your business. You do not even need large IT teams to handle your cloud data center operations, as you can enjoy the expertise of your cloud provider's staff.

Cloud also reduces costs related to downtime. Since downtime is rare in cloud systems, this means you don't have to spend time and money on fixing potential issues related to downtime.

4. Data Security :

One of the major concerns of every business, regardless of size and industry, is the security of its data. Data breaches and other cybercrimes can devastate a company's revenue, customer loyalty and brand positioning. Cloud offers many advanced security features that guarantee that data is securely stored and handled. Features like granular permissions and access management via federated roles can restrict access to sensitive data only to the employees that need access to it, and by that reducing the attack surface for malicious actors.

5. Scalability :

Different companies have different IT needs — a large enterprise of 1000+ employees won't have the same IT requirements as a start-up. Using the cloud is a great solution because it enables enterprises to efficiently — and quickly — scale up/down their IT departments, according to business demands. This scalability minimizes the risks associated with in-house operational issues and maintenance. You have high-performance resources at your disposal with professional solutions and zero up-front investment. Scalability is probably the greatest advantage of the cloud.

6. Collaboration :

Cloud environments enables better collaboration across teams: developers, QA, operations, security and product architects are all exposed to the same infrastructure and can operate simultaneously without stepping on each other toes. Cloud roles and permissions help with better visibility and monitoring on who did what and when, to avoid conflicts and confusion. Different cloud environments can be built for specific purposes like staging, QA, demo or pre-production. It's much easier to collaborate in a transparent manner and the cloud encourages it.

7. Unlimited Storage Capacity :

Related to the scalability benefit above, the cloud has essentially unlimited capacity to store any type of data in various cloud data storage types, depending on the availability, performance and frequency the data has to be accessed. The rule of thumb is that the cost of storage goes up according to the levels of availability of the data, performance and access frequency. Creating and optimizing the cloud cost structure policy can reduce the cost of cloud storage significantly while maintaining the company's business goals related to data storage in the cloud.

8. Back-up and Restore Data :

The fact that data can be stored in the cloud without capacity constraints also helps with backup and restore purposes. As end-users data changes over time and needs to be tracked for regulations or compliance reasons, older software versions can be stored for later stages, in cases they would be needed for recovery or rollback.

9. Disaster Recovery :

Having previous versions of software stored in the cloud, and having production instances running on multiple cloud availability zones or regions allow for faster recovery from disasters: if your application is deployed on multiple locations and for some reason one region goes down – the traffic can automatically failover to the working regions without any interruptions to the end-users. In other cases where there is a major bug in the software release, a quick rollback can be initiated to restore a previously released, more stable version to minimize damage.

10. Mobility :

Cloud computing allows mobile access to corporate data via smartphones and devices, which is a great way to ensure that no one is ever left out of the loop. Staff with busy schedules, or who live a long way away from the corporate office, can use this feature to keep instantly up-to-date with clients and coworkers.

11. Data Loss Prevention :

Data loss is a major concern for all organizations, along with data security. Storing your data in the cloud guarantees that data is always available, even if your equipment like laptops or PCs, is damaged. Cloud-based services provide quick data recovery for all kinds of emergency scenarios – from natural disasters to power outages. But, if you upload your data to the cloud, it remains accessible for any computer with an internet connection, even if something happens to your work computer.

12. Control :

Having control over sensitive data is vital to any company. You never know what can happen if a document gets into the wrong hands, even if it's just the hands of an untrained employee. Cloud enables you complete visibility and control over your data. You can easily decide which users have what level of access to what data. This gives you control, but it also streamlines work since staff will easily know what documents are assigned to them. It will also increase and ease collaboration. Since one version of the document can be worked on by different people, and there's no need to have copies of the same document in circulation.

13. Competitive Edge :

Not every company will migrate to the cloud, at least not yet. However, organizations which adopt cloud find that many benefits that cloud offers positively impacts their business . Cloud adoption increases every year, since companies realize that it offers them access to world-class enterprise technology. And, if you implement a cloud solution now, you'll be ahead of your competitors.

4. Explain AWS CodeStar?

Ans :

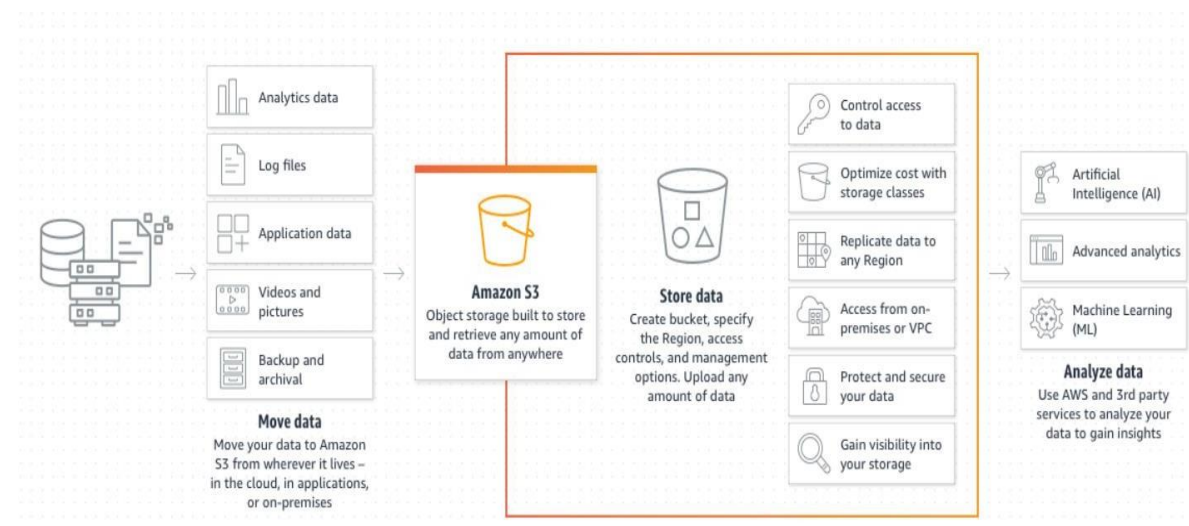
- AWS CodeStar is a cloud-based service for creating, managing, and working with software development projects on AWS. You can quickly develop, build, and deploy applications on AWS with an AWS CodeStar project. An AWS CodeStar project creates and integrates AWS services for your project development toolchain.
- Depending on your choice of AWS CodeStar project template, that toolchain might include source control, build, deployment, virtual servers or serverless resources, and more.
- AWS CodeStar also manages the permissions required for project users (called team members). By adding users as team members to an AWS CodeStar project, project owners can quickly and simply grant each team member role-appropriate access to a project and its resources.
- Features of aws codestar are:
 - Project templates.
 - Team access management.
 - Hosted Git repository.
 - Fully managed build service.
 - Automated continuous delivery pipeline.
 - Automated deployments.
 - IDE integrations.
 - Central project dashboard.

5. What is Amazon s3 and EC2 instance?

Ans :

Amazon s3 :

- Amazon Simple Storage Service (Amazon S3) is storage for the Internet. It is designed to make web-scale computing easier. Amazon S3 has a simple web services interface that you can use to store and retrieve any amount of data, at any time, from anywhere on the web.
- It gives any developer access to the same highly scalable, reliable, fast, and inexpensive data storage infrastructure that Amazon uses to run its own global network of web sites. The service aims to maximize benefits of scale and to pass those benefits on to developers.
- Amazon S3 is intentionally built with a minimal feature set that focuses on simplicity and robustness. Following are some of the advantages of using Amazon S3:
 - **Creating buckets:** Create and name a bucket that stores data. Buckets are the fundamental containers in Amazon S3 for data storage.
 - **Storing data:** Store an infinite amount of data in a bucket. Upload as many objects as you like into an Amazon S3 bucket. Each object can contain up to 5 TB of data. Each object is stored and retrieved using a unique developer-assigned key.
 - **Downloading data:** Download your data or enable others to do so. Download your data anytime you like, or allow others to do the same.
 - **Permissions:** Grant or deny access to others who want to upload or download data into your Amazon S3 bucket. Grant upload and download permissions to three types of users. Authentication mechanisms can help keep data secure from unauthorized access.
 - **Standard interfaces:** Use standards-based REST and SOAP interfaces designed to work with any internet-development toolkit.



EC2 instance:

- Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides secure, resizable compute capacity in the cloud. It is designed to make web-scale cloud computing easier for developers. Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction.
- It provides you with complete control of your computing resources and lets you run on Amazon's proven computing environment. Amazon EC2 offers the broadest and deepest compute platform with choice of processor, storage, networking, operating system, and purchase model.

6. What is the object and bucket in s3?

Ans :

Object in s3:

- An *object* is a file and any metadata that describes that file. The data portion is opaque to Amazon S3. The metadata is a set of name-value pairs that describe the object. These include some default metadata, such as the date last modified, and standard HTTP metadata, such as Content-Type.
- Amazon Web Services' (AWS) cloud storage platform S3 or Simple Storage Service stores over 100 trillion objects. The HEAD action retrieves metadata from an object without returning the object itself. This action is useful if you're only interested in an object's metadata. To use HEAD, you must have READ access to the object.

Bucket in s3:

- An Amazon S3 bucket is a public cloud storage resource available in Amazon Web Services' (AWS) Simple Storage Service (S3), an object storage offering. Amazon S3 buckets, which are similar to file folders, store objects, which consist of data and its descriptive metadata. AWS offers several features for Amazon S3 buckets. An IT professional can enable versioning for S3 buckets to preserve every version of an object when an operation is performed on it, such as a copy or delete operation. This helps an IT team prevent accidental deletion of an object. Likewise, upon bucket creation, a user can set up server access logs, object-level API logs, tags and encryption.
- Also, S3 Transfer Acceleration helps execute fast, secure transfers from a client to an S3 bucket via AWS edge locations.