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Cloud Computing
Public Cloud Computing vs. Private Cloud Computing: How Security Matter

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Abstract: *The cloud computing may be a speedily developing technology, that has brought vital changes and opportunities to numerous sector in World. Cloud Computing is represented as a sort of computing that depends on sharing computing resources instead of having native server or personal device to handle varied applications. In Cloud Computing, the word cloud is representation as a image for the internet therefore the phrase cloud computing suggests that a kind of Internet-based computing, wherever completely different services as servers, storage and applications are provided to the organization computers and devices through the internet. Cloud computing has secure to increase efficiency, flexibility, less cost and to beat geographic limitations to contend in an exceedingly international market. If adopted and enforced, businesses would need not only new architectures, however additionally new ways that to acquire IT services. A lot of and more corporations are shifting to Cloud primarily based services, however at an equivalent time they're involved regarding the protection risks.*

Keywords: Internet, Efficiency, Flexibility, Architecture

I. INTRODUCTION

Cloud computing represents a major change in how we store digital information and run computer applications hosted in the "Cloud" (Miller, 2009). The use of a network of remote servers hosted at the web to store, manage, and technique knowledge, instead of an area server or a personal pc.The main three categories of Cloud computing that are Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). The hosting industry come out of the requirement for software package and computing services that have been managed internally, however were created more budget friendly and accessible via the economies of scale of a hosted implementation Cloud computing as a computing model, no longer a technology. All through this model "customers" plug into the "cloud" to access IT resources which might be priced and provided "on demand". Delivered of service over web, the "cloud" replaces the corporate knowledge center or server providing constant service. Thus, Cloud Computing is only IT offerings sold and added over the web.

Cloud may be a figure to explain internet as an area wherever computing has been pre put in and exist as a service; information, operative systems, applications, storage and process power exist on the net able to be shared. To users, cloud computing may be a Pay-per-Use-On-Demand mode which will handily access shared IT resources through the web.

Where the IT resources contain network, server, storage, application, service and so on and that they is deployed with a fast and simple manner and minimum management and interactions with service suppliers. Cloud computing will much improve the supply of IT resources and owns several benefits over alternative computing techniques. Users will use the IT infrastructure with Pay-per-Use-On-Demand mode; this could profit and save the price to shop for the physical resources. Cloud security is additionally a broad term and is of major concern. The security challenges Cloud computing presents are formidable, together with those faced by public Cloud whose infrastructure and procedure resources are closely-held and operated by an outdoor party that delivers services to the user via a multitenant platform

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and for the personal Cloud that is hosted on-premise, scales only into the a whole bunch or maybe thousands of nodes, connected to the using organization through personal network links.
There are many cloud computing service provider such as a Amazon Web Services (AWS) Amazon Web Services(AWS), Microsoft Azure, Google Cloud and so on.

II. Architecture Of Cloud Computing

Front End: The front is employed by the shopper. It contains client-side interfaces and applications that are needed to access the cloud computing platforms. The front includes net servers (including Chrome, Firefox, etc.), skinny & fat purchasers, tablets, and mobile devices.
Back End: The back finish is employed by the service supplier. It manages all the resources that are needed to produce cloud computing services. It includes a large quantity of information storage, security mechanism, virtual machines, deploying models, servers, control mechanisms, etc.

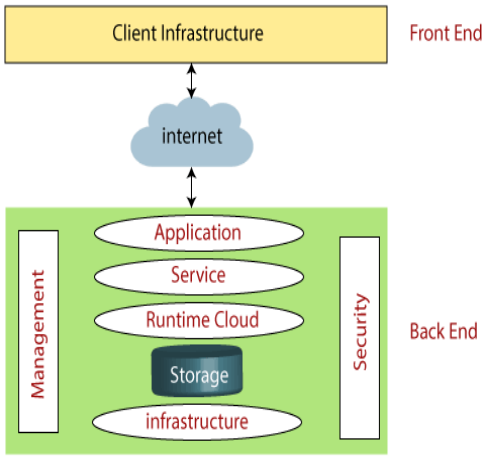

Figure 1: Architecture Of Cloud Computing

A) Client Infrastructure

Client Infrastructure may be a front part. It provides interface (Graphical User Interface) to act with the cloud.

B) Application

The application is also any computer code or platform that a shopper needs to access.

C) Service

A Cloud Services manages that which sort of service you access in keeping with the client's demand. Cloud computing offers the subsequent 3 form of services:

i. Software as a Service (SaaS)
ii. Platform as a Service (PaaS)
iii. Infrastructure as a Service (IaaS)

D) Runtime Cloud

Runtime Cloud provides the execution and runtime setting to the virtual machines.

E) Storage

Storage is one in every of the foremost vital parts of cloud computing. It provides a large quantity of storage capability within the cloud to store and manage knowledge.

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F) Infrastructure

It provides services on the host level, application level, and network level. Cloud infrastructure includes hardware and computer code parts corresponding to servers, storage, network devices, virtualization computer code, and different storage resources that are required to support the cloud computing model.

G) Management

Management is employed to manage parts corresponding to application, service, runtime cloud, storage, infrastructure, and different security problems within the backend and establish coordination between them.

H) Security

Security is associate degree in-built side part of cloud computing. It implements a security mechanism within the side.

III. CLOUD SERVICE MODELS

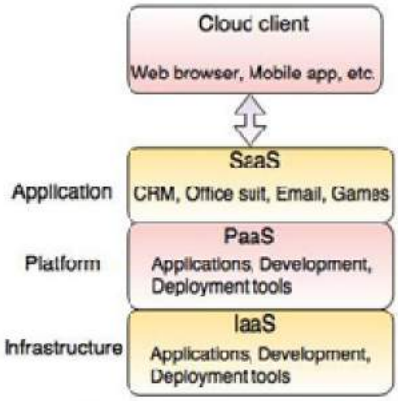

Figure 1: Models Of Cloud Computing

A) SaaS(Software as a Service)

SaaS is 'On-Demand Software'. Cloud. Cloud users or customers launch their software's in a website hosting environments, which can be accessed through networks or internet from diverse clients(Web browser, PDF etc)with the help of utility or application users. Cloud customer do no longer have administration over the cloud infrastructure that frequently employs multi-tenancy system architecture, namely different cloud customers applications are arranged in particularly single logical environment in the SaaS cloud to obtain economies of scale and optimization in terms of speed, security, availability, disaster restoration and maintenance.

Figure 3: SaaS Model Of Cloud Computing

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In simple terms the best example of Software as a Service is the Internet where every application or software is provided on a network as SaaS. Some of the SaaS applications aren't customizable inclusive of Microsoft Office Suite. But SaaS gives us Application Programming Interface (API), which lets in the developer to develop a customized application.

a) Advantages:

1. SaaS is easy to buy because of its price. The pricing of SaaS is based totally on month-to-month or annual price and it allows the businesses to access commercial enterprise functionalities at a small fee, which is less than certified applications.
2. SaaS needed less hardware, because the software program is hosted remotely, hence organizations do no longer want to put money into extra hardware.

b) Disadvantages:

1. SaaS programs are completely depending on Internet connection .They aren't usable without Internet connection.
2. It is hard to interchange amongst the SaaS vendors.

B) PaaS(Platform as a Service)

PaaS is a development platform that support full "SOFTWARE LIFECYCLE" which permits cloud users to develop cloud software and applications at the PaaS cloud. Hence the difference among SaaS and PaaS is that SaaS only Hosts fully completed cloud softwares whereas PaaS offers a development platform that hosts both completed and in-development cloud software. A developer can without difficulty write the utility and install it without delay into PaaS layer.PaaS offers the runtime environment for utility improvement and deployment tools. Google Apps Engine(GAE), Windows Azure, SalesForce.Com are the examples of PaaS.

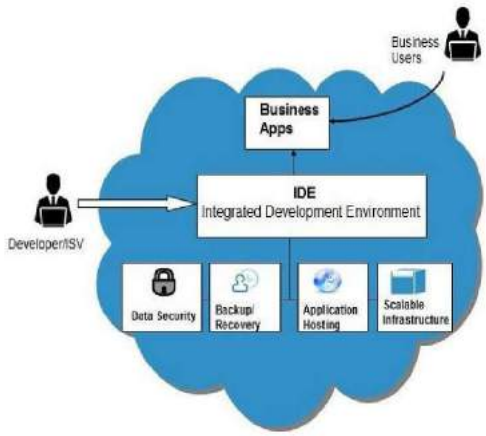

Figure 4: PaaS Model Of Cloud Computing

a) Advantages:

1. PaaS is simple to develop. Developer can give attention to the development and innovation PaaS is simpler to develop. Developer can give attention to the development and innovation without demanding about infrastructure.
2. In PaaS, developer handiest calls for a PC and an Internet connection to start constructing packages.

b) Disadvantages:

1. One developer can write the programs as per the platform provided by means os PaaS vendor hence the transferring the software to every other PaaS seller is a problem.

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C) IaaS(Infrastructure as a Service)

Cloud customers directly use IT infrastructures (processing ,storage, networks and different essential computing assets) provided within the IaaS cloud. Virtualization is notably utilized in IaaS cloud with a view to integrate? decompose physical sources in a special pattern to meet growing or shrinking resource demand from cloud customers. The basic approach of virtualization is to install independent virtual machines(VM) which are isolated from each the underlying hardware and different VMs. IaaS you purchase whole resources instead of purchasing serve, software, data center area or network equipment.

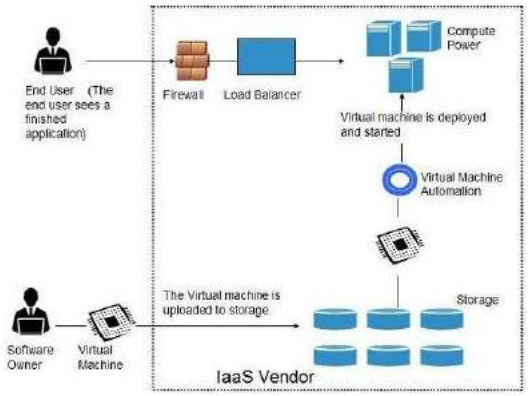

Figure 5: IaaS Model Of Cloud Computing

a) Advantage

1. In IaaS, consumer can dynamically pick out a CPU, memory configuration according to need.
2. Users can easily get right of entry to the tremendous computing power available on IaaS Cloud platform.

b) Disadvantages

1. IaaS cloud computing platform version is dependent on availability of Internet and virtualization services.

IV. PUBLIC CLOUD

Public Cloud computing means relying on other organization or third parties to offer efficient IT services or cloud services over Internet as needed. The National Institute of Standards and Technology defines a public Cloud as a Cloud infrastructure that is made available to the general public or a large industry group. Public cloud is open to all. Hence, it may be less secure. This cloud is suitable for information which is not sensitive. A public cloud is commonly suggested for code development and co-operative comes. Corporations will style their applications to be moveable, in order that a project that's tested within the public cloud is moved to the personal cloud for production. Public cloud examples vary from access to a very virtualized infrastructure that has very little over raw process power and storage (Infrastructure as a Service, or IaaS) to specialized computer code programs that are simple to implement and use (Software as a Service, or SaaS).

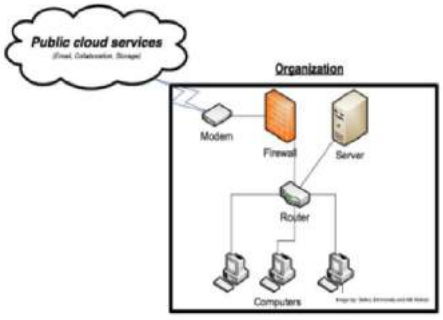

Figure 6: Public Cloud Computing

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a) Advantages:

1. Public cloud is a less expensive than the personal cloud or hybrid cloud as a result of it shares same resources with many purchasers.
2. It is simple to merge public cloud with private cloud therefore it provides the versatile approach to the client.
3. It is reliable as a result of it provides sizable amount of resources from varied locations and if any resource fails, another is utilized.

b) Security issues in Public Cloud Computing

A. Assessment of the CSP :

- Any small, young commercial enterprise can promote it Cloud-based Services or offerings to the world.
- How are you sure that organization is eligible and secure to work with?
- CSPs should have authorized industry certifications inclusive of the SAS 70 Type II, that is an audit which provides impartial 3rd party verification that a cloud service provider organization's rules and strategies are efficiently designed (SAS 70, 2012).

B. Security of the communication channels :

- Data and conversation safety is paramount in Cloud computing.
- We use the offerings provided even though the safety mechanisms for secure communication is abstract.
- Services may be accessed several ways, such as through a thin client, pc or cell phone.
- The reality that the data and records is easily accessible through these channels, data & records are transferred across a couple of networks, more specially in case your CSP is extremely a long way from your location. All communication should be protected with the help of encryption and key management.

C. Transparency of security processes :

- Some Cloud Service Providers may not explain their security operation or we can say processes for their own security reasons.

D. Potentials of a single security breach :

- A single security breach not only destroys the Cloud Service Providers reputation but put your data records and many others in danger. A perfect example is Sony's data breaches in 2011. Sony faced customer relation fallouts and lawsuits over its failure (Schwartz. M, 2011).

E. Data Loss :

- Cross-tenant data leakage - vulnerabilities of shared network infrastructure components, which include vulnerabilities in a DNS server, Dynamic Host Configuration Protocol, and IP protocol vulnerabilities, would possibly enable network-based cross-tenant attacks in an IaaS infrastructure (Pfleeger, Irvine, Kwon, 2012).

V. PUBLIC CLOUD

A private cloud consist of computing assets or resources used exclusively through on enterprise or company. According to the National Institute Of Standards And Technology (NIST) a private cloud is a cloud infrastructure that is operated solely for an organization. The private cloud can be physically situated at your companies data center or it may be hosted with the assistance of a third party cloud service provider. Mainly a private or personal cloud is used when the data is highly confidential and sensitive. In a private or a personal cloud, the services and infrastructure are always maintained on a private network and the hardware and software programs are committed entirely to the

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organization. authorized users will access, utilize and store information within the private cloud from any place, rather like they might with a public cloud. The distinction is that nobody else will access or utilize those computing resources. Private cloud solutions supply each security and management. However these advantages come back at a price. The corporate that owns the cloud is to blame for each software system and infrastructure, creating this a less economical model then the public cloud. Private clouds are mostly used by government agencies, financial companies, another mid-to large-size companies with business crucial operations searching for enhanced control over their environment.

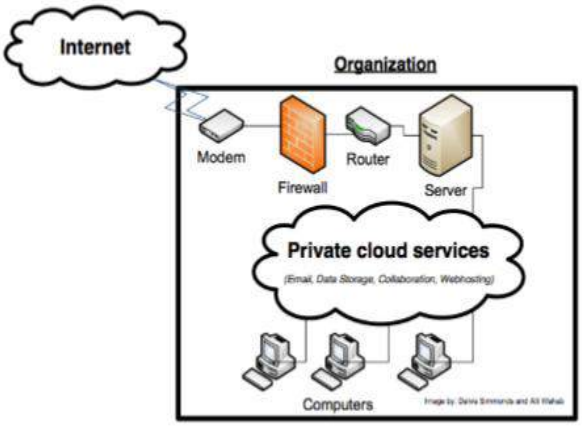

Figure 7: Private Cloud Computing

a) Advantages:

1. You get additional flexibility as your organization will customize its cloud surroundings to satisfy specific business wants.
2. Improved security is one in every of the largest professionals. Private cloud doesn't enable resource sharing therefore giving higher levels of management and security.
3. You get high measurability and potency sort of a public cloud.

b) Security issues of Private Cloud

Private Clouds have the same security issues as public Clouds do, but typically on a minute scale since private Clouds are operated solely for an organization or a company.

A. Security_Architecture

a) Perimeter Security and internal attacks :
Generally traditional perimeter security is not configured to protect resources from attacks that come from within the organization (Microsoft (2), 2012).

b) Hypervisor vulnerabilities and network level authentication (IPSec,IPS/IDS,):
Virtual machines are extensively used in Private Clouds. There is a major possibility that those virtual machines will be capable of having virtual conversation with other virtual machines. Virtual machines should be most effective to be communicating with those they need to. Encryption and authentication mechanisms should be implemented with the use of IPSec and/or IPS/IDS (Microsoft (2), 2012).

B. Security Zones
Resources of various types and vulnerability levels should be located in isolated security zones (Stawowski, M., 2007).Based on previous research and the definition of private Cloud, private Clouds will immediately seem to be greater secure than public Clouds because of how the infrastructure is designed. It offers the organization more authority over their regulations and security. According to NIST, the internal private Cloud

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is more suitable deployment models that offer an organization greater oversight and authority over security and privacy, and better limit the types of tenants that share platform resources, reducing exposure in the event of a failure or configuration error in a control. Private Clouds commonly would be affected by perimeter complacency; questioning that because it is on the internal network, it must be secure; the Internet and viruses are still present. So, warning and security requirements should not be lowered simply because it's private. The private cloud requires that to have total authority over all layers of the stack which incorporate any traditional community perimeter security you might need to have in place. In a private Cloud model, the Cloud services are not usually uncovered to the general Internet customers or users and remote access to private Cloud hosted resources is enabled through mechanisms used in data centers. Private Cloud computing usually makes use of virtualization technologies to boom hardware usage and to summarize work out, memory, community, and storage issue from non-public Cloud shoppers.

VI. COMPARISON OF PUBLIC AND PRIVATE CLOUD

Public Cloud	Private Cloud
Low funding required	High funding required
Support multiple user	Support one user
Hosted at a service provider site	Hosted at an Enterprise or a service provider site
Suited for information that is not sensitive	Suited for information that is needs a high level of security
It a shared cloud computing infrastructure that can be accessed by anyone.	It a shared cloud computing infrastructure that can be accessed by single party.
Provides the illusion of infinitely elastic resources	Provides an elastic but finite resources
Separate provider need to be found in order to maintain the computing stack	Cloud vendor can deliver a fully managed service
Negative loss and management over statistics	IT organization retains management over information
Higher risk of multi-tenancy information transfer	Fewer risk of multi-tenancy information transfer

VII. CONCLUSION

A private/personal cloud, due to the fact it functions independently for an corporate and organization and that too at the back of firewall settings does show to be on hand or accessible. By mentioning this, we suggest that a private cloud cannot be accessed from everywhere and at any factor of time. It is absolutely managed by the users working for an corporate or organization. Public cloud structure is built with the view to create an reachable commercial enterprise environment that can be shared and accessed from everywhere and at any time of the hour. Every though, it poses safety risks, public cloud is considered extra useful than the private cloud due to several reasons, Initial cost is minimal, however if data is stored for prolonged time, it proves to be expensive. However the cloud acts as an excellent supply for differing type of records, data, applications than a specific type of it. Public cloud comes with more availability than the private cloud as it is able to be accessed from everywhere round the globe. Availability and reliability are the two elements that make public cloud computing service extra popular. The reason being, it is available to users via internet at a given server off-premises. Public cloud's gain consists of low upfront cost, with practically limitless scalability, it has a sizeable drawback in particular in accountability and security.

In this paper we have furnished a definition of cloud computing and highlighted the security problems/concerns related to public cloud and private clouds. As most of companies today use of cloud service and architectures, more threats and concerns arise. The mixing if clouds-based totally offerings in businesses is continuing, both public and private cloud fashions have their own advantages and challenge; therefore security will continually be an issue. The

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wishes and desires of each company will vary. Therefore comparing specific applications, protection and compliance concern might assist in figuring out what is extra suitable for a private cloud and what is greater suitable for a public cloud.

Cloud computing is a totally wide difficult area. Even although the scope changed into scaled right down to the safety issues in public cloud computing and private cloud computing it changes into still quite a mission getting details on sure areas; maximum statistics located during the studies is related to both public cloud computing or private cloud computing in general. The motive for this is that the term "Private Cloud" isn't as widely accepted as cloud computing.

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