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Experimental Analysis on Cloud Computing Security in a Small Environment

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Abstract: Cloud computing is a general term for the delivery of facilitated benefits over the web. Cloud computing permits the clients and ventures with different abilities to store and procedures their information in either exclusive cloud, or on an outsider server keeping in mind the end goal to make information getting to components significantly more simple and dependable. At the point when an association chooses to store information or host applications on general society cloud, it loses its capacity to have physical access to the servers facilitating its data. Accordingly, possibly delicate information is at hazard from insider assaults. With a specific end goal to share assets, cut expenses, and look after effectiveness, Cloud Service Providers regularly store more than one client's information on a similar server. Accordingly, quite possibly one client's private information can be seen by different clients. To deal with such circumstances, cloud specialist should ensure to guarantee appropriate information seclusion and sensible stockpiling isolation. The security administration tends to these issues with security controls. These controls are set up to protect any shortcomings in the framework and decrease the impact of an assault.

Keywords: Cloud computing, IAAS, PAAS, SAAS, Security, attacks.

INTRODUCTION

Cloud computing describes the act of storing, managing and processing data online as opposed to on your own physical computer or network. is a type of computing that relies on sharing computing resources rather than having local servers or personal devices to handle applications. In cloud computing, the word cloud (also phrased as "the cloud") is used as a metaphor for "the Internet," so the phrase cloud computing means "a type of Internet-based computing," where different services - such as servers, storage and applications - are delivered to an organization's computers and devices through the Internet.

In Cloud computing applies traditional supercomputing, or high-performance computing power, normally used by military and research facilities, to perform tens of trillions of computations per second. In consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive online computer games.

Cloud computing uses networks of large groups of servers; typically running low-cost consumer PC technology, with specialized connections to spread data-processing chores across them. This shared IT infrastructure contains large pools of systems that are linked together. Often, virtualization techniques are used to maximize the power of cloud computing. These Cloud providers, also known as Infrastructure as a Service (IaaS) providers, allow users to set up and customize execution environments according to their application needs. It offers the illusion of infinite computing resources available on demand, with the elimination of upfront commitment from users, and Payment for the use of computing resources on a short term Basis as needed.

The term “cloud” has also been used in various contexts such as describing large ATM networks in the 1990s.However, it was after Google’s CEO Eric Schmidt used the word to describe the business model of providing services across the Internet in 2006, that the term really started to gain popularity. Since then, the term cloud computing has been used mainly as a marketing term in a variety of contexts to represent many different ideas. Certainly, the lack of a standard definition of cloud computing has generated not only market hypes, but also a fair amount of skepticism and confusion. For this reason, recently there has been work on standardizing the definition of cloud computing. As an example, the work in compared over 20 different definitions from a variety of sources to confirm a standard definition. In this paper, we adopt the definition of cloud computing provided by The National Institute of Standards and Technology (NIST), as it covers, in our opinion, all the essential aspects of cloud computing:

NIST definition of cloud computing: Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources for e.g., networks, servers, storage, applications, and services that can be rapidly provisioned and released with minimal management effort or service provider interaction. The main reason for the existence of different perceptions of cloud computing is that cloud computing, unlike other technical terms, is not a new technology, but rather a new operations model that brings together a set of existing technologies to run business in a different way. Indeed, most of the technologies used by cloud computing, such as virtualization and utility-based pricing, are not new. Instead, cloud computing leverages these existing technologies to meet the technological and economic requirements of today's demand for information technology.

CLOUD COMPUTING ARCHITECTURE

Generally speaking, the architecture of a cloud computing environment can be divided into 4 layers: the hardware/datacenter layer, the infrastructure layer, the platform layer and the application layer, as shown in Fig. below.

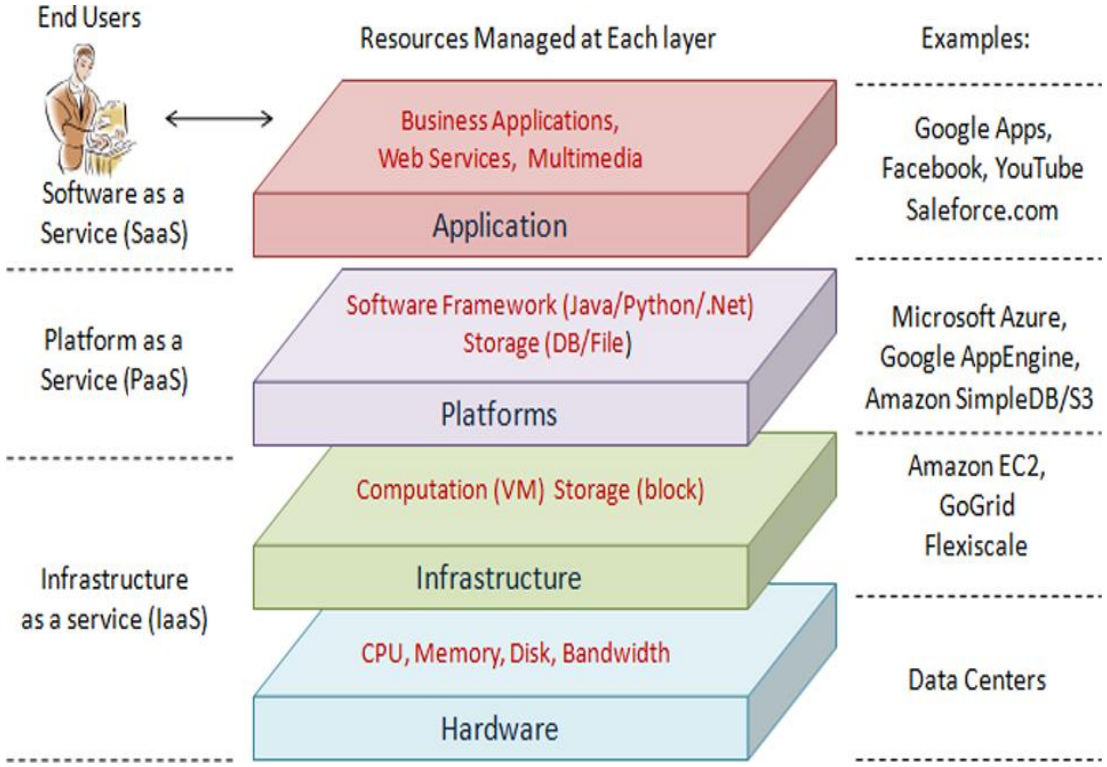

Figure 1: cloud computing architecture layers

The hardware layer: This layer is responsible for managing the physical resources of the cloud, including physical servers, routers, switches, power and cooling systems. In practice, the hardware layer is typically implemented in data centers. A data center usually contains thousands of servers that are organized in racks and interconnected through switches, routers or other fabrics. Typical issues at hardware layer include hardware configuration, faulttolerance, traffic management, power and cooling resource management.

The infrastructure layer: Also known as the virtualization layer, the infrastructure layer creates a pool of storage and computing resources by partitioning the physical resources using virtualization technologies such as Xen, KVM and VMware . The infrastructure layer is anessential component of cloud computing, since many key features, such as dynamic resource assignment, are only made available through virtualization technologies.

The platform layer: Built on top of the infrastructure layer, the platform layer consists of operating systems and application frameworks. The purpose of the platform layer is to minimize the burden of deploying applications directly into VM containers. For example, Google App Engine operates at the platform layer to provide API support for implementing storage, database and business logic of typical web applications.

The application layer: At the highest level of the hierarchy, the application layer consists of the actual cloud applications. Different from traditional applications, cloud applications can leverage the automatic-scaling feature to achieve better performance, availability and lower operating cost. Compared to traditional service hosting

environments such as dedicated server farms, the architecture of cloud computing is more modular. Each layer is loosely coupled with the layers above and below, allowing each layer to evolve separately. This is similar to the design of the OSI model for network protocols. The architectural modularity allows cloud computing to support a wide range of application requirements while reducing management and maintenance overhead.

BUSSINESS MODEL

Cloud computing employs a service-driven business model. In other words, hardware and platform-level resources are provided as services on an on-demand basis. Conceptually, every layer of the architecture described in the previous section can be implemented as a service to the layer above. Conversely, every layer can be perceived as a customer of the layer below. However, in practice, clouds offer services that can be grouped into three categories: software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS).

1. Infrastructure as a Service: IaaS refers to on-demand provisioning of infrastructural resources, usually in terms of VMs. The cloud owner who offers IaaS is called an IaaS provider. Examples of IaaS providers include Amazon EC2, GoGrid and Flexiscale.
2. Platform as a Service: PaaS refers to providing platform layer resources, including operating system support and software development frameworks. Examples of PaaS providers include Google App Engine, Microsoft Windows Azure.
3. Software as a Service: SaaS refers to providing on demand applications over the Internet. Examples of SaaS providers include, Rackspace and SAP Business By Design .The business model of cloud computing is depicted by Fig. . According to the layered architecture of cloud computing, it is entirely possible that a PaaS provider runs its cloud on top of an IaaS provider's cloud. However, in the current practice, IaaS and PaaS providers are often parts of the same organization (e.g., Google and Salesforce). This is why PaaS and IaaS providers are often called the infrastructure providers or cloud providers.

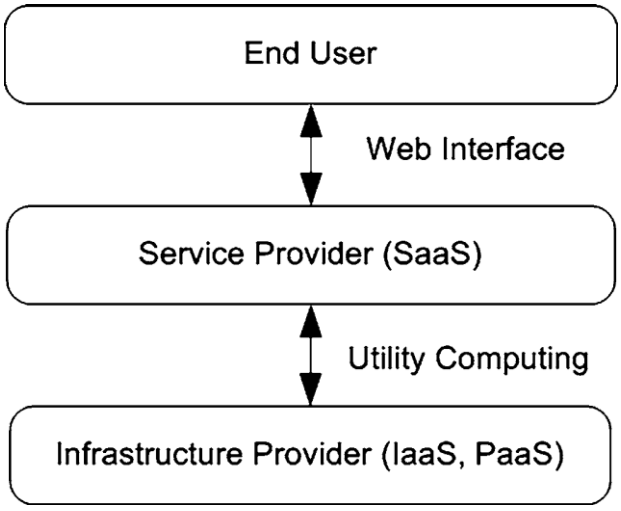

Figure 2: Business Model of Cloud Computing

INFRASTRUCTURE AS A SERVICE

Cloud computing have also facilitated the realization of new models such as IaaS. Infrastructure as a Service is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components. The service provider owns the equipment and is responsible for housing, running and maintaining it. The client typically pays on a per-use basis. The main idea is to supply users with on-demand access to computing or storage resources and charge fees for their usage. In these models, users pay only for the resources they utilize. A key provider of this type of on-demand infrastructure is Amazon Inc. with its Elastic Compute Cloud (EC2).

SECURITY ANALYSIS

- Software as a Service (SaaS). The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client Devices through a thin client interface such as a web Browser (e.g., web-based email).

- Platform as a Service (PaaS). The capability provided to the consumer is to deploy onto the cloud Infrastructure his own applications without installing any platform or tools on their local machines. PaaS Refers to providing platform layer resources, Including operating system support and software Development frameworks that can be used to build Higher-level services.

- Infrastructure as a Service (IaaS). The capability Provided to the consumer is to provision processing, Storage, networks, and other fundamental Computing resources where the consumer is able to deploy and run arbitrary software, which can Include operating systems and applications.

1. Software-as-a-service (SaaS) security issues SaaS provides application services on demand such as email, conferencing software, and business applications such as ERP, CRM, and SCM [30]. SaaS users have less control over security among the three fundamental. Software-as-a-service (SaaS) security issues SaaS provides application services on demand such as email, conferencing software, and business applications such as ERP, CRM, and SCM [30]. SaaS users have less Control over security among the three fundamental.

2. Application security: - Most of these applications are delivered through internet however flaws in application may create vulnerabilities in Saas applications. We can employ smart techniques in development phase of our application to counter measure attacks like URL hacking, sql injection etc.

3. Data security:- As in cloud users rely on cloud venders to provide secure features to their data and application. So it is vulnerable to attack. In critical cases we should implement security features like encryption of critical data before placing it to cloud and decrypting it after receiving it to our system.

4. Paas security issues: - As paas offers underplaying architecture to support our application runtime environment. So here we need to ensure security at two layers. First at underlying architecture that should be ensured by cloud venders. Second is security at software development life cycle to ensure flexibility in process to accommodate up gradations in application and in cloud components.

5. Iaas security issues: - As Iaas provides full control over computational resources to users. So security issue here is less serious. But still as underlying hardware is not in control of user. Because virtual machines share a no. of resources so vulnerability at one resource may lead to same in others. So cloud venders should ensure that there is no security leaks in these resources. And also they should offer limited access to these resources to avoid Dos like attacks.

PROGRESS SEQUENCE OPERATION AND APPLICATION

Implementing Secure Crud Operations

Prerequisites

- The Ruby language version 1.9.3 or newer
- The Ruby Gems packaging system
- To learn more about Ruby Gems, please read the Ruby Gems
- A working installation of the SQLite3 Database

Rails

Rails are a web application development framework written in the Ruby language. It is designed to make programming web applications easier by making assumptions about what every developer needs to get started. It allows you to write less code while accomplishing more than many other languages and frameworks.

Creating a New Rail Application

Here we are going to create a ruby and rail application web-blog.

a) 3.1.3.1. Installing Rails

Verify that you have a current version of Ruby installed:
$ ruby -v
ruby 1.9.3p385

To verify that you have everything installed correctly, you should be able to run the following:

$ rails --version

If it says something like "Rails 4.0.0", you are ready to continue.

b) 3.1.3.2. Creating the Blog Application

Here we are going to create a ruby rails application i.e. Web-blog.

c) 3.1.4. Hello Rails!

To begin with, let's get some text up on screen quickly. To do this, you need to get your Rails application server running.

d) 3.1.4.1 Starting up the Web Server

You actually have a functional Rails application already. To see it, you need to start a web server on your development machine. You can do this by running:
$ rails server

This will fire up WEBrick, a web server built into Ruby by default. To see your application in action, open a browser window and navigate to http://localhost:3000. You should see the Rails default information page:

To stop the web server, hit Ctrl+C in the terminal window where it's running. The "Welcome Aboard" page is the smoke test for a new Rails application: it makes sure that you have your software configured correctly enough to serve a page.

e) 3.1.4.2 Say "Hello", Rails

To get Rails saying "Hello", you need to create at minimum a controller and a view.

A controller's purpose is to receive specific requests for the application. Routing decides which controller receives which requests. Often, there is more than one route to each controller, and different routes can be served by different actions. Each action's purpose is to collect information to provide it to a view. A view's purpose is to display this information in a human readable format. An important distinction to make is that it is the controller, not the view, where information is collected. The view should just display that information. By default, view templates are written in a language called ERB (Embedded Ruby) which is converted by the request cycle in Rails before being sent to the user.To create a new controller, you will need to run the "controller" generator and tell it you want a controller called "welcome" with an action called "index", just like this:
$ rails generate controller welcome index

Open the app/views/welcome/index.html.erb file in your text editor. Delete all of the existing code in the file, and replace it with the following single line of code:
<h1>Hello, Rails!</h1>

Figure 3: create a new controller

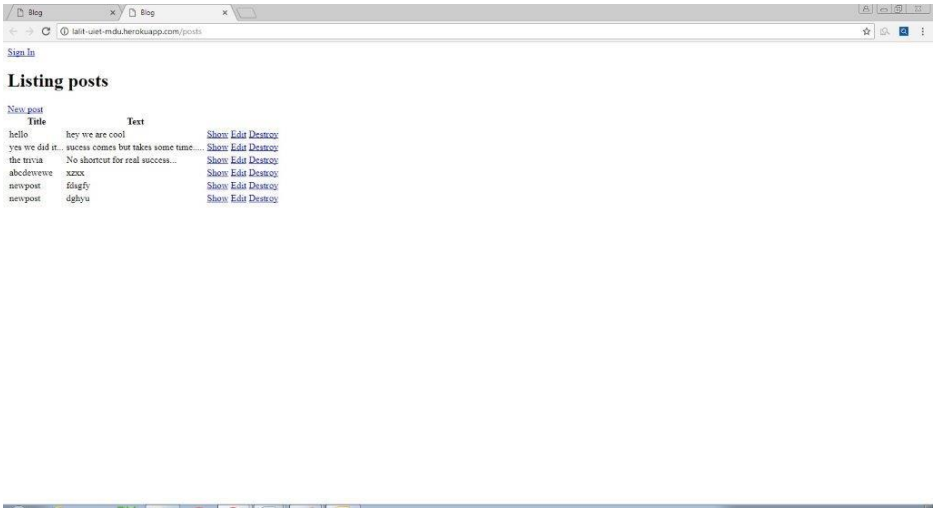

Figure 4: generate a new post

CONCLUSION

Cloud computing has started to obtain mass appeal in corporate data centers as it enables the data center to operate like the Internet through the process of enabling computing resources to be accessed and shared as virtual resources in a secure and scalable manner. In this paper, we have surveyed the state-of-the-art of cloud computing, covering its essential concepts, architectural designs and security issues and counter measures. We believe that small application developers can make a good use of cloud vendors for hosting their applications. As the development of cloud computing technology is still at an early stage, we hope our work will provide a better understanding of the design challenges of cloud computing, and pave the way for further research in this area.

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