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Cloud Computing Challenges and Its Models

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Abstract: The cloud computing is the fastest growing concept in research and industry. The 'Cloud' represents the internet and it related to several technologies and the convergence of various technologies has emerged to be called cloud computing. It reduces cost by sharing computing and storage resources, merged with an on demand provisioning mechanism relying on a pay per use business model. Three main services provided by the cloud are IaaS, SaaS, and PaaS. The intent of this paper is to investigate the security related issues and challenges in Cloud computing environment. Cloud computing is the means of accessing a shared pool of configurable computing resources (including hardware, software, networks, servers, storage applications and services) that can be rapidly provided, used and released with minimal effort on the part of users or service providers. This paper presents the major challenge on Security & Privacy related with Cloud Computing.
Keywords: Cloud computing, Iaas, Saas, Paas, CDN, Service

I. INTRODUCTION

The term "cloud", appears to have its origins in network diagrams that represented the internet, or various parts of it, as schematic clouds. "Cloud computing" was coined for what happens when applications and services are moved into the internet "cloud." Cloud computing is not something that suddenly appeared overnight; in some form it may trace back to a time when computer systems remotely time-shared computing resources and applications. More currently though, cloud computing refers to the many different types of services and applications being delivered in the internet cloud, and the fact that, in many cases, the devices used to access these services and applications do not require any special applications.

II. SERVICE MODELS

Once a cloud is established, how its cloud computing services are deployed in terms of business models can differ depending on requirements. The primary service models being deployed are commonly known as:

A. Software as a Service (SaaS)

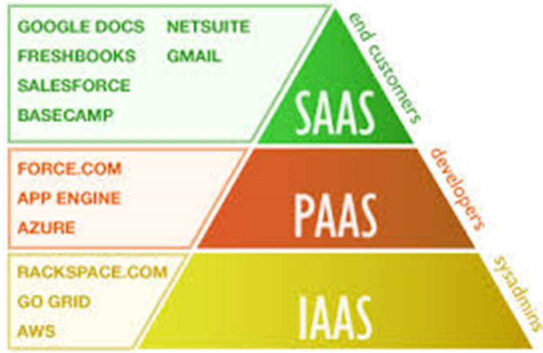
Consumers purchase the ability to access and use an application or service that is hosted in the cloud. A benchmark example of this is Salesforce.com, as discussed previously, where necessary information for the interaction between the consumer and the service is hosted as part of the service in the cloud. Also, Microsoft is expanding its involvement in this area, and as part of the cloud computing option for MicrosoftOffice 2010, its Office Web Apps are available to Office volume licensing customers and Office Web App subscriptions through its cloud-based Online Services.

B. Platform as a Service (PaaS)

Consumers purchase access to the platforms, enabling them to deploy their own software and applications in the cloud. The operating systems and network access are not managed by the consumer, and there might be constraints as to which applications can be deployed.

C. Infrastructure as a Service (IaaS)

Consumers control and manage the systems in terms of the operating systems, applications, storage, and network connectivity, but do not themselves control the cloud infrastructure. Also known are the various subsets of these models that may be related to a particular industry or market. Communications as a Service (CaaS) is one such subset model used to describe hosted IP telephony services. Along with the move to CaaS is a shift to more IP-centric communications and more SIP trunking deployments. With IP and SIP in place, it can be as easy to have the PBX in the cloud as it is to have it on the premise. In this context, CaaS could be seen as a subset of SaaS.



III. DEPLOYMENT MODELS

Deploying cloud computing can differ depending on requirements, and the following four deployment models have been identified, each with specific characteristics that support the needs of the services and users of the clouds in particular ways

A. Private Cloud

The cloud infrastructure has been deployed, and is maintained and operated for a specific organization. The operation may be in-house or with a third party on the premises.

B. Community Cloud

The cloud infrastructure is shared among a number of organizations with similar interests and requirements. This may help limit the capital expenditure costs for its establishment as the costs are shared among the organizations. The operation may be in-house or with a third party on the premises.

C. Public Cloud

The cloud infrastructure is available to the public on a commercial basis by a cloud service provider. This enables a consumer to develop and deploy a service in the cloud with very little financial outlay compared to the capital expenditure requirements normally associated with other deployment options.

D. Hybrid Cloud

The cloud infrastructure consists of a number of clouds of any type, but the clouds have the ability through their interfaces to allow data and/or applications to be moved from one cloud to another. This can be a combination of private and public clouds that support the requirement to retain some data in an organization, and also the need to offer services in the cloud.

IV. CHARACTERISTICS

Cloud computing has a variety of characteristics, with the main ones being:

A. Shared Infrastructure

Uses a virtualized software model, enabling the sharing of physical services, storage, and networking capabilities. The cloud infrastructure, regardless of deployment model, seeks to make the most of the available infrastructure across a number of users.

B. Dynamic Provisioning

Allows for the provision of services based on current demand requirements. This is done automatically using software automation, enabling the expansion and contraction of service capability, as needed. This dynamic scaling needs to be done while maintaining high levels of reliability and security.

C. Network Access

Needs to be accessed across the internet from a broad range of devices such as PCs, laptops, and mobile devices, using standards-based APIs (for example, ones based on HTTP). Deployments of services in the cloud include everything from using business applications to the latest application on the newest smartphones.

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D. Managed Metering

Uses metering for managing and optimizing the service and to provide reporting and billing information. In this way, consumers are billed for services according to how much they have actually used during the billing period. In short, cloud computing allows for the sharing and scalable deployment of services, as needed, from almost any location, and for which the customer can be billed based on actual usage

E. Cloud computing trends

1) *Business Benefits:* Businesses have shrewder and more interesting reasons for liking the cloud. Instead of depending on Microsoft Office, to give one very concrete example, they can use free, cloud-based open-source alternatives such as Google Docs. So there are obvious cost and practical advantages: you don't have to worry about expensive software licenses or security updates, and your staff can simply and securely share documents across business locations (and work on them just as easily from home). Using cloud computing to run applications has a similarly compelling business case: you can buy in as much (or little) computing resource as you need at any given moment, so there's no problem of having to fund expensive infrastructure upfront. If you run something like an ecommerce website on cloud hosting, you can scale it up or down for the holiday season or the sales, just as you need to. Best of all, you don't need a geeky IT department because—beyond commodity computers running open-source web browsers—you don't need IT. Spot the difference

When say cloud computing is growing, do we simply mean that more people (and more businesses) are using the Web (and using it to do more) than they used to? Actually we do—and that's why it's important not to be too loose with our definitions. Cloud web hosting is much more sophisticated than ordinary web-hosting, for example, even though—from the viewpoint of the webmaster and the person accessing a website—both work in almost exactly the same way. This web page is coming to you courtesy of cloud hosting where, a decade ago, it ran on a simple, standalone server. It's running on the same open-source Apache server software that it used then and you can access it in exactly the same way (with http and html). The difference is that it can cope with a suddenly spike in traffic in the way it couldn't back then: if everyone in the United States accessed this web page at the same time, the grid of servers hosting it would simply scale and manage the demand intelligently. The photos and graphics on the page (and some of the other technical stuff that happens behind the scenes) are served from a cloud-based **Content Delivery Network (CDN)**: each file comes from a server in Washington, DC, Singapore, London, or Mumbai, or a bunch of other "edge locations," depending on where in the world you (the browser) happen to be.

V. BENEFITS

The following are some of the possible benefits for those who offer cloud computing-based services and applications:

A. Cost Savings

Companies can reduce their capital expenditures and use operational expenditures for increasing their computing capabilities. This is a lower barrier to entry and also requires fewer in-house IT resources to provide system support.

B. Scalability/Flexibility

Companies can start with a small deployment and grow to a large deployment fairly rapidly, and then scale back if necessary. Also, the flexibility of cloud computing allows companies to use extra resources at peak times, enabling them to satisfy consumer demands.

C. Reliability

Services using multiple redundant sites can support business continuity and disaster recovery.

D. Maintenance

Cloud service providers do the system maintenance, and access is through APIs that do not require application installations onto PCs, thus further reducing maintenance requirements.

E. Mobile Accessible

Mobile workers have increased productivity due to systems accessible in an infrastructure available from anywhere.

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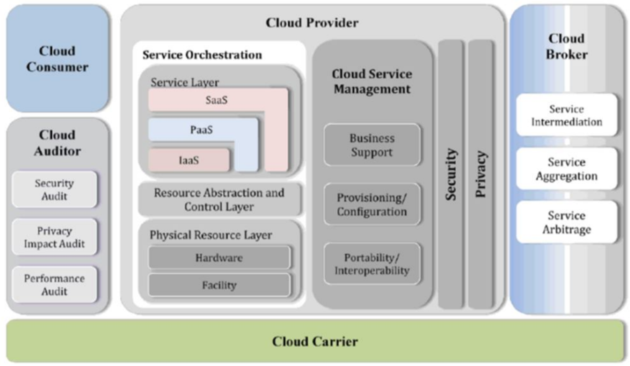
VI. CONCEPTUAL REFERENCE MODEL

Cloud computing reference architecture, which identifies the major actors, their activities and functions in cloud computing. The diagram depicts a generic high-level architecture and is intended to facilitate the understanding of the equirements, uses, characteristics and standards of cloud computing.



A. The Technical Building Blocks

Cloud computing combines several technical innovations from the last 10 to 15 years that constitute its fundamental technical building blocks, including:

B. SOA

A library of proven, functional software applets that can be connected to become a useful application
Application programming interfaces (APIs)Tags to direct applets about the Internet

C. XML

Identifier tags attached to information (data, pages, pictures, files, fields, etc.) that allow them to be transported to any designated application located on the Internet Simplistically, one could look at SOA in the same way as designing a necklace. The beads are the SOA applets, while the string is the Internet bringing the applets together. Most often, this is a complex, matrix-type necklace that is interwoven with various possible applet selections, depending on specific output values from the previous applet. API and XML are used to connect web-based SOA applications. While the ensuing SOA application may require more lines of code than an equivalent application that is perfectly designed from scratch, the ease of design and the development time savings that result from creating a "bead-based" SOA application far outweigh the added line costs.There are many components and terms used in cloud computing that are helpful in understanding the internal working of cloud technologies. Some of these terms include:

D. Hypervisor

A computer tool allowing various software applications running on different OSs to coexist on the same server at the same time. This means that
Windows, Java, Linux, C++, Simple Object Access Protocol (SOAP) and Pearl-based applications can operate concurrently on the same machine. The hypervisor is the enabling technology for server virtualization.

E. Virtualization

The process of adding a "guest application" and data onto a "virtual server," recognizing that the guest application will ultimately part company from this physical server

F. Dynamic partitioning

The variable allocation of CPU processing and memory to multiple applications and data on a server. Also known as logical partitioning
(LPAR), dynamic partitioning provides variable CPU and server memory capacity the various concurrently operating applications as needed. This is important because of the variable processing requirements experienced with batc and real-time processing. Multiple concurrent applications may require near-equal portions of CPU cycles and memory, but in some instances, one of the

applications may need a much larger appropriation of processing power and memory space to avoid throughput delays. Dynamic partitioning reallocates the CPU and memory capacity as needed.

G. OS, application and data migration

The process of migrating data, the application and the underlying OS onto another server. Dynamic partitioning reallocates server processing and memory capacity as needed, automatically, on the fly. However, when the hypervisor senses that there is too much demand from the various applications for the host server's horsepower, tools exist to migrate data, the
application and the underlying OS onto another server identified as available.

H. Cloud client usage measurement

The ability to measure usage of CPU processing, input/output and memory utilization per customer, per application. This measured services tool allows the CSPs that operate the servers for the cloud to charge clients usage fees based on the actual processing consumed.

VII. CLOUD COMPUTING CHALLENGES

For all the benefits of cloud computing, it also incorporates unique and notable technical or business risk. Some of the business challenges related to cloud computing include:

A. Data location

Regardless of the deployment model selected, customers may not know the physical location of the server used to store and process their data
and applications. Cloud computing technology allows cloud servers to reside anywhere. From a technology standpoint, location becomes mostly irrelevant. However, for many compliance and data governance requirements, the physical location of the cloud computing server hosting user data is a critical issue. While the data may reside anywhere, it is important to understand that many CSPs can also specifically define where data are to be located—down to the server, data center and country levels.

VIII. COMMINGLED DATA

Many clients will use the same application on the same server concurrently, which may result in the clients' data being stored in the same data files. SaaS providers claim that each data field has an appropriate metatag affixed to keep clients' commingled data separate. Encryption is another
control that can assist in data confidentiality; however, users need to ascertain the specifics of encryption key management and the process used to unencrypt data prior to being processed. Ultimately, to be sure that data are not commingled or exposed, some auditability must be built into the contract between the customer and the provider.

A. Cloud security policy/procedure transparency

Some CSPs may have less transparency than others when it comes to their current information security policies. The rationalization for this is that the policies may be proprietary. This practice may cause conflict with clients' information compliance requirements. Clients need to have an understanding of and detailed contracts with service level agreements (SLAs) that provide the desired level of security to ensure that CSPs are applying appropriate controls.

B. Cloud data ownership

Contract agreements may state that the CSP owns the data placed in the cloud computing environment that it maintains. The CSP may also require significant service fees for data to be returned to clients if and when a cloud computing services agreement terminates. Lock-in with CSP's proprietary APIsAs in the 1970s, with proprietary software vendor applications, many CSPs currently implement their applications using proprietary APIs. This makes transitioning between CSPs extremely difficult, time-consuming and labor-intensive. Uploading data into a cloud SaaS is easier and less costly than transferring data from one CSP with proprietary APIs to another replacement CSP.

C. CSP business viability

—As cloud computing continues to mature, there will be CSPs going out of business. Clients need to consider the risk and how data and applications can be easily transferred back to the traditional enterprise or to another CSP.

D. Record protection for forensic audits

Clients must also consider the availability of data and records if required for forensic audits. Since data may have been commingled and migrated among multiple servers located widely apart, it may be possible that the data for a specific point in time cannot be identified. Furthermore, local authorities may impound a cloud computing server to assess court-warranted data records of a suspect client—taking with it the data of all the cloud computing clients sharing this impounded server.

E. Identity and access management (IAM)

Current CSPs may not develop and implement adequate user access privilege controls. With ever more sophisticated applications going online—available for access by enterprise users, partners and clients—highly granular, least privilege-based user access tools are required.

IX. CONCLUSION

As the main purpose of cloud computing is to provide services to the client on demand. It is an attractive solution when the infrastructure or the IT personnel are not available or too expensive. In this paper, most of the cloud security threats from three prospective levels: application, network and user levels. Also it address some possible ways to reduce security as possible. The security issues could severely affect could infrastructures. Security itself is conceptualized in cloud computing infrastructure as a distinct layer.

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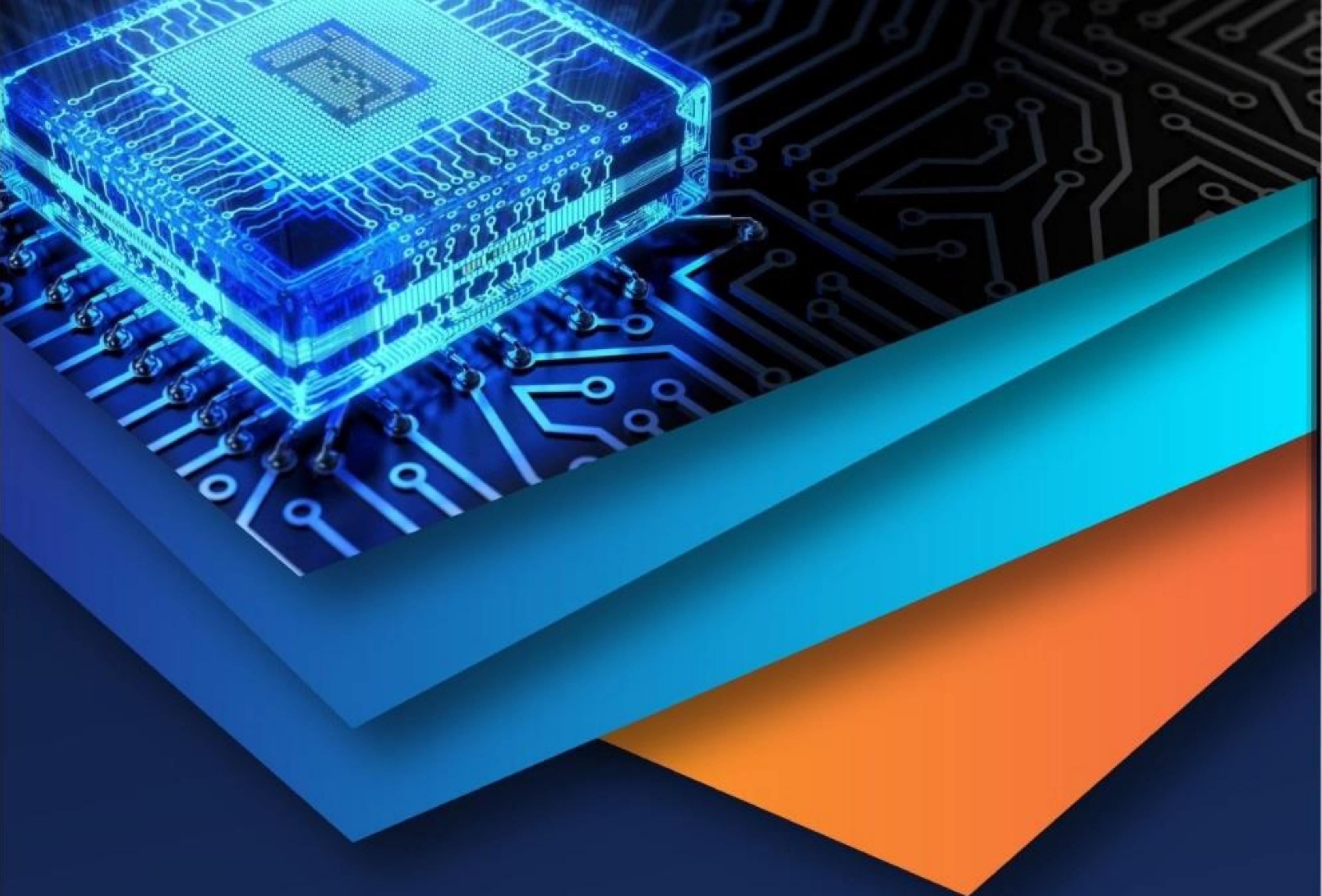

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