UNIT-5

Date ___/___/___
Page _____

(1) Market-based management of clouds

The real potential of cloud computing resides in the fact that it actually facilitates the establishment of a market for trading IT utilities.

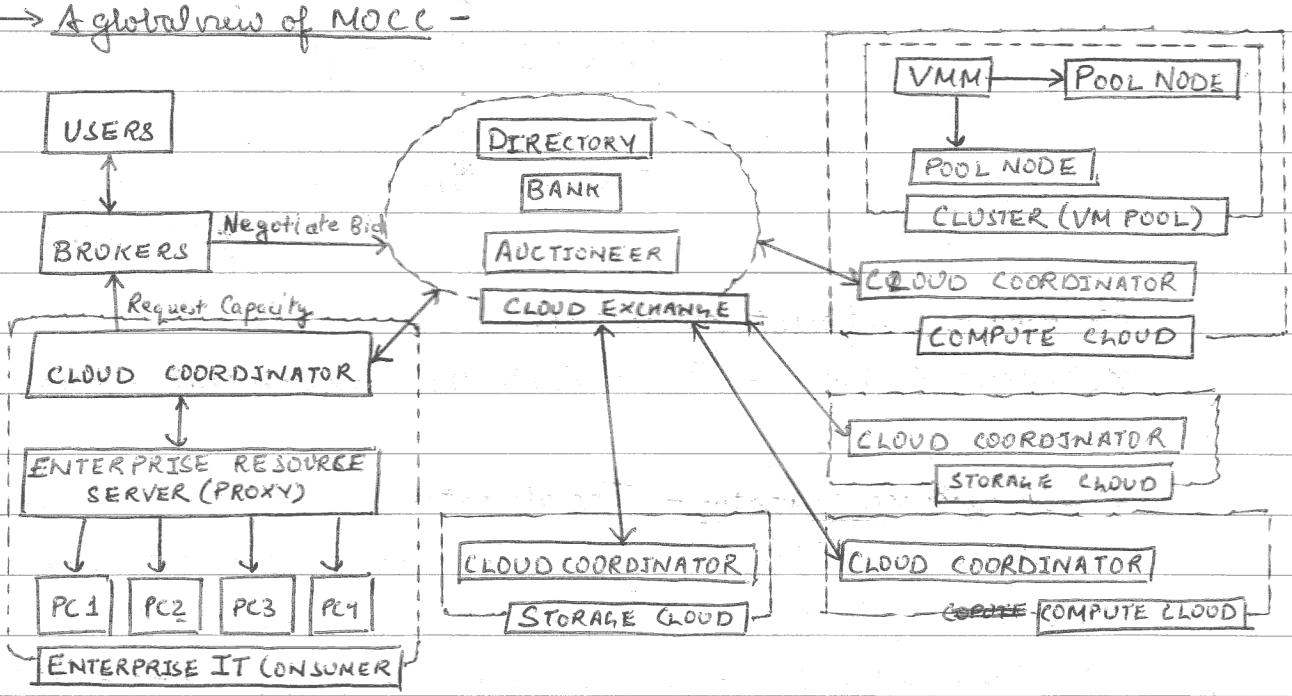
→ **Market oriented cloud computing (MOCC) –**

MOCC is the presence of a virtual marketplace where IT services are traded and brokered dynamically.

→ **A reference model for MOCC –**

MOCC originated from the coordination of several components – service consumers, service providers, and other entities that make trading between these two groups possible.

→ **A global view of MOCC –**



Three major components of cloud exchange are –

(1) Directory – The market directory contains a listing of all the published services that are available in the cloud marketplace.

(2) Auctioneer – The auctioneer is in charge of keeping track of the running auctions in the market place and of verifying that the auctions for services are properly conducted and that malicious market players are prevented from performing illegal activities.

(3) Bank – The bank is the component that takes care of the financial aspect of all the operations happening in the virtual marketplace.

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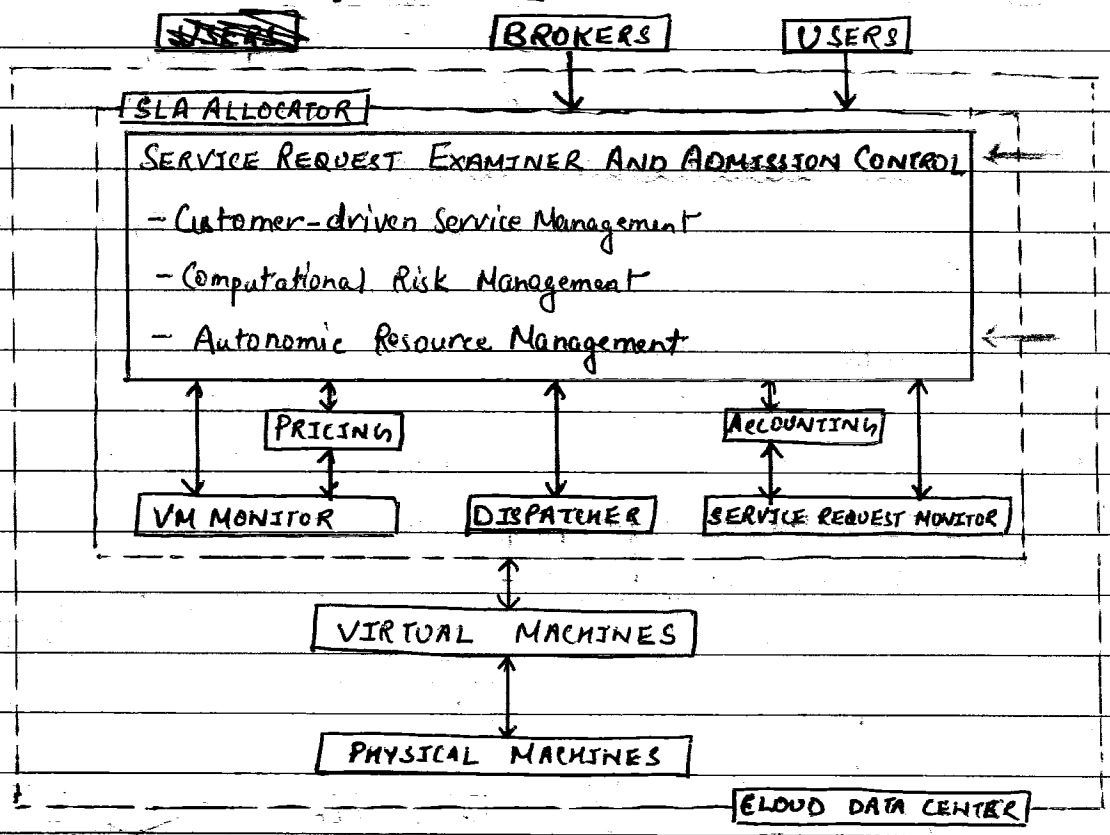
→ Market-oriented architecture for datacenters –



SLA → Service level agreements

Four major components of the architecture are –

(1) Users and Brokers – They originate the workload that is managed in the cloud datacenter.

(2) SLA resource allocator – The allocator represents the interface between the data center and the cloud service provider and the external world. It has –

(i) Service Request Examiner and Admission Control module – This module operates in the front-end and filter users and broker requests in order to accept those that are feasible given the current status of the system and the workload that is already processing.

(ii) Pricing module – This module is responsible for charging users according to the SLA they signed.

(iii) Accounting module – This module maintains the actual information on usage of resources and stores the billing information for each user.

(iv) Dispatcher – This component is responsible for the low-level operations that are required to realize admitted service requests.

(v) Resource Monitor – This component monitor the status of the computing

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resources, either physical or virtual.

(vi) Service Request Monitor - This component keeps track of the execution progress of service requests.

(3) Virtual Machines (VMs) - VM constitute the basic building blocks of a cloud computing infrastructure, especially for IaaS providers.

(4) Physical Machines - At the lowest level of the reference architecture resides the physical infrastructure that can compromise one or more datacenters.

② Federated clouds / Intercloud -

These are enablers for MCC since they provide means for interoperation among different cloud providers.

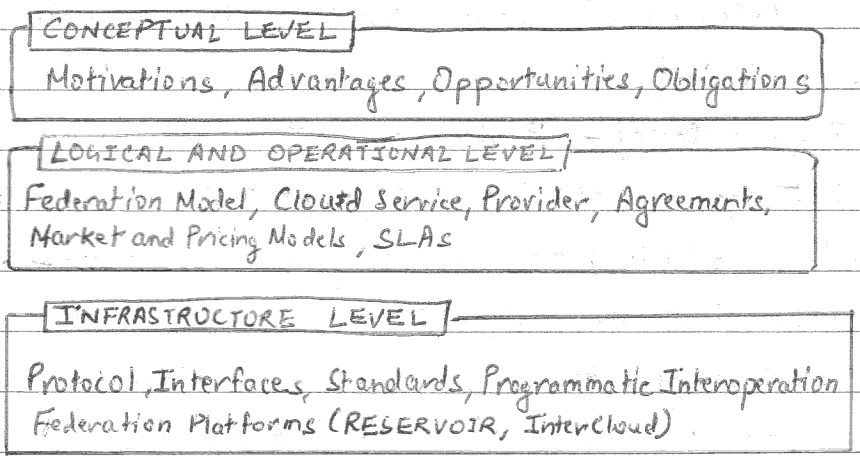
→ Characterization and Definition -

The term cloud federation and Intercloud, often used interchangeably, convey the general meaning of an aggregation of cloud computing providers that have separate administrative domains.

Cloud federation manages consistency and access controls when two or more independent geographically distinct clouds ~~have~~ share either authentication, files, computing resources, command and control or access to storage resources.

Intercloud (Cloud of Clouds) refers mostly to a global vision in which interoperability among different cloud providers is governed by standards, thus creating an open ~~flat~~ platform where applications can shift workloads and freely compose services from different sources.

→ Cloud federation stack -



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Each cloud federation level presents different challenges and operates at a different layer of the IT stack.

(1) Conceptual level - It addresses the challenges in presenting a cloud federation as a favorable solution with respect to the use of services leased by single cloud providers. Elements of concern at this level are -

(i) Motivations for cloud providers to join a federation.

(ii) Motivations for service consumers to leverage a federation.

(iii) Advantages for service consumers providers in having their services to other providers

(iv) Obligations of providers once they have joined the federation

(v) Trust agreements between providers

(vi) Transparency ~~versus~~ versus consumers.

(2) Logical and Operational level - It identifies and addresses the challenge in devising a framework that enables the aggregation of providers that belong to different administrative domains within a context of a single overlay infrastructure, which is the cloud federation. It is important at this level to address the following challenges -

(i) How should a federation be represented?

(ii) How should we model & represent a cloud service, providers or an agreement?

(iii) How should we define the rules & policies that allow providers to join a federation?

(iv) What are the mechanism in place for settling agreements among providers?

(v) What are the provider responsibilities with respect to each other?

(vi) When should providers & consumers take advantages of the federation?

(vii) Which kinds of services are more likely to be leased or bought?

(viii) How should ~~be~~ we price resources that are leased, and which fraction of resource should be we lease?

(3) Infrastructure level - It addresses the technical challenges involved in enabling heterogeneous cloud computing systems to interoperate seamlessly. At this level it is important to address the following issues -

(i) What kind of standards should be used?

(ii) How should design interfaces and protocols be designed for interoperation?

(iii) Which are the technologies to use for interoperation?

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(iv) How can we realize a software system, design platform components, and services enabling interoperability?

③ Third party cloud services –

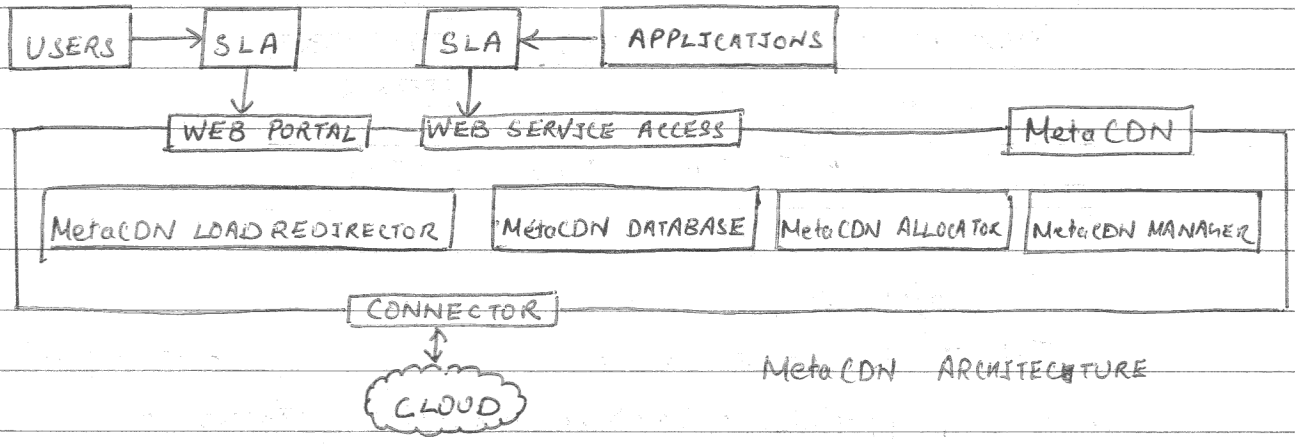
These are the result of adding value to freeexisting cloud computing services, thus providing customers with a different and more sophisticated service.

→ MetaCDN –

It provides users with the high-level services of a Content Delivery Network (CDN) for content distribution and interacts with the low-level interfaces of storage clouds to optimally place the user content in accordance with the emputed geography of its demand.

Four deployment options are –

(i) Coverage and performance-optimized deployment
(ii) Direct deployment
(iii) Cost optimized deployment
(iv) QoS optimized deployment



MetaCDN ARCHITECTURE

→ SpotCloud –

It is an online portal that implements a virtual marketplace, where sellers and by buyers can register and trade cloud computing services.

For service consumers, it act as a market directory where they can browse. For service providers, it constitutes an opportunity for advertising their offerings.

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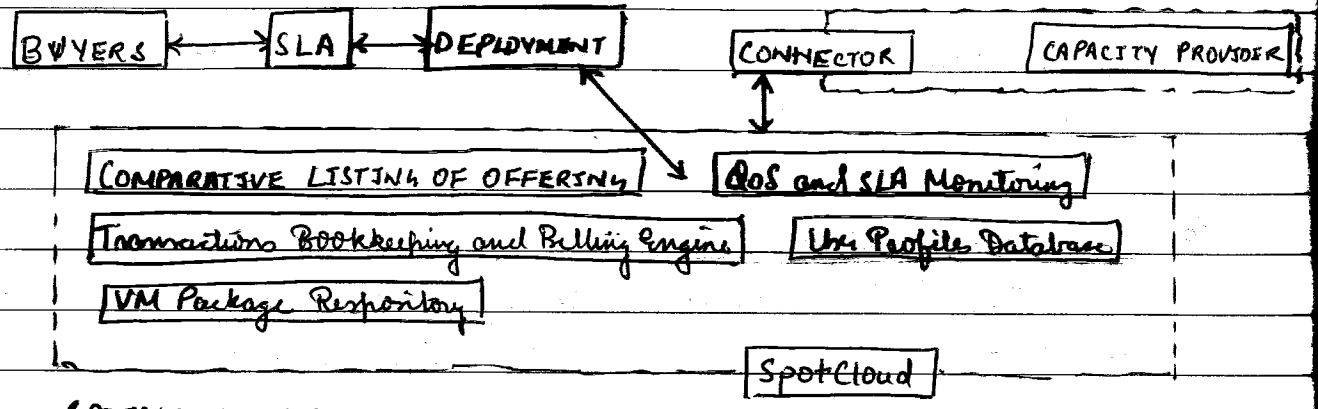


SPOTCLOUD MARKET ARCHITECTURE

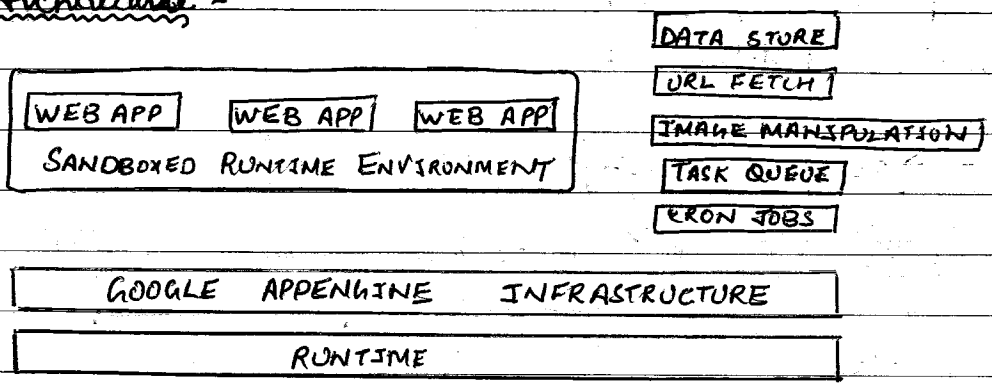
CASE STUDY –

① Google App Engine –

It is PaaS implementation that provides services for developing and hosting scalable web applications.

Application usage of Google resources and services is metered by AppEngine, which bills users when their applications finish their free quotas

→ Architecture –



Four major components –

1) Infrastructure – server uses request efficiently, also responsible for monitoring application performance and collecting statistics on which the billing is calculated.

2) Runtime Environment – Represents the execution content of applications hosted on AppEngine. Provides sandboxing. Supported runtimes are Java, Python and Go.

3) Storage – Provides in memory-cache, storage for semistructured data, and long-term storage for static data.

4) Services – Application and compute services.

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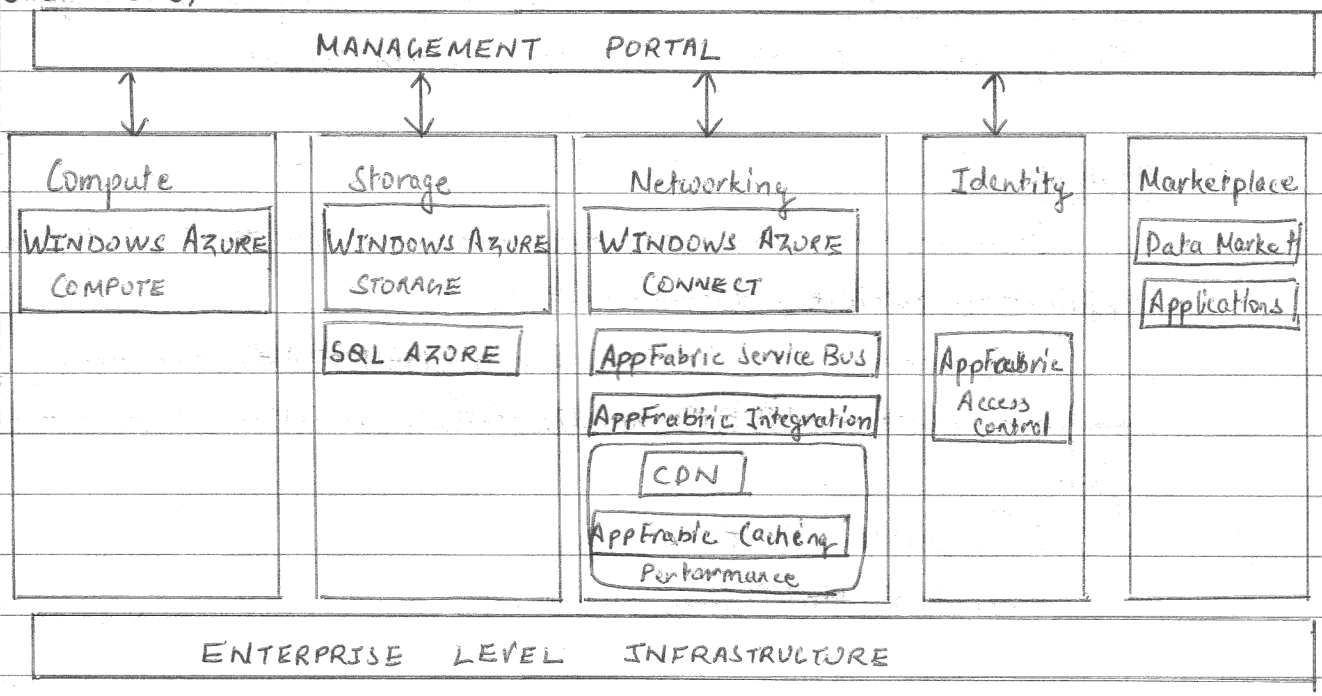
Application services - UrlFetch, MemCache (DataStore), Mail and Instant messaging, account management, image manipulation.
Compute services - Task Queues, Cron jobs (schedule the required operation)

② Microsoft Azure -

It is a cloud operating system built on top of microsoft data centers infrastructure and provides developers with a collection of services for building applications with cloud technology.

→ Architecture -



Services can be managed and controlled by through the Windows Azure Management Portal

Compute services - Web role, Worker role, VM role

Storage services - BLOBs (Binary large objects), Azure drive, Tables, Queues

Core infrastructure: AppFrabric - middleware for developing, deploying and managing applications on the cloud.

③ Amazon Web Services -

It is platform that allows the development of flexible applications by providing solutions for elastic infrastructure scalability, messaging and data storage.

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Date ____/____/____
Page _____

Two popular servics of Amazon are Amazon Elastic Compute (EC2) and Amazon Simple Storage Service (S3).

Compute servics - Amazon machine images, EC2, Amazon Elastic MapReduce, AWS Elastic Beanstalk, AWS Cloudformation, Autoscaling.

Storage servics - S3, Elastic Block store, ElastiCache, SimpleDB, Relational Database Service (RDS), CloudFront, Import/Export.

Communication servics - Simple Queue Services (SQS), Simple notification Services (EBS), Simple Email Services (SES), Direct Connect, Route 53, ~~Under~~

Additional servics - GovCloud, CloudWatch, DevPlay, Flexible Payment Services (FPS), Fulfillment Web Services (FWS), Alexa Top sites.

(4) Hadoop - (developed by Apache)

It is an open source software framework for storing data and running applications on clusters of commodity hardware.

It provides massive storage for any kind of data, enormous processing ~~pro~~power and the ability to handle virtually limitless concurrent tasks and jobs.

It is written in JAVA.

Concept of MapReduce are used here

(5) Aneka - (developed by Manjasoft)

It is platform and a framework for developing distributed applications on the cloud.

One of the key features of Aneka is the ability of providing different ways for expressing distributed applications by offering different programming models. -

~~Few~~ Two key components -

(1) SDK (Software development kit)

(2) Runtime Engine and platform.

Concept of MapReduce are used here.

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