CLOUD COMPUTING

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Abstract

Cloud computing is the delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computers and other devices as a utility (like the electricity grid) over a network (typically the internet).

Cloud computing provides computation, software, data access, and storage services that do not require end-user knowledge of the physical location and configuration of the system that delivers the services. Parallel to this concept can be drawn with the electricity grid, wherein end-users consume power without needing to understand the component devices or infrastructure required to provide the service.

Keywords

AUTONOMIC COMPUTING, GRID COMPUTING, APPLICATION PROGRAMMING INTERFACE, LAYERS, PARALLEL COMPUTING

1.1 Introduction

Cloud computing describes a new supplement, consumption, and delivery model for IT services based on Internet protocols, and it typically involves provisioning of dynamically scalable and often virtualized resources. It is a byproduct and consequence of the ease-of-access to remote computing sites provided by the internet. This may take the form of web-based tools or applications that users can access and use through a web browser as if the programs were installed locally on their own computers. Cloud computing providers deliver applications via the internet, which are accessed from web browsers and desktop and mobile apps, while the business software and data are stored on servers at a remote location.

1.2 Comparison

Cloud computing shares characteristics with:

Autonomic computing: Computer systems capable of management Client–server computing refers broadly to any distributed application that distinguishes between service providers (servers) and service requesters (clients).

Grid computing : "A form of distributed and parallel computing, whereby a 'super and virtual computer' is composed of a cluster of networked, loosely coupled computers acting in concert to perform very large tasks."

Mainframe computer: Powerful computers used mainly by large organisations for critical applications, typically bulk data processing such as census, industry and consumer statistics, enterprise resource planning, and financial transaction processing.

Utility computing :The "packaging of computing resources, such as computation and storage, as a metered service similar to a traditional public utility, such as electricity.

Peer-to-peer: Distributed architecture without the need for central coordination, with participants being at the same time both suppliers and consumers of resources

1.3 Characteristics

Cloud computing exhibits the following key characteristics:

Agility improves with users' ability to re-provision technological infrastructure resources.

Application programming interface (API) accessibility to software that enables machines to interact with cloud software in the same way the user interface facilitates interaction between humans and computers. Cloud computing systems typically use REST-based APIs.

Device and location independence enable users to access systems using a web browser regardless of their location or what device they are using (e.g., PC, mobile phone). As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet, users can connect from anywhere.

Multi-tenancy enables sharing of resources and costs across a large pool of users thus allowing for:

Centralisation of infrastructure in locations with lower costs (such as real estate, electricity, etc.)

Peak-load capacity increases (users need not engineer for highest possible load-levels)

Utilisation and efficiency improvements for systems that are often only 10–20% utilised.

Reliability is improved if multiple redundant sites are used, which makes well-designed cloud computing suitable for business continuity and disaster recovery.

Scalability and Elasticity via dynamic ("on-demand") provisioning of resources on a fine-grained, self-service basis near real-time, without users having to engineer for peak loads.

Performance is monitored and consistent and loosely coupled architectures are constructed using web services as the system interface.

Security could improve due to centralisation of data, increased security-focused resources, etc., but concerns can persist about loss of control over certain sensitive data, and the lack of security for stored kernels.

Maintenance of cloud computing applications is easier, because they do not need to be installed on each user's computer.

1.4 Layers

Once an internet protocol connection is established among several computers, it is possible to share services within any one of the following layers.

1.4.1 Client

A cloud client consists of computer hardware and/or computer

Software that relies on cloud computing for application delivery and that is in essence useless without it. Examples include some

computers, phones and other devices, operating systems, and browsers.

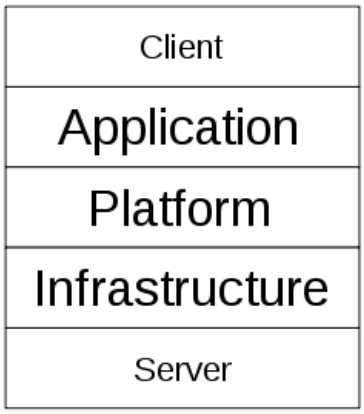
1.4.2 Application

Cloud application services or "Software as a Service (SaaS)" deliver software as a service over the Internet, eliminating the need to install and run the application on the customer's own computers and simplifying maintenance and support.

1.4.3 Platform

Cloud platform services, also known as platform as a service (PaaS), deliver a computing platform and/or solution stack as a service, often consuming cloud infrastructure and sustaining cloud applications. It facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers.

1.4.4 Infrastructure



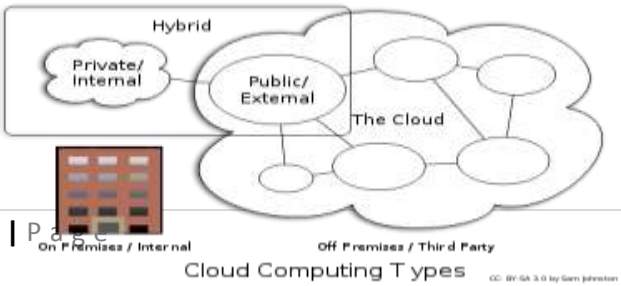
Cloud infrastructure services, also known as "infrastructure as a service" (IaaS), deliver computer infrastructure – typically a platform virtualisation environment – as a service,

along with raw (block) storage and networking. Rather than purchasing servers, software, data-center space or network equipment, clients instead buy those resources as a fully outsourced service. Suppliers typically bill such services on a utility computing basis; the amount of resources consumed (and therefore the cost) will typically reflect the level of activity.

1.4.5 Server

The server layer consists of computer hardware and/or computer software products that are specifically designed for the delivery of cloud services, including multi-core processors, cloud-specific operating systems and combined offerings.

1.5 Deployment Models



1.5.1 Public Cloud

Public cloud describes cloud computing in the traditional mainstream sense, whereby resources are dynamically provisioned to the general public on a fine-grained, self-service basis over the Internet, via web applications/web services, from an off-site third-party provider who bills on a fine-grained utility computing basis.

1.5.2 Community Cloud

Community cloud shares infrastructure between several organisations from a specific community with common concerns (security, compliance, jurisdiction, etc.), whether managed internally or by a third-party and hosted internally or externally. The costs are spread over fewer users than a public cloud (but more than a private cloud), so only some of the benefits of cloud computing are realised.

1.5.3 Hybrid Cloud

Hybrid cloud is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together, offering the benefits of multiple deployment models. It can also be defined as a multiple cloud systems that are connected in a way that allows programs and data to be moved easily from one deployment system to another.

1.5.4 Private Cloud

Private cloud is infrastructure operated solely for a single organisation, whether managed internally or by a third-party and hosted internally or externally.

1.5.5 Architecture

Cloud architecture, the systems architecture of the software systems involved in the delivery of cloud computing, typically involves multiple cloud components communicating with each other over a loose coupling mechanism such as a messaging queue.

1.6 Issues in Cloud Computing

1.6.1 Privacy

The cloud model has been criticised by privacy advocates for the greater ease in which the companies hosting the cloud services control, thus, can monitor at will, lawfully or unlawfully, the communication and data stored between the user and the host company. Instances such as the secret NSA program, working with AT&T, and Verizon, which recorded over 10 million phone calls between American citizens, causes uncertainty among privacy advocates, and the greater powers it gives to telecommunication companies to monitor user activity.

1.6.2 Compliance

In order to obtain compliance with regulations

including FISMA, HIPAA, and SOX in the United States, the Data Protection Directive in the EU and the credit card industry's PCI DSS, users may have to adopt community or hybrid deployment modes that are typically more expensive and may offer restricted benefits. This is how Google is able to "manage and meet additional government policy requirements beyond FISMA" and Rackspace Cloud or QubeSpace are able to claim PCI compliance.

1.7 Conclusion

The Cloud Data Management Interface defines the functional interface that applications will use to create, retrieve, update and delete data elements from the Cloud. As part of this interface the client will be able to discover the capabilities of the cloud storage offering and use this interface to manage containers and the data that is placed in them.

1.8 References

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