



FIGURE 4.2.7. Flowchart of the SLA management in cloud.

1. Ability of an application to scale out.
2. Compatibility of the application with the cloud platform being used within the MSP's data center.
3. The need and availability of a specific hardware and software required for hosting and running of the application.
4. Preliminary information about the application performance and whether they can be met by the MSP.

Performing the infrastructure feasibility involves determining the availability of infrastructural resources in sufficient quantity so that the projected demands of the application can be met.

On-Boarding of Application

Once the customer and the MSP agree in principle to host the application based on the findings of the feasibility study, the application is moved from the customer servers to the hosting platform. The application is accessible to its end users only after the on-boarding activity is completed.

On-boarding activity consists of the following steps:

- a. Packing of the application for deploying on physical or virtual environments. Application packaging is the process of creating deployable components on the hosting platform (could be physical or virtual). Open Virtualization Format (OVF) standard is used for packaging the application for cloud platform .
- b. The packaged application is executed directly on the physical servers to capture and analyze the application performance characteristics.
- c. The application is executed on a virtualized platform and the application performance characteristics are noted again.
- d. Based on the measured performance characteristics, different possible SLAs are identified. The resources required and the costs involved for each SLA are also computed.
- e. Once the customer agrees to the set of SLOs and the cost, the MSP starts creating different policies required by the data center for automated management of the application. These policies are of three types: (1) business, (2) operational, and (3) provisioning. Business policies help prioritize access to the resources in case of contentions. Operational policies (OP) are represented in the following format:



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It means, if average latency of the web server is more than 0.8 sec then automatically scale out the web-server tier.



Cloud Technology



De-commissioning. SLA decommissioning involves termination of all activities performed under a particular SLA when the hosting relationship between the service provider and the service consumer has ended.

SLA MANAGEMENT IN CLOUD

SLA management of applications hosted on cloud platforms involves five phases.

1. Feasibility
2. On-boarding
3. Pre-production
4. Production
5. Termination

Different activities performed under each of these phases are shown in Figure 4.2.7. These activities are explained in detail in the following subsections.

jntuworldupdates.org

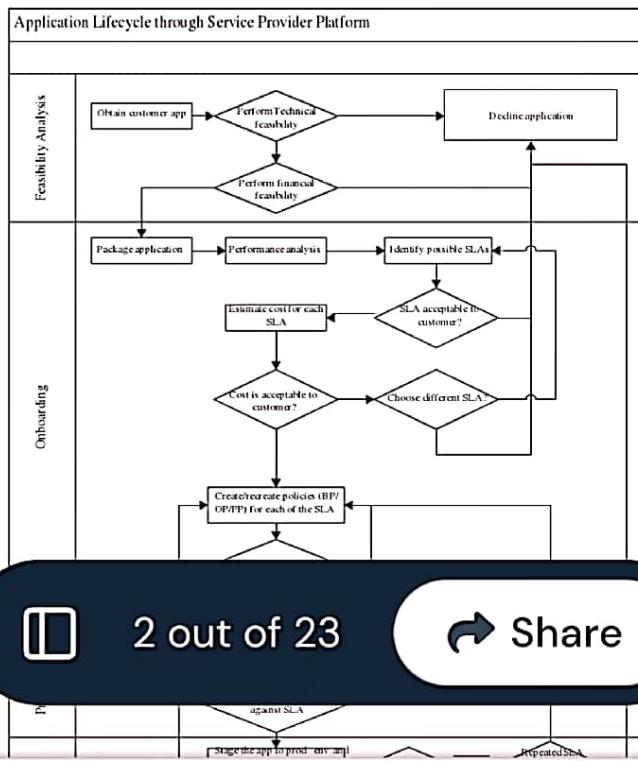
Specworld.in

Smartworld.com

Smartworld.asia

Feasibility Analysis

MSP conducts the feasibility study of hosting an application on their cloud platforms. This study involves three kinds of feasibility: (1) technical feasibility, infrastructure feasibility, and (3) financial feasibility. The technical feasibility of an application implies determining the following:



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Cloud Technology



OP 5 collection of hCondition, Actioni

Here the action could be workflow defining the sequence of actions to be undertaken. For example, one OP is

OP5 havverage latency of webserver < 0.8sec, scale-out the web-server tier

It means, if average latency of the web server is more than 0.8 sec then automatically scale out the web-server tier.

Scale-out, scale-in, start, stop, suspend, resume are some of the examples of provisioning actions. A provisioning policy (PP) is represented as

PP 5 collection of hRequest, Actioni

For example, a provisioning policy to start a web site consists of the following sequence: start database server, start web-server instance 1, followed by start the web-server instance 2, and so on.

Preproduction

Once the determination of policies is completed as discussed in previous phase, the application is hosted in a simulated production environment. Once both parties agree on the cost and the terms and conditions of the SLA, the customer sign-off is obtained. On successful completion of this phase the MSP allows the application to go on-live.

Production

In this phase, the application is made accessible to its end users under the agreed SLA. In the case of the former, on-boarding activity is repeated to analyze the application and its policies with respect to SLA fulfillment. In case of the latter, a new set of policies are formulated to meet the fresh terms and conditions of the SLA.

Termination

When the customer wishes to withdraw the hosted application and does not wish to continue to avail the services of the MSP for managing the hosting of its application, the termination activity is initiated.

AUTOMATED POLICY-BASED MANAGEMENT

This section explains in detail the operationalization of the "Operational" and "Provisioning" policies defined as part of the on-boarding activity. The policies specify the sequence of actions to be performed under different circumstances. *Operational policies* specify the functional relationship between the system-level infrastructural attributes and the business level SLA goals. attributes at various workloads, workload compositions, and operating conditions, so that the SLA goals are met. Figure 4.2.8 explains the importance of such a relationship. For example, consider a three-tier web application consisting of jntuworldupdates.org and Specworld.in.



Install Studocu
www.studocu.com

Install

Cloud Technology



Smartzworld.com

Smartzworld.asia

OP 5 collection of hCondition, Actioni

Here the action could be workflow defining the sequence of actions to be undertaken. For example, one OP is

OP5 haverage latency of webserver _ 0.8sec, scale-outtheweb-servertieri

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jntuworld.in



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6.3.9 Secure Software Development Life Cycle (SecSDLC)

The SecSDLC involves identifying specific threats and the risks they represent, followed by design and implementation of specific controls to counter those threats and assist in managing the risks they pose to the organization and/or its customers. The SecSDLC must provide consistency, repeatability, and conformance. The SDLC consists of six phases, and there are steps unique to the SecSLDC in each of phases:

- **Phase 1.Investigation:** Define project processes and goals, and document them in the program security policy.
- **Phase 2.Analysis:** Analyze existing security policies and programs, analyze current threats and controls, examine legal issues, and perform risk analysis.
- **Phase 3.Logical design:** Develop a security blueprint, plan incident response actions, plan business responses to disaster, and determine the feasibility of continuing and/or outsourcing the project.
- **Phase 4.Physical design:** Select technologies to support the security blueprint, develop a definition of a successful solution, design physical security measures to support technological solutions, and review and approve plans.
- **Phase 5.Implementation:** Buy or develop security solutions. At the end of this phase, present a tested package to management for approval.
- **Phase 6.Maintenance:** Constantly monitor, test, modify, update, and repair to respond to changing threats.⁸

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In the SecSDLC, application code is written in a consistent manner that can easily be audited and enhanced; core application services are provided in a common, structured, and repeatable manner; and framework modules are thoroughly tested for security issues before implementation and continuously retested for conformance through the software regression test cycle. Additional security processes are developed to support application development projects such as external and internal penetration testing and

⁸ Michael E. Whitman and Herbert J. Mattord, Management of Information Security, Thomson Course Technology, 2004, p. 57



FURTHER EXPLAINED ARCHITECTURE.

10.2.4.2 Maya rendering with Aneka

Interesting applications of media processing are found in the engineering disciplines and the movie production industry. Operations such as rendering of models are now an integral part of the design workflow, which has become computationally demanding. The visualization of mechanical models is not only used at the end of the design process, it is iteratively used to improve the design. It is then fundamental to perform such tasks as fast as possible. Cloud computing provides engineers with the necessary computing power to make this happen.

A private cloud solution for rendering train designs has been implemented by the engineering department of GoFront group, a division of China Southern Railway (see Figure 10.9). The department is responsible for designing models of high-speed electric locomotives, metro cars, urban transportation vehicles, and motor trains. The design process for prototypes requires high-quality, three-dimensional (3D) images. The analysis of these images can help engineers identify problems and correct their design. Three-dimensional rendering tasks take considerable amounts of time, especially in the case of huge numbers of frames, but it is critical for the department to reduce the time spent in these iterations. This goal has been achieved by leveraging cloud computing technologies, which turned the network of desktops in the department into a desktop cloud managed by Aneka.

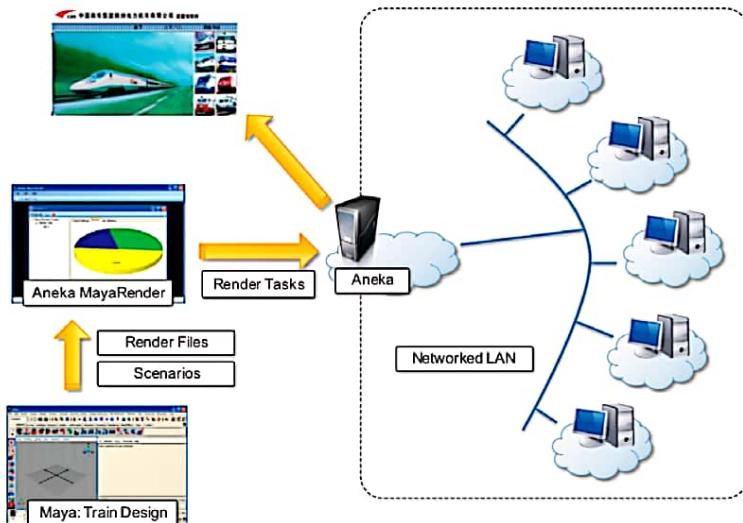


FIGURE 10.9
3D rendering on private clouds.

The implemented system includes a specialized client interface that can be used by GoFront engineers to enter all the details of the rendering process (the number of frames, the number of cameras,



ges. They are computationally intensive and potentially require considerable amounts of storage. Moreover, with the continuous improvement of mobile devices as well as the diffusion of the



1. Masteri...ar Buyya

graph of the user is composed. The social graph identifies a collection of interlinked information that is of relevance for a given user. Most of the user data are served by querying a distributed cluster of MySQL instances, which mostly contain key-value pairs. These data are then cached for faster retrieval. The rest of the relevant information is then composed together using the services mentioned before. These services are located closer to the data and developed in languages that provide better performance than PHP.

The development of services is facilitated by a set of internally developed tools. One of the core elements is *Thrift*. This is a collection of abstractions (and language bindings) that allow cross-language development. Thrift allows services developed in different languages to communicate and exchange data. Bindings for Thrift in different languages take care of data serialization and deserialization, communication, and client and server boilerplate code. This simplifies the work of the developers, who can quickly prototype services and leverage existing ones. Other relevant services and tools are *Scribe*, which aggregates streaming log feeds, and applications for alerting and monitoring.

10.2.4 Media applications

Media applications are a niche that has taken a considerable advantage from leveraging cloud computing technologies. In particular, video-processing operations, such as encoding, transcoding, composition, and rendering, are good candidates for a cloud-based environment. These are computationally intensive tasks that can be easily offloaded to cloud computing infrastructures.

10.2.4.1 Animoto

*Animoto*² is perhaps the most popular example of media applications on the cloud. The Website provides users with a very straightforward interface for quickly creating videos out of images, music, and video fragments submitted by users. Users select a specific theme for a video, upload the photos and videos and order them in the sequence they want to appear, select the song for the music, and render the video. The process is executed in the background and the user is notified via email once the video is rendered.

The core value of Animoto is the ability to quickly create videos with stunning effects without user intervention. A proprietary artificial intelligence (AI) engine, which selects the animation and transition effects according to pictures and music, drives the rendering operation. Users only have to define the storyboard by organizing pictures and videos into the desired sequence. If users don't like the result, the video can be rendered again and the engine will select a different composition, thus producing a different outcome every time. The service allows users to create 30-second videos

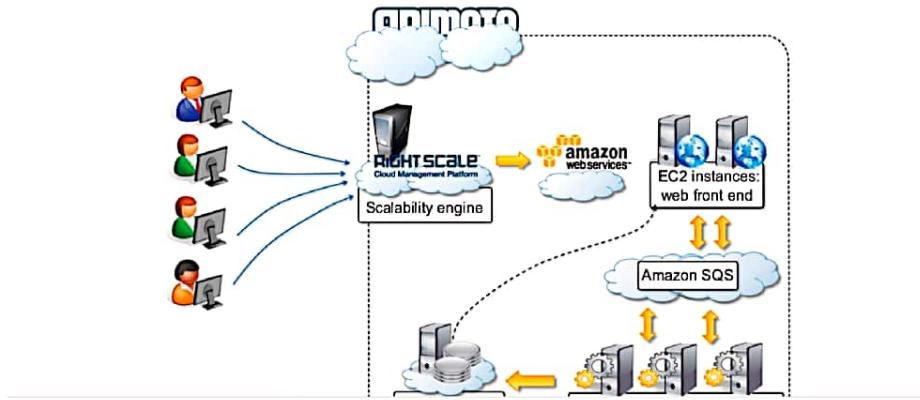
²www.animoto.com.

10.2 Business and consumer applications 367

for free. By paying a monthly or a yearly subscription it is possible to produce videos of any length and to choose among a wider range of templates.

The infrastructure supporting Animoto is complex and is composed of different systems that all need to scale (see Figure 10.8). The core function is implemented on top of the Amazon Web Services infrastructure. In particular, it uses Amazon EC2 for the Web front-end and the worker nodes; Amazon S3 for the storage of pictures, music, and videos; and Amazon SQS for connecting all the components. The system's auto-scaling capabilities are managed by Rightscale, which monitors the load and controls the creation of new worker instances as well as their reclaim. Front-end nodes collect the components required to make the video and store them in S3. Once the storyboard of the video is completed, a video-rendering request is entered into a SQS queue. Worker nodes pick up rendering requests and perform the rendering. When the process is completed, another message is entered into a different SQS queue and another request is served. This last queue is cleared routinely and users are notified about the completion. The life of EC2 instances is controlled by Rightscale, which constantly monitors the load and the performance of the system and decides whether it is necessary to grow or shrink.

The architecture of the system has proven to be very scalable and reliable by using up to 4,000 servers on EC2 in peak times without dropping requests but simply causing acceptable temporary delays for the rendering process.



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TLS (transport layer security)

- Transport layer security (TLS) is a protocol that provides communication security between client/server applications that communicate with each other over the Internet. It enables privacy, integrity and protection for the data that's transmitted between different nodes on the Internet. TLS is a successor to the secure socket layer (SSL) protocol.



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SSL/TLS

- SSL and TLS are both cryptographic protocols used to increase security by encrypting communication over computer networks
- Secure Sockets Layer (SSL) is a standard protocol used for the secure transmission of documents over a network. Developed by Netscape, SSL technology creates a secure link between a Web server and browser to ensure private and integral data transmission. SSL uses Transport Control Protocol (TCP) for communication.



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OpenID

- OpenID is an open, decentralized standard for user authentication and access control that allows users to log onto many services using the same digital identity. It is a single-sign-on (SSO) method of access control. As such, it replaces the common log-in process (i.e., a log-in name and a password) by allowing users to log in once and gain access to resources across participating systems.



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Open Authentication (OAuth)

OAuth is an open-standard authorization protocol or framework that describes how unrelated servers and services can safely allow authenticated access to their assets without actually sharing the initial, related, single logon credential. In authentication parlance, this is known as secure, third-party, user-agent, delegated authorization.



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Security Assertion Markup Language (SAML)

- Security Assertion Markup Language is a language protocol for handling authentication and authorization in a network. It is one of various XML-based markup languages available to help with aspects of web development and use.



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Standards for Security

- Security Assertion Markup Language (SAML)
- Open Authentication (OAuth)
- OpenID
- SSL/TLS



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Communications (HTTP, SIMPLE, and XMPP)

- HTTP is a request/response communications standard based on a client/server model.
- SIMPLE, the Session Initiation Protocol for Instant Messaging and Presence Leveraging Extensions, is an instant messaging (IM) and presence protocolsuite based on Session Initiation Protocol (SIP) managed by the Internet Engineering Task Force.
- XMPP was built to provide full support for cross-platform messaging so that one proprietary system's users could talk to another's.



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Simple Object Access Protocol (SOAP)

- SOAP, originally defined as Simple Object Access Protocol, is a protocol specification for exchanging structured information in the implementation of Web Services in computer networks.
- It relies on XML as its message format and usually relies on other application-layer protocols, most notably Remote Procedure Call (RPC) and HTTP for message negotiation and transmission.



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Really Simple Syndication (RSS)

- RSS is a family of web feed formats used to publish frequently updated works—such as blog entries, news headlines, audio, and video—in a standardized format.

Example : GEO News Headline Links



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Internet Messaging Access Protocol (IMAP)

- **Internet Message Access Protocol (IMAP)** is a standard protocol for accessing email on a remote server from a local client. IMAP is an application layer **Internet Protocol** using the underlying transport layer **protocols** to establish host-to-host communication services for applications.



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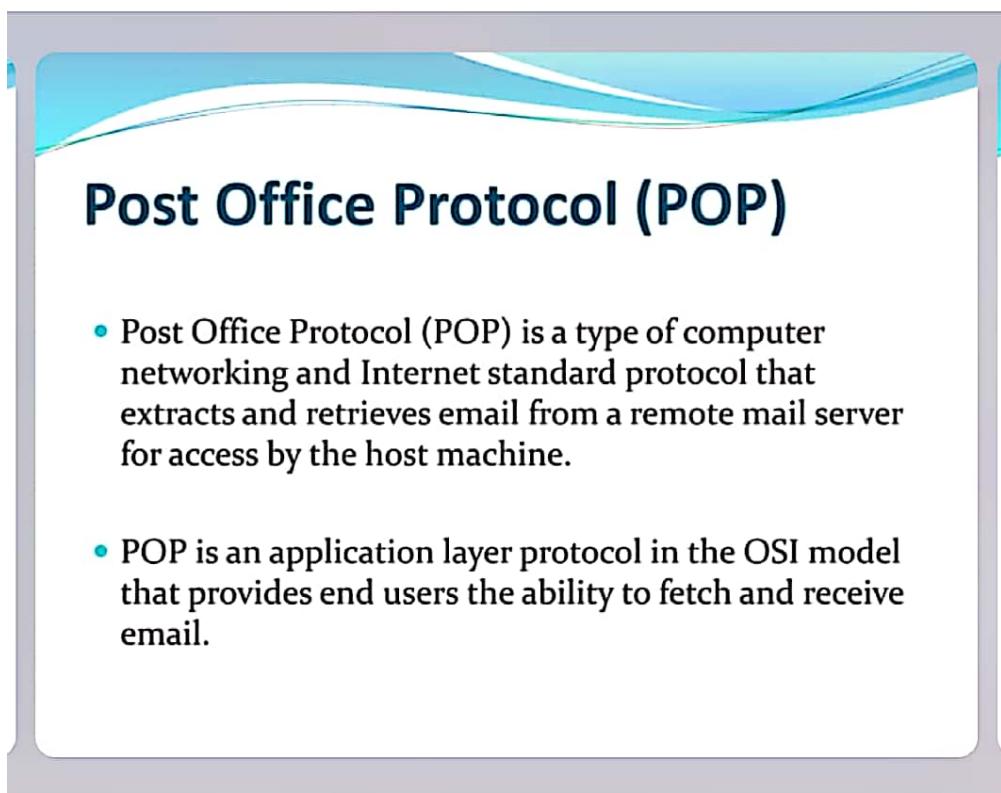


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Post Office Protocol (POP)

- Post Office Protocol (POP) is a type of computer networking and Internet standard protocol that extracts and retrieves email from a remote mail server for access by the host machine.
- POP is an application layer protocol in the OSI model that provides end users the ability to fetch and receive email.



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Simple Message Transfer Protocol (SMTP)

- Simple Mail Transfer Protocol (SMTP) is the standard protocol for email services on a TCP/IP network. SMTP provides the ability to send and receive email messages.
- SMTP is an application-layer protocol that enables the transmission and delivery of email over the Internet. SMTP is created and maintained by the Internet Engineering Task Force (IETF).
- Simple Mail Transfer Protocol is also known as RFC 821 and RFC 2821.



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Standards for Messaging

- Simple Message Transfer Protocol (SMTP)
- Post Office Protocol (POP)
- Internet Messaging Access Protocol (IMAP)
- Syndication (Atom, Atom Publishing Protocol, and RSS)
- Atom and Atom Publishing Protocol (APP)
- Web Services (REST)
- SOAP
- Communications (HTTP, SIMPLE, and XMPP)



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Solution Stacks (LAMP and LAPP)

LAMP:

- LAMP is a popular open source solution commonly used to run dynamic web sites and servers. The acronym derives from the fact that it includes
- L
- Linux,
- A
- Apache,
- M
- MySQL, and
- P
- PHP (or Perl or Python)
- and is considered by many to be the platform of choice for development and deployment of high-performance web applications which require a solid and reliable foundation.



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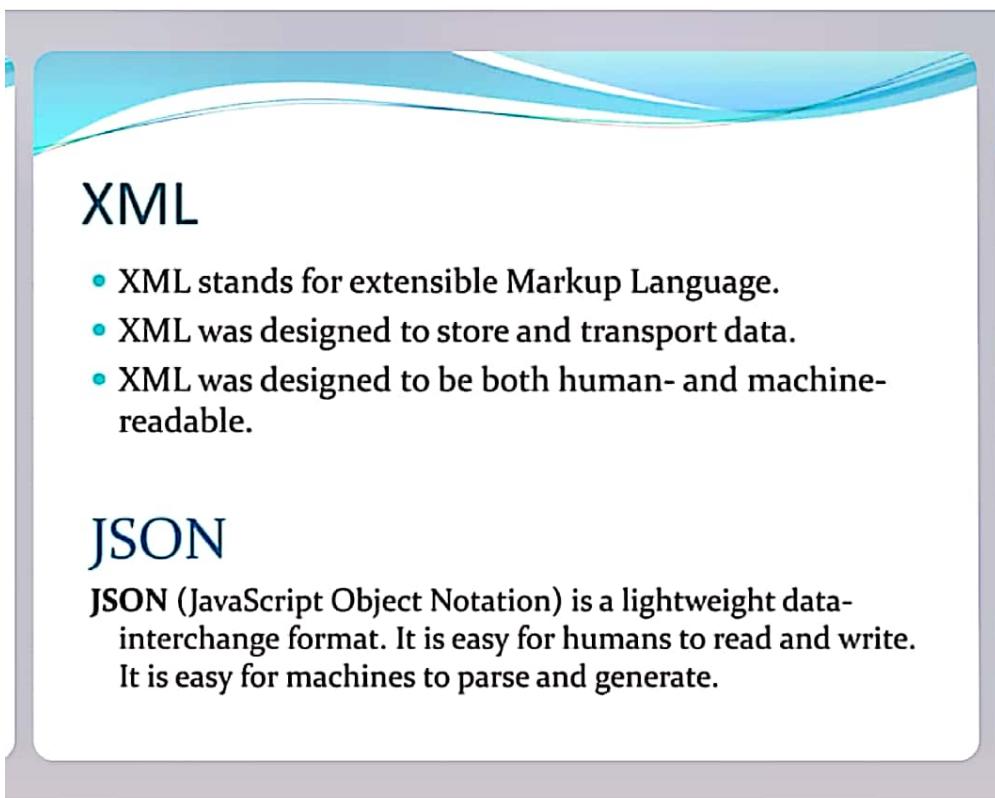


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XML

- XML stands for extensible Markup Language.
- XML was designed to store and transport data.
- XML was designed to be both human- and machine-readable.

JSON

JSON (JavaScript Object Notation) is a lightweight data-interchange format. It is easy for humans to read and write. It is easy for machines to parse and generate.



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Browsers (Ajax)

- Ajax is a technique , not programming language
- When we used ajax in website there is no need to refresh page
- Small code



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Standards for Application Developers

- **Browsers (Ajax)**
- **Data (XML, JSON)**
- **Solution Stacks (LAMP and LAPP)**



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Standards :

- Standards for Application Developers
- Standards for Messaging
- Standards for Security



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- The DMTF started the Virtualization Management Initiative (VMAN).
- **Open Virtualization Format (OVF)**

Open Virtualization Format (OVF) is an [open-source](#) standard for packaging and distributing software [applications](#) for virtual machines ([VM](#)).

Open Virtualization Format is an open standard for packaging and distributing virtual appliances or, more generally, software to be run in virtual machines.



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The Distributed Management Task Force (DMTF)

- The **Distributed Management Task Force (DMTF)** is a computer software trade group which works to simplify the manageability of network-accessible technologies.
- Enables more effective management of millions of IT systems worldwide by bringing the IT industry together to collaborate on the development, validation and promotion of systems management standards.



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• OCC manages a testing platform and a test-bed for cloud computing called the Open Cloud Test-bed.

• Provide On-Demand Computing

• One architecture for clouds that was popularized by a series of Google technical reports describes a

- *storage cloud*
providing a distributed file system
- *compute cloud*
supporting MapReduce
- *data cloud*
supporting table services.



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Open Cloud Consortium (OCC)

- The Open Cloud Consortium (OCC) is a not for profit that manages and operates cloud computing and data commons infrastructure to support scientific, medical, health care and environmental research.
- The purpose of the OCC is to support the development of standards for cloud computing and to develop framework for interoperability among various clouds.



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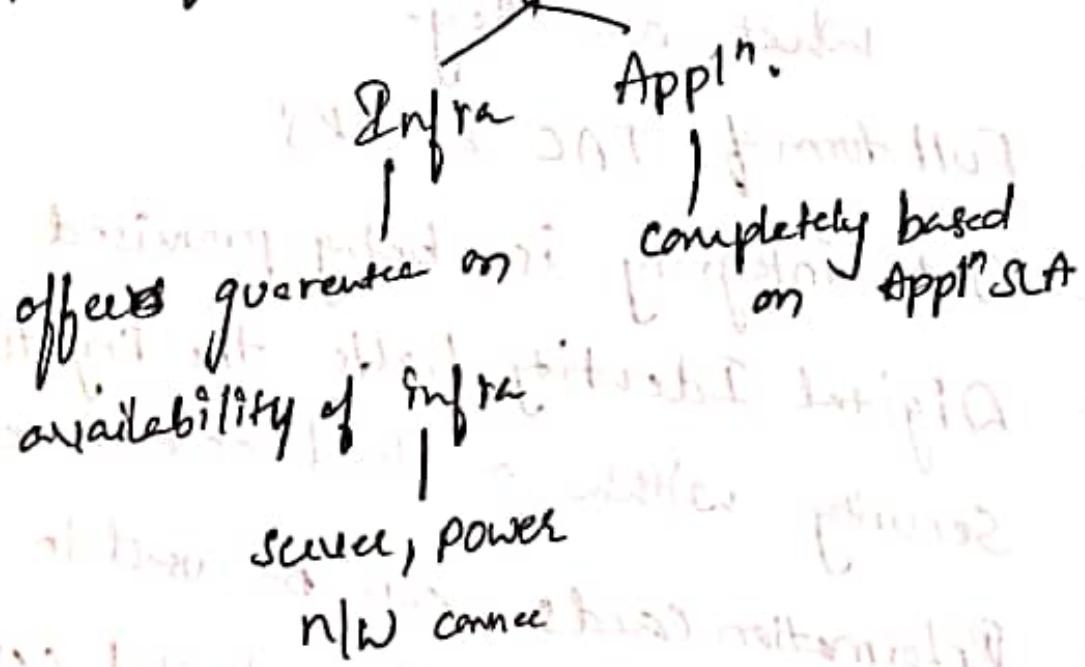


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S.No	Question	Marks	CO	BT level
1a	Write how the role of cloud computing helps in business and consumer applications in terms of CRM & ERP.	[5M]	CO4	L-4
1b	Explain ECG Analysis and its maintenance in cloud computing.	[5M]	CO4	L-2
2a	Compare between existing commercial cloud services along with their diagrams while moving from LANs to WANs.	[5M]	CO5	L-4
2b	Define Digital Identity and Discuss about pros and cons of content level security. 5	[5M]	CO5	L-2
3a	Summarize cloud security challenges.	[5M]	CO5	L-2
3b	Discuss about the phases involved in Secure Software Development Life Cycle.	[5M]	CO5	L-1
4a	What are the traditional approaches involved in SLO Management? Explain them.	[6M]	CO6	L-2
4b	Define SLA in cloud. Write about the various types of SLA.	[4M]	CO6	L-1
5a	Identify the different standards of application developers to be followed in cloud computing.	[5M]	CO6	L-2
5b	How is distributed management task force helping to collaborate on development, validation? Explain.	[5M]	CO6	L-4

- Digital Identity is the link between the Identity & the Reputation
- Full forms of QoS, SLO's & SLA's.
- Different forms of load balancing Algorithms.
class Agnostic & Class aware
- Different types of Admission control mechanisms.
- Different types of Admission control mechanisms.
Request based & Session based
- Different types of SLA's. ②



Phases of Life cycle in SLA ⑤ & Name them

SLA management of appln hosted on cloud platforms involves with ⑤ phases & name them.

- Full forms of CRM, ERP
- Microsoft Dynamics CRM is the solⁿ implemented by microsoft for customer Relationship management.
- Drop Box & iCloud, Google docs are the productivity applications.
- Animoto, Maya Rendering With Anke, Encoding.com are examples for Media Applications in cloud.
- Secure SLDC consists of How many phases & what are they
- full form of TAC & SKS
- Data integrity is being promised by TAC + SKS
- Digital Identity holds the key to flexible data security within a cloud environment
- Information cards can be used in the place of user name, password, digital certificates & other identification idm.
- OpenID was developed for the purpose of an easier logon into multiple websites

- stds for Messaging (SMTP, POP)
- stds for security (security, OAuth, OpenID, SSL, TLS)