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A Retrospective and Prospective Analysis of Cloud Computing: Historical Context, Deployment Strategies, and Service Models

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Abstract - The network concerned usually discusses the use of the Internet for various services, including data storage, software, security, etc. These services are commonly referred to as cloud-based information services. Examples of such services include Gmail, YouTube, Amazon, and Dropbox. The paper covers the evolution of cloud computing from its early stages to the present day and explores the different services offered by cloud computing in both personal and business computing scenarios. It provides an overview of the history, deployment, and service models that led to the development of cloud computing.

Keywords - Cloud computing, service models, deployment

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INTRODUCTION

Cloud processing is a type of net-located computing that is very similar to the Internet. It enables electronic preferred web holding servers to offer a variety of services, including data, tools, and applications to customers on a pay-as-you-use basis. Cloud processing customers need the physical construct, but rather, they lease the use of infrastructure from a 3rd party provider. They pay only for what they are using. IT organization companies source solutions for buyers, which customers then utilize on a pay-per-use basis. Buyers can access these services provided by vendors using a web browser. A large amount of data is stored in many cloud net hosting servers, and the collection of host servers constitutes a Data center.

The vendors provided by distributors could be categorized into three variants that present exclusively just how companies are being offered to the clients. The service models are, in simple fact, solution-altered design that informs us about the unique level of absorption. They are as follows:

Platform as a Service (PaaS): PaaS provides all the information and tools required to develop applications and services completely using the internet without installing or downloading software. PaaS service includes helpful suggestions, development, and hosting. Other services include connection, web service integration, DB integration, security, and scaling.

Customers do not need to worry about getting software and hardware or hiring experts to manage them. PaaS provides flexibility in developing software on a system, and scalability is another advantage. The disadvantage of PaaS is the lack of interoperability and mobility among providers.

Software as a Service (SaaS): This model is the one in which an application is hosted as a service to customers who access it through the internet. It provides us with the functionality of various software applications, operating systems, and resources without the need to install them on your device, upgrade, and obtain licenses.

Infrastructure as a Service (IaaS): This model is responsible for providing virtualized computer essential information and physique information. IaaS users design their virtual lot, on which they are responsible for installing, maintaining, and executing their very own software application stack. IaaS

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offers various resources for virtualizing and converting physical resources to logical ones that users can provision and accept as required.

HISTORY

Cloud computing has its roots in the early days of computer science. In 1961, computer scientist John McCarthy predicted that computers would revolutionize the world and become as commonplace as telephones. He believed that computing might someday be seen as a form of electricity, powering everything from homes to businesses.

In 1969, Leonard Kleinrock, a key researcher on the ARPANET project (which eventually led to the Internet), predicted that we would soon see the emergence of "computer utilities." Today, we use a variety of Internet-based computer utilities, such as search engines, email services, and social media sites. These services have become the foundation of modern cloud computing.

In the late 1990s, companies like Salesforce.com began offering remotely provisioned business solutions. In 2002, Amazon introduced its AWS platform, which provides remotely provisioned storage, computing resources, and business applications.

The term "cloud" or "cloud computing" originated in the 1990s among networking professionals. It referred to the distribution of information across various public and semi-public networks. This concept has since been applied to mobile networks as well. Today, social media platforms use the cloud to store and disseminate vast amounts of data.

It wasn't until 2006 that the term "cloud computing" became mainstream. Amazon's Elastic Compute Cloud (EC2) allowed businesses to "rent" computing power to run their applications. Google followed suit with its App Engine in 2008. Today, cloud computing is an integral part of modern business and technology.

SERVICE MODELS

Depending on specific requirements, cloud computing services can be deployed in various ways. There are three main service models, also known as the major business models:

1. Software as a Service (SaaS): Users can access and use a service or application hosted in the cloud. For example, Salesforce.com offers a service where customer interactions are hosted in the cloud.

Microsoft has also developed its own cloud-based Office suite, which is available through a subscription model as part of their cloud computing solution, Microsoft Office 365.

2. Platform as a Service (PaaS): Users can access a platform that allows them to deploy and build software applications in the cloud. The user does not manage the operating system and hardware, and there may be limitations on which applications can be used. Examples include Amazon Web Services (AWS), Rackspace, and Microsoft Azure.

3. Infrastructure as a Service (IaaS): Users manage and control the systems within the platform application, including storage, network, and physical infrastructure, but do not manage the cloud infrastructure itself.

There are also other specific models, such as Communications as a Service (CaaS), a managed Internet Protocol (IP) telephony service. CaaS is part of the SaaS model and is used in more IP-centric communications with SIP trunking implementations. With IP and SIP in place, it is now as easy to have a Private Branch Exchange (PBX) in the cloud as it is on the premises .

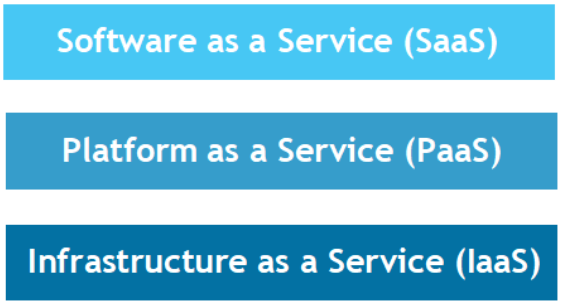

Figure 1: Service Model Types

DEPLOYMENT MODELS

The establishment of cloud computing can vary depending on the requirements. Four types of cloud deployment have been identified, each with specific features that cater to the needs of businesses and cloud users.

1. Personal Cloud: This cloud infrastructure is created and maintained for a specific organization, and can be operated internally or by a third party off-site.

2. Community Cloud: The cloud infrastructure is shared among multiple organizations with similar interests and requirements. This can help reduce costs for each organization, as expenses are shared among them. The operation can be internal or by a third party off-site.

3. Public Cloud: The cloud infrastructure is available to the general public through a cloud provider, allowing users to establish and run their business in the cloud with minimal financial investment compared to other deployment options.

4. Hybrid Cloud: This cloud infrastructure combines multiple clouds of any type, allowing for the transfer of data and/or applications from one cloud to another. It can be a combination of private and

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public clouds that maintain certain data in-house while also providing services in the cloud.

CHALLENGES & ISSUES

Our provider has identified several barriers and complications that hinder the processing of cloud-based services. As significant economic activity is linked to this area, it is crucial to address these issues as early as possible. Figure 2 provides an overview of the research conducted by our company on the standard concerns of cloud computing. The consumer's primary concern is taken into account, and only a percentage of 4.5 is being discovered. Security is a significant issue that must be addressed in a cloud computing environment.

When using cloud-based services, one is entrusting their information to a third party for storage and security. Can one assume that a cloud-based company will adequately secure and protect one's information? Cloud computing poses certain challenges to privacy and security. Backing up data, looking for file errors, and protecting against security breaches are just some of the challenges. When data is entrusted to a cloud-based service, which third-parties have access to that information? Cloud sourcing involves using multiple providers, and many cloud-based providers offer services to each other. As a result, cloud-based products may need to share your data with third parties if they are involved in managing or transferring your data. They may even share your information with advertisers. Security and privacy present a real risk to cloud computing.

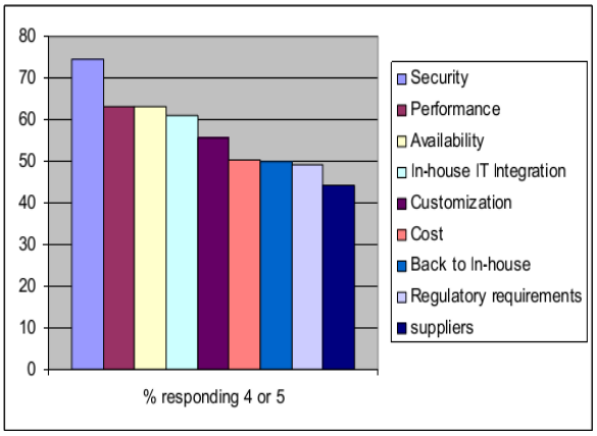

Figure 2: Graph depicting the concerns of clients on cloud computing issues

Table 1: Economy Impact Table Due To Cloud Outages

	Total (Hour)	Average (Hour)	Availability	Cost (USD)
Amadeus	1	0.167	99.998	89,000
Facebook	3	0.500	99.994	600,000
ServerBeach	4	0.667	99.992	400,000
Paypal	5	0.833	99.990	1,125,000
Google	5	0.833	99.990	1,000,000
Yahoo!	6	1.000	99.989	1,200,000
Twitter	7	1.167	99.987	1,400,000
Amazon	24	4.000	99.954	4,320,000
Microsoft	31	5.167	99.941	6,200,000
Hostway	72	12.000	99.863	7,200,000
BlackBerry	72	12.000	99.863	14,400,000
Navisite	168	28.000	99.680	16,800,000
OVH	170	28.333	99.667	17,000,000
Total	568	94.667	99.917	71,734,000

Performance

Cloud computing involves significant availability concerns. The cloud providers need to ensure that the functionality of the service being used remains the same throughout. There may be peak usage breakdowns, internal issues, and other technical glitches arising. Load balancers, data replicators, and powerful servers have to be installed when needed.

Although cloud services promise to be 24x7x365, outages occur regularly. Interruptions can be planned or unplanned. Table 1 provides information about the downtime in hours and the economic impact of cloud power interruptions of various cloud providers from 2007 to 2012.

Cloud computing may have higher costs due to its requirements for both "always on" connection and the use of large amounts of data.

Cloud computing requires "high-speed broadband." While many websites are usable on non-broadband or slow broadband connections, cloud-based applications often need to be more practical. Link speed in kilobytes per second (or MB/s and GB/s) is necessary for the use of cloud computing services. Also important are Quality of Service (QoS) metrics, such as the amount of time the connections are lost, ping time, and the size of the delays in processing network information (latency), as well as packet loss.

Only a few providers are currently available, which is still holding back many SMEs from joining the cloud

THE EVOLUTION OF CLOUD COMPUTING

Cloud Computing is a term used to describe a system that provides services through a remote server. This term has become increasingly popular in recent years and is often depicted as a cloud in illustrations of cloud-based systems. The use of cloud-like shapes in visual representations of the internet is a common practice in mainstream media and publications that cover communication systems. However, the term "Cloud Computing" is relatively

new. To fully understand this concept, we need to look back at the history of computing and examine the earlier models of service provisioning over a communication system.

In the early 1950s, data central processing units were introduced, and companies rented these single-user, non-shareable machines for about $25,000 per month. Programmers would register for "jobs" on these computers, and each job would be a block of time dedicated to processing a single program. These manual processes were time-consuming and often resulted in wasted processing time due to inefficiencies.

To improve efficiency, General Motors (GM) and N. American Aviation (NAA) developed the GM NAA I/O (Input/Output) system in 1956. This system allowed for "batch processing," where multiple programs could be processed at once without manual intervention. The IBM System/360 data processor, introduced in 1964, further improved upon this system by separating I/O tasks from the processor and allocating them to an I/O sub-system. This freed up the CPU to perform computations required for other tasks.

Interactive processing, on the other hand, allows users to interact with the computer in real-time. This concept was introduced by the SAGE (Semi-Automatic Ground Environment) system, which allowed a single user to actively use a computer at once. However, allowing a single user to monopolize a resource led to inefficiencies in resource usage.

To address this issue, MIT developed the Compatible Time-Sharing System (CTSS) in 1961, which allowed for multiple users to access a computer simultaneously. IBM's Time Sharing Option (TSO) further improved upon this system by enabling the CPU to switch between tasks quickly, giving each user the impression of having the full attention of the computer.

In addition to time-sharing, remote access to computers through terminals became a crucial component of computing. Multiple locations were "multiplexed" over telephone lines, allowing users to connect to a specific data processor through a modem. This remote access was a significant development in computing and greatly expanded its reach.

Overall, the history of computing has seen significant developments in service provisioning systems. These systems have evolved from single-user, manual processes to time-sharing and interactive processing to provide faster and more efficient computing solutions. The introduction of remote access has further expanded the reach of computing, making it an integral part of our daily lives.

CONCLUSION

Various cloud implementation models are available that can help produce relevant information for clients. However, the market value of each model depends on the selection and the user who will be using it, which affects its security. Table 1 shows the range of implementation models and their security levels. Due to the shared nature and different environments of the cloud, security and privacy concerns are significant issues. This paper provides an overview of the data, implementation, and service models used in cloud processing.

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