ISSN: 2277-9655
(I2OR), Publication Impact Factor: 3.785

IJESRT

INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

A STRUCTURED ANALYSIS ON LEXICONS FOR OPEN SOURCE CLOUD TECHNOLOGIES

Dr. Ananthi Sheshasaayee*, Swetha Margaret T.A.

* Research Supervisor, PG and Research Department Of Computer Science & Application, Quaid-E-Millath Government College for Women(Autonomous), Tamil Nadu, India.

Research Supervisor, PG and Research Department Of Computer Science & Application, Quaid-E-Millath Government College for Women(Autonomous), Tamil Nadu, India.

ABSTRACT

Cloud computing is a smart computing model since it allows for resources to be provisioned rendering on a demand basis, i.e., cloud users can lease resources as they become essential. Cloud Computing refers to both the applications delivered as services over the Internet and the hardware and systems software in the data centers that provide those services. This terminology of computing is estimated to be one of the most transformative technologies in the history of computing. Cloud computing delivers infrastructure, platform, and software as services, which are made available as subscription-based services in a pay-as-you-go model to consumers. By leveraging cloud services, organizations can deploy their software systems over a pool of resources. As this computing technology is a rapidly evolving research area, there is a severe lack of defined standards, tools and methods that can efficiently tackle the infrastructure and application level intricacies. This paper presents and discusses the comprehensive and structured overview of cloud computing and its requirements by analysing its open source technologies along with its main characteristics and infrastructure technologies. This paper will also motivate several academic and non-academic institutions to develop open-source cloud solutions.

KEYWORDS: Software as a Service (SaaS), Subscription-based services, Pay-as-you-go model, Open-source, Instrumented data processing, Web Hosting.

INTRODUCTION

In modern years, the importance of affordable access to consistent high-performance hardware and software resources and evading maintenance costs and security apprehensions has encouraged large institution managers and stakeholders of information technology to migrate to cloud computing. Cloud computing is an progressing paradigm. The NIST definition characterizes important aspects of cloud computing and is envisioned to serve as a means for broad comparisons of cloud services and deployment strategies, and to provide a baseline for discussion from what is cloud computing and how best is the terminology with its resources. Cloud is a model for enabling pervasive, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be swiftly provisioned and it is released with minimal management effort for provider's interaction. This model is composed of five essential characteristics, three service models, and four deployment models [3][4].

The relative novelty and rapidly increasing growth of cloud computing makes it an exhilarating area for research. The current paper aims to evaluate the state of cloud computing research and also portrays the current scenario for research stream and its relevance [2][3]. A cloud infrastructure is the assortment of hardware and software that permits the five essential characteristics of cloud computing. Cloud infrastructure can be regarded as containing both a physical layer and an abstraction layer. The physical layer involves on hardware resources that are necessary to support the cloud services being provided. His This includes server, storage and network components. The abstraction layer consists of the software deployed across the physical layer, which manifests the essential cloud characteristics. Conceptually the abstraction layer sits above the physical layer [3][4].

SCOPE OF THE LITERATURE SURVEY

The first stride of a literature analysis study is to trace pertinent literature material through computer and manual examinations. Traditionally this is done by navigating conspicuous journals and conferences. Focusing on various resources for cloud computing and domain areas like PaaS, IaaS and SaaS. Service models and its essential characteristics are also conferred [3][4].

Essential Characteristics

"Cloud computing is a model for facilitating ubiquitous, expedient, on-demand network access to a shared pool of configurable computer resources that can be rapidly provisioned and released with trifling management effort or service provider interaction"[8][9]. Five essential characteristics of the cloud are summarized below:

- **On-demand self-service**. A consumer can individually provision computing abilities, such as server time and network storage, as needed automatically without requiring human interaction with apiece service provider.

- **Broad network access.** Capabilities are available over the network and accessed through standard mechanisms that promote use by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops, and workstations).

- **Resource pooling.** The provider's computing resources are pooled to serve multiple consumers using a multi-tenant model, with different physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center). Examples of resources include storage, processing, memory, and network bandwidth [3][4].

- **Rapid elasticity.** Competencies can be elastically provisioned and released, in some cases automatically done to scale rapidly outward and inward commensurate with on- demand requirements and resources. To the user, the resources available for provisioning often appear to be infinite and can be appropriated in any magnitude at any time [3][4].

- **Measure Services.** Cloud systems inevitably controls and optimize resources that is used by leveraging a metering capability at some level of abstraction apposite to the type of service (e.g., storage, processing, bandwidth, and active user accounts). Resource usage can be supervised, controlled, and reported, provided transparency for both the provider and consumer [user] is legitimate [3][4][5].

Cloud Service Models

It is important to comprehend what cloud really is and its diverse mechanisms. Since the Cloud is a broad assortment of services, organizations can choose where, when, and how they want to use the terminologies of Cloud Computing. This report also elucidates on different types of Cloud Computing services commonly referred to as Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [6][7][8].

Software as a Service (SaaS): The capability provided to the user [consumer] is to use the provider's applications running on a cloud arrangement. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The user [consumer] does not accomplish or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the conceivable exclusion of limited user specific application configuration settings[6][7][8].

Platform as a Service (PaaS): The competence provided to the consumer [user] is to deploy onto the cloud infrastructure consumer-created or assimilated applications created using programming languages, libraries, services, and tools supported by the provider.3 The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment[6][7][8].

Infrastructure as a Service (IaaS): The capability provided to the consumer [user] is to provision processing, storage, networks, and other essential computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications and perchance limited control of select networking components (e.g., host firewalls)

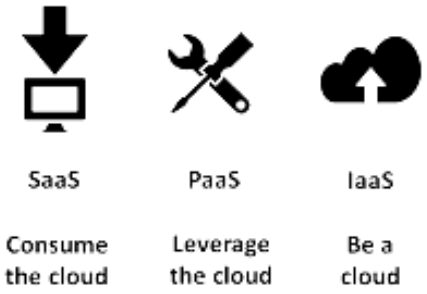

Fig -1: Cloud Service Model

ANTIQUITY AND EMINENCE

This review surveyed the existing literature using a principled and systematic approach: searched major research databases for computer science, the ACM Digital Library, IEEE Xplore, Springer along with SpringerPlus, Science Direct, Research Gate and Google Scholar, for the following keywords: cloud computing, elastic computing, utility computing, Infrastructure as a Service, IaaS, Platform as a Service, PaaS, Software as a Service, SaaS, Everything as a Service, XaaS [15][16].

With the detonation of the Internet, constricted pressure is put to the prevailing storage and computing amenities. The Internet service providers start to use the inexpensive commodity PCs as the underlying hardware platform. Numerous kinds of software technologies are invented to make these PCs work elastically, which has led to 3 major cloud computing panaches based on the underlying resource abstraction technologies: the Amazon style, Google Style and Microsoft style [1].

- Amazon's cloud computing is based on server virtualization technology. Amazon released Xen-based Elastic Compute Cloud™ (EC2), object storage service (S3) and structure data storage service (SimpleDB) during the 2006 – 2007, under the name Amazon Web Service™ (AWS). On-demand and inexpensive AWS becomes the forerunner of Infrastructure as a Service (IaaS) provider [1].
- Google's style is based on technique-specific sandbox. Google published several research papers from 2003 to 2006, which outline a kind of Platform as a Service (PaaS) cloud computing. The platform, which is called Google App Engine™ (GAE), is released to public as a service in 2008 [1][2].
- Microsoft Azure™ is released in Oct. 2008, which uses Windows Azure Hypervisor (WAH) as the primary cloud infrastructure and .NET as the application container. Azure also offers services including BLOB object storage and SQL service [1][2].

Except these public cloud services, lots of companies has experimented and/or instigated internal cloud computing systems. Cloud computing is already key stratagem for IT merchants, ISP and telecom service providers.

Resource Intellection	Adopters
Server Virtualization (Amazon Style)	Amazon EC2 (Xen), GoGrid (Xen), 21vianet CloudEx (Xen), RackSpace Mosso (Xen), Joyent (Accelerator), AT&T Synaptic (Vmware), Verizon CaaS (Vmware)

Technique-specific sandbox (Google Style)	GAE (Python & JVM), Heroku (Ruby), Morph Application Platform(Ruby)
Server Virtualization & Technique specific sandbox (Microsoft Style)	Microsoft Azure (WAH & .NET)

Table -1: Resource Provision

CONCEPTUALISING CLOUD COMPUTING

This classification contains articles that provide a general view of cloud computing practice and research, with an aim to provide a general understanding of this area rather than to focus on any specific facet of it. These articles can be further classified into two subcategories.

Foundational/Overviews: This subcategory contains tutelages that introduce foundational concepts and components of cloud computing. Such exploratory tutelages provide delineations and outline key structures of cloud computing [1], imitate the timeline of cloud computing, analyse the correlated benefits and obstacles, strengths and weaknesses of cloud computing and suggest future research directions [1]. To further eloquent the essence of the cloud computing archetype, some tutelages make comparisons between cloud computing and other concepts such as grid computing [1], cluster computing, virtual computing and even electricity. Comparisons are also made between public cloud and private cloud, as well as across public cloud providers, such as Amazon, Microsoft, and Google [1][3].

Predictions: This subcategory contains tutelages converging on forecasting the future of cloud computing and portentous potential implications. Some project the technical and decision-making effects of cloud computing on network and software vendors, as well as on HPC (High Performance Computing) systems while others speculate the economic prospects of cloud computing for developing nations [1][2].

Challenges: The development of cloud computing solutions brings several technical challenges to cloud developers. These challenges can be grouped in three main areas: negotiation, decision, and operation. In the negotiation area, these are the challenges relative to how application developers interface with the cloud as well as the description of the cloud offerings. It includes also the definition of the programmability level that the cloud solution will offer [5][6]. The decision area copes with the main problem that clouds faces behind the scenes: How virtual resources can be scheduled to meet user requirements, for example? Last, the operation area is associated with the enforcement of decisions and the communication between cloud elements [5] [20][21]..

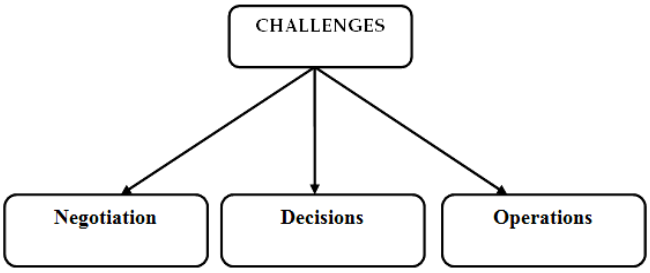

Fig -2: Challenges in Cloud

Standardization efforts: A considerable challenge present in many of the raised discussions around the cloud is related to the need for standardization. Currently, cloud providers offer proprietary interfaces to access their services. This locks users within a given provider as they cannot migrate their applications and services easily between cloud providers [5]. It is hoped that cloud providers see such a problem and work together to offer a standardized API based on open standards like SOAP and REST. An important effort in the standardization comes from the Open Cloud Manifesto [5]. This is an initiative supported by hundreds of companies that aims to discuss with cloud organizations a way to produce open standards for cloud computing. Their major doctrines are collaboration and coordination of efforts on the standardization, adoption of open standards wherever appropriate, and the development of standards based on customer requirements [5].

OPEN SOURCE CLOUD TECHNOLOGIES

Open source technologies has an extensive history. Linux, MySQL and the Apache Web Server are among the most popular and successful technologies brought forth by the community. Over the years, open source experienced a big propaganda which, driven by developers, moved into corporate IT[9][10]. Today, IT environments are no longer conceivable without open source technologies. Driven by cloud computing, open source presently gains strong momentum [7]. Open source cloud computing software can offer distinct advantages to organizations, often leveraging strong user and developer communities and aggressive release cycles. And, open source means open access to application programming interfaces (APIs) and the open standards they are written against. More transparency in the application code base often helps move the innovation forward and increase knowledgeable community support [10]. Most software applications today incorporate some open source software directly or indirectly (dynamically linked). Developer's resourcefulness, code reuse, and efficiencies of development make open source an attractive option for all technology organizations. Cloud applications are no exception and many applications deployed in clouds are either entirely open source (think OpenStack or OpenERP Server), or have significant amount of open source in them [20][21].

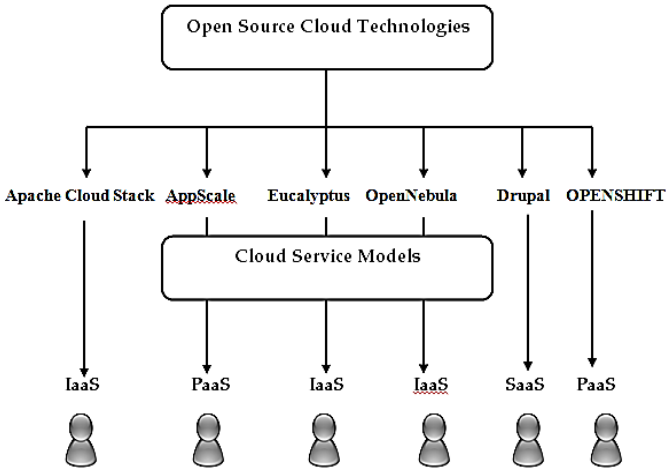

Fig -3: Open Source Cloud Model

Fig 3., Clearly explains open source cloud solutions and the service models of cloud on which they operate. The figure also explains the various cloud technologies that are available to explore. Any application needs a model of computation, a model of storage, and a model of communication. The statistical multiplexing necessary to achieve elasticity and the illusion of infinite capacity requires each of these resources to be virtualized to hide the implementation of how they are multiplexed and shared. Our view is that different utility computing offerings will be distinguished based on the level of abstraction presented to the programmer and the level of management of the resources. From a hardware point of view, three aspects are new in Cloud Computing[17][18]:

- The illusion of infinite computing resources available on demand, thereby eliminating the need for Cloud Computing users to plan far ahead for provisioning.
- The elimination of an up-front commitment by Cloud users, thereby allowing companies to start small and increase hardware resources only when there is an increase in their needs.
- The ability to pay for use of computing resources on a short-term basis as needed (e.g., processors by the hour and storage by the day) and release them as needed, thereby rewarding conservation by letting machines and storage go when they are no longer useful.

There is a clear need for the standardization of current cloud platforms at least of terms of interface, negotiation and access through Web services. Understandably, this is a considerable task as many clouds use different abstraction levels some are generic whereas others focus on a specific application domain, etc. Some initial steps have been taken into this direction with the setup of the Open Cloud technologies. Interestingly, some solutions such as the OpenNebula have been first to adopt policies for resource management. The use of policies remains a challenge in many areas and clouds may benefit from it.

CONCLUSION

Current software licenses commonly restrict the computers on which the software can run. Users pay for the software and then pay an annual maintenance fee. Indeed, SAP announced that it would increase its annual maintenance fee to at least 22% of the purchase price of the software, which is comparable to Oracle's pricing. Hence, many cloud computing providers originally relied on open source software in part because the licensing model for commercial software is not a good match to Utility Computing. The primary opportunity is either for open source to remain popular or simply for commercial software companies to change their licensing structure to better fit Cloud Computing[20]. A related obstacle is encouraging sales forces of software companies to sell products into Cloud Computing. Pay as-you-go seems incompatible with the quarterly sales tracking used to measure effectiveness, which is based on one-time purchases. The opportunity for cloud providers is simply to offer Open source technologies to the users (Consumer) which would serve the purpose.

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