ISSN (Print) : 2319-5940
ISSN (Online) : 2278-1021

International Journal of Advanced Research in Computer and Communication Engineering
Vol. 2, Issue 8, August 2013

Cloud Computing Management and Synchronization Tools

Lalit Gehlod[1], Vaibhav Jain[2], Manish Sharma[3]

Asst.Professor, Computer Engg. Department, IET, DAVV, Indore, India [1]
Asst.Professor, Computer Engg. Department, IET, DAVV, Indore, India [2]
Student, Computer Engg. Department, IET, DAVV, Indore, India [3]

Abstract: Rapidly increasing demand of computation on business processing, data centres and large file transfers leads to develop a new kind of technology that provide services for computational need, storage in high secure and manageable way. Cloud computing answers our technological ambitions by introducing different kinds of service platforms in low cost and a high computational environment. In this paper we discuss different domain of research and innovations in cloud computing domain. Additionally this paper provides a literature for challenges and issues in cloud computing environment.

Keywords: Cloud computing, research, challenges

I. INTRODUCTION

Web is a large source of information and knowledge, where about all solutions are exists. In some times ago personal computers and workstations are played important role for develop and utilize different applications and they consumes local resources for computation. But due to rapidly changed technology introduces a new internet based computing strategies.

If we describe a cloud computing system in simple words that is an internet based application platform that provide different services on plug and play basis. Now we starts with a formal definition of cloud computing. According to National Institute of Standards and Technology [1] appears to include key common elements widely used in the Cloud Computing community.

"Cloud computing is a model for enabling 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."

Cloud computing involves some key elements, that is required to understand first. A consumer with an immediate need at a particular timeslot can advantage computing resources such as CPU, network storage, software and others in an automatic manner without interactions with providers of these resources. These computing resources are delivered over the network or Internet and used by various client applications with heterogeneous platforms such as mobile phones and personal computers.

Cloud service providers have the mechanism to pool the computer resources to serve the service to the multiple clients. Multiple tenancy or virtualization model are used to do it. Multi tenancy is the software architecture mechanism to serve the single instance of program is run on the server and this instance is dynamically assigned or reassigned to multiple clients according to their demand. The motivation for setting up such a pool-based computing hypothesis lies between two important factors: economies of scale and concentration. The result of pooled based model is that computing resources is made available to the customer are invisible to them. Pooled based model made limited resources available to many customer.

For consumers, computing resources become immediate rather than persistent: there are no up-front commitment and contract as they can use them to scale up whenever they want, and release them once they finish scaling down.. Although computing resources are pooled and shared by multiple consumers the cloud infrastructure is able to use appropriate mechanisms to measure the usage of these resources for each individual consumer through its metering capabilities.

II. BACKGROUND

A. Clouds, Grids, and Distributed Systems

Cloud Computing overlaps with many existing technologies, like Grid Computing, Utility Computing, Services

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ISSN (Online) : 2278-1021

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Computing, and distributed computing. Cloud Computing not only overlaps with Grid Computing, it is really evolved out of Grid Computing and depend on Grid Computing as like it provide backbone and infrastructure support. The evolution has been a result of a shift in focus from an infrastructure that delivers storage and compute resources to one that is economy based aiming to deliver more intellectual resources and services in the case of Clouds. As for Utility Computing, it is not a new model of computing infrastructure, it is a business model in which computing resources, such as computation and storage, are packaged as metered services similar to a physical public utility, such as electricity and other utility bills. Utility computing is typically implemented using other computing infrastructure with additional accounting and monitoring services. A Cloud infrastructure can be utilized internally by a company or exposed to the public as utility computing.

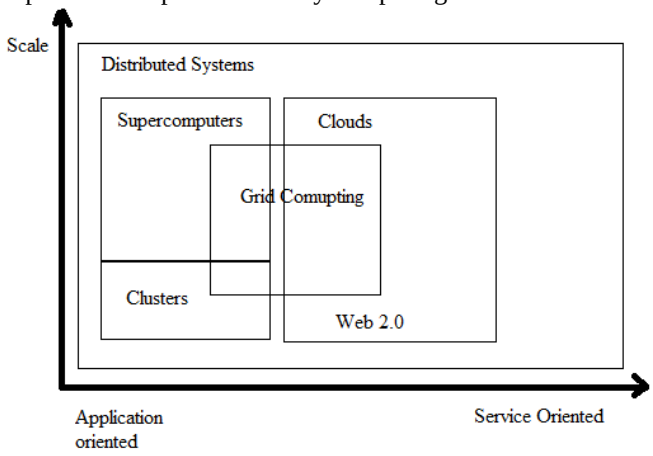

Fig 1 Different Computing and Services

Figure 1 provides an overview of the relationship between Clouds and other domains that it overlaps with. Web 2.0 covers almost the whole spectrum of service-oriented applications, where Cloud Computing lies at the large-scale side. Supercomputing and Cluster Computing have been more focused on traditional non-service applications. Grid Computing overlaps with all these fields where it is generally considered of lesser scale than supercomputers and Clouds. [2]

B. Comparison in Cloud and Grid Computing

Traditional model of software was the one time payment for license for unlimited use of it. This was the very costly to the customer, so the limited no. of user have to access it. In a cloud based business model, a customer will pay on consumption basis like utility company bill payment. Utility company like electricity, water are charged on the consumption basis. This is on scale of economies to get the price down for user and made profit up for the provider. The former is charged based on per instance-hour consumed for each instance type and the later is charged by per GB-Month of storage used. In addition, data transfer is charged by TB /month data transfer.

The business model for Grids is project-oriented in which the users or community represented by that proposal have certain number of service units they can spend. This model has worked rather well for many Grids around the globe, giving institutions incentives to join various Grids for access to additional resources for all the users from the corresponding institution. There are also activities to build a Grid economy for a global Grid infrastructure that supports the trading, negotiation, provisioning, and allocation of resources based on the levels of services provided, risk and cost, and users' preferences; so far, resource exchange auctions, game theory based resource coordination, virtual currencies, resource brokers and intermediaries, and various other economic models have been proposed and applied in practice [2].

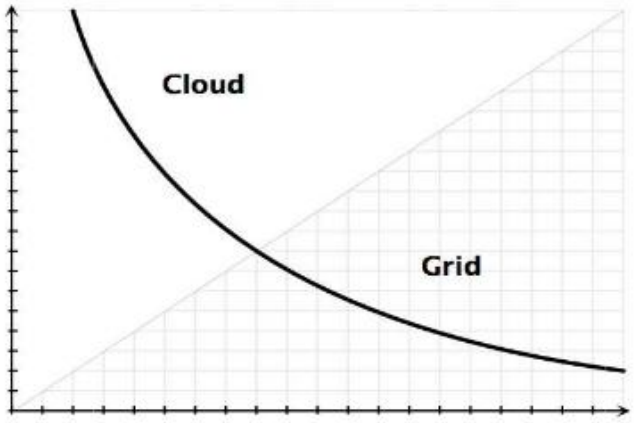

Fig 2 Scale comparison

Grids provide protocols and services at five different layers as identified in the Grid protocol architecture. At the fabric layer, Grids provide access to different resource types such as compute, storage and network resource, code repository, etc. Grids usually rely on existing fabric components, for instance, local resource managers. There are also multiple versions of definition for Cloud architecture, we define a four-layer architecture for Cloud Computing in comparison to the Grid architecture, composed of 1) fabric, 2) unified resource, 3) platform, and 4) application Layers.

The critical role of Cloud Computing goes without saying, but the importance of Client Computing cannot be overlooked either for several reasons: 1) For security reasons, people might not be willing to run mission-critical applications on the Cloud and send sensitive data to the Cloud for processing and storage; 2) Users want to get their things done even when the Internet and Cloud are down or the network communication is slow; 3) With the advances of

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multi-core technology, the coming decade will bring the possibilities of having a desktop supercomputer with 100s to 1000s of hardware threads/cores. Furthermore, many end-users will have various hardware-driven end-functionalities, such as visualization and multimedia playback, which will typically run locally.

In this section we provide the study of cloud and grid computing strategies and provide a brief about the computational need and architecture related aspects, in the next section of our survey work we provide the different platforms and services fall under the concept of cloud computing.

III. CLOUD COMPUTING

The cloud computing service models are Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). In Software as a Service model, software is hosted centrally on cloud with operating system, database and any other supporting software and user can access it through a web browser. In PaaS, an operating system, hardware, and network are provided to the customer and customer install and develop own application on it. The IaaS model provides just the hardware and network; the customer need to install or develops own operating systems, software and applications[4].

Cloud services are available to the clients by any of the cloud service model. Cloud services provided by the public cloud are made available to the user through the internet and generally maintain the cloud service provider. Cloud provider has the full control on it. In public cloud application along with storage service are made available on the internet for the general public. Service provided by the public cloud can be free and on the pay basis.

The infrastructure may be owned and operated by the organizations or by a cloud service provider. A hybrid cloud is a combination of different methods of resource pooling (for example, combining public and community clouds). [4]

Cloud services are popular because they can reduce the cost and complexity of owning and operating computers and networks. Since cloud users do not have to invest in information technology infrastructure, purchase hardware, or buy software licenses, the benefits are low up-front costs, rapid return on investment, rapid deployment, customization, flexible use, and solutions that can make use of new innovations. In addition, cloud providers that have specialized in a particular area can bring advanced services that a single company might not be able to afford or develop.

Some other benefits to users include scalability, reliability, and efficiency. Scalability means that cloud computing offers unlimited processing and storage capacity. The cloud is reliable in that it enables access to applications and documents anywhere in the world via the Internet. Cloud computing is often considered efficient because it allows organizations to free up resources to focus on innovation and product development. [5]

Another important benefit of cloud computing is that personal information is protected in cloud. cloud computing provide better security mechanism to protect the user application and data. It enable more flexible IT acquisition and improvement, which may permit adjustments to procedures based on sensitivity of data. Widespread use of the cloud may also exchange open standards for cloud computing.

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IV. DEPLOYMENT

More recently, four cloud deployment models have been defined in the Cloud community:

Private cloud: The cloud infrastructure is operated solely within a single organization, and managed by the organization or a third party regardless whether it is located premise or off premise. The motivation to setup a private cloud within an organization has several aspects. First, to maximize and optimize the utilization of existing in-house resources. Second, security concerns including data privacy and trust also make Private Cloud an option for many firms. Third, data transfer cost [2] from local IT infrastructure to a Public Cloud is still rather considerable. Fourth, organizations always require full control over mission-critical activities that reside behind their firewalls. Last, academics often build private cloud for research and teaching purposes.

Community cloud: In this model several organizations jointly construct and share the same cloud infrastructure policies to run the cloud, requirements that are needed, values, and some other concerns. This will provide the degree of economic to organization. The cloud infrastructure also can be hosted by third party to a community.

Public cloud: This is the dominant form of current Cloud deployment model. Public cloud is run by cloud service provider and has full control on it and general public use the service of it through internet on their end. Many popular example of public cloud services are Amazon EC2, S3, Google AppEngine, and Force.com.

Hybrid cloud: The cloud infrastructure is a combination of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability. Organizations use the hybrid cloud model in order to optimize their resources to increase their

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core competencies by margining out peripheral business functions onto the cloud while controlling core activities on-premise through private cloud. Interestingly, Amazon Web Services (AWS) has recently rolled out a new type of deployment model -Virtual Private Cloud (VPC), a secure and seamless bridge between an organization's existing IT infrastructure and the Amazon public cloud. This is positioned as a mixture between Private Cloud and Public Cloud. It uses computing resources pooled by Amazon for the general public. However, it is virtually private for two reasons. First reason is that a virtual private network is used for establishing connection between IT legacy and infrastructure.

Second, AWS will dedicate a set of 'isolated' resources to the VPC. However, this does not mean users have to pay these isolated resources up-front. Users still enjoy "pay-per-use" on these isolated resources. VPC represents a perfect balance between control (Private Cloud) and flexibility (Public Cloud). Notice that the service model is orthogonal to the deployment model. For example, a SaaS could provision on a Public cloud or Private cloud.

V. CLOUD SIMULATIONS

For creating a development platform for cloud computing, there need to be tools available that enables a developer to build and deploy an application without having to download anything to their desktop. Some tools are:

EyeOS

EyeOs is an open source web desktop following the cloud computing concept that seeks to enable collaboration and communication among users. It is encoded in JavaScript, PHP and in XML. It acts as a platform for web applications written using the eyeOS Toolkit. It includes a Desktop environment having 67 different types of applications and system utilities. It is accessible by portable devices via its mobile front end.

Aneka

Aneka is a flexible, extensible market oriented cloud application development and deployment solution. It allows servers and desktop PCs to be linked together to form a very powerful computing infrastructure. Some of the key features supported by ANEKA are:

- It provides a configurable and flexible execution platform.
- Aneka APIs supports three popular Cloud programming models: Task, Thread, and Map Reduce.
- SDK (Software Development Kit) containing application programming interfaces (APIs) and tools essential for rapid development of applications.
- A Runtime Engine and Platform for managing deployment and execution of applications on private or public Clouds.

Ubuntu 11.10 Oneiric Ocelots

Ubuntu 11.10 or Oneiric Ocelot is the fifteenth version of the Ubuntu OS family. Oneiric Ocelot includes major features of Ubuntu including desktop, server, cloud, Kubuntu, Xubuntu, Lubuntu, Edubuntu, Mythbuntu, and Ubuntu Studio. It also includes a customized Unity greeter. Kubuntu showcases the best and the newest features of the KDE Platform, Plasma Workspaces, and Applications (including the Muon Software Centre). Ubuntu Server introduces a technical preview of Juju, a modern approach to service deployment and orchestration on cloud and bare metal environments, and support for the ARM architecture.

Windows Azure

Microsoft Windows Azure Platform is a Microsoft cloud computing platform used to build, host and scale web applications through Microsoft data centers. Azure is classified as platform as a service and forms part of Microsoft's cloud computing strategy, along with its software as a service offering, Microsoft Online Services.

Globus Nimbus

This is an open source tool compatible with infrastructure as a service implementation. It provide the feature to scientific community such as support for proxy credentials, batch schedulers etc.. The Amazon EC2 interface is carried over, but is not the only interface you can choose.

Manjrasoft Aneka 2.0

Aneka is a market oriented Cloud development and management platform with rapid application development and distribution capabilities. It is an integrated middleware package that allows building and managing an interconnected network. Additionally it provides the accelerating of application development, deployment and management of distributed applications using Microsoft .NET frameworks on networks. It allows to build, schedule, provision and monitor results using pricing, accounting, QoS/SLA services in private and/or public (leased) network

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environments. Some of the key feature of Aneka over other GRID or Cluster based workload distribution solutions is:

a. Rapid deployment tools and framework

b. Ability to harness multiple virtual and/or physical machines for accelerating application result

c. Provisioning based on QoS/SLA

d. Support of multiple programming and application environments

e. Simultaneous support of multiple run-time environments

f. Built on-top of Microsoft .NET framework, with support for Linux environments through Mono.

Below table shows the feature comparison of some cloud service providers tool.

Properties	**Amazon EC2**	**Google App Engine**	**Micro soft Azure**	**Manjras oft Aneka**
Service type	Iaas	Iaas – Paas	Iaas – Paas	Paas
User access interface	Web api and command line tool	Web api command line tool	Azure web portal	Web api
Platform and runtime	Linux, windows	Linux	.NET on windo w	.NET on window/ Linux
Deployment model	Customizab le VM	Web apps (Python, Java, JRuby)	Azure Servic es	Applicati ons (C#, C++, VB…)

Table 1 Comparing some feature of various cloud service provider

VI. SYNCHRONIZATION TOOLS

For managing different cloud storage services and for synchronization between them, there need to be tools available. Some of them are presented below.

CloudFuze: - CloudFuze is a desktop based application that allows single sign in for multiple cloud based services. It is used for managing cloud data across multiple cloud such as Google Drive, Dropbox, Box, SugarSync and FTP with easy. By using this service in synchronization we can edit, delete, create and rename folder, and drag and drop item between desktop and cloudFuze file manager and can share their content. By this tool we can share content b/w our cloud services.

Otixo: - It is a web based tool for cloud user. It is like a file manager for all our cloud services and social networking sites. This tools support for Dropbox, Box, Google Drive, SugarSync, CX, Facebook, SkyDrive, Amazon S3, etc. this tools can be used for to do copy and paste between services. By this tool we can access all our cloud services with a single credentials.

Hojoki:- It is an android and IOS based tool used for provide collaboration between different cloud services like Basecamp, Box, Dropbox, Evernote, Google Drive, SkyDrive, Twitter etc. it is used for messaging b/w collaborated services, manage tasks and forget notification from connected application.

VII.CONCLUSION

In this paper we provide the different research challenges and working environment of cloud and their similar technologies. this paper includes architectural and deployment services and application additionally at last part of the information we include the different development tools and techniques of cloud computing.

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