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Considerations on Models, Algorithms And Security Challenges In Cloud Computing

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Abstract_ From the perspective of data security, which has always been an important aspect of quality of service, cloud computing focuses a new challenging security threats. Therefore, a data security model must solve the most challenges of cloud computing security. Cloud Computing is a set of IT Services that are provided to a customer over a network and these services are delivered by third party provider who owns the infrastructure. It is often provided "as a service" over the Internet, typically in the form of infrastructure as a service (IaaS), platform as a service (PaaS), or software as a service (SaaS). If authorized person accesses successfully in his cloud, the data is decrypted in real time for your use. The default gateway platform must contain strong and fast encryption algorithm, file integrity, malware detection, firewall, tokenization and more. This paper describes about the different security algorithms , Data Security Model,security issues and security attacks in cloud computing.

Keywords: Cloud computing, Infrastructure, Service, Security Algorithms. Cloud computing, randomness testing.

1. Introduction

In the traditional model of computing, both data and software are fully contained on the user's computer; in cloud computing, the user's computer may contain almost no software or data (perhaps a minimal operating system and web browser, display terminal for processes occurring on a network). Cloud computing is based on five attributes: multi-tenancy (shared resources), massive scalability, elasticity, pay as you go, and self-provisioning of resources, it makes new improvements in processors, Virtualization technology, disk storage, broadband Internet connection, and combined fast, inexpensive servers to make the cloud to be a more compelling solution. Cloud computing is a technology that keep up data and its application by using internet and central remote servers [1]. Cloud computing can be considered a new computing paradigm with implications for greater flexibility and availability at lower cost. Because of this, cloud computing has been receiving a good deal of attention lately. The four deployment models operated by cloud computing are the: Public Cloud, Private Cloud, Community Cloud, and Hybrid Cloud as shown in Fig 1.Each model has its own features and especial characteristics that suits to the cloud users' particular reasons in embracing cloud computing.

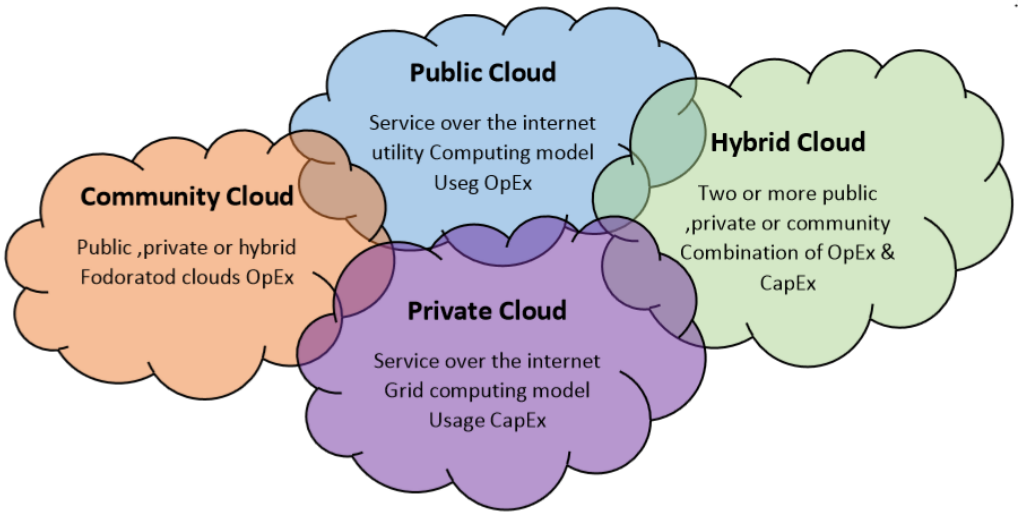

Fig 1: Deployment models operated by Cloud Computing

Private cloud -- The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.

Community cloud -- The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise.

Public cloud -- The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services and the comparison of private and public cloud as shown in fig2.

Hybrid cloud -- The cloud infrastructure is a composition 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 (e.g., cloud bursting for load-balancing between clouds).

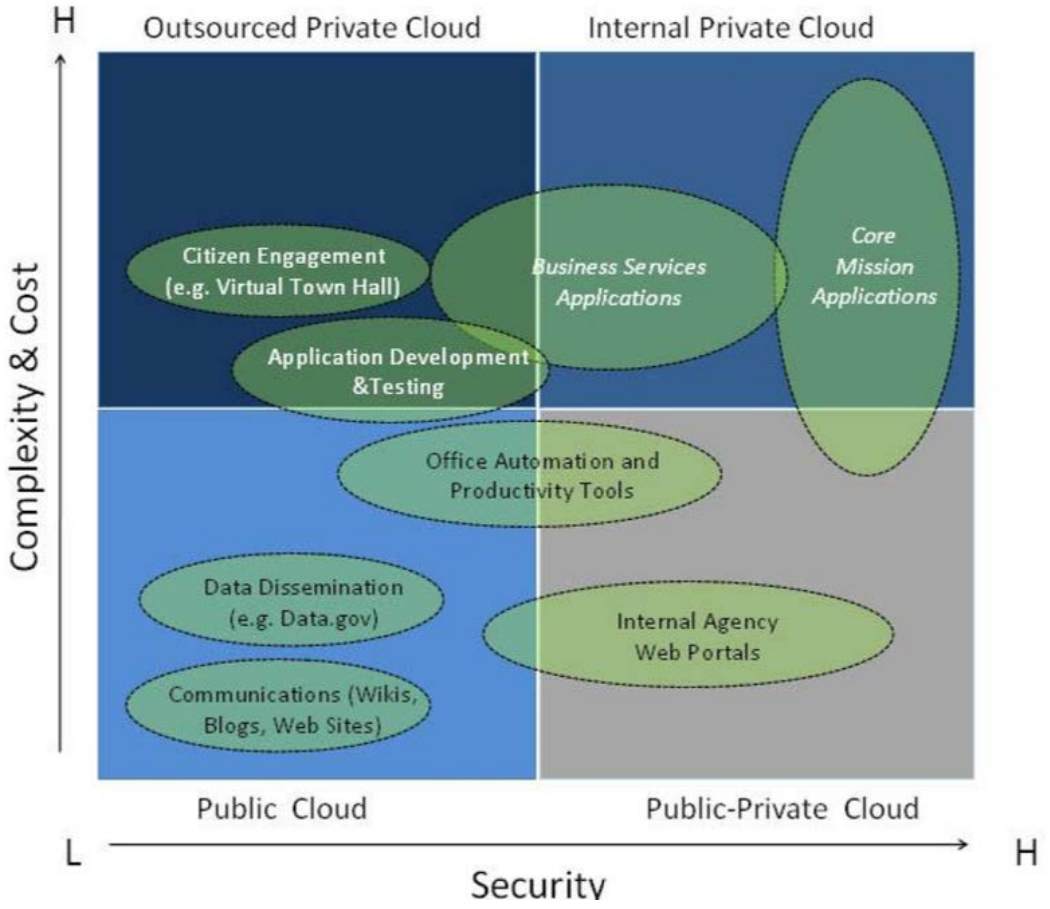

Fig 2 :Comparision of Security and complexity between Private and Public cloud.

The main attributes of cloud computing are illustrated as follows [1]: Multi-tenancy (shared resources): Cloud computing is based on a business model in which resources are shared (i.e., multiple users use the same resource) at the network level, host level and application level; Massive scalability: Cloud computing provides the ability to scale to tens of thousands of systems, as well as the ability to massively scale bandwidth and storage space; Elasticity: Users can rapidly increase and decrease their computing resources as needed; Pay as you used: Users to pay for only the resources they actually use and for only the time they require them; Self-provisioning of resources: Users' self-provision resources, such as additional systems (processing capability, software, storage) and network resources.

2. Security issues associated with the cloud

The world of computation has changed from centralized to distributed systems and now we are getting back to the virtual centralization which is the Cloud Computing. Location of data and processes makes the difference in the realm of computation. We have the cloud computing wherein, the service and data maintenance is provided by some vendor which leaves the client/customer unaware of where the processes are running or where the data is stored. So, logically speaking, the client has no control over it. The cloud computing uses the internet as the communication media. There are number of security issues/concerns associated with cloud computing but these issues fall into two broad categories: Security issues faced by cloud providers (organizations providing infrastructure as a service (IaaS), platform as a

service (PaaS), or software as a service (SaaS) via the cloud) and security issues faced by their customers[2] .In most cases, the provider must ensure that their infrastructure is secure and that their clients' data and applications are protected while the customer must ensure that the provider has taken the proper security measures to protect their information[3]. Cloud computing becomes a successful and popular business model due to its charm- ing features. In addition to the benefits at hand, the former features also result in serious cloud-specific security issues. The people whose concern is the cloud security continue to hesitate to transfer their business to cloud. Security issues have been the dominate barrier of the development and widespread use of cloud computing. Understanding the security and privacy risks in cloud computing and developing efficient and effective solutions are critical for its success.

2.1 Security issues faced by cloud providers

2.1.1 Infrastructure as a Service (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. Characteristics and components of IaaS include: Utility computing service and billing model. Automation of administrative tasks. Dynamic scaling. Desktop virtualization. Policy-based services. Internet connectivity.

2.1.2 Platform as a Service (PaaS)

Platform as a Service (PaaS) is a way to rent hardware, operating systems, storage and network capacity over the Internet. The service delivery model allows the customer to rent virtualized servers and associated services for running existing applications or developing and testing new ones. Platform as a Service (PaaS) is an outgrowth of Software as a Service (SaaS), a software distribution model in which hosted software applications are made available to customers over the Internet. PaaS has several advantages for developers. With PaaS, operating system features can be changed and upgraded frequently. Geographically distributed development teams can work together on software development projects. Services can be obtained from diverse sources that cross international boundaries. Initial and ongoing costs can be reduced by the use of infrastructure services from a single vendor rather than maintaining multiple hardware facilities that often perform duplicate functions or suffer from incompatibility problems. Overall expenses can also be minimized by unification of programming development efforts.

2.1.3 Software as a Service (SaaS)

Software as a Service (SaaS) is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the Internet.SaaS is becoming an increasingly prevalent delivery model as underlying technologies that support Web services and service-oriented architecture (SOA) mature and new developmental approaches, such as Ajax, become popular. Meanwhile, broadband service has become increasingly available to support user access from more areas around the world.SaaS is closely related to the ASP (application service provider) and on demand computing software delivery models. IDC identifies two slightly different delivery models for SaaS. The hosted application management (hosted AM) model is similar to ASP: a provider hosts commercially available software for customers and delivers it over the Web. In the software on demand model, the provider gives customers network-based access to a single copy of an application created specifically for SaaS distribution.

Benefits of the SaaS model include:

easier administration

automatic updates and patch management

compatibility: All users will have the same version of software.

easier collaboration, for the same reason

global accessibility.

The extensive use of virtualization in implementing cloud infrastructure brings unique security concerns for customers or tenants of a public cloud service[4]. Virtualization alters the relationship between the OS and underlying hardware - be it computing, storage or even networking. This introduces an additional layer - virtualization - that itself must be properly configured, managed and secured[5]. Specific concerns include the potential to compromise the virtualization software, or "hypervisor". While these concerns are largely theoretical, they do exist[6].

Dimensions of cloud security

Correct security controls should be implemented according to asset, threat, and vulnerability risk assessment matrices[7]. While cloud security concerns can be grouped into any number of dimensions (Gartner names seven[8] while the Cloud Security Alliance identifies fourteen areas of concern[9]) these dimensions have been aggregated into three general areas: Security and Privacy, Compliance, and Legal or Contractual Issues[10].

3. Security Concerns

1. Data? The main thing that is where the data is because the data is in cloud so the cloud provider should agree to provide security to the data of our customers.

2. Access? And second thing that who has access to the data that is at cloud. If anyone using the cloud needs to look at who is managing their data and what types of controls are applied

3. Training to Employees? Train the employees because the employees need to know how to access the data maintaining security

. 4. Data Classification? Because there is data of different user so the question is ―Is Data Classified‖

5 service level agreement (SLA) ? The SLA serves as a contracted level of guaranteed service between the cloud provider and the customer that specifies what level of services will be provided.

6. What happens if there is a security breach? If a security incident occurs, what support will you receive from the cloud provider? While many providers promote their services as being unhackable, cloudbased services are an attractive target to hackers.

4. SecurityAlgorithms

RSA- is an algorithm for public-key cryptography, involves a public key and a private key. The public key can be known to everyone and is used for encrypting messages. Messages encrypted with the public

key can only be decrypted using the private key. user data include encryption prior to storage, user authentication procedures prior to storage or retrieval, and building secure channels for data transmission.

MD5- (Message-Digest algorithm 5), a widely used cryptographic hash function with a 128-bit hash value, processes a variable-length message into a fixed-length output of 128 bits. The input message is broken up into chunks of 512-bit blocks . the message is padded so that its length is divisible by 512. In this sender use the public key of the receiver to encrypt the message and receiver use its private key to decrypt the message.

AES- In cryptography, the Advanced Encryption Standard (AES) is a symmetric-key encryption standard. Each of these ciphers has a 128-bit block size, with key sizes of 128, 192 and 256 bits, respectively [11]. AES algorithm ensures that the hash code is encrypted in a highly secure manner. AES has a fixed block size of 128 bits and uses a key size of 128 in this paper. Its algorithm is as follows:

1. Key Expansion

2. Initial Round

3. Add Round Key

4. Rounds

5. Sub Bytes—a non-linear substitution step where each byte is replaced with another according to a lookup table.

6. Shift Rows—a transposition step where each row of the state is shifted cyclically a certain number of steps.

7. Mix Columns—a mixing operation which operates on the columns of the state, combining the four bytes in each column

8. Add Round Key—each byte of the state is combined with the round key; each round key is derived from the cipher key using a key schedule.

9. Final Round (no Mix Columns)

10. Sub Bytes

11. Shift Rows

12. Add Round Ke

Encryption- converts data to an unintelligible form called cipher text; decrypting the cipher text converts the data back into its original form, called plain text .

Security Attacks cloud computing systems are providing awide variety of services and interfaces to enable vendors to rent out spaces on their physical machines at an hourly rate for a tidy profit. Threats Extortionists : Using DDoS attack to exhaust server resources Competitors : Using known vulnerabilities to interrupt services

Distributed Denial of Service (DDoS) attack, which means many nodes systems attacking one node allat the same time with a flood of messages

The DDos Attack Tools Complex: Agobot,Mstream,Trinoo Simple: Extensible Markup Language (XML) based Denial of Service (X-DoS) Hypertext Transfer Protocol (HTTP) based Denial of Service (H-DoS) X-DoS: Coercive Parsing attack Open xml tags Exhaust CPU usage

H-DoS:

Using HTTP Flooder

starts up 1500 threads

send randomized HTTP requests to the victim web server

exhaust victim's communication channels

Cloud TraceBack, CTB

service-oriented traceback architecture

to defend against X-DoS attacks the area of cloud computing.

H-DoS attack

affected Iran

using the attack as an example of bringing down a cloud system

train our back propagation neural network called Cloud Protector

Cloud Protector

Back propagation neuralnetwork

5. Conclusion

Cloud computing is revolutionizing how information technology resources and services are used and managed, but the revolution always comes with new problem In the future, we will extend our research by providing implementations and producing results to justify our concepts of security for cloud computing.

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