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Benefit and Security Issues in Cloud Computing

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Abstract:

In this paper we had described about the cloud computing and how cloud computing becomes beneficial in the field of business. In this paper I have given the name of top Cloud Service providers in the world and how it becomes beneficial for the Microsoft technology to reduce its number of servers from 75 to only 12 – cutting maintenance cost significantly. This paper also provides the information about the components of Cloud Computing and how they interact with each other. This paper gives the information regarding various types of services provided by the cloud which is one of the major benefits of cloud computing. This paper also provide the information about various security challenges related to the cloud computing.

Keywords--Cloud Computing, Clients, Datacenter, Distributed Server, Mobile Client, Thin Client, Thick Client, Secure data transfer, Secure software interfaces, Secure stored data, User access control, Data separation.

I. INTRODUCTION

Cloud computing is internet based computing power. For years the Internet has been represented on network diagrams by a cloud symbol until 2008 when a variety of new services started to emerge that permitted computing resources to be accessed over the Internet termed cloud computing [1]. Cloud computing has emerged as one of the hottest concepts in Information and Communication Technology (ICT) today. The big possible savings promised by virtualization and on-demand resource usage also attract the telecom industry [2]. Most of the social networking sites based on the cloud computing. Cloud computing is a new method to add capabilities to a computer without licensing new software, investing in new hardware or infrastructure or training new personnel. Applications are purchased, licensed and run over the network instead of users desktop. It provides common business applications online that are that are accessed from a web browser, while the software and data are stored on the servers [3].

A. Definition of Cloud Computing

There seems to be many definitions of cloud computing around. A study by McKinsey (the global management consulting firm) found that there are 22 possible separate definitions of cloud computing. In fact, no common standard or definition for Cloud Computing seems to exist (Grossman, 2009; Voas & Zhang, 2009)[4].

It starts with a premise that the data services and architecture should be on servers. We call it cloud computing, they should be in "cloud" somewhere. Eric Schmidt**--**Wikipedia Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the common use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation [5].

II. COMPONENTS OF CLOUD COMPUTING

Cloud computing is made up of following three components:

A. Client

Clients are in a cloud computing architecture, exactly the same things that they are in a plain, old, every day local area network (LAN), they are typically the computers that sit on your desk. In cloud computing a client may be a Laptop, a phone or PDA. Anyway, clients are the devices that end user interact with to manage their information on the cloud.

i) *Mobile Client:* Mobile devices includes PDAs or Smartphone's, Windows Mobile, Smartphone or iphone.

ii) *Thin Client*: A thin client (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on some other computer. It does not have internal hard drives, but rather let the server does all the work, but then displays the information.

iii) *Thick Client:* A Thick client (also called heavy, rich, or fat client) is a computer (client) in client–server *architecture* or networks that typically provides rich functionality independent of the central server. Originally known as just a "client" or "thick client". This type of client using a web browser like Firefox or Internet Explorer to connect the cloud.

B. Data Center

A data center or computer centre (also datacenter) is a facility used to house computer systems and associated components, such as telecommunications and storage systems. It generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g., air conditioning, fire suppression) and security devices. A grooming trend in IT world is virtualizing server. That is, software can be installed allowing multiple instances of virtual servers to be used. In this way you can have half a dozen virtual servers running on one Physical Server.

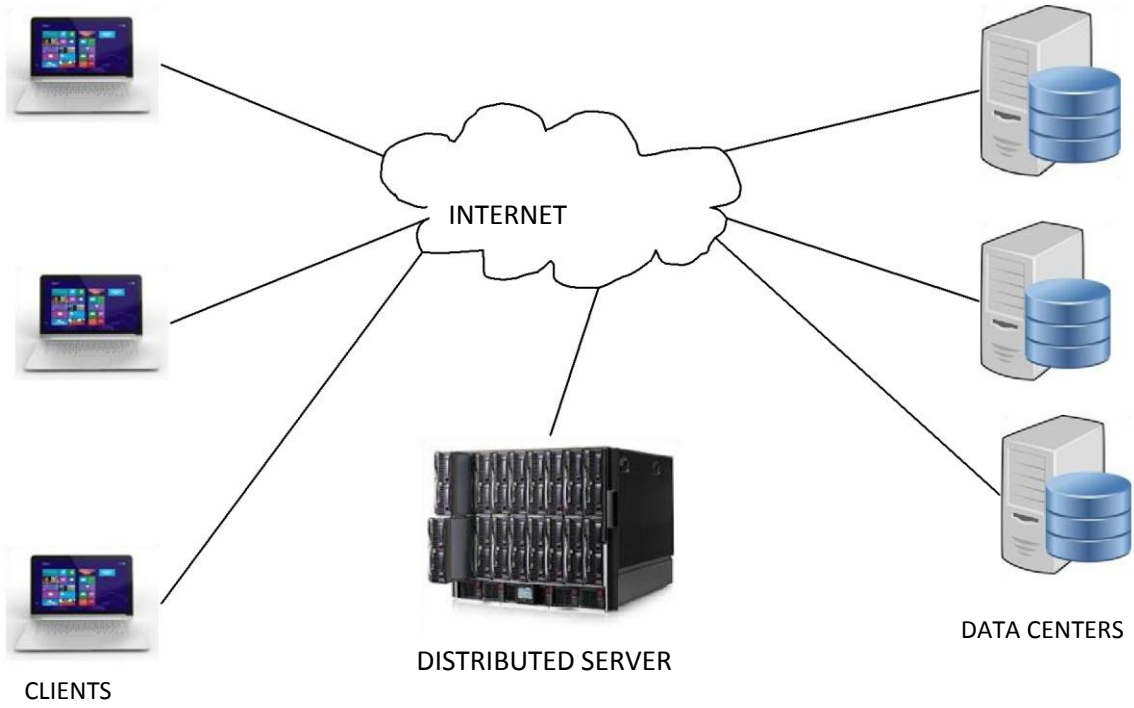

Fig. 1 Components of Cloud Computing

C. Distributed Servers

Often Servers are in geographically disparate locations. But to you, the cloud subscriber, these servers act as if they're humming away right next to each other. This gives the service provider more flexibility in options and security. For instance Amazon has their cloud solution in servers all over the world. If something were to happen at one site, causing failure the service would still be accessed through another site. Also if the cloud needs more hardware, they need not throw more servers in the safe room – they can add them at another site and simple make it part of cloud.

III. SERVICES PROVIDED BY THE CLOUD

A. Types of Services

A cloud can either be public or private. A public cloud is where the services is provided on demand for any number of clients and private cloud is where the services is provided to a single client.

B. Services

There are so many services which are provided by the cloud computing.

i) *Storage-as-a-service* : (also known as disk space on demand), as you may expect, is the ability to leverage storage that physically exists at a remote site but is logically a local storage resource to any application that requires storage. This is the most primitive component of cloud computing and is a component or pattern that is leveraged by most of the other cloud computing components.

ii) *Database-as-a-service (DaaS)*: provides the ability to leverage the services of a remotely hosted database; sharing it

with other users and having it logically function as if the database were local. Different models are offered by different providers, but the power is to leverage database technology that would typically cost thousands of dollars in hardware and software licenses.

iii) *Information-as-a-service*: is the ability to consume any type of information, remotely hosted, through a well-defined interface such as an API. Examples include stock price information, address validation, and credit reporting.

iv) *Process-as-a-service:* is remote resource that can bind many resources together, such as services and data, either hosted within the same cloud computing resource or remotely, to create business processes. You can think of a business process as a meta-application that spans systems, leveraging key services and information that are combined into a sequence to form a process. These processes are typically easier to change than are applications and thus provide agility to those who leverage these processes engines that are delivered on demand.

v) *Application-as-a-service (AaaS):* also known as software-as-a-service (SaaS), is any application that is delivered over the platform of the Web to an end user, typically leveraging the application through a browser. While many people associate application-as-a-service with enterprise applications such as Salesforce SFA, office automation applications are indeed applications-as-a-service as well, including Google Docs, Gmail, and Google Calendar.

vi) *Platform-as-a-service (PaaS:* is a complete platform, including application development, interface development, database development, storage, testing, and so on, delivered through a remotely hosted platform to subscribers. Based on the traditional time-sharing model, modern platform-as-a-service providers provide the ability to create enterprise-class applications for use locally or on demand for a small subscription price or for free.

vii) *Integration-as-a-service:* is the ability to deliver a complete integration stack from the cloud, including interfacing with applications, semantic mediation, flow contr ol, integration design, and so on. In essence, integration-as-a-service includes most of the features and functions found within traditional enterprise application integration (EAI) technology but delivered as a service.

viii) *Security-as-a-service:* as you may have guessed, is the ability to deliver core security services remotely over the Internet. While the typical security services provided are rudimentary, more sophisticated services such as identity management are available.

ix) *Management/governance-as-a-service (MaaS and GaaS):* is any on-demand service that provides the ability to manage one or more cloud services. These are typically simple things such topology, resource utilization, virtualization, and uptime management. Governance systems are becoming available as well, offering, for instance, the ability to enforce defined policies on data and services.

x) *Testing-as-a-service (TaaS):* is the ability to test local or cloud-delivered systems using testing software and services that are remotely hosted. It should be noted that while a cloud service requires testing unto itself, testing-as-a-service systems have the ability to test other cloud applications, Web sites, and internal enterprise systems, and they do not require any hardware or software footprint within the enterprise.

xi) *Infrastructure-as-a-service (IaaS):* is actually data center-as-a-service, or the ability to remotely access computing resources. In essence, you lease a physical server that is yours to do with as you will and, for all practical purposes, is your data center, or at least part of a data center. The difference with this approach versus more mainstream cloud computing is that instead of using an interface and a metered service, you have access to the entire machine and the software on that machine. In short, it is less packaged.

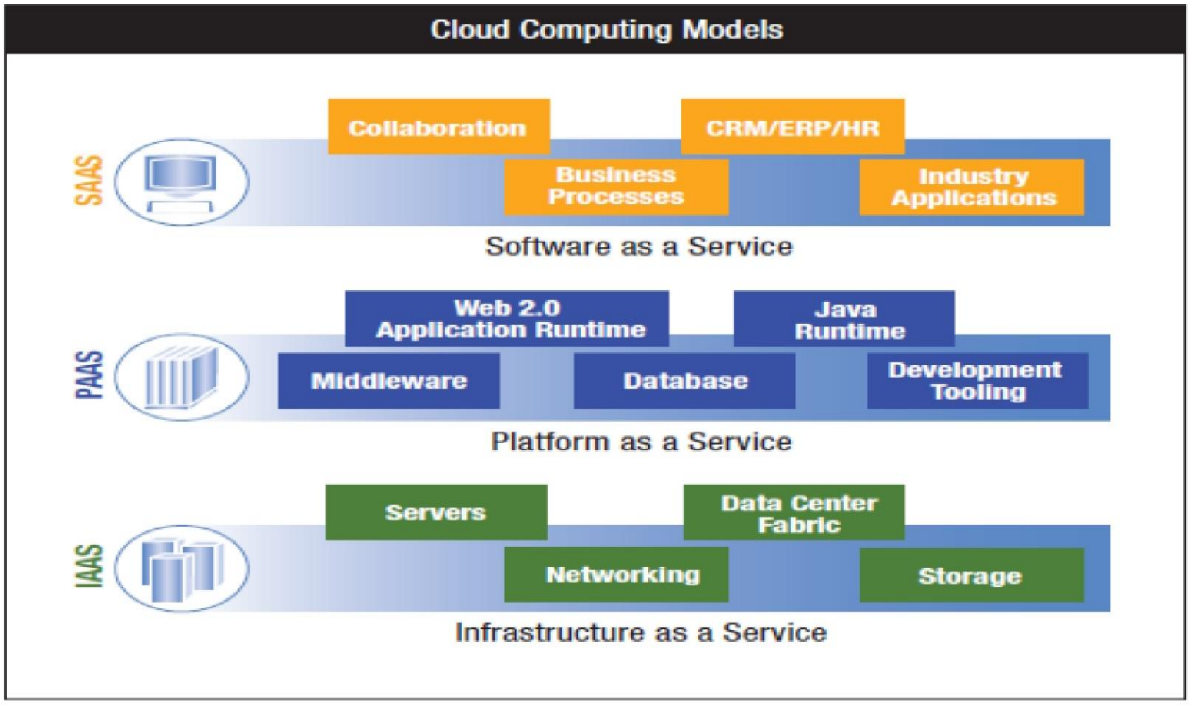

Fig.2 Cloud Computing Services Delivery Model

IV. ADVANTAGES

A. Price

It is easy to see that start-up enterprise companies do not have to invest huge sums of money into setting up infrastructure such as huge application servers, data servers, database administrators, people resources for managing such critical systems including backup and recovery, etc. Instead, enterprise companies pay for services based on usage.

i) *Flexibility and cost:* Economics, simplification and convenience of the way computing-related services are delivered seem to be among the main drivers of cloud computing (Erdogmus, 2009). Many see huge potential of the technology in reducing the cost of IT to organizations and freeing them from the expense and hassle of having to install and maintain applications locally (Leavitt, 2009). Providing IT services in the cloud shifts much of this expense to a pay-as-you-go model and consequently offers significant cost advantages according to one view (Lin, Fu, Zhu, & Dasmalchi, 2009). Furthermore, a great proportion of the costs of running an IT infrastructure comes from electricity consumption (needed to run hardware e.g., PCs, servers, switches, backup drives, etc.) and cooling (needed to reduce the heating generated by the hardware). Cloud computing is likely to reduce expenditure in this area and also reduce labor-related costs, as less people (e.g., technicians) than before will be required to run a cloud-based IT infrastructure[4].

ii) *Cloud computing can cut business cost by half:* By acquiring cloud computing solutions, businesses can save up to 50% of what they spend on maintaining their information technology (IT) infrastructure "Cloud computing is all about building a shared pool of configurable computing resources – network, servers, storage, applications and services – and letting the end user consume these resources, whenever he wants" Cloud provides better return on investment.

iii) For example, one of Microsoft's clients that deployed the technology reduced its number of servers from 75 to only 12 – cutting maintenance cost significantly [6].

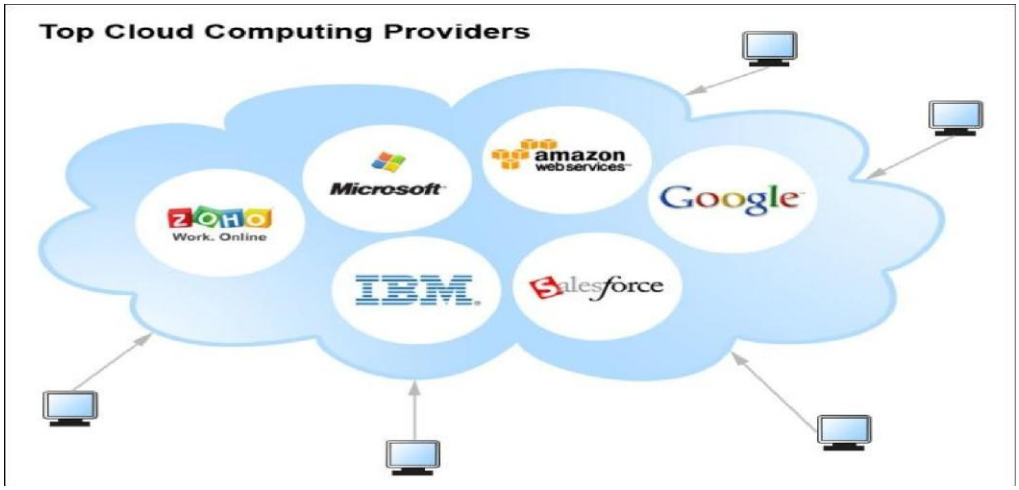

Fig. 3 Top Cloud Computing Provider

B. Simplicity

It is simple to use and set up all the services without having to worry about resource management and other hassles that come with infrastructure set up and management.

C. Reliability

Network and data access are guaranteed to be reliably maintained as the service provides are experts in maintaining the infrastructure and such reliability is backed by some kind of "money back guarantees" or penalties for the providers in the event if they have a down time.

D. Flexibility

Service consumers have the flexibility to "outsource" parts of the infrastructure and can still maintain to some extent proprietary data at their own site.

E. Collaboration

Since all the applications are on the cloud, it becomes a natural fit for consumers to effectively collaborate on a common project or application.

V. SECURITY ISSUES IN CLOUD COMPUTING

Security has always been the main issue for IT Executives when it comes to cloud adoption. In two surveys carried out by IDC in 2008 [7] and 2009 [8] respectively, security came top on the list (see Figure 4).

When evaluating potential providers of cloud-based services, you should keep these top five security concerns in mind.

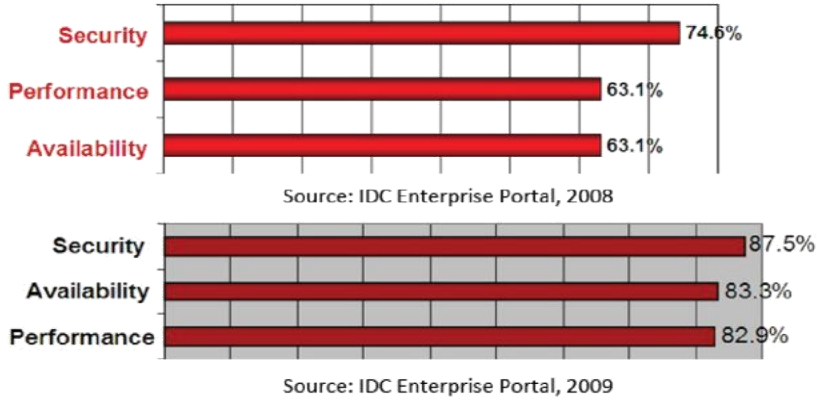

Fig. 4 Top 3 issues with the cloud/on-demand model

A. Secure data transfer

All of the traffic travelling between your network and whatever service you're accessing in the cloud must traverse the Internet. Make sure your data is always travelling on a secure channel; only connect your browser to the provider via a URL that begins with "https." Also, your data should always be encrypted and authenticated using industry standard protocols, such as IPSec (Internet Protocol Security), that have been developed specifically for protecting Internet traffic.

B. Secure software interfaces

The Cloud Security Alliance (CSA) recommends that you be aware of the software interfaces, or APIs, that are used to interact with cloud services. "Reliance on a weak set of interfaces and APIs exposes organizations to a variety of security issues related to confidentiality, integrity, availability, and accountability," says the group in its Top Threats to Cloud Computing document. CSA recommends learning how any cloud provider you're considering integrates security throughout its service, from authentication and access control techniques to activity monitoring policies.

C. Secure stored data

Your data should be securely encrypted when it's on the provider's servers and while it's in use by the cloud service. In Q&A: Demystifying Cloud Security, Forrester warns that few cloud providers assure protection for data being used within the application or for disposing of your data. Ask potential cloud providers how they secure your data not only when it's in transit but also when it's on their servers and accessed by the cloud-based applications. Find out, too, if the providers securely dispose of your data, for example, by deleting the encryption key.

D. User access control

Data stored on a cloud provider's server can potentially be accessed by an employee of that company, and you have none of the usual personnel controls over those people. First, consider carefully the sensitivity of the data you're allowing out into the cloud. Second, follow research firm Gartner's suggestion to ask providers for specifics about the people who manage your data and the level of access they have to it.

E. Data separation

Every cloud-based service shares resources, namely space on the provider's servers and other parts of the provider's infrastructure. Hypervisor software is used to create virtual containers on the provider's hardware for each of its customers. But CSA notes that "attacks have surfaced in recent years that target the shared technology inside Cloud Computing environments." So, investigate the compartmentalization techniques, such as data encryption, the provider uses to prevent access into your virtual container by other customers.

VI. CONCLUSIONS

Cloud computing offers real benefits to companies seeking a competitive edge in today's economy. Many more providers are moving into this area, and the competition is driving prices even lower. Attractive pricing, the ability to free up staff for other duties, and the ability to pay for "as needed" services will continue to drive more businesses to consider cloud computing.

Just as there are advantages to cloud computing, there are also several key security issues to keep in mind. One such concern is that cloud computing blurs the natural perimeter between the protected inside the hostile outside. Security of any cloud-based services must be closely reviewed to understand what protections your information has.

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