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 **Cloud Computing (Sub.code: P16CS41)**

 **Two Mark Questions**

1. What is Cloud Computing & their common characteristics?

  **Cloud Computing :** Cloud Computing is the use of Hardware / software to deliver a service over the network(typically the internet). With cloud computing users can access files & use applications from any device that can access the internet

 (or)

 Cloud computing is a type of computing that deals with shared computer resources & data to provide the data for large number of user over the internet / network.

 (or)

It is a techno-business disruptive model using distributed large-scale data centers either private or public or hybrid offering customers a scalable virtualized infrastructure or an abstracted set of services qualified by ***Service Level Agreements(SLA)*** & charged only by the abstracted IT resources consumed.

 **Characteristics for Cloud Computing :** (i)pay-per-use(no ongoing commitment utility prices)(ii)Elastic capacity & the illusion of infinite resources(iii)self service interface(iv)resources that are abstracted / virtualized.

2. What is utility & Grid computing?

 Computing delivered as a **Utility** can be defined as “on demand delivery of infrastructure , applications , & business processes in a security-rich , shared , scalable & based computer environment over the internet for the fee”

**Grid computing :** Grid computing is a processor architecture that combines computer resources

From various domains to reach a main objective. In a grid computing the computers on the network can work on a task together, thus functioning as a supercomputer.

3.What are the types of Cloud & Services of cloud?

**Types of cloud:**

*Public Cloud* **-** Cloudmade available in a pay-as-you-go manner to the general public**.**

*Private Cloud* - Internal data center of a business (or) other organizations, not made available to the general public.

*Community Cloud* - Shared by the several organizations & supports a specific community that has shared concerns(mission,policy,etc).

*Hybrid Cloud* - It takes shape when a private cloud is supplemented with computing capacity from public clouds**(*The approach of temporarily renting capacity to handle spikes in load is known as “Cloud Bursting”)***

**Services of Cloud:**

*IAAS* – Infrastructure As A Service, Offering virtualized resources on demand is known as IAAS.A cloud infrastructure enables on demand provisioning of servers running several choices of operating systems & a customized software stack. It considered to be the bottom layer of cloud computing. Example for IAAS – Amazon Web Services in EC2.

*PAAS* – Its offer a higher level of abstraction to make a cloud easily programmable, known as PAAS.A cloud platform offers an environment on which developers create & deploy applications. Example for PAAS – Google App Engine.

*SAAS*- Traditional desktop applications such as word processing & spreadsheet can now be accessed as a service in the web. This model delivering applications, known as SAAS. Example for SAAS – Salesforce.com (Dynamic nature of the metadata native to a saas provider such as Salesforce.com)

1. Define Quality of Service & Service mash ups & Relay service?

 **QOS**: Its refers to the ability of networks to attain maximum bandwidth & handle other network elements like latency, error rate & uptime. It includes the management of other networks resource by allocating priorities to specific type of data(Audio, Video &File).

 **Service Mash ups:** In a consumer Web, Information & Services may be Programmatically aggregated acting as building blocks of complex compositions called Service Mash ups.

 **Relay Services** : The Relay Service is a service residing in the cloud whose job is to assist the connectivity & relaying the calls to the service. Relay service solution require both the client & the service intranets to allow connections to the cloud.

5 . List out the Constrain attributes of the Saas application.

Dynamic nature of the saas interfaces that constantly change

Dynamic nature of the metadata native to a saas provider such as salesforce.com

Managing assets that exist outside of the firewall

Massive amount of information that need to move between saas & on - premise systems daily & the need to maintain data quality & integrity.

1. Define migration in cloud computing.

 **Cloud Migration** : It is the process of moving data, applications (or) other business elements to a cloud computing environment.

Examples for the migration services in public cloud: AWS(Amazon Web Services),Ms Azure, AWS snowball, Google Transfer Appliance.

1. List out of the OLTP-Type Components using cloud.

 Sales & Distributions (SD).

 Banking & Financials (BF).

 Customer Relationship Management (CRM).

 Supply Chain Management (SCM).

8.What is SSL & the categories of Cloud:

* Secure Sockets Layer is a Protocol that provides reliable secure communication on the Internet for things such as Web browsing, E-mail, Instant messaging & other data transfers.
* There are 3 types of cloud categories. such as (i)Infrastructure as a Service (ii)Platform as a service (iii)Software as a service

9.Define SOA & IAAS**:**

* Cloud computing is an emerging research infrastructure that builds on the achievements of different research areas, such as **Service Oriented Architecture.**
* It offers infrastructure as a service that is based on pay-as-you-use and on-demand computing models to the end users(exactly the same as a public utility service like electricity, water, gas, etc).This service is referred to as **Infrastructure as a service.**

10.What are the Characteristics of Private Clouds:

* Allow service provisioning & compute capability for an organization’s users in a self-service manner.
* Automate & provide Well managed virtualized environments.
* Optimize computing resources, & servers’ utilization.
* Support specific workloads.

11.Define Virtualization& High Availability & VIM:

* **Virtualization** enables high, reliable, & and agile deployment mechanisms & management of services, providing on-demand cloning & live migration services which improve reliability.
* **High availability** is a system design protocol & an associated implementation that ensures a certain absolute degree of operational continuity during a given measurement period.
* **Virtual Infrastructure management**: VIM- the management of virtual machines distributed across a pool of physical resources

12.Define Cloud & Types of Cloud:

* **Cloud**: cloud that actually is a collection of devices & resources connected through the Internet.
* **Public cloud** :Its Provide a publicly accessible interface for purchasing & managing computing infrastructure that is instantiated as VMs running on the provider’s data center. there is also a growing ecosystem of technologies & tools to build Private clouds.
* **Private cloud** : where in house resources are virtualized & internal users can request & manage these resources using interfaces similar & equal to those of public clouds.
* **Hybrid cloud**: where an organization’s private cloud can supplement its capacity using a public cloud.

13.What is (i)Live Migration & (ii)Characteristics for Iaas :

* **Live Migration** can be defined as the movement of a virtual machine from one physical host to another while being powered on.(its also called as hot/ real time migration).
* **Characteristics for Iaas(5 Characteristics)**

1.They provide on-demand provisioning of computational resources

2.They use virtualization technologies to lease resources

3.They provide public & simple remote interfaces to manage those resources

4.They use a pay as you go cost model, typically charging by the hour.

5.They operate data centers large enough to provide a seemingly unlimited amount of resources to their clients(Usually touted as “infinite capacity/unlimited elasticity”).

14.What is Open Nebula & Steps for Reservation with VMs:

* **Open Nebula:** It is capable of managing groups of interconnected VMs- with support for the Xen, KVM, & VMWare platforms- within data centers & private clouds that involve a large amount of virtual & Physical servers.It can be used to build hybrid clouds by interfacing with remote cloud sites. (or)Open Nebulla is a virtual infrastructure manager that can be used to deploy & manage virtual machines on local resources or external public clouds, automating the setup of the virtual machines regardless of the underlying virtualization layer(xen,kvm or vmware are currently supported.
* **Steps for Reservation with VMs :**

(i)Preparation Overhead (ii)Runtime Overhead

15.Define Leasing Model & Types of Lease :

* A **Lease** as “a Negotiated & Renegotiable agreement between a resource provider & a resource consumer, where the former agrees to make a set of resources available to the latter, based on a set of lease terms presented by the resource consumer”.
* Three Types of **Lease**: (i)Advanced Reservation Lease (ii)Best-Effort Lease (iii)Immediate Lease

16. Define Caas & Elements of cluster :

* **Caas**: Cluster as a service ,is a web service for exposing via WSDL & for discovering & using clusters to run jobs.
* **Elements of Cluster**: A Typical Cluster comprised of 3 Elements, such as (i)Nodes (ii)Data Storage (iii)Middleware

17.What are the Types of Attacks:

* **Authentication:** It is a process of verifying a claim that a subject made to act on behalf of a given principal.
* **Authorization:** It is a process, used to verify if an authenticated subject can perform a certain operation. It must precede Authorization.
* **Client side attacks :** The client side attacks lure victims to click a link in a malicious web page & then leverage the trust relationship expectations of the victims for the real website.
* **Command Execution :** The command Execution attacks exploit server side vulnerabilities to execute remote commands on the website.
* **Information Disclosure :** The Information Disclosure attacks acquire sensitive information about a website revealed by developer comments, error messages, or well-know file name conventions.
* **Logical Attacks :** It involve the explotation of a web application’s logical flow.

18.Define MS Windows Azure & Salesforce :

* **MS Windows Azure :** Ms Azure allows clients to build services using developer Libraries which make use of communication, computational & storage services in Azure & then simply upload the completed services.
* **Salesforce :** Sales force is a Saas cloud that offers customer relationship management(CRM)software as a service.

19.what is EC2 & Google App Engine :

* **Elastic Compute Cloud(EC2):** EC2 offers “Elastic” access to hardware resources that EC2 clients use create virtual servers. Amazon EC2 provides scalable computing capacity in the **AWS(Amazon Web Service-it is a subsidiary of Amazon that provides on-demand cloud computing platforms to individuals, companies & governments on a metered pay-as-you-go basis)** cloud.EC2 to launch as few virtual servers as you need, configure security & networking & manage storage.
* **Google App Engine :** It is a Web Framework & cloud computing platform for developing & hosting web applications in Google-managed date centers.

**20.** What are the advantages for private cloud computing infrastructure?

* + Customer Information Protection
	+ Infrastructure Ensuring Service Level Agreements (SLAs).
	+ Compliance with Standard Procedures and Operations

**21.** Define Aneka & Their Cloud Platform?

* **Aneka:** It is a programming and management platform for building and deploying cloud computing applications. The core value of Aneka is its service-oriented architecture that creates an extensible system able to address different application scenarios and deployments such as public, private, and heterogeneous clouds.
* **Aneka Cloud Platform** : It is a software platform & a framework for developing distributed application on the cloud. It is essentially an implementation of the Paas model & its provides a runtime environment for executing applications by leveraging the underlying infrastructure of the cloud.

**22.** Define Paas?

* **Paas**: It is a category of cloud computing services that provides a platform allowing customers to develop, run & manage applications without the complexity of building & maintaining the infrastructure typically associated with developing & launching an app(Google App Engine).

**23.** What is Resource Provisioning Service & Resource Pool & Resource Pool Manager?

* **Resource Provisioning Service** : This is an Aneka-specific service that implements the service interface & wraps the resource pool manager, thus allowing its integration within the Aneka Container.
* **Resource Pool :** A Resource pool is in charge of managing the virtual resources it contains & eventually releasing them when they are no longer in use.
* **Resource Pool Manager :** This manages all the registered resource pools & decides how to allocate resources from those pools.

**24.** What are the types/classes for public resources & private resources?

* **Public Resources :** (i)On-Demand Resources (ii)Reserved Resources
* **Private Resources:** (i)Static Resources (ii)Dynamic Resources

**25.** Define Comet Cloud & Comet Space &VAR:

* **Comet Cloud :** It is based on a decentralized coordination substrate, & it supports highly heterogeneous 7 dynamic cloud/grid infrastructure, integration of public/private clouds & cloud bursts.
* **Comet Space :** In Comet, a tuple is a simple XML string, where the first element is the tuple’s tag & is followed by an ordered list of elements containing the tuple’s fields.
* **VAR :** It is a market standard risk measure used by senior management & regulators to quantify the risk level of a firm’s holdings.

**26.** What is Cloud bursting & Cloud bridging :

* **Cloud bursting** : The goal of autonomic cloudbursts is to seamlessly and securely integrate private enterprise clouds and data centers with public utility clouds on-demand, to provide the abstraction of resizable computing capacity. It enables the dynamic deployment of application components (which typically run on internal organizational compute resources) onto a public cloud to address dynamic workloads, spikes in demands, and other extreme requirements.
* Autonomic **cloudbridging** is meant to connect CometCloud and a virtual cloud which consists of public cloud, data center, and grid by the dynamic needs of the application.

**27.** What is SFC & DHT :

* **SFC** : A Hilbert SFC is a locality preserving continuous mapping from a k-dimensional (kD) space to a 1D space. It is locality preserving in that points that are close on the curve are mapped from close points in the kD space
* **DHT** : Comet uses the Hilbert SFC constructs the distribute hash table (DHT) for tuple distribution and lookup. If the keys of a tuple only include complete keywords, the tuple is mapped as a point in the information space and located on at most one node. If its keys consist of partial keywords, wildcards, or ranges, the tuple.

**28**.What is T System in cloud**:**

* T-Systems is one of Europe’s largest ICT service providers. It offers a wide range of IT, telecommunications, and integrated ICT services, and it boasts extensive experience in managing complex outsourcing projects.
* T-Systems approaches cloud computing from the viewpoint of an organization with an established portfolio of dynamic, scalable services delivered via networks.

29.Define MapReduce Programming Model & Types:

* MapReduce is a software framework for solving many large-scale computing problems. The MapReduce abstraction is inspired by the Map and Reduce functions, which are commonly used in functional languages such as Lisp.
* The MapReduce system allows users to easily express their computation as **map** **and reduce functions :**
* Map Function : map (key1, value1) - list (key2, value2)
* Reduce Function : reduce (key2, list (value2)) - list (value2)

30.What are the main features of Map Reduce Model:

* Data-Aware
* Simplicity.
* Manageability.
* Scalability.
* fault Tolerance and Reliability

31.What is meant by Mapredure.Net& Hadoop **:**

* **Mapreduce.NET** is a realization of MapReduce for the.NET platform. It aims to provide support for a wider variety of data-intensive and compute-intensive applications. MapReduce.NET is designed for the Windows platform, with emphasis on reusing as many existing Windows components as possible.
* **Hadoop** is a top-level Apache project, being built and used by a community of contributors from all over the world . It was advocated by industry’s premier Web players—Google, Yahoo!, Microsoft, and Facebook—as the engine to power the cloud . The Hadoop project is stated as a collection of various subprojects for reliable, scalable distributed computing.

32. **what is Skynet & Disco**

* **Skynet** is a Ruby implementation of MapReduce, created by Geni. Skynet is “an adaptive, self-upgrading, fault-tolerant, and fully distributed system with no single point of failure”. Skynet works by putting “tasks” on a message queue that are picked up by skynet workers. Skynet workers execute the tasks after loading the code at startup; Skynet tells the worker where all the needed code is. The workers put their results back on the message queue.
* **Disco** is an open-source MapReduce implementation developed by Nokia . The Disco core is written in Erlang, while users of Disco typically write jobs in Python. Disco is based on the master-slave architecture as shown is Figure 14.5. When the Disco master receives jobs from clients, it adds them to the job queue, and runs them in the cluster when CPUs become available. On each node there is a Worker supervisor that is responsible for spawning and monitoring all the running Python worker processes within that node

33. **what is Gridgain:**

* **GridGain** is an open cloud platform, developed in Java, for Java. GridGain enables users to develop and run applications on private or public clouds. The MapReduce paradigm is at core of what GridGain does. It defines the process of splitting an initial task into multiple subtasks, executing these subtasks in parallel and aggregating (reducing) results back to one final result.

**34.** What is BSM& SAP:

BSM : Business Service Management (BSM) is a management strategy that allows businesses to align their IT management with their high-level business goals. The key aspect of BSM is service-level agreement (SLA) management. Current cloud computing solutions are not designed to support the BSM practices that are well established in the daily management of the enterprise IT departments.

**SAP** : SAP systems are used for a variety of business applications that differ by version and functionality [such as customer relationship management (CRM) and enterprise resource planning (ERP)]. For a given application type, the SAP system components consist of generic parts customized by configuration and parts custom-coded for a specific installation.

**35.** What is Federation cloud & Service Application & Service Manifest:

To create the illusion of an infinite pool of resources, IPs shared their unused capacity with each other to create a **federation cloud.** A Framework Agreement is document that defines the contract between two IPs—that is, it states the terms and conditions under which one IP can use resources from another IP.

A **Service Application** is a set of software components that work collectively to achieve a common goal. Each component of such service applications executes in a dedicated VEE(Virtual Execution Environments)

**Service Manifest**—that is, a document that defines the structure of the application as well as the contract and SLA between the SP and the IP

**36**. what is the Categories of Virtual Infrastructure & categories of Federation cloud & Types of Algorithms:

Categories of Federation cloud **-** (i) Service Providers (SPs) (ii) Infrastructure Providers (IPs)

Categories of Virtual Infrastructure **-**  (i)External Threats (ii)Internal Threats.

Types of Algorithms- (i)Request-based algorithms and (ii) Session-based algorithms.

37**.** Define Capacity Planning.

**Capacity Planning** **:** The activity of determining the number of servers and their capacity that could satisfactorily serve the application end-user requests at peak loads is called capacity planning.

38. what is Data Centers**?**

Data Centers: The planned capacity for each of the applications to run successfully is three servers. As the number of web applications grew, the server rooms in the organization became large and such server rooms were known as data centers. These data centers were owned and managed by the enterprises themselves.

39.What is SLA & Phases & their types:

SLA : Typically, the QoS parameters are related to the availability of the system CPU, data storage, and network for efficient execution of the application at peak loads. This legal agreement is known as the service-level agreement (SLA).

Types of SLA : (i)Infrastructure SLA.

 (ii)Application SLA

Phases of SLA : (i)Contract definition

1. (ii)Publishing and discovery
2. (iii)Negotiation
3. (iv)Operationalization
4. (v)De-commissioning

40.What is HPC ?

* 1. **High-performance computing** **(HPC)** : It is one of the contexts in which the adoption of the cloud computing paradigm is debated. Traditionally, HPC users are accustomed to managing directly very complex parallel systems and performing a very fine-tuning of their applications on the target hardware. cloud computing may be exploited at three different levels: IaaS (Infrastructure as a Service), PaaS (Platform as a Service), and AaaS (Application as a Service).

 **FIVE MARK QUESTIONS** :

1. Explain Cloud Computing in a nutshell.

 Technologies such as cluster, grid, and now Cloud Computing have all aimed at allowing access to large amounts of computing power in a fully virtualized manner by aggregating resources & offering a single system view.

 Computing delivered as a **Utility** can be defined as “on demand delivery of infrastructure , applications , & business processes in a security-rich , shared , scalable & based computer environment over the internet for the fee”

 **Cloud Computing** has been coined as an umbrella term to describe a category of sophisticated on demand computing services initially offered by commercial providers such as Amazon, Google, & Microsoft.

 It denotes a model on which a computing infrastructure is viewed as a “cloud”. The Main Principle behind this model is offering Computing, Storage, & Software as a Service.

 **Cloud** is a parallel & distributed computing system consisting of a collection of inter connected & virtualized computers that are dynamically provisioned & presented as one (or) more unified computing resources based on service level agreements(SLA) established between the service provider & consumers.

 **Cloud** are hardware based services offering compute, network, & storage capacity where: **Hardware Management** is highly abstracted from the buyer, buyers incur infrastructure costs as variable OPEX, & infrastructure capacity is highly elastic.

 **Cloud Computing :** Cloud Computing is the use of Hardware / software to deliver a service over the network(typically the internet). With cloud computing users can access files & use applications from any device that can access the internet

 **Cloud computing** is a type of computing that deals with shared computer resources & data to provide the data for large number of user over the internet / network.

 **California Berkeley** summarized the key characteristics of the cloud computing as,”(i)the illusion of infinite computing resources(ii)the elimination of an up-front commitment by cloud users(iii)the ability to pay for use…..as needed….”

The **National Institute of Standards & Technology(NIST)** characterizes cloud computing as “……pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources”.

 **Characteristics for Cloud Computing :** (i)pay-per-use(no ongoing commitment utility prices)(ii)Elastic capacity & the illusion of infinite resources(iii)self service interface(iv)resources that are abstracted / virtualized.

 The most significant practical Cloud Computing realizations are listed, with special focus on architectural aspects & innovative technical features.

42. Write short notes on Grid Computing.

 Grid computing is a processor architecture that combines computer resources from various domains to reach a main objective. In a grid computing the computers on the network can work on a task together, thus functioning as a supercomputer.

 Grid computing enables aggregation of distributed resources & transparently access to them. Most Production Grids such as Tera grid & EGEE seek the share compute & storage resources distributed across different administrative domains, with their main focus being speeding up a broad range a scientific applications, such as climate modeling, drug design, & protein analysis.

 A key aspect of the grid vision realization has been building standard web service based protocols that allow distributed resources to be “discovered, accessed, allocated, monitored, accounted for, & billed for, etc.,

 In general managed as a single virtual system, ”**The Open Grid Services Architecture** “ **(OGSA)** addresses this need for standardization by defining a set of core capabilities & behaviors that address key concerns in grid systems.

 **(i)**[**http://www.programmableweb.com**](http://www.programmableweb.com)

 **(ii)**[**http://sites.force.com.appexchange**](http://sites.force.com.appexchange)

 **Globus Toolkit** is a middleware that implements several standard grid services & over the years has aided the deployment of several service oriented Grid Infrastructures & Applications.

 Grid computing to allow delivery of on demand computing services over the internet. Activities associated with one user (or) **Virtual organization** can influence, in an uncontrollable way, the performance perceived by other users using the same platform.

 In this direction, some research projects(e.g. Globus Virtual Workspaces) aimed at evolving grids to support an additional layer to virtualize computation, storage, & network resources.

43. Explain the Desired features of cloud.

 Certain features of a cloud are essential to enable services that truly represent the cloud computing model & satisfy expectations of consumers, & cloud offerings must be

 (i)Self service (ii)Per usage metered & billed (iii)Elastic (iv)Customizable

(i)Self service : Consumers of cloud computing services expect on-demand, nearly instant access to resources. To support this expectation, clouds must allow self-service access so that consumers can request, customize, pay, & use services without intervention of human operators.

(ii)Per-Usage Metering & Billing : Cloud computing eliminates up-front commitment by users, allowing them to request & use only the necessary amount. services must be priced on a short- term basis(example: by the hour), allowing users to release(and not pay for) resources as soon as they are not needed.

(iii)Elasticity : Cloud computing gives the illusion of infinite computing resources available on demand. Therefore users expect clouds to rapidly provide resources in any quantity at a time. It is expected that the additional resources can be (a) Provisioned, possibly automatically, when an application load increases (b) Released when load decreases (scale up & down)

(iv)Customization : It means allowing users to deploy specialized virtual appliances & to be given privileged(root)access to the virtual servers. Other service classes (Paas & Saas) offer less flexibility & are not suitable for general-purpose computing ,but still are expected to provide a certain level of customization.

44. Explain the Challenges & Risks of Cloud.

 Challenges & Risks of cloud includes the following topics:

1. Security, privacy, & trust.
2. Data lock-in & standardization
3. Availability, fault-tolerance & Disaster recovery
4. Resource management & energy efficiency

 **Security, privacy, & trust**

Security & Privacy affect the entire cloud computing stack, since there is a massive use of third-party services & infrastructures that are used to host important data or to perform critical operations.

 Trust towards providers is fundamental to ensure the desired level of privacy for applications hosted in the cloud. Country laws can impose that sensitive data such as patient health records are to be stored within national borders.

 **Data lock-in & standardization**

 **The cloud computing interoperability forum** (CCIF) was formed by organizations such as Intel, Sun, & Cisco in order to “enable a global cloud computing ecosystem whereby organizations are able to seamlessly, work together for the purposes for wider industry adoption of cloud computing technology.”

 The development of the **Unified Cloud Interface** (UCI) by CCIF aims at creating a standard programmable point of access to an entire cloud infrastructure.

 The **Open Virtual Format (OVF)** aims at facilitating packing & distribution of software run on VMs.

 **Availability, Fault-tolerance, & Disaster Recovery**

 The Expectations include availability of the service, its overall performance, and what measures are to be taken when something goes wrong in the system or its components.

 SLAs(SERVICE LEVEL AGREEMENTS) which include QOS requirements, must be ideally set up between customers & cloud computing providers to act as warranty. An SLA specifies the details of the service to be provided, including availability, & performance gurantees.

 **Resource Management & Energy-Efficiency**

 Cloud Computing Services is the Efficient Management of virtualized resource Pools. Physical resources such as CPU cores, disk space, & network bandwidth must be sliced & shared among virtual machines running potentially heterogeneous workloads.

 Migration of VMs also brings additional challenges such as detecting when to intiate a migration, which VM to migrate, and where to migrate.

1. 45. Discuss about the challenges of saas paradigm.

 SAAS & Cloud concepts too suffer a number of limitations. The overall views are listed out below. Loss or Lack of the following features deters the massive adoption of clouds.

1. Controllability
2. Visibility & Flexibility
3. Security & Privacy
4. High Performance & Availability
5. Integration & Composition
6. Standards

 A Number of approaches are being investigated for resolving the identified issues & flaws. Private cloud, Hybrid & the latest community cloud are being prescribed as the solution for the most of these inefficiencies & deficiencies.

 **Integration Conundrum**. While Saas applications offer outstanding value in terms of features & functionalities relative to cost, they have introduced several challenges specific to integration. Real-time data & functionality sharing is an essential ingredient for clouds.

 **APIs are Insufficient**. Many Saas providers have responded to the integration challenge by developing application programming interfaces (APIs). The IT Department expends an excess amount of time & resources developing & maintaining a unique method of communication for the API of each Saas application deployed within the organization.

 **Data** **Transmission Security**. Saas providers go to great length to ensure that consumer data is secure within the hosted environment. Decision makers as well as users tactically as well as strategically. Data integrity, confidentiality, quality & value have to be preserved as services & applications are interlinked & saddled to work together.

 **The impacts of clouds**. On the infrastructural front, in the recent past, the clouds have arrived onto the scene powerfully & have extended the horizon & the boundary of business applications, events & data. that is business applications, development platforms etc., are moved to elastic, online & on-demand cloud infrastructures. The integration’s scope, size, & scale is expanding & this beneficial extension however have put integration architects, specialists & consultants in deeper trouble.

46. Discuss about New Integration Scenarios.

 Cloud Integration scenarios. We have identified 3 major integration scenarios as discussed below.

 (i)Within a public cloud

 (ii)Homogeneous cloud

 (iii)Heterogeneous cloud

 **Within a public cloud**. Two different applications are hosted in a cloud. The role of the cloud integration middleware (say cloud-based ESB or Internet service bus (ISB) is seamlessly enable these applications to talk to each other. they may live a single physical server but run on different virtual machines.

**Homogeneous Clouds.** The Applications to be Integrated are posited in 2 geographically separated cloud infrastructures. The Integration Middleware can be in cloud 1 or 2 or in a separate cloud. There is a need for data & Protocol transformation and they get done by the ISB. The approach is more or less compatible to enterprise application integration procedure.

 **Heterogeneous Clouds**. One application is in public cloud & the other application is private cloud. Businesses are subscribing to popular on-demand enterprise packages from established providers such as Salesforce.Com & Ramco Systems([http://www.ramco.com/)s](http://www.ramco.com/%29s) Customer Relationship Management (CRM), Net Suite’ (<http://www.netsuite.com>) Enterprise Resource Planning(ERP),etc.

47. Discuss about Transition Challenges of Clouds.

 Transition Challenges : These challenges can be classified in five different categories, which are the five aspects of the enterprise cloud stages:

1. Build
2. Develop
3. Migrate
4. Run
5. Consume

Transition is the understanding of the state of their own IT assets & what is already, can, & cannot be **submitted(the process of transitioning from physical to less visible vapor).**

Based on the Information gathered by this audit they need to evaluate what can be Salvaged from the existing infrastructure and how high in the cloud stack they should venture.

Major development shops may envisage delving into the Paas & Saas sphere. Shifting the current architecture requires us to scrap a good chunk of it. Which should be taken literally.

The Unplanned Cloud spreads throughout the organization. coherency becomes a challenge. The requirement for a company-wide cloud approach should then become the number one priority of the CIO, especially when it comes to having a coherent & cost effective development & migration of services on this architecture.

The expected average lifetime of ERP product is ~ 15 years, which means that companies will need to face this aspect sooner than later as they try to evolve toward the new IT Paradigm. An Applications migration is not a straightforward process. It is risky, and doesn’t always guarantee a better service delivery.

 Challenges for cloud operations can be divided into running the enterprise cloud & running the enterprise cloud & applications on the enterprise cloud.

Before leveraging such features, much more basic functionalities are problematic monitoring, troubleshooting, and comprehensive capacity planning are actually missing in more offers.

48. Explain the cloud supply chain

 The concept of a Cloud Supply Chain (C-SC) & hence Cloud Supply Chain Management (C-SCM) appear to be viable future business models for the enterprise cloud computing paradigm.

 The Idea of (C-SCM) represents the management of a network of interconnected businesses involved in the the end-to-end provision of product & service packages required by consumers.

 **A Special definition of C-SC is hence : “two or more parties linked by the provision of cloud services, related information & funds”.**

Innovative products are characterized by additional (other) reasons for a consumer in addition to basic needs that lead to purchase. Unpredictable demand (that is high uncertainties, difficult to forecast & variable demand) & short product life cycles (typically 3 months to 1 year).

 Cloud services should fulfill basic needs of consumers & favor competition due to their reproducibility.

49. ANEKA CLOUD PLATFORM

Aneka is a software platform and a framework for developing distributed applications on the cloud. It harnesses the computing resources of a heterogeneous network of workstations and servers or data centers on demand. Aneka provides developers with a rich set of APIs for transparently exploiting these resources by expressing the application logic with a variety of programming abstractions. System administrators can leverage a collection of tools to monitor and control the deployed infrastructure.

Aneka is essentially an implementation of the PaaS model, and it provides a runtime environment for executing applications by leveraging the underlying infrastructure of the cloud. Developers can express distributed applications by using the API contained in the Software Development Kit (SDK) or by porting existing legacy applications to the cloud. Such applications are executed on the Aneka cloud, represented by a collection of nodes connected through the network hosting the Aneka container.

There are three classes of services that characterize the container:

Execution Services. They are responsible for scheduling and executing applications. Each of the programming models supported by Aneka defines specialized implementations of these services for managing the execution of a unit of work defined in the model.

Foundation Services. These are the core management services of theAneka container. They are in charge of metering applications, allocating important service in this layer is the Resource Provisioning Service, which enables horizontal scaling in the cloud.

Aneka also provides a tool for managing the cloud, allowing administrators to easily start, stop, and deploy instances of the Aneka container on new resources and then reconfigure them dynamically to alter the behavior of the cloud.

50.OVERVIEW OF COMETCLOUD-BASED APPLICATIONS

two types of applications which are VaR for measuring the risk level of a firm’s holdings and image registration for medical informatics. A VaR calculation should be completed within the limited time, and the computational requirements for the calculation can change signifi-cantly. Besides, the requirement for additional computation happens irregu-larly. Hence, for VaR we will focus on how autonomic cloudbursts work for dynamically changing workloads. Image registration is the process to deter-mine the linear/nonlinear mapping T between two images of the same object or similar objects that are acquired at different time, or from different perspec-tives. Besides, because a set of image registration methods are used by different (geographically distributed) research groups to process their locally stored data, jobs can be injected from multiple sites. Another distinguished difference between two applications is that data size of image registration is much larger than that of VaR. For a 3D image, the image size is usually a few tens of megabytes.

Value at Risk (VaR)

Monte Carlo VaR is a very powerful measure used to judge the risk of portfolios of financial instruments. The complexity of the VaR calculation stems from simulating portfolio returns. To accomplish this, Monte Carlo methods are used to “guess” what the future state of the world may look like. Guessing a large number of times allows the technique to encompass the complex distributions and the correlations of different factors that drive portfolio returns into a discreet set of scenarios

The process of generating Monte Carlo scenarios begins by selecting primitive instruments or invariants. To simplify simulation modeling, invariants are chosen such that they exhibit returns that can be modeled using a stationary normal probability distribution

To properly capture the nonlinear pricing of portfolios containing options, we use Monte Carlo techniques to simulate many realizations of the invariants. Each realization is referred to as a scenario

Image Registration

Nonlinear image registration is the computationally expensive process to determine the mapping T between two images of the same object or similar objects acquired at different time, in different position or with different acquisition parameters or modalities. Both intensity/area based and landmark based methods have been reported to be effective in handling various registra-tion tasks. Hybrid methods which integrate both techniques have demonstrated advantages in the literature .

Alternative landmark point detection and matching method are developed as a part of hybrid image registration algorithm for both 2D and 3D images

The algorithm starts with automatic detection of a set of landmarks in both fixed and moving images, followed by a coarse to fine estimation of the nonlinear mapping using the landmarks. Intensity template matching is further used to obtain the point correspondence between landmarks in the fixed and moving images. Because there is a large portion of outliers in the initial landmark correspondence, a robust estimator, RANSAC , is applied to reject outliers. The final refined inliers are used to robustly estimate a Thin Spline Transform (TPS) to complete the final nonlinear registration.

51..COMET SPACE

In Comet, a tuple is a simple XML string, where the first element is the tuple’s tag and is followed by an ordered list of elements containing the tuple’s fields. Each field has a name followed by its value. The tag, field names, and values must be actual data for a tuple and can contain wildcards (“\*”) for a template tuple. This lightweight format is flexible enough to represent the information for a wide range of applications and can support rich matching relationships

1. Further more, the cross-platform nature of XML makes this format suitable for information exchange in distributed heterogeneous environments.

A tuple in Comet can be retrieved if it exactly or approximately matches a template tuple. Exact matching requires the tag and field names of the template tuple to be specified without any wildcard, as in Linda. However, this strict matching pattern must be relaxed in highly dynamic environments, since applications (e.g., service discovery) may not know exact tuple structures. Comet supports tuple retrievals with incomplete structure information using approximate matching, which only requires the tag of the template tuple be specified using a keyword or a partial keyword. Examples are shown in Figure 10.2. In this figure, tuple (a) tagged “contact” has fields “name, phone, email, dep” with values “Smith, 7324451000, smith@gmail.com, ece” and can be retrieved using tuple template (b) or (c).

Comet adapts Squid information discovery scheme and employs the Hilbert space-filling curve (SFC) to map tuples from a semantic information space to a linear node index. The semantic information space, consisting of based-10 numbers and English words, is defined by application users.

1. 53. TECHNOLOGIES & TOOLS FOR CLOUD COMPUTING
2.

Cloud computing covers the entire computing stack from hardware infra-structure to end-user software applications. Hence, there are heterogeneous offerings addressing different niches of the market.the Infrastructure as a Service (IaaS) and Platform as a Service (PaaS) implementations of the cloud computing model by first presenting a subset of the most representative commercial solutions and then discussing the few research projects and platforms, which attracted consider able attention.Amazon is probably the major player for what concerns the Infrastructure-as-a-Service solutions in the case of public clouds. Amazon Web Services deliver a set of services that, when composed together, form a reliable, scalable, and economically accessible cloud. Within the wide range of services offered, it is worth noting that Amazon Elastic Compute Cloud (EC2) and Simple Storage Service (S3) allow users to quickly obtain virtual compute resources and storage space, respectively. Go Grid provides customer with a similar offer: it allows users to deploy their own distributed system on top of their virtual infrastructure.

1. Both GoGrid and Amazon EC2 charge their customers on a pay-as-you-go basis, and resources are priced per hours of usage. 3Tera AppLogic lays at the foundation of many public clouds, it provides a grid operating system that includes workload distribution, metering, and management of applications. These are described in a platform-independent manner, and App Logic takes care of deploying and scaling them on demand.Solutions that are completely based on a PaaS approach for public clouds are Microsoft Azure and Google App Engine. Azure [9] allows developing scalable applications for the cloud. It is a cloud services operating system that serves as the development runtime, and control environment for the Azure Services Platform.
2. Google AppEngine is a development platform and a runtime environment focusing primarily on web applications that will be run on top of Google’s server infrastructure. It provides a set of APIs and an application model that allow developers to take advantage of additional services provided by Google such as Mail, Datastore, Memcache, and others. Developers can create applications in Java, Python, and JRuby. These applications will be run within a sandbox, and AppEngine will take care of automatically scaling when needed. Google provides a free limited service and utilizes daily and per minute quotas to meter and price applications requiring professional service
3. Different options are available for deploying and managing private clouds. At the lowest level, virtual machine technologies such as Xen , KVM , and VMware can help building the foundations of a virtual infrastructure. On top of this, virtual machine managers such as VMWare vCloud and Eucalyptus allow the management of a virtual infrastructure and turning a cluster or a desktop grid into a private cloud.
4. Eucalyptus provides a full compatibility with the Amazon Web Services interfaces and supports different virtual machine technologies such as Xen, VMWare, and KVM.For what concerns the Platform-as-a-Service solutions, we can notice DataSynapse, Elastra, Zimory Pools, and the already mentioned App-Logic. DataSynapse [16] is a global provider of application virtualization software. By relying on the VMWare, virtualization technology provides a flexible environment that converts a data center into a private cloud.

OpenNebula is a virtual infrastructure manager that can be used to deploy and manage virtual machines on local resources or on external public clouds, automating the setup of the virtual machines regardless of the underlying virtualization layer (Xen, KVM, or VMWare are currently supported) or external cloud such as Amazon EC2.

1. A similar set of capabilities is provided by OpenPEX , which allows users to provision resources ahead of time through advance reservations. It also incorporates a bilateral negotiation protocol that allows users and providers to come to an agreement by exchanging offers and counter offers.
2. Zimory, the core feature of Aneka is represented by a configurable software agent that can be transparently deployed on both physical and virtual resources and constitutes the runtime environment for the cloud. This feature, together with the resource provisioning infrastructure, is at the heart of Aneka-based hybrid clouds.
3. DYNAMIC ICT SERVICES
4. Expectations differ considerably, depending on company size and industry. For example, a pharmaceuticals multinational, a traditional midsize retailer, and a startup will all have very different ICT requirements, particularly when it comes to certification.
5. However, they all face the same challenges: the need to penetrate new markets, to launch new services, to supply sales models, or to make joint offerings with partners. This is where dynamic ICT delivers tangible benefits.
6. ICT services of this kind are the foundation of a cloud that provides services on demand. Only by industrializing ICT is it possible to create the conditions for the flexible delivery of individual ICT services, and for combining them in advantageous ways.
7. Standardized production also enables ICT providers to achieve greater economies of scale. However, this calls for highly effective ICT management— on the part of both the service provider and the customer. Proven concepts and methodologies from the manufacturing industry can be applied to ICT.
8. The following are particularly worth mentioning:
9. Standardization Automation
10. Modularization
11. Integrated creation of ICT services
12. Steps Toward Industrialized ICT
13. Standardization and automation greatly reduce production costs and increase the efficiency and flexibility of ICT. However, they come at a price: There is less scope for customization. This is something that everyone with a personal e-mail account from one of the big providers has encountered. Services of this kind fulfill their purpose, but offer only very stripped-down functionality and are usually free of charge.
14. The growing popularity of standard software reflects this. In the ERP space, this trend has been evident for years, with homegrown solutions being replaced by standard packages.
15. Standardization has the appeal (particularly for service providers) of cutting ICT production costs. This means that ICT providers have to take these arguments in favor of standardization seriously and adapt their production accordingly.
16. Customization through Modularization
17. Modular production enables ICT to be tailored to customers’ specific requirements—in conjunction with standardization. Modularization allows providers to pool resources as the basis for delivering the relevant services .
18. Modularization is essentially a set of standardized individual modules that can be combined. The resulting combinations give rise to sophisticated applications tailored to the needs of the specific company. Standardized interfaces (e.g., APIs) between individual modules play a pivotal role. And one of the great strengths of modules is their reusability.
19. The more easily and flexibly such modules can be combined, the greater the potential benefits. Providers have to keep the number of modules as low as possible while meeting as many of their customers’ requirements as possible, and this is far from easy.
20. One example of modularization in a different context is combining Web services from various sources (mashups). In the cloud era, providers of modules of this kind claim that they enable users with no programming skills to support processes with ICT. However, experience shows that where such skills are lacking, a specialist integrator is generally called in as an implementation partner.
21. The benefit of modular services is that they can be flexibly combined, allowing standard offerings to be tailored to specific requirements. At the same time, they prevent customized solutions from straying too far from the standard, which would significantly drive up the costs of later modifications.
22. Integrated Creation of ICT Services
23. Each of the elements outlined above can have significant advantages. But only an integrated approach to creating ICT services—combining standardization, automation and modularization—can deliver the entire range of benefits. This gives the provider standardized, automated production processes and enables the desired services to be delivered to the customer quickly and flexibly.
24. In the context of outsourcing, this form of industrialization yields its full potential when providers and users have a close, two-way relationship with corresponding connectivity. This enables businesses to play an active part in production (ICT supply chain), tailoring ICT services to their changing needs. However, the technology that supports this relationship must be based on standards. Cloud computing promises to make switching to a different provider quick and easy, but that is only possible if users are careful to avoid provider lock-in.

55. IMPORTANCE OF QUALITY AND SECURITY IN CLOUDS

Quality (End-to-End SLAs)

If consumers’ Internet or ICT services are unavailable, or data access is slow, the consequences are rarely serious. But in business, the nonavailability of a service can have a grave knock-on effect on entire mission-critical processes— bringing production to a standstill, or preventing orders from being processed.

In such instances, quality is of the essence. The user is aware of the performance of systems as a whole, including network connectivity. Cloud-service providers therefore have to offer end-to-end avail-ability, backed by clearly defined SLAs.

The specific quality requirements are determined by weighing up risk against cost. The importance of a particular process and the corresponding IT solution are assessed. The findings are then compared with the service levels on offer. As a rule, higher service levels come at a higher price. Where a process is not critical, businesses are often willing to accept relatively low availability to minimize costs.

 But if a process is critical, they will opt for a higher service level, with a corresponding price tag. So the quality question is not about combining the highest service levels, but about selecting the right levels for each service.

Compliance and Security

Compliance and security are increasingly important for cloud-computing providers. Security has been the subject of extensive media coverage and debate. And surveys consistently pinpoint it as the greatest obstacle to cloud computing. In a 2008 cio.com study, IT decision-makers cited security and loss of control over data as the key drawbacks of cloud computing.

However, for businesses looking to deploy a form of cloud computing, legal issues (e.g., privacy and liability) are considerably more important. And this is why cloud providers have to find ways of enabling customers to meet statutory requirements.

Consumer Cloud Versus Enterprise Cloud. The Internet has given rise to new forms of behavior, even when concluding contracts on-line. When presented with general terms and conditions, many consumers simply check the relevant box and click “OK,” often not realizing that they are entering into a legally binding agreement.

On the other hand, business scenarios involving multiple partners are now conceivable. It is therefore often impossible to say exactly where data are stored and what national legislation applies. And where data are handled by multiple providers from different countries (sometimes on the basis of poorly structured contracts), the issue of liability becomes correspondingly complex

Cloud Computing from an Enterprise Perspective. With this in mind, businesses should insist on comprehensive, watertight contracts that include provisions for the recovery and return of their data, even in the event of provider bankruptcy. Cloud principles notwithstanding, services still have to be performed and data stored at specific physical locations. Where data are located determines whose law applies and also determines which government agencies can access it.

Having the legal basis for liability claims is one thing; successfully prosecut-ing them is quite another. This is why it is important to know the contractually agreed legal venue. Moreover, it is useful to have a single end-to-end service level agreement defining availability across all services.

Even stricter statutory requirements apply where data are of a personal nature (e.g., employee details in an HR system). Financial data are also subject to stringent restrictions. In many parts of Europe, personal data enjoys special protection. But even encryption cannot guarantee total security. Solutions that process and store data in encrypted form go a long way toward meeting statutory data-protection requirements. However, they are prohibited in some countries. As a result, there are limits to secure data encryption in the cloud.

Companies listed on the U.S. stock exchange are subject to the Sarbanes Oxley Act (SOX), requiring complete data transparency and audit trails. This poses particular challenges for cloud providers. To comply with SOX 404, CEOs, CFOs, and external auditors have to report annually on the adequacy of internal control systems for financial reporting.

ICT service providers are responsible for demonstrating the transparency of financial transactions. How-ever, providing this evidence is especially difficult, if not impossible, in a cloud environment. This is a challenge that cloud providers must master—if necessary, by departing from cloud principles.

Service providers also have to ensure that data are not lost and do not fall into the wrong hands. The EU has data-security regulations that apply for all European companies. For example, personal details may only be disclosed to third parties with the consent of the individual involved. Moreover, public-sector organizations generally insist on having sensitive data processed in their home country. This is a particularly thorny issue when it comes to patents, since attitudes to intellectual property differ greatly around the world.

What Enterprises Need. Cloud computing and applicable ICT legislation are based on diametrically opposed principles. The former is founded on liberalism and unfettered development—in this case, of technical opportunities.

The latter imposes tight constraints on the handling of data and services, as well as on the relationship between customers and providers.

Cloud providers have to meet the requirements of the law and of customers alike. As a rule, this leads them to abandon some principles of “pure” cloud computing—and to adopt only those elements that can be aligned with applicable legislation and without risk.

Furthermore, providers working for major corporations have to be depend-able in the long term, particularly where they deliver made-to-measure solutions for particular business processes. This is true whether the process is critical or not.

If a provider goes out of business, companies can expect to be without the service for a long time.

So before selecting a cloud provider, customers should take a long hard look at candidates’ services, ability to deliver on promises, and, above all, how well SLAs meet their needs of the program on a cluster. One is the “master” and the rest are “workers.”

The master is responsible for scheduling (assigns the map and reduce tasks to

the worker) and monitoring (monitors the task progress and the worker

health).

When map tasks arise, the master assigns the task to an idle worker, taking

into account the data locality. A worker reads the content of the corresponding

input split and emits a key/value pairs to the user-defined Map function. The

intermediate key/value pairs produced by the Map function are first buffered in

memory and then periodically written to a local disk, partitioned into R sets by

the partitioning function.

**TEN MARK QUESTIONS** :

56.Discuss about the Roots of Cloud Computing ?

57.Explain about the Seven Step Model of Migration into a Cloud?

58.Discuss about (a) Evolution of saas (b) saas Integration services (c) Challenges of saas Paradigm.

59.Explain abut the Management of virtual machine for cloud infrastructures.

60.Discuss about (a)RVWS Design (b)Virtual Machines Provisioning & Manageability

61.Short notes on (a) Aneka Cloud Platform (b)Aneka Resource Provisioning Service

62.Explain about Comet-Cloud Architecture

63.Discuss about the Autonomic Cloud Bursts Behaviors

64.Explain about Major Map reduce Implementations for the cloud.

65.Discuss about (a) Overview of Dynamic services (b) T-Systems core cloud modules

66.Discuss about (a) Types of SLA (b) Lifecycle of SLA

67.Explain about the SLA Management in cloud.