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CLOUD COMPUTING

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ABSTRACT

Cloud Computing denotes the latest trend in application development for Internet services, relying on clouds of servers to handle tasks that used to be managed by individual machines. With Cloud Computing, developers take important services, such as email, calendars, and word processing, and host them entirely online, powered by a vast array (or cloud) of interdependent commodity servers. Cloud Computing presents advantages for organizations seeking to centralize the management of software and data storage, with guarantees on reliability and security for their users. Recently, we have seen many efforts of the commercialization of the cloud.

Cloud computing lets you access all your applications and documents from anywhere in the world, freeing you from the confines of the desktop and facilitating wholesale group collaboration. But cloud computing isn't for everyone; there are pros and cons to this type of web-based computing. Cloud computing represents a major change in how we store information and run applications. Instead of hosting apps and data on an individual desktop computer, everything is hosted in the "cloud"—an assemblage of computers and servers accessed via the Internet.

DEFENITION

Cloud computing is a general term for anything that involves delivering hosted services over the Internet The name cloud computing was inspired by the cloud symbol that's often used to represent the Internet in flow charts and diagrams. Cloud computing is a style of computing in which dynamically scalable and often virtualized resources are provided as a service over the Internet. Users need not have knowledge of, expertise in, or control over the technology infrastructure in the "cloud" that supports them.

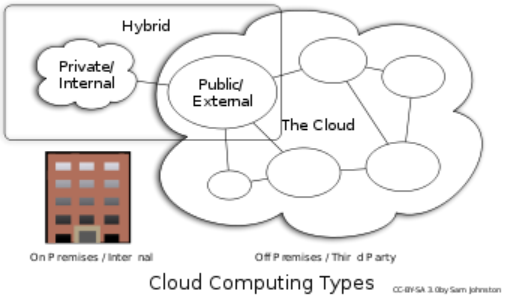
Characteristics

- It is sold on demand, typically by the minute or the hour.
- It is elastic; a user can have as much or as little of a service as they want at any given time.
- The service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access).

Types of Cloud computing

- A cloud can be private or public. A public cloud sells services to anyone on the Internet. (Currently, Amazon Web Services is the largest public cloud provider.)
- A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people.
- When a service provider uses public cloud resources to create their private cloud, the result is called a virtual private cloud. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services
- The three types of Cloud computing are,

  - **Public cloud**
  - **Private cloud**
  - **Hybrid cloud**



Public cloud

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

Private cloud

Private cloud and internal cloud are neologisms that some vendors have recently used to describe offerings that emulate cloud computing on private networks. These (typically virtualisation automation) products claim to "deliver some benefits of cloud computing without the pitfalls", capitalising on data security, corporate governance, and reliability concerns.

Hybrid cloud

A hybrid cloud environment consisting of multiple internal and/or external providers" will be typical for most enterprises".

These services are broadly divided into three categories:

- **Infrastructure as a service (IaaS)**
- **Platform as a service (PaaS)**
- **Software as a service (SaaS)**

Infrastructure as a Service (IaaS)

Iaas provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use the provider's application program interface (API) to start, stop, access and configure their virtual servers and storage.

Platform as a Service (PaaS)

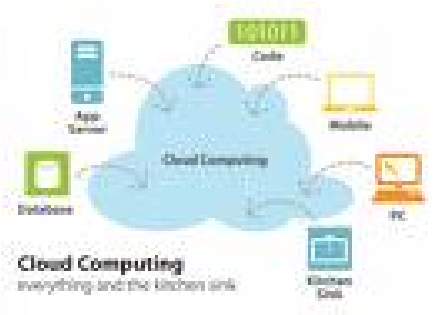
Paas is defined as a set of software and product development tools hosted on the provider's infrastructure. Developers create applications on the provider's platform over the Internet.

Software as a Service (SaaS)

In Saas, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal.

Cloud computing services

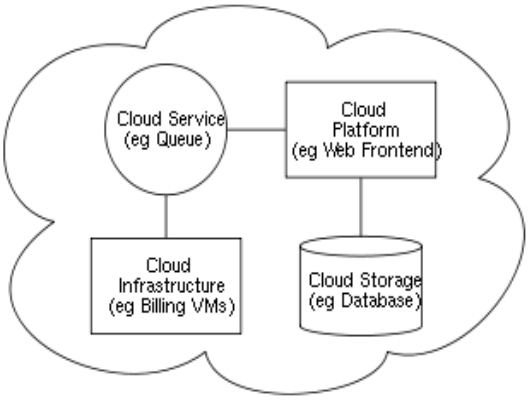
- Cloud computing services often provide common business applications online that are accessed from a web browser, while the software and data are stored on the servers.
- The term *cloud* is used as a metaphor for the Internet, based on how the Internet is depicted in computer network diagrams and is an abstraction for the complex infrastructure it conceals.



Architecture

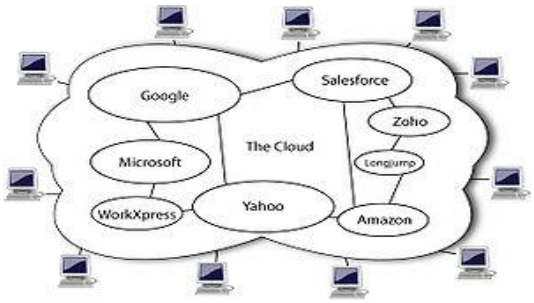
- The majority of cloud computing infrastructure, as of 2009, consists of reliable services delivered through data centers and built on servers with different levels of virtualization technologies.
- The services are accessible anywhere that provides access to networking infrastructure.

- Clouds often appear as single points of access for all consumers' computing needs. Commercial offerings are generally expected to meet quality of service (QoS)
- Open standards are critical to the growth of cloud computing, and open source software has provided the foundation for many cloud computing implementations.



Need of Cloud Computing

- Clients would be able to access their applications and data from anywhere at any time.
- They could access the cloud computing system using any computer linked to the Internet. Data wouldn't be confined to a hard drive on one user's computer or even a corporation's internal network.
- It could bring hardware costs down. We don't need to buy the fastest computer with the most memory.
- We wouldn't need a large hard drive because you'd store all your information on a remote computer.
- The companies don't have to buy a set of software or software licenses for every employee. Instead, the company could pay a metered fee to a cloud computing company.
- Cloud computing gives these companies the option of storing data on someone else's hardware, removing the need for physical space on the front end.
- The cloud system would tap into the processing power of all available computers on the back end, significantly speeding up the calculation.



Cloud computing providers

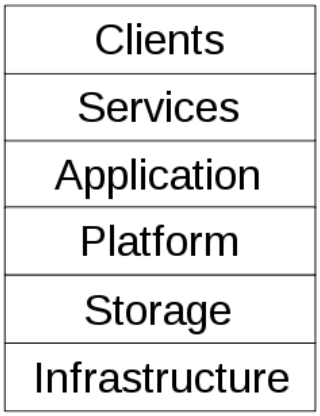
A cloud computing provider or cloud computing service provider owns and operates live cloud computing systems to deliver service to third parties. Usually this requires significant resources and expertise in building and managing next-generation data centers. Some organisations realise a subset of the benefits of cloud computing by becoming "internal" cloud providers and servicing themselves, although they do not benefit from the same economies of scale and still have to engineer for peak loads.

Cloud Computing – Companies

Dell, Vmware, Sun Microsystems, Rackspace US, ThinkGrid, Star UK, IBM, Amazon, Google, BMC, Microsoft and Yahoo are some of the major cloud computing service providers. Cloud services are also being adopted by individual users through large enterprises including Vmware, General Electric, and Procter & Gamble.

Components

Six layers components of cloud computing:



Cloud clients

- A cloud client consists of computer hardware and/or computer software which relies on cloud computing for application delivery, or which is specifically designed for delivery of cloud services and which, in either case, is essentially useless without it. For example:
- Mobile (Android, iPhone, Windows Mobile)
- Thin client (CherryPal, Zonbu, gOS-based systems)
- Thick client / Web browser (Microsoft Internet Explorer, Mozilla Firefox)

Cloud services

A cloud service includes "products, services and solutions that are delivered and consumed in real-time over the Internet"[40]. For example, Web Services ("software system[s] designed to support interoperable machine-to-machine interaction over a network") which may be accessed by other cloud computing components, software, e.g., Software plus services, or end users directly. Specific examples include:

- Identity (OAuth, OpenID)
- Integration (Amazon Simple Queue Service)
- Payments (Amazon Flexible Payments Service, Google Checkout, PayPal)
- Mapping (Google Maps, Yahoo! Maps, MapQuest)
- Search (Alexa, Google Custom Search, Yahoo! BOSS)
- Video Games (OnLive, Gaikai)
- Live chat (LivePerson)

Cloud platforms

A cloud platform, such as Platform as a service, the delivery of a computing platform, and/or solution stack as a service, facilitates deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers. For example:

- Code Based Web Application Frameworks.

- Java Google Web Toolkit (Google App Engine)
- Python Django (Google App Engine)
- Ruby on Rails (Heroku)
- .NET (Azure Services Platform)
- Non-Code Based Web Application Framework
- WorkXpress
- Cloud Computing Application & Web Hosting (Rackspace Cloud)
- Proprietary (Force.com)

Applications

A cloud application leverages the Cloud in software architecture, often eliminating the need to install and run the application on the customer's own computer, thus alleviating the burden of software maintenance, ongoing operation, and support.

For example:

1. Peer-to-peer / volunteer computing (Bittorrent, BOINC Projects, Skype)
2. Web application (Twitter)
3. Software as a service (Google Apps, SAP and Salesforce)
4. Software plus services (Microsoft Online Services)

Cloud infrastructure

Cloud infrastructure, such as Infrastructure as a service, is the delivery of computer infrastructure, typically a platform virtualization environment, as a service.[57] For example:

- Full virtualization (GoGrid, Skytap, iland)
- Grid computing (Sun Cloud)
- Hosted desktop (Think Grid)
- Management (Right Scale)
- Compute (Amazon Elastic Compute Cloud)
- Platform (Force.com)
- Storage (Amazon S3, Nirvanix, Rackspace)

Advantages of Cloud Computing

- **Lower computer costs:**
  - No need a high-powered and high-priced computer to run cloud computing's web-based applications.
  - Since applications run in the cloud, not on the desktop PC, your desktop PC doesn't need the processing power or hard disk space demanded by traditional desktop software.
  - When you're using web-based applications, your PC can be less expensive, with a smaller hard disk, less memory, more efficient processor, and the like.
  - In fact, your PC in this scenario doesn't even need a CD or DVD drive, as no software programs have to be loaded and no document files need to be saved.
- **Improved performance**
  - With fewer bloated programs hogging your computer's memory, we will see better performance from our PC.
  - Computers in a cloud computing system boot and run faster because they have fewer programs and processes loaded into memory.
- **Reduced software costs**
  - Instead of purchasing expensive software applications, you can get most of what you need for free.
  - Most cloud computing applications today, such as the Google Docs suite, are totally free.
- **Instant software updates**.
  - Another software-related advantage to cloud computing is that you're no longer faced with choosing between obsolete software and high upgrade costs.
  - When the app is web-based, updates happen automatically and are available the next time you log into the cloud. When you access a web-based application, you get the latest version without needing to pay for or download an upgrade.
- **Improved document format compatibility**.
  - We don't have to worry about the documents you create on your machine being compatible with other users' applications or operating systems.
- **Unlimited storage capacity**:
  - Cloud computing offers virtually limitless storage, our computer's current 200 gigabyte hard drive is peanuts compared to the hundreds of petabytes (a million gigabytes) available in the cloud. Whatever you need to store, you can access.
- **Increased data reliability**.
  - Unlike desktop computing, in which a hard disk crash can destroy all your valuable data, a computer crashing in the cloud shouldn't affect the storage of your data.
  - That also means that if your personal computer crashes, all your data is still out there in the cloud, still accessible.
- **Universal document access**
  - No need to take your documents with you. Instead, they stay in the cloud, and you can access them whenever you have a computer and an Internet connection.

- All your documents are instantly available from wherever you are; there's simply no need to take your documents with you.

- **Latest version availability**

  - Another document-related advantage of cloud computing: When you edit a document at home, that edited version is what you see when you access the document at work.

  - The cloud always hosts the latest version of your documents; as long as you're connected, you're never in danger of having an outdated version.

- **Easier group collaboration**

  - Sharing documents leads directly to collaborating on documents. To many users, this is one of the most important advantages of cloud computing.

  - Multiple users can collaborate easily on documents and projects. Because the documents are hosted in the cloud, not on individual computers, all you need is a computer with an Internet connection, and you're collaborating.

- **Device independence**:

  - We no longer tethered to a single computer or network. Change computers, and your existing applications and documents follow you through the cloud.

  - Move to a portable device, and your apps and docs are still available. There's no need to buy a special version of a program for a particular device, or to save your document in a device-specific format. Our docs and their apps are the same no matter what computer or other device you're using.

Disadvantages of Cloud Computing

- If you are going to move all of your information to data centers situated outside your company, then security should be of utmost importance.
- Lost control comes with handing over your data and information.
- Depending on third-party to ensure the security and confidentiality of data and information.
- If you are a small business, or even a Fortune 500 company, cloud computing can take a large expense and make it work for your budget. Funding the servers, software, and information technology professionals can be a real burden and finding cost-efficient means through cloud hosting can be very beneficial.

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