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An Analysis of Cloud Model-Based Security for Computing Secure Cloud Bursting and Aggregation in Real Environment

Pritesh Jain[1], Vaishali Chourey[2], Dheeraj Rane[3]
M.Tech Scholar, Medicaps Institute of Technology &Management, Indore, India[1]
Head, PG Department of Information technology, Medicaps Institute of Technology &Management, Indore[2]
PG Department of Information Technology, Medicaps Institute of Technology & Management Indore, India[3]

Abstract

Cloud Computing has emerged as a major information and communications technology trend and has been proved as a key technology for market development and analysis for the users of several field. The practice of computing across two or more data centers separated by the Internet is growing in popularity due to an explosion in scalable computing demands. However, one of the major challenges that faces the cloud computing is how to secure and protect the data and processes the data of the user. The security of the cloud computing environment is a new research area requiring further development by both the academic and industrial research associations. While cloud-bursting is addressing this process of scaling up and down across data centers .To provide secure and reliable services in cloud computing environment is an important issue. One of the security issues is how to reduce the impact of denial-of-service (DoS) attack or distributed denial-of-service (DDoS)in this environment. In this paper we survey several aspects of cloud computing and the security concerns.

Keywords

Cloud Computing, Cloud Model, Security Model, Cloud

1. Introduction

Cloud computing is TCP/IP based high development and integrations of computer technologies such as fast microprocessor, huge memory, high-speed network and reliable system architecture. Cloud computing is an application implementation of distribution computing, parallel computing, grid computing and “Software as a Service” in the service oriented architecture. As a new kind of resource sharing and service mode, cloud computing platform could flexibly group various service resources by the centralized resources In 2007, IBM and Google announced collaboration in cloud computing [1]. The term “cloud computing” become popular from then on. Beside the web email, the Amazon Elastic Compute Cloud (EC2) [2], Google App Engine [3] and Salesforce’s CRM [4] largely represent a promising conceptual foundation of cloud services. The services of cloud computing is broadly divided into three categories: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS) [5, 6]. Cloud computing also is divided into five layers including clients, applications, platform, infrastructure and servers. The five layers look like more reasonable and clearer than the three categories [7].

Cloud computing has evolved through a number of implementations. Moving data into the cloud provides great convenience to users. Cloud computing is a collection of all resources to enable resource sharing in terms of scalable infrastructures, middleware and application development platforms, and value-added business applications [8].

The characteristics of cloud computing includes: virtual, scalable, efficient, and flexible. Computation is increasingly becoming mobile with the proliferation of the relatively inexpensive and networked mobile devices. Mobile devices will continue to be the only computing devices accessible to populations in developing countries. The global market for mobile devices is bound to grow in leaps and bounds, as more and more echelons of the global society get added to the economic mainstream. The Ubiquitous Computer that the cloud represents needs to scale to this need very quickly. Any paradigm shift in computing cannot afford to overlook mobility aspect to be successful.

Many organizations rely on dedicated clusters for running computing applications. Users submit an application as Bags-of-Tasks to a scheduler, which then executes those tasks as independent processes. A typical cluster purchase is based on expected usage and funding. The size of the cluster and therefore the number of available resources is static, and cannot increase dynamically. It is common to have periods when the demand on the cluster exceeds capacity but these peaks do not justify the purchase of new resources to increase the throughput. Nonetheless, over shorter time periods the increased load can be very heavy, and making the existing IT infrastructure inadequate to provide a reasonable service.

Since cloud computing is an on-demand computing paradigm, immediate and automated leasing is a favorite scheduling strategy. And most of the strategies is both being an automated scheduling and considering the maximum usage of resources. To achieve an optimal or suboptimal allocation for immediate cloud services, the cloud environment with security is the best option.

We provide here an overview of executing data mining services on grid. The rest of this paper is arranged as follows: Section 2 introduces Cloud Computing; Section 3 describes about Security model; Section 4 shows the Grid Structure and Evolution; Section 5 describes the challenges. Section 6 describes Conclusion and outlook.

2. Cloud Computing

Cloud computing refers to the provision of computational resources on demand via a computer network. Users or clients can submit a task, such as word processing, to the service provider, such as Google, without actually possessing the software or hardware. The consumer's computer may contain very little software or data (perhaps a minimal operating system and web browser only), serving as little more than a display terminal connected to the Internet. Since the cloud is the underlying delivery mechanism, cloud based applications and services may support any type of software application or service in use today.

In the past, both data and software had to be stored and processed on or near the computer. The development of Local Area Networks allowed for a system in which multiple CPUs and storage devices may be organized to increase the performance of the entire system. In an extension to that concept, cloud computing fundamentally allows for a functional separation between the resources used and the user's computer, usually residing outside the local network, for example, in a remote datacenter. Consumers now routinely use data intensive applications driven by cloud technology which were previously unavailable due to cost and deployment complexity. In many companies employees and company departments are bringing a flood of consumer technology into the workplace and this raises legal compliance and security concerns for the corporation.

The term "software as a service" is sometimes used to describe programs offered through "The Cloud". A common shorthand for a provided cloud computing service (or even an aggregation of all existing cloud services) is "The Cloud" An analogy to explain cloud computing is that of public utilities such as electricity, gas, and water. Centralized and standardized utilities freed individuals from the difficulties of generating electricity or pumping water. All of the development and maintenance tasks involved in doing so were alleviated. With Cloud computing, this translates to a reduced cost in software distribution to providers who still use hard mediums such as DVDs. Consumer benefits are that software no longer has to be installed and is automatically updated but savings in terms of dollars is yet to be seen.

The principle behind the cloud is that any computer connected to the Internet is connected to the same pool of computing power, applications, and files. Users can store and access personal files such as music, pictures, videos, and bookmarks or play games or do word processing on a remote server rather than physically carrying around a storage medium such as a DVD or thumb drive. Even those who use web-based email such as Gmail, Hotmail, Yahoo, a company owned email, or even an e-mail client program such as Outlook, Evolution, Mozilla Thunderbird or Entourage are making use of cloud email servers. Hence, desktop applications which connect to cloud email can also be considered cloud applications.

Cloud computing builds on established trends for driving the cost out of the delivery of services while increasing the speed and agility with which services are deployed. It shortens the time from sketching out application architecture to actual deployment. Cloud computing incorporates virtualization, on-demand deployment, Internet delivery of services, and open source software. From one perspective, cloud computing is nothing new because it uses approaches, concepts, and best practices that have already been established. From another perspective, everything is new because cloud computing changes how we invent, develop, deploy, scale, update, maintain, and pay for applications and the infrastructure on which they run.

The increased degree of connectivity and the increasing amount of data has led many providers and in particular data centers to employ larger infrastructures with dynamic load and access balancing. By distributing and replicating data across servers on demand, resource utilization has been significantly improved. Similarly web server hosts replicate images of relevant customers who requested a certain degree of accessibility across multiple servers and route requests according to traffic load.
However, it was only when Amazon published these internal resources and their management mechanisms for use by customers that the term “cloud” was publicly associated with such elastic infrastructures – especially with “on demand” access to IT resources in mind. In the meantime, many providers have rebranded their infrastructures to “clouds”, even though this had little consequences on the way they

provided their capabilities.

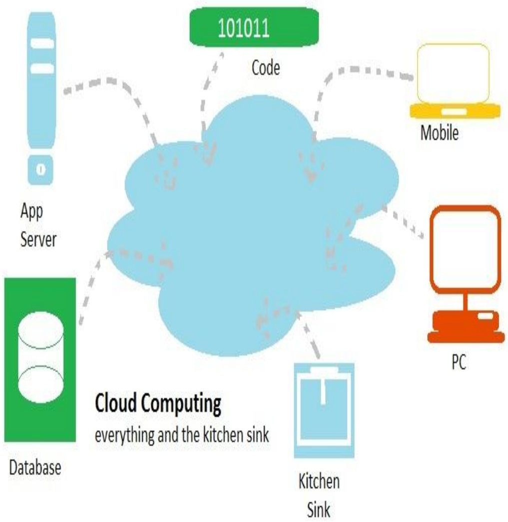

Fig 1. Advent of Cloud Computing

3. Security Model

Sun's view of cloud computing is an inclusive one: cloud computing can describe services being provided at any of the traditional layers from hardware to applications (Fig 2). In practice, cloud service providers tend to offer services that can be grouped into three categories: software as a service, platform as a service, and infrastructure as a service. These categories group together the various layers illustrated in Figure 2, with some overlap.

Software as a service (SaaS)
Software as a service features a complete application offered as a service on demand. A single instance of the software runs on the cloud and services multiple end users or client organizations. The most widely known example of SaaS is salesforce.com, though many other examples have come to market, including the Google Apps offering of basic business services including email and word processing. Although salesforce.com preceded the definition of cloud computing by a few years, it now operates by leveraging its companion force.com, which can be defined as a platform as a service.

Platform as a service (PaaS)
Platform as a service encapsulates a layer of software and provides it as a service that can be used to build higher-level services. There are at least two perspectives on PaaS depending on the perspective of the producer or consumer of the services:

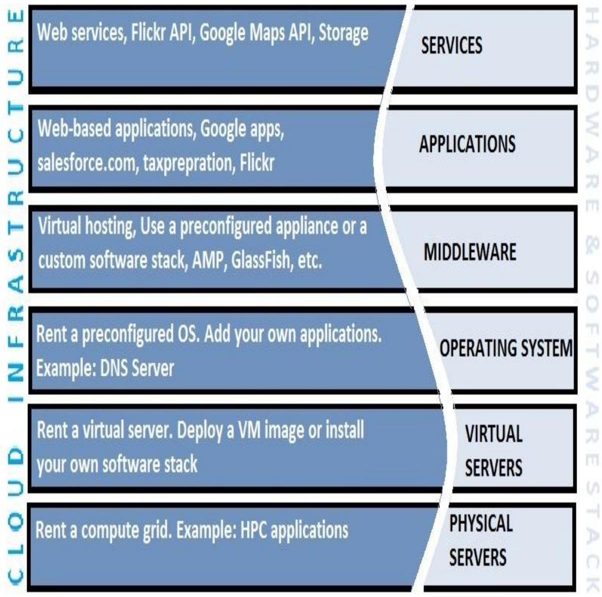

Fig 2. Cloud Computing Layer

• Someone producing PaaS might produce a platform by integrating an OS, middleware, application software, and even a development environment that is then provided to a customer as a service. For example, someone developing a PaaS offering might base it on a set of Sun™ xVM hypervisor virtual machines that include a NetBeans™ integrated development environment, a Sun GlassFish™ Web stack and support for additional programming languages such as Perl or Ruby.

• Someone using PaaS would see an encapsulated service that is presented to them through an API. The customer interacts with the platform through the API, and the platform does what is necessary to manage and scale it to provide a given level of service. Virtual appliances can be classified as instances of PaaS. Content switch appliance, for example, would have all of its component software hidden from the customer, and only an API or GUI for configuring and deploying the service provided to them.

PaaS offerings can provide for every phase of software development and testing, or they can be specialized around a particular area such as content management. Commercial examples of PaaS include the Google Apps Engine, which serves applications on Google's infrastructure. PaaS services such as these can provide a powerful basis on which to deploy applications, however they may be constrained by the capabilities that the cloud provider chooses to deliver.

Infrastructure as a service (IaaS)
Infrastructure as a service delivers basic storage and compute capabilities as standardized services over the

network. Servers, storage systems, switches, routers, and other systems are pooled and made available to handle workloads that range from application components to high-performance computing applications. Commercial examples of IaaS include Joyent, whose main product is a line of virtualized servers that provide a highly available on-demand infrastructure.

4. Grid Structure and Evolution

Grid computing concerns the application of the resources of many computers in a network to a single problem at the same time, usually to a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data.

There is an on-going confusion about the relationship between Grids and Clouds [9], sometimes seeing Grids as "on top of" Clouds, vice versa or even identical. More surprising, even elaborate comparisons (such as [10][11][12]) still have different views on what "the Grid" is in the first instance, thus making the comparison cumbersome. Indeed most ambiguities can be quickly resolved if the underlying concept of Grids is examined first: just like Clouds, Grid is primarily a concept rather than a technology thus leading to many potential misunderstandings between individual communities.

With respect to research being carried out in the Grid over the last years, it is therefore recommendable to distinguish (at least) between (1) "Resource Grids", including in particular Grid Computing, and (2) "eBusiness Grids" which centres mainly on distributed Virtual Organizations and is closer related to Service Oriented Architectures (see below). Note that there may be combination between the two, e.g. when capabilities of the eBusiness Grids are applied for commercial resource provisioning, but this has little impact on the assessment below.

Resource Grids try to make resource - such as computational devices and storage - locally available in a fashion that is transparent to the user. The main focus thereby lies on availability rather than scalability, in particular rather than dynamic scalability. In this context we may have to distinguish between HPC Grids, such as EGEE, which select and provide access to (single) HPC resources, as opposed to distributed computing Grids (cf. Service Oriented Architecture below) which also includes P2P like scalability - in other words, the more resources are available, the more code instances are deployed and executed. Replication capabilities may be applied to ensure reliability, though this is not an intrinsic capability of in particular computational Grids. Even though such Grid middleware(s) offers manageability interfaces, it typically acts on a layer on top of the actual resources and thus does rarely virtualise the hardware, but the computing resource as a whole (i.e. not on the IaaS level).

In 2010, Yi Hu et al. [13] proposed about security aware and fault-tolerant jobs scheduling strategy for grid (SAFT), which makes the assess of SD and SL to become more flexible and more reliable. Meanwhile, the different fault-tolerant strategy has been applied in grid job scheduling algorithm by the SD and job workload. Moreover, much more important, we are able to set up some rules and active each qualitative rule to select a suitable fault tolerant strategy for a scheduling job by input value (the SD and job workload) to realize the uncertainty reasoning.

In 2010, Hai Zhong et al. [14] proposed about simulation experiments indicate that their dynamic scheduling policy performs much better than that of the Eucalyptus, Open Nebula, Nimbus IaaS cloud, etc. The tests illustrate that the speed of the IGA almost twice the traditional GA scheduling method in Grid environment and the utilization rate of resources always higher than the open-source IaaS cloud systems**.**

In 2010, Yu Weng1 et al. [15] proposed about cloud architecture for psychological health analysis and describes the service component representation, workflow customization and workflow execution. With the excellent semantic representation ability of resource description frame (RDF), a service component metadata representation method is presented. Through querying the metadata of service component, end-users could choose the service components and customize the logic workflow on demand.

5. Challenges

Most research projects pursue a strong open source approach, which is beneficial for both the community pursuing existent results further, as well as for uptakes that do not want to be restricted to a specific vendor and / or want to adapt the application / service to their specific needs. It should be noted in this context that Europe has a strong background in open source code development.

Related to this, Europe has a wider market and governmental structure at its disposal and accordingly more expertise and influence on global policies, legislation issues and global business models than most other nations. This expertise and capability will prove particularly useful to build up new global policies and regulate cloud specific legislations.

Similarly, this knowledge can be employed to provide the environment into new business models and expertise to ensure economic value creation from the employment of cloud systems for various use cases. This information can be used for new systems that automate the cloud configuration even more efficiently.

The issue implicitly relates to aspects of Green IT, which currently has found little support in cloud systems, but is a significant issue in current data centre design. It should be noted here that, just because the "cloud" in Europe is not visible, it does not imply that it does not exist: in fact, just like the Grid, several companies already employ cloud technologies for the provisioning of enhanced services to their customers. As noted, the concept of cloud computing is not new as such and as opposed to many other technology, not first driven by research but developed and exploited from a commercial perspective from the beginning. Countries hence already have a comparatively strong background in (indirect) cloud provisioning, and its industrial players already show the relevant business incentives to take the final steps towards cloud usage. However, there is little effort being vested into making the according systems publically available, i.e. European vendors typically employ cloud strategies for improved service provisioning (cloud adopters & vendors) rather than selling cloud infrastructures (cloud providers or resellers).

6. Conclusion and Outlook

Cloud providers have begun offering users at-cost access to on demand computing infrastructures. We also discuss about a Cloud-based cooperative cache system for reducing execution times of data-intensive processes. The resource allocation algorithm presented herein is cost-conscious as not to over-provision Cloud resources. We have evaluated our system extensively, showing that, among other things, our system is scalable to varying high workloads.

The benefits of deploying applications using cloud computing include reducing run time and response time, minimizing the risk of deploying physical infrastructure, lowering the cost of entry, and increasing the pace of innovation. Cloud computing can help to increase the pace of innovation. The low cost of entry to new markets helps to level the playing field, allowing start-up companies to deploy new products quickly and at low cost. This allows small companies to compete more effectively with traditional organizations whose deployment process in enterprise datacenters can be significantly longer.

In future we concentrate on the real time scenario with their implementation.

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