IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A DETAILED SURVEY OF CLOUD COMPUTING SERVICES AND ITS SECURITY APPLICATIONS

[1]PRASHANTHA H A, [2]PRASHANTH KUMAR GOUDA

[1]Lecturer, [2]Lecturer

[1]Department of CS&E, [2]Department of E&CE

[1]Government Polytechnic, Devadurga, Karnataka, India, [2]Government Polytechnic, Devadurga, Karnataka, India

Abstract: Cloud computing is a newly evolved technology for complex systems that allow on- demand, flexible, scalable, and low cost services with massive-scale services sharing among plentiful users. The wide receiver of the cloud computing idea has brought about significant effects in both fixed and mobile communication systems prompting frontline research to give fitting System protocols and network architecture, alongside resource administration/management components. In cloud computing, access control and security are two major problems. Therefore, Security of both services and users is a substantial issue for the uses and trust of the cloud computing. This paper audits recent works concentrating on security issues, solutions, and difficulties in cloud computing infrastructure.

Index Terms*: *Cloud Computing, Cloud Security, Cloud Computing Infrastructure, User Authentication.

I. INTRODUCTION

Cloud computing is not just a buzz-word, but it represents strong direction of Information Technology industry development. In the last couple of years, "Cloud Computing" has increasingly been discussed. This is a relatively new trend of Information Technology industry development, focused on users, and driven by the increasing use of various mobile devices such as laptops, tablet PCs and smart phones.

Research has shown that it is one of the fastest growing sectors of the digital economy. European governments and industry plan to invest 45 billion Euros in the development of cloud computing by the year 2020. In cloud computing networks of remote servers, storage systems (data centers and server farms) and their resources are being used upon user request.

The term “cloud” is used as a metaphor for the Internet since it doesn’t matter where the hardware and software resources that are used are located. For IT professionals cloud computing is a new business model and a new technology platform for developing and deploying applications, and for end-users a new and cheaper way to use applications. Speaking of cloud computing we should be able to distinguish three different models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). The scope of this work is a model of Software as a Service.

This represents the lease of computing resources on a network of remote servers where applications are executed and data is stored. The application of cloud computing is very broads and growing daily because of many advantages to the users, and is driven by the increasing use of various mobile devices (laptops, tablets and smart phones) and mobile Internet access being more available. In general it can be portrayed as a synonym for distributed computing over a network, with the ability to run a program or application on many connected computers at the same time.

It specifically refers to a computing hardware machine or group of computing hardware machines commonly referred as a server connected through a communication network such as the Internet, an intranet, a local area Network (LAN) or wide area Network (WAN) and individual users or user who have permission to access the server can use the server's processing power for their individual computing needs like to run application, store data or any other computing need.

Cloud computing is applicable in education, but it implies the acceptance of these services by all involved in the educational process. Cloud computing provides shared resources, software and information through internet as a PAYGO (Pay-as-you-go) basis. Cloud computing is a kind of virtualization; thus also known as Virtualization Technology.

Cloud computing and it benefits attracts several other field. Education Systems also interacts with educational applications for cloud computing. Cloud computing provides several benefits in educational systems such as creation of virtual teaching learning environment, making interactive and speedy smart classroom. It also minimizes the time of knowledge collection, model preparation and delivery. Thus, cloud computing has not only many advantages but also some limitations; both arising from the fact that all the data and applications are located somewhere on the Internet. It can be used in various activities of everyday life, including in education. In addition to providing students and teachers (usually fee of charge) access to may applications and services in the cloud, which can be used in formal and informal education, cloud computing allows for greater flexibility and mobility in the use of resources for teaching and learning, greater degree of collaboration, communication and sharing of resources, and creates a personalized learning environment of virtual communities of learning and teaching.

Cloud computing has the potential to offer staff and students better services at a lower cost than the technology deployment models they're using now. Saving money and improving efficiencies are two areas where schools can use all the help they can get.

The term, "cloud computing" originated from the clouds metaphor and graphic that are often represent the Internet on network diagrams, because cloud computing relies on applications and file storage that reside on a network, a local area network, a district intranet, or the Internet itself.

Cloud computing is the on-demand delivery of networking, computing power, database, storage, applications, and other IT resources via the internet with a pay-as-you-go pricing. It states that the cloud computing purpose is storing and accessing the data and programs over the internet rather than the computer's hard disk. The data can be videos, music, files, images, documents, and many more. Furthermore, Cloud computing allowing access to virtual resources to its user over the Internet. Many of the daily things you do that made possible through the cloud—like email, file storage and backup, social media, Google drive, drop box, online shopping and banking. Rather than keeping files on a hard drive or local storage device, cloud-based storage makes it possible to save them to a remote service provider. Moreover, an electronic device has access to the web; it has access to the data and the software programs to run it. The cloud computing technology has become in demand because it provides benefits to people, consumers and businesses alike, including lower costs, easier access, reduced management cost, free provision of services and higher reliability. Cloud service examples are Google Drive, Apple iCloud, Amazon Cloud Drive, Microsoft One Drive and Oracle Cloud. The concept of cloud computing is based on the Everything-as-a-Service, mostly referred as XaaS [1], where the Fig. 1 shows the different components of a system—Software-as-a-Services(i.e. SaaS services are End-user applications, Scientific applications, Office automation, photo editing, CRM, and social networking), Platforms-as-a-Services (i.e. PaaS mainly focusing on the runtime environment for applications, development and data processing platforms and Infrastructure-as-a-Services(i.e. IaaS provides services like hardware, virtualized servers, storage and networking). The Cloud provides four deployment models for consumers that are Public, Private, Hybrid and Community models.

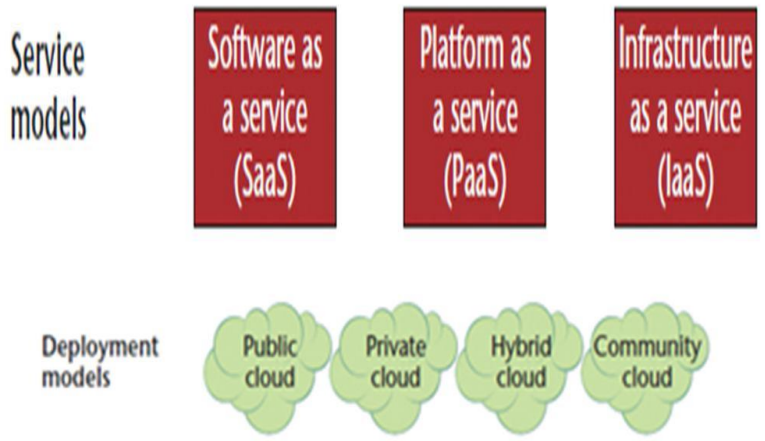

Fig. 1 Cloud Computing Services & Deployment Models

II. History And Other Definition of Cloud Computing

The Cloud Computing concept came into the spotlight in the year 1950 with access via thin/static clients and the implementation of mainframe computers. Then in 1961, John McCarthy delivered a speech at MIT in which he suggested that computing services will be readily available on demand service [2], just as other utility services such as water, electricity, telephone, and gas that computing can be sold like a utility. In the 21st century, this model has been referred to as utility computing or as cloud computing. Using cloud computing you can go with Pay-per-use or Pay-As-u-go Model. In 1999, Salesforce.com became the 1st company to enter the cloud arena, excelling the concept of providing enterprise-level applications to end users through the Internet. Then in 2002, Amazon came up with Amazon Web Services, providing services like computation, storage, and even human intelligence. *In 2009,* Google Apps, Hadoop, Salesforce.com, Manjra soft Aneka and Microsoft's Windows Azure also started to provide cloud computing enterprise applications. Other companies like HP and Oracle also joined the stream of cloud computing, for fulfilling the need for greater data storage.

Many definitions have been introduced for the last years to define exactly what "cloud Computing" are: According to Buyya et al. [3] have defined it as follows: "Cloud is a parallel and distributed computing system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service level agreements (SLA) established through negotiation between the service provider and consumers." The National Institute of Standards and Technology (NIST) [4] characterizes cloud computing as "a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications, services) that can be rapidly provisioned and released with minimal management effort or service provider interaction." Vaquero et al. [5] have stated "clouds are a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms and/or services). These resources can be dynamically reconfigured to adjust to a variable load (scale), allowing also for an optimum resource utilization. This pool of resources is typically exploited by a pay-per-use model in which guarantees are offered by the Infrastructure Provider by means of customized Service Level Agreements." definition proposed by the U.S. National Institute of Standards and Technology (NIST)[4]:"Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction".

III. Existing System

1) Mainframes: Mainframes were powerful, highly reliable computers specialized for large data movement and massive input/output (I/O) operations. They are mostly used by large organizations for bulk data processing tasks such as online transactions, enterprise resource planning, and other operations involving the processing of significant amounts of data. The main application of mainframes is Batch Processing. The evolved version of application which are still use for transaction processing i.e. airline ticket booking, online banking, government services and supermarkets.

2) Clusters: This technology is faster, more powerful, high availability of resources, high performance and cheap cost than mainframe computers[6].High performance or cluster computing is form by large number of groups that are connected through a LAN so that is act as a single machine. Due to its faster processing speed, better integrity it solve the complex problems more efficiently. It is used for critical applications some are Earthquake Simulation, Weather Forecasting, Google search engine etc.

3) Grid: Grid computing is evolution of the cluster computing [7]. It aggregates the geographically dispersed clusters with a internet to solve a particular task. These clusters belonged to heterogeneous computing nodes, and arrangements are made among them to share the computational power, data storage and memory.

IV. Characteristics of Cloud Computing

- On demand access
- No up-front commitments
- Pay-per-use model
- Nice Pricing
- Efficient resource allocation
- 24/7 hours available
- Easily manageable, flexible and scalable
- Energy efficiency
- Increased agility
- Service orientation
- Security
- High performance and reliability
- Accessible from anywhere

V. Major Categories of Cloud Computing Services

The cloud computing is the capability to deliver, on demand, a variety of IT services to users over the internet. Cloud computing service offerings into three major categories: Infrastructure-as-a-Service(IaaS), Platform-as-a-Service(PaaS), and Software-as-a-Service (SaaS)[8].

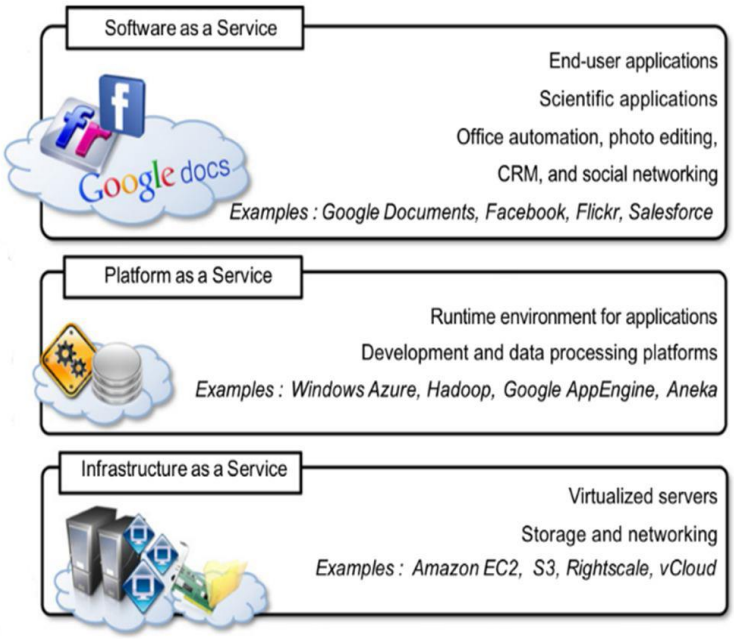

Fig. 2 Cloud Computing Services

A. *Infrastructure as a Service(IaaS):* Hardware as a Service or IaaS is a bottom layer which delivers infrastructure on demand in the form of virtual storage, networking, virtual machines, hardware and other resources. They deliver customizable infrastructure on user request to IaaS provider. Then provider creates one or more virtual machines on the demand of the client. The user can able to deploy and run the software stack in the virtual machine. IaaS help the consumer to reduced the cost of purchasing and managing their storage, networking and physical servers. The cloud service provider hosts the IaaS infrastructure services in which the users access these computing resources in a virtualized environment and priced according to the specific resource of the virtual hardware, memory, number of processors, disk storage etc. IaaS service providers are Amazon EC2 and S3, GoGrid etc. Besides the virtual machine management capabilities, additional services can be provided by IaaS that generally including the SLA(Service Level Aggrement) resource-based allocation, workload management, support for infrastructure design through advanced Web interfaces, and the ability to integrate third-party[9]. IaaS services provides by public clouds vendors such as Amazon, GoGrid, Joyent, Rightscale, Terremark, Rackspace, ElasticHosts, and Flexiscale, which has their own large datacenters and give access to their computing infrastructures as a renting bases.

Fig. 3 IaaS Services

B. *Platform as a Service(PaaS):* PaaS providers commonly provides a development and deployment environment that allow users to create and run their applications on cloud with little or no trouble to low-level details of the platform. It is the responsibility of the PaaS service provider to offer scalability and to manage fault tolerance, while users are requested to focus on the logic of the application developed by the provider's APIs, programming tools and libraries [9]. Client design their applications and are not concerned with hardware that may be physical or virtual, server, storage, operating systems and other low-level services. The core middleware or hypervisor is in charge of managing the resources and scaling and descending applications on demand or automatically, according to the commitments made with users in SLA. This approach increases the level of abstraction at which cloud computing take advantage but also some restrictions for the user. The user works under a more controlled environment. PaaS providers usually support multiple programming languages in platforms include Python and Java (e.g., Google AppEngine), .NET languages (e.g., Microsoft Azure), and Ruby (e.g. Heroku), force.com or Saleforce.com has made its own programming language (Apex) and an Excel-like query language, which provide higher levels of abstraction to key platform functionalities [10]. The most popular is Microsoft Windows Azure [9], which provides a comprehensive framework for building service-oriented cloud applications on top of the .NET technology, hosted on Microsoft's data centers.

Fig. 4 PaaS Services

C. Software as a Service(SaaS): SaaS is top most layer of the cloud computing service. In this model, consumers neither need install anything on their personal computer, nor have to pay considerable up-front costs to purchase the software and the required licenses. They simply access the application website, enter their credentials and billing details, and can instantly use the application, which, in most of the cases, can be further customized for their needs. On the provider side, the specific details and features of each customer's application are maintained in the infrastructure and made available on demand. Software-as-a-Service is a software distribution model in which applications are hosted by a vendor and made available to customers over a network, typically the Internet. The common features of desktop applications—such as office automation, document management, photo editing, and customer relationship management (CRM) software—are duplicates on the provider's infrastructure and made more scalable and accessible through a web browser on demand and billing done through renting weekly, monthly, yearly and pay-per-use. These applications are shared across multiple users whose interaction is isolated from the other users. Examples are Google drive, social networking site, Gmail, etc.

Fig. 4 PaaS Services

VI. CLOUD COMPUTING PLATFORMS

1) Amazon web Services (AWS): AWS is mostly known for its compute and storage-on-demand services, namely Elastic Compute Cloud (EC2) and Simple Storage Service (S3). EC2 provides users with customizable virtual hardware that can be used as the base infrastructure for deploying computing systems on the cloud[11]. AWS offers cloud IaaS services ranging from virtual compute, storage, and networking to complete computing stacks. EC2 also provides the capability to save a specific running instance, as an image, thus allowing users to create their own templates for deploying systems.

2) Google App Engine: Google App Engine is a scalable runtime environment, mostly developed to executing Web applications and dynamically scale as user demand varies over the time [12]. App Engine provides services include in-memory caching, scalable data store, job queues, messaging, secure execution environment and a collection of services that simplify the development of scalable and high-performance Web applications. Developers can build and test applications on their own machines using the AppEngine software development kit (SDK), which replicates the production runtime environment and helps test and profile applications.

3) Hadoop: Apache Hadoop is an open-source framework that is suited for processing large data sets on commodity hardware.

Hadoop is an implementation of Map Reduce, an application programming model developed by Google, which provides two fundamental operations for data processing: map and reduce. The former transforms and synthesizes the input data provided by the user; the latter aggregates the output obtained by the map operations. Hadoop provides the runtime environment, and developers need only provide the input data and specifies the map and reduce functions that need to be executed[12].Hadoop is an integral part of the Yahoo! Cloud infrastructure and supports several business processes of the company. Currently, Yahoo! manages the largest Hadoop cluster in the world.

4) Microsoft Azure: Microsoft Azure is a cloud operating system and a platform for developing applications in the cloud. It provides a scalable runtime environment for Web applications and distributed applications in general. Applications on Azure are organized around the concept of roles, which identify a distribution unit for applications and embody the application's logic. There are three types of role: *Web role, worker role, and virtual machine role*. The Web's role is designed to host a Web application, the worker role is a more generic container of applications and can be used to perform workload processing, and the virtual machine role provides a virtual environment in which the computing stack can be fully customized, including the operating systems.

5) Force.com and Salesforce.com: Force.com is a cloud computing platform for developing social enterprise applications. The platform is the basis for SalesForce.com, a Software-as-a-Service solution for customer relationship management. Force.com allows developers to create applications by composing ready-to-use blocks; a complete set of components supporting all the activities of an enterprise is available [9]. It is also possible to develop your own components or integrate those available in AppExchange into your applications.

6) Manjrasoft Aneka: It is a cloud application platform for rapid creation of scalable applications and their deployment of various types of clouds in a seamless and elastic manner. It supports a collection of programming abstractions for developing applications and a distributed runtime environment that can be deployed on heterogeneous hardware (clusters, networked desktop computers, and cloud resources). Developers can choose different abstractions to design their application: tasks, distributed threads, and map-reduce. These applications are then executed in the distributed service-oriented runtime environment, which can dynamically integrate additional resource on demand [9].

7) Rackspace Cloud Servers: Rackspace Cloud Servers are an IaaS solution that provides fixed size instances in the cloud. Cloud Servers offer a range of Linux-based pre-made images. A user can request different-sized images, where the size is measured by requesting RAM, not CPU.

VII. CLOUD DATA SECURITY

We have investigated the structure and substance of the system. We attempt to feature the essential improvements and look to future patterns. This investigated goes past simply taking a gander at PC frameworks, cell phones, and different items, and reaches out into expansive ideas like the economy, national security, information assurance, data protection and privacy. Systems to secure again those vulnerabilities are discharged routinely, including for SSL/TLS convention libraries, for example, OpenSSL, however, site proprietors still need to introduce them. We have found that this is still not happening rapidly enough. The quantity of vulnerable websites keeps on persevering a seemingly endless

amount of time, with almost no change to appear. While the transfer from SHA-1 certificates to the significantly more grounded SHA-2 is picking up motion, organizations must convey the new testimonies appropriately all together for the progressions to be successful and effective.

This study takes an abnormal state perspective of Internet threats and cyber security, highlighting the striking changes and progresses. Although, we should not oversee that cyber-crime isn't harmless. For instance, ransom ware keeps individuals out of their PCs, holding treasured family photographs to payment, seizing incomplete original copies for books, and blocking access to government forms, saving money records, and other important reports. In addition, there are no ensures that paying the payoff will discharge those latches.

Organizations, and additionally home users'/clients' have progressed toward becoming casualties, and depending on reinforcements is frequently the last procession of defense when cyber security should be the foremost.

Directed assaults take valuable intellectual property from the organizations, and an information disruption can scrap an organization's reputation—even devastating its survival. Cyber assurance/insurance claims are rising in number and cost. In the widest sense, cyber security issues debilitate national security and financial development, by which every one of us is influenced.

Any framework is not invulnerable to cyber security threats, and in this study, the outcomes of overlooking the dangers from lack of concern, carelessness, and inadequacy is clear. Around three years back a remarkable number of vulnerabilities were recognized, and web assault misuse units are adjusting and advancing them more rapidly than any time in recent memory. As various gadgets are associated, susceptibilities will be misused. Protective Internet-connected gadgets will turn out to be critical to assuring the security of modern control frameworks and medical gadgets in the network. Close by the growing number of software liabilities / vulnerability, and the motorcade of attacks on various frameworks, the future will carry with it a more prominent scope of assorted variety as threats against Windows frameworks will stretch out to other working frameworks, mobile, operating systems and additional IoT devices.

VIII. SECURITY APPLICATIONS

Cloud security applications and SaaS application monitoring solutions are transforming the way enterprises protect against application-layer attacks.

Flaws and vulnerabilities in web applications are one of the primary sources of data breaches, yet only one in 10 enterprises today tests all critical software for resilience against data breaches. Traditional application testing solutions slow the pace of innovation.

Typical on-premises solutions are not only expensive to deploy but complex and time consuming to operate, creating tension with development teams intent on bringing software to market faster. Consequently, testing is often ignored or postponed until a later date when fixing flaws is more expensive.

Veracode offers a better solution: cloud security applications and cloud-based security testing solutions that are purpose built for the speed and scale required to simplify secure DevOps and enable development teams to innovate rapidly, Veracode cloud security applications require no special testing expertise and no dedicated staff to operate and maintain. Developers can upload applications to Veracode's online platform and receive test results within a matter of hours. Veracode's cloud security applications combine automated services, centralized policies and world class expertise to help organizations manage best practices for cloud application security more effectively.

Comprehensive cloud security applications for testing

Static Analysis, a service that quickly identifies and remediates flaws in any application written, purchased or downloaded. Software Composition Analysis, a tool for analyzing commercial and open source code and cataloging open source components for greater visibility into risk when open source vulnerabilities are discovered.

Dynamic Analysis, a service that finds, scans and monitors all the web applications belonging to an organization – even the ones that IT teams are unaware of.

Veracode Greenlight, a tool that runs in the background of an IDE to provide developers with real-time feedback and security recommendations as they write code.

IX. CONCLUSION

Cloud computing is a one of the most emerging technology and its popularity increasing very rapidly. Many companies providing the various services to the consumer on rent bases like Google, Amazon Services, Oracle, Microsoft etc. Today, IT companies shift their business over the cloud based architecture because it

provides physical infrastructure to build an application, the developer deploy their application on virtual environment and user run many software without installing on their personal computers.
Moreover, user can store their personal data on cloud as per their requirement. This paper discussed the history, cloud computing services, security applications and its various technologies which recently used by IT industries.
The cloud is a noteworthy test in how processing of resources will be used since the point of the cloud computing is to alter the financial aspects of the data center, however, before delicate and directed information move into the public cloud. Issues of security benchmarks and similarity must be tended to including solid verification, secure authentication, and assigned authorization, key management for encoded information, data misfortune assurances and regulatory reporting. The clients ought to know about the risks and shortcomings exhibit in the present cloud computing environment before being a part of it. All are components of a protected identity, data and infrastructure model can be connected to the public and private cloud and also to IaaS, SaaS and PaaS services. There is no enormous venture required to update infrastructure, work and proceeding with cost. This paper presented the latest work which is concentrating on security issues, solutions, and difficulties in cloud computing infrastructure. In the advancement of private and public clouds, the specialist service providers should utilize the managing standards to embrace and expand security methods/tools and secure products to create and offer end-to-end dependable cloud computing and services.

X. REFERENCES

[1] Armbrust M, Fox A, Griffith R, Joseph A, Katz R, Konwinski A, et al. Technical Report No. UCB/ EECS-2009-28 Above the clouds: a berkeley view of cloud computing. USA: University of California at Berkeley; 2009.
[2] J. F. Yang and Z. B. Chen, "Cloud Computing Research and Security Issues," 2010 IEEE International Conference on Computational Intelligence and Software Engineering (CiSE), Wuhan pp. 1-3, DOI= 10-12 Dec. 2010.
[3] R. Buyya, C. S. Yeo, and S Venugopal, Market oriented cloud computing: Vision, hype, and reality for delivering IT services as computing utilities, in Proceedings of the 10th IEEE International Conference on High Performance Computing and Communications (HPCC 2008, IEEE CS Press, Los Alamitos, CA, USA), Dalian, China, September 25 27, 2008.
[4] IST Cloud computing definition, http://csrc.nist.gov/groups/SNS/cloudcompu ting/index.html, 2009.
[5] J. van Bon and A. van der Veen, Foundations of IT Service Management based on ITIL, Vol. 3, Van Haren Publishing, Zaltbommel, September 2007.
[6] Buyya R. High-performance cluster computing: architecture and systems. Upper Saddle River, NJ, USA: Prentice Hall PTR; 1999.
[7] Foster I, Kesselman C, Tuecke S. The anatomy of the grid: enabling scalable virtual organizations. Int High Perform Comput Appl 2001;15(3).
[8] Rao, C.C., Leelarani, M. and Kumar, Y.R., 2013. Cloud: Computing Services and Deployment Models. International Journal Of Engineering And Computer Science, 2(12), pp.3389-3390.
[9] "Mastering Cloud Computing" book authored by Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi.
[**10**] Lv, C., et al. PaaS: A revolution for information technology platforms. in Educational and Network Technology (ICENT), 2010 International Conference on. 2010. IEEE.
[11] Tanenbaum AS, Van Steen M. Distributed systems: principles and paradigm. Upper Saddle River, NJ, USA: Prentice Hall PTR; 2001.
[12] J. J. Peng, X. J. Zhang, Z. Lei, B. F. Zhang, W. Zhang, and Q. Li, "Comparison of Several Cloud Computing Platforms," 2009 Second International Symposium on Information Science and Engineering (ISISE '09). IEEE Computer Society, Washington, DC, USA, pp. 23-27, DOI=10.1109/ISISE.2009.94.