UNIT-3.

cloud Architecture :-

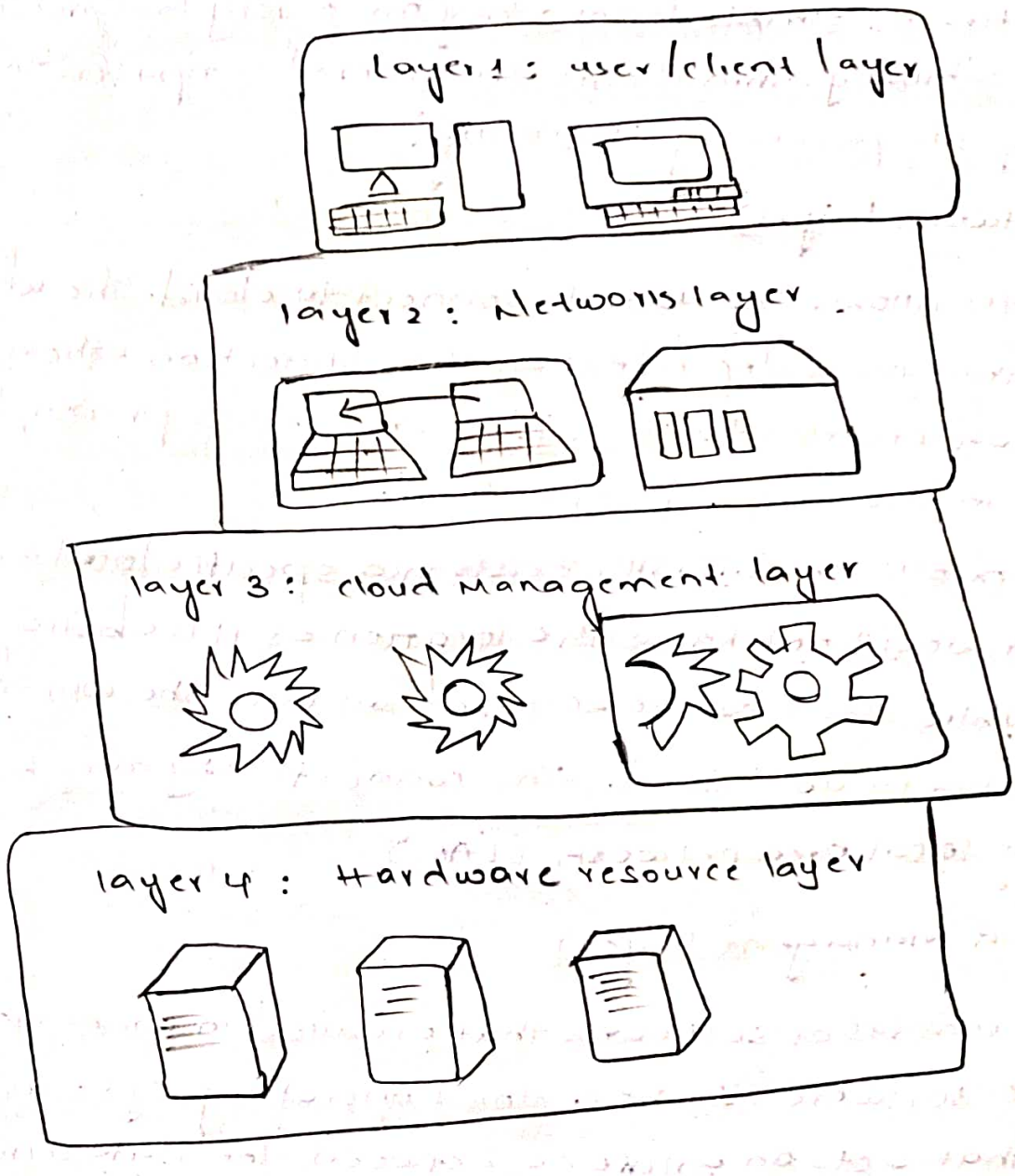

fig :- cloud Architecture.

Layer 1 (user / client layer)

→ This layer is the lowest layer in the cloud architecture.
→ All the users or clients belongs to this layer.
→ This the place where the client / user initiates the connection to the cloud.
→ The client can be any device such as a thin client, thick client, or mobile or any handled device that

would support basic functionalities to access a web application. Thin client here refers to a device that is completely dependent on some other system for its complete functionality. In simple terms, they have very low processing capability. similarly, thin clients are general computers that have adequate processing capability.

Layer 2 (Network layer)

This layer allows the users to connect to cloud. The whole cloud infrastructure is dependent on this connection where the services are offered to the customers. this is primarily the internet in the case of public cloud.

The public cloud usually exists in a specific location and the user would not know the location as it is abstract. And, the public cloud can be accessed all over the world. In the case of a private cloud, the connectivity may be provided by local area network (LAN).

Layer 3 (Cloud Managent layer)

This layer consists of softwares that are used in managing the cloud. The software can be a cloud operating system (OS) a software that acts an interface between the data centre (actual resources) and the user, or a management software that allows managing resources.

These softwares usually allow the resources management (scheduling, provisioning, etc) optimization (server consolidation, storage workload consolidation) and internal cloud governance

layer 4 (Hardware Resource layer)

layer 4 consists of provisions for actual hardware resources. usually, in the case of a public cloud, a data centre is used in backend. similarly, in a private cloud, it can be a data centre, which is a huge collection of hardware resources interconnected to each other that is present in a specific location or a high configuration system.

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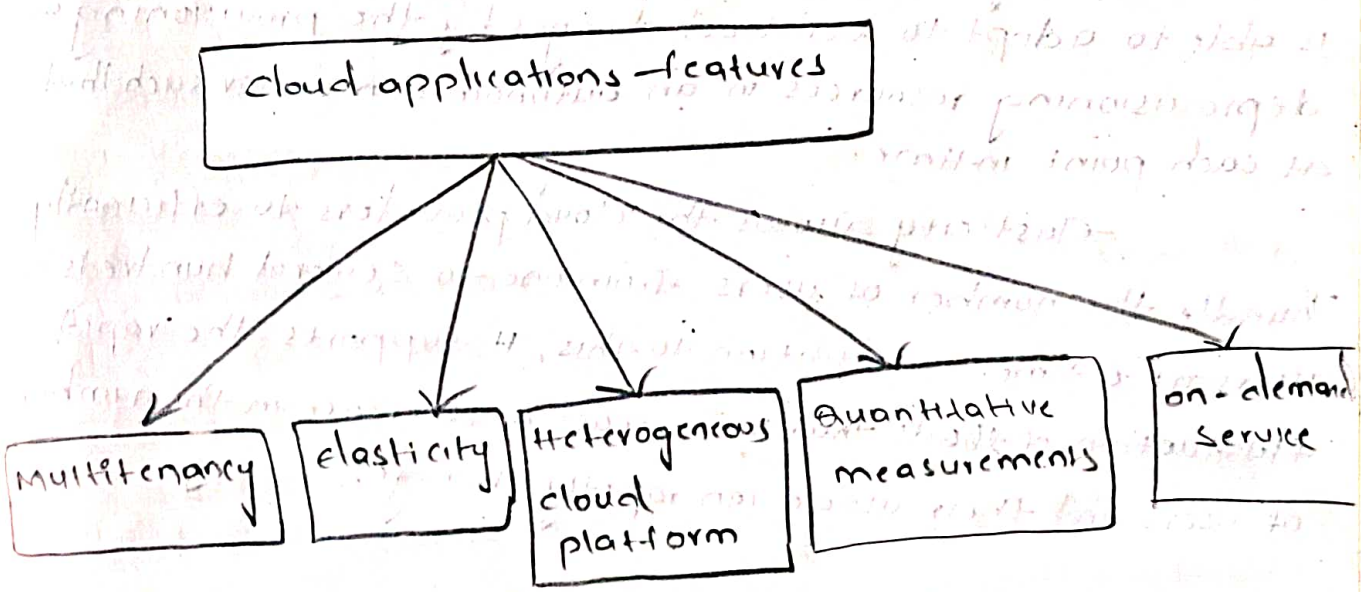
Applications on the cloud :-

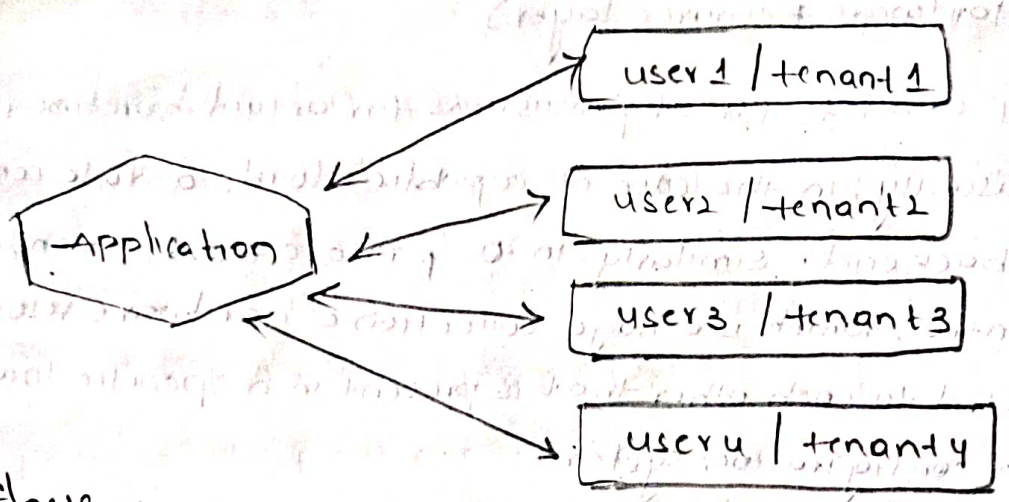


The feature that makes cloud application unique are described in the following.

Multitenancy :-

Multitenancy is one of the important property of the cloud that make it different from other types of application in which the software can be shared by different users with full independence. Here independence refers to logical independence.

- each user will have a separate application instance and the changes in one application would not affect the other.



Elasticity :-

Elasticity can be defined as the degree to which a system is able to adopt to workload changes by the provisioning and deprovisioning resources in an autonomic manner such that at each point in time.

Elasticity allows the cloud providers to efficiently handle the number of users, from one to several hundreds of users at a time. In addition to this, it supports the rapid fluctuation of loads that is, increase or decrease in the number of users and their usage can rapidly change.

Heterogeneous cloud platform :-

The cloud platform supports heterogeneity, wherein any type of application can be deployed in the cloud. because of this property, the cloud is flexible for the developers, which facilitates deployment. The applications that are usually deployed can be accessed by the users using a web browser.

Quantitative measurement :-

The services provided can be quantitatively measured. The user is usually offered services based on certain charges. Here, the application or resources are given as a utility on a pay-per-use basis. Thus, the use can be monitored and measured.

on-demand service :-

The cloud applications offer service to the user, on demand, that is, whenever the user requires it. The cloud service would allow the users to access web applications usually without any restrictions on time, duration, and type of device used.

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Managing the cloud.

Cloud management can be divided into two parts :-

1. Managing the infrastructure of cloud.
2. Managing the cloud application.

1. Managing the cloud infrastructure :-

The infrastructure of the cloud is considered to be the backbone of the cloud. this component is mainly responsible for the QoS factor. If the infrastructure is not properly managed, then the whole cloud can fail and QoS would be adversely affected. The core of cloud management is resource management. Resource management involves several internal tasks such as resource scheduling, provisioning and load balancing. These tasks are mainly managed by cloud service provider's core software capabilities such as the cloud OS that is responsible for providing services to the cloud and that internally controls the cloud. A cloud infrastructure is very complex system that consists of a lot of resources. these resources are usually shared by several users.

SLA (service level Agreement)

poor resource management may lead to several inefficiencies in terms of performance, functionality, and cost. If a

resource is not efficiently managed, the performance of the whole system is affected. performance is the most important aspect of the cloud, because everything in the cloud is dependent on the SLAs and the SLAs can be satisfied only if the performance is good.

The cost is a very important criterion as far as the business prospects of the cloud are concerned. on the part of the service providers, if they incur less cost for managing the cloud, then they would try to reduce the cost so as to get a strong user base hence, a lot of users would use the services, improving their profit margin. similarly, if the cost of resource management is high, then definitely the cost of accessing the resources would be high and there is never a lossy business from any organisation and so the service provider would not bear the cost and, hence the users have to pay more. similarly, this would prove costly for service providers as they have a high chance of losing a wide user base, leading to only a marginal growth in the industry. And competing with its industry rivals would become a big issue. Hence efficient management with less cost is required.

2. Managing the cloud Application :-

Business companies are increasingly looking to move or build their corporate applications on cloud platforms to improve agility or to meet dynamic requirements that exist in the globalisation of businesses and responsiveness to market demands. but this shift or moving the applications to the cloud environment brings new complexities. Applications become more composite and complex, which requires leveraging not only capabilities like storage and database offered by the cloud providers but also third-party SaaS capabilities like e-mail and messaging.

cloud application management is to address these issues and propose solutions to make it possible to have insight into the application that runs in the cloud, as well as implement or enforce enterprise policies like governance and auditing and environment management while the application is deployed in the cloud. These cloud based monitoring and management services can collect a multitude of events, analyze them, and identify critical information that requires additional remedial actions like adjusting capacity or provisioning new services.

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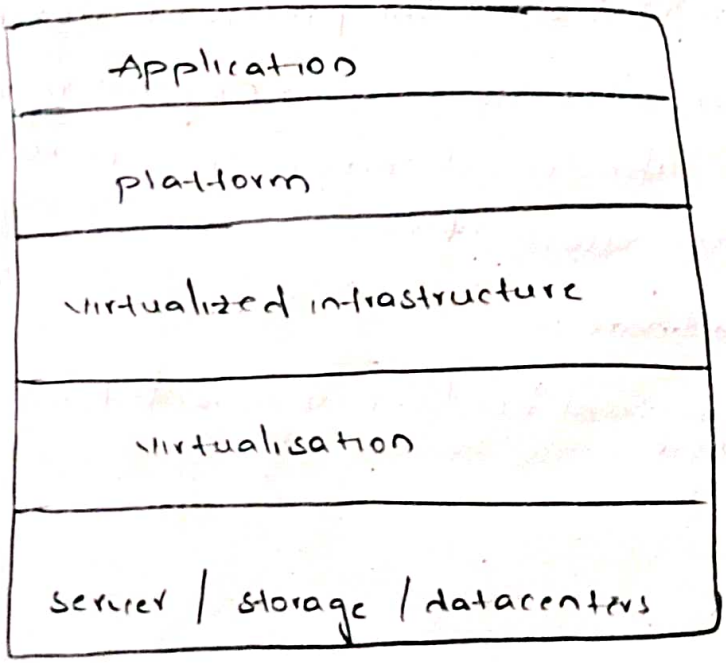
Anatomy of the cloud :-

cloud anatomy can be simply defined as the structure of cloud. cloud anatomy cannot be considered as same as cloud architecture.

It may not include any dependency on which or over the which the technology works.



There are basically five components of the cloud :-

1. Application :-

The upper layer is the application layer. in this layer, any applications are executed.

2. plat-form :-

This component consists of platforms that are respon for the execution of application.

This plat-form is between the infrastructure and the application.

3. in-frastructure :-

The infrastructure consists of resources over which the other components works. This provides computational capabi to the user.

4. virtualization :-

virtualization is the process of making logical compo -nts of resources over the existing physical resources.

The logical components are isolated & indepen which form the infrastructure.

5. physical hardware :-

The physical hardware is provided by server and storage units.

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Network connectivity in cloud computing :-

Cloud computing is a technique of resource sharing where servers, storage, and other computing infrastructure in multiple locations are connected by networks.

In the cloud, when an application is submitted for its execution, needy and suitable resources are allocated from this collection of resources; as these resources are connected via the internet, the users get their required results.

- For many cloud computing applications, network performance will be key issue to cloud computing performance.

→ public cloud access Networking :-

* In this option the connectivity is often through the internet, though some cloud providers may be able to support virtual private networks (VPNs) for customers.
* Accessing public cloud services will always create issues related to security, which in turn is related to performance.
* One of the possible approaches toward the support of security is to promote connectivity through encrypted tunnels, so that the information may be sent via secure pipes on internet
* This procedure will be an overhead in the connectivity, and using it will certainly increase delay and may impact performance.

→ private cloud access Networking :-

In the private cloud deployment model, since the cloud is part of an organisational network, the technology and approaches are local to the in-house network structure.

This may include an internet VPN or VPN service from a network operator.

→ intracloud Networking for public cloud services:-

* Another network connectivity consideration in cloud computing is intracloud networking for public cloud services.
* Here, the resources of the cloud provider and thus the cloud service to the customer are based on resources that are geographically apart from each other but still connected via the internet.
* public cloud computing networks are internal to the service provider and thus not visible to user / customer; however, the security aspects of connectivity and access mechanisms of the resources are important.

→ private intracloud networking :-

* The most complicated issues for networking and connectivity in cloud computing is private intracloud networking.
* what makes this particular issue so complex is that is depends on how much intracloud connectivity is associated with the applications being executed in this environment.
* private intracloud networking is usually supported over connectivity between the major data center sites owned by the company.
* At a minimum, all cloud computing implementations will rely on intracloud networking to link users with the resource to which their application was assigned.

→ New facets in private networks :-

* conventional private networks have been architected for on-premise applications and maximum internet security.
* typically, applications such as e-mail, file sharing, and enterprise resource planning (ERP) system are delivered

to on-premise-based servers at each corporate data center.

* Increasingly today, software vendors are offering software as a service (saas) as an alternative for their software support to the corporate offices, which brings more challanges in the access and usage mechanisms of software from the data center servers and in the connectivity of network architectures.

→ path for internet traffic :-

The traditional internet traffic through a limited set of internet gateways poses performance and availability issues for end users who are using cloud-based applications.

It can be improved if a more widely distributed internet gateway infrastructure and connectivity are being supported for accessing applications, as they will provide lower-latency access to their cloud applications.

Migrating Application to cloud :-

Cloud migration encompasses moving one or more enterprise applications and their IT environments from the traditional hosting type to the cloud environment, either public, private, or hybrid. cloud migration presents an opportunity to significantly reduce costs incurred on application. This activity comprises, of different phases like evaluation, migration strategy, prototyping, provisioning and testing.

phases of cloud migration :-

1. Evaluation :-

Evaluation is carried out for all the components like current infrastructure and application architecture, environment in terms of compute, storage, monitoring, and management, SLAs, operational processes, financial

considerations, risks, security, compliance, and licensing needs are identified to build a business case for moving to cloud.

2. Migration strategy :-

Based on the evaluation, a migration strategy is drawn - a hotplug strategy is used where the applications and their data and interface dependancies are isolated and these applications can be operationalized at all once. A fusion strategy is used where the applications can be operationalized all at once partially migrated; but for a portion of it, there are dependancies based on existing licenses, specialized server requirements like main-frames, or extensive interconnections with other applications.

3. prototyping :-

Migration activity is preceded by a prototyping activity to validate and ensure that a small portion of the applications are tested on the cloud environment with test data setup.

4. provisioning :-

premigration optimizations identified are implemented cloud servers are provisioned for all the identified environments necessary platform softwares and applications are deployed, configurations are tuned to match the new environment sizing, and data-bases and files are replicated.

All internal and external integration points are properly configured. web services, batch jobs, and operation and management software are set up in the new environments.

5. Testing :-

post migration tests are conducted to ensure that migration has been succesful. performance and loading

testing, failure and recovery testing, and scale-out testing are conducted against the expected traffic load and resource utilisation levels.

Approaches for cloud migration :-

The following are the four broad approaches for cloud migration that have been adopted effectively by vendors.

1. Migrate existing applications :-

Rebuild or rearchitect some or all the applications, taking advantage of some of virtualisation technologies around to accelerate the work. but it requires top engineers to develop new functionality. This can be achieved over the course of several releases with timing determined by the customer demand.

2. Start from Scratch :-

Rather than cannibalize sales, confuse customers with choice, and tie up engineers trying to rebuild existing application, it may be easier to start again. many of R&D decisions will be different now and with some of the more sophisticated development environments, one can achieve more even with a small-focused working team.

3. Separate company :-

one may want to create a whole new company with separate brand, management, R&D and sales. The investment and internet protocol (IP) may come from existing company but many of the conflicts disappear once a new born in the cloud ~~computing~~ company is established.

The separate company may even be a subsidiary of the existing company. what important is that the new company can act, operate and behave like a cloud based start-up.

4. Buy an existing cloud vendor :-

- for a large established vendor, buying a cloud-based competitor achieves two things. firstly, it removes a competitor and secondly, it enables the vendor to hit the ground running in the cloud space. the risk of course is that the innovation, drive, and operational approach of cloud-based company are destroyed as it is merged into the larger acquirer.