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Cloud Computing: Overview & Utility

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Abstract: *Cloud computing enables the process of storing documents, files photos online instead of using home computer, or webmail or a social networking site. If in an organization, it is desired to use an online invoicing service instead of updating the in-house one, which has been used since many years, then that online invoicing service is a "cloud computing" service.*
This paper briefs about Cloud computing that refers to the delivery of computing resources over the Internet. Also instead of keeping data on one's own hard drive or updating applications for one's needs, it is suggested to use a service over the Internet, at another location, to store the information or use its applications.
Keyword: *cloud, online, internet, virtualization, data centre, business application*

I. Introduction

Cloud computing is a new pattern of computing service, and it transforms the processor, storage device and other physical resources on Internet to virtual resources which is expandable and can be shared. The traditional computing mode puts the computing task on the local computer or the remote server, while the cloud computing distributes the computing task on the massive distributed computers which constitute the enterprise's data storage and processing centre (i.e. Data Centre). Cloud computing is a kind of pay-per-use service pattern, which enables the enterprise to switch the needed resources for application and visit computing service and memory system according to the demand. Computing and storage tasks are given to the cloud computing service provider, which can reduce the computing and storage burden of the users computing device and enhance the enterprise resources utility and computing efficiency.

The following definition of cloud computing has been developed by the U.S. National Institute of Standards and Technology (NIST):

Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

At present, this emerging service pattern of cloud computing develops rapidly, all kinds of manufacturers are developing different cloud computing services, the security problem in cloud computing gradually becomes a problem urgently waiting to research. While cloud computing reduces the enterprise and user's computing and storage burden, it also imports security problem into the cloud, how to guarantee the security of important data and computing task in cloud computing by means of different kinds of security mechanisms becomes important research content of cloud computing.

At the foundation it is broader concept of infrastructure storage and share services. This type of Data centreenvironment allows enterprises to get applications up and running faster with easier manageability and less maintenance and enables IT to more rapidly adjust IT resources such as servers, storage and networking to meet fluctuating and unpredictable business demands. Most cloud computing infrastructure consists of services delivered through shared data centres and appearing as single point of access for consumers computing needs. Commercial offerings may be required to meet service-level agreements (SLA), but specific terms are less often negotiatedby smaller companies.

Comparison: Cloud computing characteristics- [2]

Autonomic Computing	**Client – server model**	**Grid computing**	**Utility computing**	**Mainframe computer**	**Peer – to – peer**
computer system capable of self-management	Client server computer refers broadly to any distributed application that distinguish between service providers	A form of distributed and parallel computing, where by a super and virtual computers is composed of a	The packaging of computing resources such as computation and storage as a metered service similar to a traditional public	Powerful computer used mainly by large organisations for critical applications typically bulky data processing such as	Distributed architecture without the need for central coordination with participants being at the same time both suppliers and

	(servers) and service requesters (clients)	cluster of networked, loosely coupled computers acting in concert to perform very large tasks	utility such as electricity.	census, industry and consumer statistics, policies and secret intelligence services, enterprise resource planning etc.	consumers of resources.

Various Models Of Cloud Computing:-[2]
There are certain services and models working behind the scene making the cloud computing feasible and accessible to end users. Following are the working models for cloud computing:

Service models:

Cloud computing offers both the software and hardware as a service over the internet. Some product offer internet based services such as storage, middleware, collaborations and database capabilities directly to users. These services are classified into three major categories.

Software as a service (SaaS) – It provides a complete turnkey application including complex program such as those for CRM or enterprises resource management via internet. These software services are delivered through web browsers to its user as a service on demand to use software as service through cloud computing, users just request for the service of a particular software to its vendor and the vendor will provide the services of software to its users. End user is not concerned about the software licensing and other issues related to the genuineness of the software that he is using.
Advantages – Pay per use, instant scalability, security, reliability, No need of specific hardware to run software.
Examples – financial planning, CRM, Human Resources, word processing, email cloud.

Platform as a service (PaaS) – It offers a full or partial development environment that users can access and utilize online, even in collaboration with others. It dramatically changed the scenario of development, deployment and run process of business applications. As the core element of cloud computing, PaaS eliminates the costs and complexity of evaluating, buying, configuring and managing all the hardware and software needed for enterprise applications.
Popular services – Storage, Database and scalability
Advantages - pay per use, reliability, instant scalability, no need to buy special hardware and software to develop and deploy enterprises applications, security.

Infrastructure as a service (Iaas) – It delivers full computer infrastructure via internet. It is main service model of cloud computing. Infrastructure as a service is sometimes referred to as Hardware as a service (HaaS). It is a provision model in which 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 per-use basis. Access to infrastructure stack includes full OS access, firewalls, routers, load balancing etc services.
Advantages – Pay per use, instant scalability, security, reliability, APIs etc.
Examples- AWS:EC2, FLexiscale etc.

Deployment models

Cloud services are typically made available via a private cloud, community cloud, public cloud or hybrid cloud.
Services provided by a public cloud are offered over the Internet and are owned and operated by a cloud provider. Some examples include services aimed at the general public, such as online photo storage services, e-mail services, or social networking sites. However, services for enterprises can also be offered in a public cloud.
In a private cloud, the cloud infrastructure is operated solely for a specific organization, and is managed by the organization or a third party.

In a community cloud, the service is shared by several organizations and made available only to those groups. The infrastructure may be owned and operated by the organizations or by a cloud service provider.Ahybrid cloud is a combination of different methods of resource pooling (for example, combining public and community clouds).

Characteristics-[1]
Cloud computing exhibits the following key characteristics:

1) **Empowerment** of end users of computing resources by putting the provisioning of those resources in their own control, as opposed to the control of centralised IT service. Agility improves with users ability to re-provision technological infrastructure resources.
2) **Application** programming interface (API) accessibility to software that enables machines to interface facilitates interaction between humans and computers. Cloud computing systems typically use REST – based APIs.
3) **Cost** is claimed to be reduced and in a public cloud delivery model capital expenditure is converted to operational expenditure. This is purported to lower barriers to entry, as infrastructure is typically provided by a third party and does not need to be purchased for one-time or infrequent intensive computing tasks. Pricing utility computing basis is fine-grained with usage – based options and fewer IT skills are required for implementation (in-house).
4) **Device and Location independence** enables users to access systems using a web browser regardless of their location or what device they are using. As infrastructure site (typically provided by a third party) and accessed via the internet, users can connect from anywhere.
5) **Mutli-tenancy** enables sharing of resources and costs across a large pool of users thus allowing for centralisation, peak –load capacity, utilisation and efficiency improvements.
6) **Reliability** is improved if multiple redundant sites are used, which makes well-designed cloud computing suitable for business continuity and disaster recovery.
7) **Scalability and Elasticity** via dynamic provisioning of resources on a fine grained, self-service basis near real time, without users having to engineer for peak loads.
8) **Performance** is monitored and consistent. Loosely coupled architecture are constructed using web service as the system interface.
9) **Security** could improve due to centralisation of data, increased security focussed resources etc., but concerns can persist of about loss of control over certain sensitive data and the lack of security for stored kernels. The complexity of security is generally increased when data is distributed over a wider area or greater number of devices and in multi-tenant systems that are being shared by unrelated users. Private cloud installations are in part motivated by users desired to retain a control over the infrastructure and avoid losing control of information security.
10) **Maintenance** of cloud computing applications is easier because they do need to be installed on each client computer.

Advantages Of Cloud Computing -
Cloud computing has a lot of advantages over traditional computing. The benefits of deploying applications using cloud computing include reducing run time and response time, minimising the risk of deploying physical infrastructure, lowering the cost of entry and increasing pace of innovation. Some other advantages of cloud computing are:

- Lower cost of ownership
- Reduce infrastructure management responsibility
- Avoids capital expenditure (CapEx) on hardware, software and services when they pay a provider only for what they use.
- Allow for unexpected resource loads.
- Faster Application rollout
- Immediate access to a broad range of applications.
  In general, users can terminate the contract at any time (thereby avoiding return on investment risk and uncertainty) and the services are often covered by service level agreements(SLA) with financial penalties.

II. Limitations

- **Possible downtime.** Cloud computing makes your small business dependent on the reliability of your Internet connection. When it's offline, you're offline. If your internet service suffers from frequent outages or slow speeds cloud computing may not be suitable for your business. And even the most reliable cloud computing service providers suffer server outages now and again.
- **Security issues.** How safe is your data? Cloud computing means Internet computing. So you should not be using cloud computing applications that involve using or storing data that you are not comfortable having on the Internet. Established cloud computing vendors have gone to great lengths to promote the idea that they have the latest, most sophisticated data security systems possible as they want your business and realize that data security is a big concern; however, their credibility in this regard has suffered greatly in the wake of the recent NSA snooping scandals. Keep in mind also that your cloud data is accessible from anywhere on the internet, meaning that if a data breach occurs via hacking, a disgruntled employee, or careless username/password security, your business data can be compromised.

- **Cost.** At first glance, a cloud computing application may appear to be a lot cheaper than a particular software solution installed and run in-house, but you need to be sure you are doing a total cost comparison. While many cloud computer vendors present themselves as utility-based providers, claiming that you're only charged for what you use. In most cases, a company must commit to a predetermined contract independent of actual use. To be sure you're saving money; you have to look closely at the pricing plans and details for each application. The cost savings of cloud computing primarily occur when a business first starts using it. Cloud computing costs are constantly changing, so current pricing needs to be checked now and then.
- **Inflexibility.** Be careful when you're choosing a cloud computing vendor that you're not locking your business into using their proprietary applications or formats. You can't insert a document created in another application into a Google Docs spreadsheet, for instance. Also make sure that you can add and subtract cloud computing users as necessary as your business grows or contracts.
- **Lack of support.** All too many cloud-based apps make it difficult to get customer service promptly – or at all. Sending an email and hoping for a response within 48 hours is **not** an acceptable way for most of us to run a business.

Examples Of Cloud Computing- [3]

- **Email communications -** Cloud computing enables webmail clients to use cloud storage and give you the opportunity to check your emails from any place in the world. All big technology corporations use cloud computing to make their email messaging service more reliable**. Yahoo mail, Gmail, rediffmailetc**
- **No need to upgrade local storage -** Data saved on your home or business computer is accessible only when you use the particular device. With cloud computing users are able to store all the files they need to access later on over the internet.The most popular among these are the **Microsoft SkyDrive and Amazon S3.**
- **Collaboration made Easy -**Cloud computing collaboration is similar to instant messaging, but offers users to complete particular work activities that are likely to take few months, in just few hours. Although, the **Google Wave** is the most popular cloud collaboration solution out there, other great choices are **Mikogo and Vyew.**
- **The Virtual office -** Probably the most popular use of the cloud computing is to enable business owners to "rent" software instead of buying it. Google Docs is the most popular suite for running virtual office, but there are lots of other solutions available such as ThinkFree and Microsoft Office Live.

III. Conclusion:

Cloud computing infrastructure is next generation platform that can provide tremendous value to companies of any size. The cloud is reliable in sense that it enables access to applications and documents anywhere in the world via the Internet. Cloud computing is often considered efficient because it allows organizations to free up resources to focus on innovation and product development. Cloud computing may improve efforts to build privacy protection into technology from the start and the use of better security mechanisms. Cloud computing will enable more flexible IT acquisition and improvements, which may permit adjustments to procedures based on the sensitivity of the data. Widespread use of the cloud may also encourage open standards for cloud computing that will establish baseline data security features common across different services and providers. Cloud computing may also allow for better audit trails. In addition, information in the cloud is not as easily lost (when compared to the paper documents or hard drives, for example).

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