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Data Storage Security in Cloud Computing

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***Abstract*—**Cloud computing has achieved a lot of publicity in the current world of I.T. Cloud computing is the biggest thing in the Internet world. Cloud computing is the use of the Internet for the tasks performed on the computer and it is visualized as next generation architecture of IT industry. The Cloud represents the internet. Internet is used for the communication. Cloud computing is used for the companies and the organizations. Cloud computing is related to several technologies. The different service models ie. SaaS, laaS, PaaP and development model i.e. Private, Public, Hybrid which are used with the companies and the organizations for the data security. In comparison to conventional methods Cloud Computing transfer application software and databases to the large data centers, where the data and services will not be fully trustworthy. This researcher paper, focus on secure data storage in cloud.

***Keywords*—** *Cloud computing, data security, cloud storage.*

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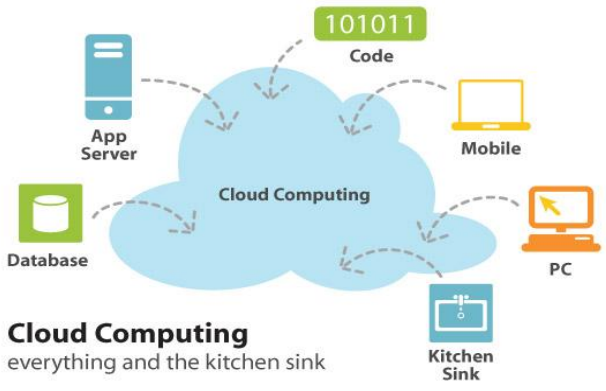
I. INTRODUCTION

Cloud computing, the long-proposed dream of computing as a utility, has the potential to transform a large part of the IT industry, making the software even more appealing as a service and shaping the way IT hardware is designed and purchased. (1) Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of organize computing resources like networks, servers, storage, applications, and services that can be rapidly provisioned and publish with minimal management effort or service provider interaction. (2) Developers with innovative ideas for new Internet services once require the large capital outlays in hardware to deploy their service or the human expense to operate it. (1) Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of setting up computing resources like networks, servers, storage, applications and services such that can be rapidly provisioned and promptly with minimal management effort.



Cloud computing has become a highly demanded service or benefit due to the advantages of high computing power, cheap cost of services, high performance, scalability, accessibility as well as obtainability. Vendors are experiencing growth rates of 50% per annum, but due to being in early stages, it still has pitfalls that need proper attention to make cloud computing services more reliable and user-friendly. (3)

II. THE FIVE CHARACTERISTICS THAT DEFINE CLOUD COMPUTING

A. On-demand self-service

On-demand self-service: A consumer can unilaterally provision computing potential, such as server time and network storage, as needed automatically without requiring human interaction with each service provider.(5) This means that computing facilities can be accessed from anywhere over the network using any variety of thin or thick clients (for example smartphones, tablets, laptops, personal computers and so on).

B. Ubiquitous network access

Capabilities are available over the network and accessed through standard mechanisms that promote utilize by heterogeneous thin or thick client platforms (e.g., mobile phones, tablets, laptops and workstations). (5) This means that computing facilities can be accessed from anywhere over the network using any sort of thin or thick clients.

C. Resource pooling

The contributor's computing resources are pooled to serve multiple consumers using a multi-tenant model, with unlike physical and virtual resources dynamically assigned and reassigned according to consumer demand. There is a sense of location self-determination in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to definitely location at a higher level of abstraction. Examples of resources involve storage, processing, memory and network bandwidth. (5) This means that computing resources are pooled to meet the

demand of the consumers so that resources (physical or virtual) can be dynamically assigned, reassigned or de-allocated as per the requirement. Normally, the consumers are not aware of the exact location of computing resources. However, they may be able to specify a location (country, city, region and the like) for their need. For example, I as a consumer might want to host my services with a cloud contributor that has cloud data centers within the boundaries of India.

D. Rapid elasticity

Can be potential for elastically provisioned and released, in some cases automatically, to scale rapidly outward and inward commensurate with the request. To the consumer, the capabilities available for provisioning often appear to be unlimited and can be suitable in any quantity at any time. (5) Cloud computing provides an illusion of unlimited computing resources to the users. In cloud models, resources can be elastically provisioned or released according to the request. For example, my cloud-based online services should be able to handle a sudden peak in traffic demand by expanding the resources elastically. When the peak became less intense, unnecessary resources can be released automatically.

E. Measured service

Cloud systems are mechanically controlled and optimize resource use by leveraging a metering capability at some level of abstraction suitable for the kind of service (e.g., storage, processing, bandwidth, and active user account). Resource usage would be monitored, controlled and reported, providing transparency for the provider and consumer.[5] This means that consumers only pay for the computing resources they have used. This concept is alike to utilities like water or electricity.

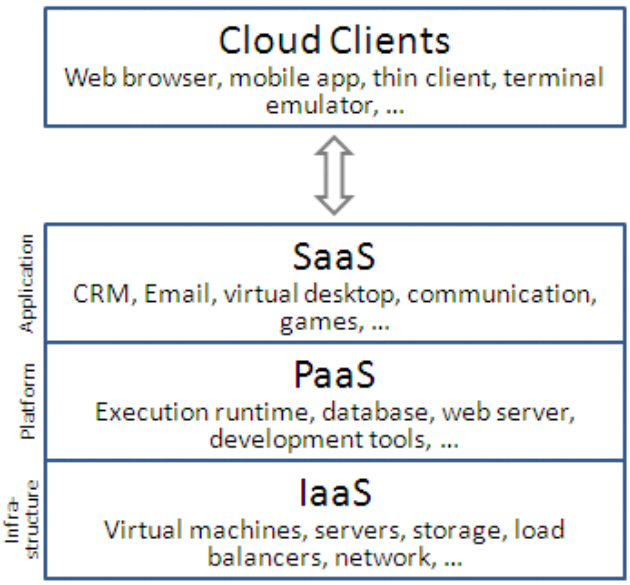


Fig. 1. Service Models. (7)

III. THREE MAIN SERVICE MODELS OF CLOUD COMPUTING

A. Software as a service (SaaS)

Applications hosted by a contributor on a cloud infrastructure are accessed from thin or thick clients over the network or a program interface. (6)

B. Platform as a service (PaaS)

Providers deliver not only infrastructure but also middleware and solution piles for application build development and deploy. IBM Smart Cloud Application Services and Google App Engine are the two examples of PaaS. (6)

C. Infrastructure as a service (IaaS)

It is the delivery of computing infrastructure as a service. There are some examples like IBM SmartCloud Enterprise+, SoftLayercloud and Amazon EC2 of IaaS. (6)

IV. DEPLOYMENTNG MODELS

A. Private cloud

It is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted likewise internally or externally. When done right, it can improve business, but every step in the project raises security problems that must be addressed to prevent serious vulnerabilities. They have a significant physical footprint, requiring assign of space, hardware and environmental controls.

B. Public cloud

A cloud is called public cloud when services are rendered on a network that is open for public use. Public cloud services may be free. Technically there may be minor or no difference between public and private cloud architecture, however, security consideration may be substantially unlike for services (applications, storage, and other resources) that are made available by the service provider for the public audience and when communication is effected over a non-trusted network.

C. Hybrid cloud

It is a constituent of two or more clouds (private, community or public) that remain distinct entities but are bound together, offering the benefits of various deployment models. Hybrid cloud can also mean the ability to connect collocation, managed and or devoted services with cloud resources.

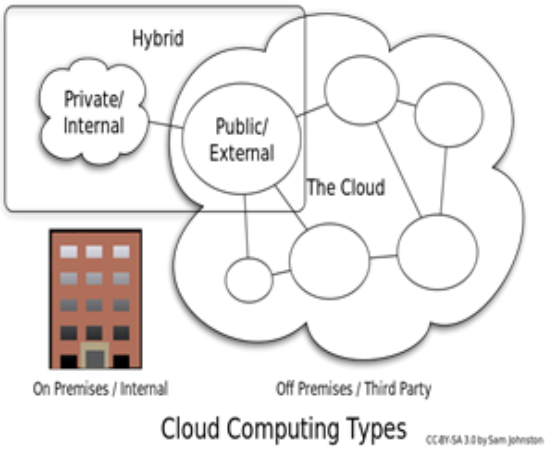


Fig. 2. Deployement Models. (7)

V. CLOUD COMPUTING SECURITY ISSUES:

A. Critical business data at risk

The chief concern firms have with the cloud which has the security of their data. Putting information into services that are accessible over the public internet means that criminals have potential gold mine of targets.

B. Little room for negotiation on contracts

Another risk the cloud poses that you are utterly at the mercy of the terms and conditions offered by cloud providers. They set the contracts and the offers around key problems like service level availability and it's up to you to accept them.

C. Cost-saving benefits disappear as demand grows

One of the most cited benefits of the cloud is that it is cheaper than on-premise installations. This would be true for small deployments, but for larger firms, it can often end up being cheaper to ditch the cloud.

D. Lack of internet access leaves data out of reach

We live in an age of fair connectivity, but there are occasions when this access disappears, leaving us cut off from the digital world. While using the cloud, the results can be a nightmare.

E. Cloud vendor outages leave you high and dry

On the flip side of the above, even if your network is absolutely resilient or you're willing to splash out for ridiculous WiFi charges, that don't guarantee cloud access.

F. Automatic updates enforce change

One of the benefits of the cloud, according to its devotees, that it removes much of the discard of managing systems. For example, when a new update is available it happens seamlessly, managed by the vendor and rolled out to users in a fast, efficient manner. Of course, if you don't want the update, well, tough luck. (8)

VI. SOLUTIONS FOR CLOUD COMPUTING ISSUES:

A. Water hole attacks

The attacker does some reconnaissance and research on its target, in which they discover, trusted websites often visited by employees of the target company. Second, attackers enter an exploit into the trusted sites. Finally, when your employees visit the trusted site, the exploit takes benefit of their system vulnerabilities.

B. Verify the access controls

Set up data access control with rights and then confirm these access controls by the cloud service provider whenever data is being used by cloud service consumer. To implement the access control methods for consumer side, the cloud service provider must describe and ensure that the only authorized users who can access the user or consumer's data. (9)

C. Monitor the Data Access

Cloud service providers have to ensure about whom, when and what data is being accessed for what purpose. For example, many website or server had a security complaint concerning snooping activities by many people such as listening to voice calls, reading emails and personal data etc.

D. Share demanded records and Verify the data deletion

If the user or consumer needs to report its compliance and then the cloud service provider will share diagrams or any other information or provide audit records to the consumer or user. And also to verify the proper deletion of data from shared or reused devices. Many providers do not provide for the actual degaussing of data from drives each time the drive space is abandoned. Insist on a assure deletion process and have that process written into the contract.

E. Security check events

Ensure that the cloud service provider gives enough details about the fulfillment of promises, break remediation and reporting contingency. These security events will relate responsibility, promises, and actions of the cloud computing service provider. (10)

VII. CLOUD COMPUTING AFFECTS PRIVACY

The major privacy issues in cloud computing environment relate to:

1) Trust
2) Uncertainty
3) Complience

The most common problem related to privacy in cloud computing environment.

A. Lack of User Control

Full control of user on the data is not possible in the cloud, since both the visibility and control of a user is minimized as soon as the cloud environment is used. The key aspects here are, that in cloud computing the personal data of a person is present on the machines which are not owned or controlled by him/her, and therefore, there is the warning of the data being stolen, misused or even resold without authorization.

B. Lack of Training and Expertise

The deployment and running of cloud services require high skill jobs, but the unavailability of highly skilled people is a serious issue from the point of view of information security. Employees may also not understand the consequences their decisions could have on privacy. The increase of technology has also worsened the scenario, as more employees are now able to cause such privacy problems which may have far-reaching consequences.

C. Unauthorized Secondary Usage

The risk of unauthorized use of data either it is stored or processed in the cloud is always present. The authorized secondary usage of any user's data by the service provider to obtain revenue is part of the standard business model. However, the data could also be used in a way which is unacceptable to the user. (11)

VIII. BENEFITS IN CLOUD COMPUTING

Cloud computing has some benefits are as follows:

A. Reduced IT cost

Moving to cloud computing may minimize the cost of managing and maintaining your IT systems. we able to reduce your operating costs because the cost of the system upgrades, new hardware and software may be included in their contract ,we no longer need to pay wages for expert staff and their energy consumption costs may be reduced. (12) Cloud computing can significantly reduce the cost and complexity of owning and the operating computers and networks. If an organization uses a cloud provider, it does not require spending money on information technology infrastructure or buying hardware or software licenses.

B. Flexibility

Cloud-based services are ideal for businesses with growing or fluctuating bandwidth demands. If your needs increase it's simple to scale up your cloud capacity, drawing on the service's remote servers. Likewise, if you need to scale down again, the flexibility is baked into the service. (12) Cloud services can often be customized and flexible to use, and providers can provide advanced services that an individual company might not have the money or expertise to develop.

C. Disaster recovery

Businesses of all the sizes should be investing in robust disaster recovery, but for smaller businesses that lack needed cash and expertise, this is often more an ideal than the reality. Cloud is now helping more organizations buck that trend. (13) For businesses that are considering using a cloud service, cloud computing could provide better protection of personal information compared with current security and privacy practices. Cloud providers may be inspired to build privacy protections into new technology, and to support better audit trails.

D. Security

Lost laptops are a billion dollar business issues. And potentially greater than the loss of an expensive piece of kit is the loss of sensitive data inside it. (13) Cloud computing may not increase the risk that personal information will be misused or improperly exposed to it could increase the scale of exposure. The aggregation of data in a cloud provider can make that data be very attractive to cyber criminals for example. Moreover, given how inexpensive it is to keep data in the cloud, there may be a tendency to keep it indefinitely, thereby increasing the risk of breaches.

IX. CONCLUSION

The current environment, cloud computing is one of the top technologies trends and intends to be the saving solution for optimizing the IT budgets. A better way with cloud computing, we can eliminate those headaches because we are not managing hardware and software that has the responsibility of an experienced vendor. The shared infrastructure means it works like an untidy. We only pay for what you need, upgrades are automatic, and scaling up or down is easy.

Cloud Computing is a way to serve the necessity of computation through the virtualization of some resources through the Internet. Under a virtualized management, accessible to the users and other services through the Internet under pay per use payment system.

Recently the Cloud Computing market includes more companies, each and every one of them developing the business further more. Mainly, reason is the acceptance and adoption of these revolutionary technologies.

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