

# Cloud Computing – A Next Generation Platform

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**Abstract:** *This paper describes cloud computing, a computing platform for the next generation of the Internet. The paper defines cloud, explains the types of cloud computing, and outlines cloud computing architecture and its major components.*

## I. INTRODUCTION

Imagine yourself in the world where the users of the computer of today's internet world don't have to run, install or store their application or data on their own computers, imagine the world where every piece of your information or data would reside on the Cloud (Internet). *Cloud computing* is a term used to describe both a platform and type of application. Cloud (Internet) is a computing platform for users.

### A. What is Cloud?



Fig. 1 – Internet as a Cloud

The *cloud* itself is a set of hardware, networks, storage, services, and interfaces that enable the delivery of computing as a service.

### B. Types of Cloud:

**1. Public cloud:** In Public cloud the computing infrastructure is hosted by the cloud vendor at the vendor's premises. The customer has no visibility and control over where the computing infrastructure is hosted. The computing infrastructure is shared between any organizations.

**2. Private cloud:** The computing infrastructure is dedicated to a particular organization and not shared with other organizations. Some experts consider that private clouds are not real examples of cloud computing. Private clouds are more expensive and more secure when compared to public clouds.

**3. Hybrid cloud** Organizations may host critical applications on private clouds and applications with relatively less security concerns on the public cloud. The usage of both private and public clouds together is called hybrid cloud. A related term is Cloud Bursting. In Cloud bursting organization use their own computing infrastructure for normal usage, but access the cloud for high/peak load requirements. This ensures that a sudden increase in computing requirement is handled gracefully.

**4. Community cloud** involves sharing of computing infrastructure in between organizations of the same community. For example all Government organizations within the state of India may share computing infrastructure on the cloud to manage data related to citizens residing in India.

### C. Classification of Clouds based upon service provided:

Cloud computing is typically divided into three levels of service offerings:

Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a service (IaaS):

**1. Software as a service (SaaS)** includes a complete software offering on the cloud. Users can access a software application hosted by the cloud vendor on pay-per-use basis. This is a well-established sector. The pioneer in this field has been Salesforce.coms offering in the online Customer Relationship Management (CRM) space. Other examples are online email providers like Google's gmail and Microsoft's hotmail, Google docs and Microsoft's online version of office called BPOS (Business Productivity Online Standard Suite).

**2. Platform as a Service (PaaS)** involves offering a development platform on the cloud. Platforms provided by different vendors are typically not compatible. Typical players in PaaS are Google's Application Engine, Microsoft's Azure, Salesforce.com's force.com.

**3. Infrastructure as a service (IaaS)** involves offering hardware related services using the principles of cloud computing. These could include some kind of storage services (database or disk storage) or virtual servers. Leading vendors that provide Infrastructure as a service are Amazon EC2, Amazon S3, Rackspace Cloud Servers and Flexiscale.

*Cloud services* include the delivery of software, infrastructure, and storage over the Internet (either as separate components or a complete platform) based on user demand.

The term *cloud* is used as a metaphor for the Internet.

## II. CHARACTERISTICS

**Cost:** is greatly reduced and capital expenditure is converted to operational expenditure. This lowers 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 on a utility computing basis is fine-grained with usage-based options and minimal or no IT skills are required for implementation.

**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. As infrastructure is off-site (typically provided by a third-party) and accessed via the Internet the users can connect from anywhere.

**Multi-tenancy:** enables sharing of resources and costs among a large pool of users, allowing for:

1. **Centralization** of infrastructure in areas with lower costs (such as real estate, electricity, etc.)
2. **Peak-load capacity** increases (users need not engineer for highest possible load-levels)
3. **Utilization and efficiency** improvements for systems that are often only 10-20% utilized.

**Reliability:** improves through the use of multiple redundant sites, which makes it suitable for business continuity and disaster recovery. Nonetheless, most major cloud computing services have suffered outages and IT and business managers are able to do little when they are affected.

**Scalability:** 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:** typically improves due to centralization of data, increased security-focused resources, etc., but raises concerns about loss of control over certain sensitive data. Security is often as good as or better than traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford. Providers typically log accesses, but accessing the audit logs themselves can be difficult or impossible.

**Sustainability:** comes about through improved resource utilization, more efficient systems, and carbon neutrality. Nonetheless, computers and associated infrastructure are major consumers of energy.

### III. CLOUD COMPONENTS

#### (1) Clients:

Clients are, in a cloud computing architecture, the exact same things that they are in a plain, old, everyday local area network (LAN). They are, typically, the computers that just sit on your desk. But they might also be laptops, tablet computers, mobile phones, or PDAs—all big drivers for cloud computing because of their mobility. Anyway, clients are the devices that the end users interact with to manage their information on the cloud. Clients generally fall into three categories:

- **Mobile** Mobile devices include PDAs or smartphones, like a Blackberry, Windows Mobile Smartphone, or an iPhone.
- **Thin** Clients are computers that do not have internal hard drives, but rather let the server do all the work, but then display the information.
- **Thick** This type of client is a regular computer, using a web browser like Firefox or Internet Explorer to connect to the cloud.

Thin clients are becoming an increasingly popular solution, because of their price and effect on the environment.

#### (2) Datacenter:

The *datacenter* is the collection of servers where the application to which you subscribe is housed. It could be a large room in the basement of your building or a room full of servers on the other side of the world that you access via the Internet.

A growing trend in the IT world is virtualizing servers. That is, software can be installed allowing multiple instances of virtual servers to be used. In this way, you can have half a dozen virtual servers running on one physical server.

#### (3) Distributed Servers:

Servers don't all have to be housed in the same location. Often, servers are in geographically disparate locations. But for the cloud subscriber, these servers act as if they're humming away right next to each other. This gives the service provider more flexibility in options and security. For instance, Amazon has their cloud solution in servers all over the world. If something were to happen at one site, causing a failure, the service would still be accessed through another site. Also, if the cloud needs more hardware, they can add them at another site and simply make it part of the cloud.

#### (4) Application:

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.

#### (5) Service:

A *cloud service* includes "products, services and solutions that are delivered and consumed in real-time over the Internet".

## IV. ARCHITECTURE

When talking about a cloud computing system, it's helpful to divide it into two sections: the **front end** and the **back end**. They connect to each other through a network, usually the Internet. The front end is the side the computer user, or client, sees. The back end is the "cloud" section of the system.

The front end includes the client's computer (or computer network) and the application required to access the cloud computing system. Not all cloud computing systems have the same user interface. Services like Web-based e-mail programs leverage existing Web browsers like Internet Explorer or Firefox. Other systems have unique applications that provide network access to clients.

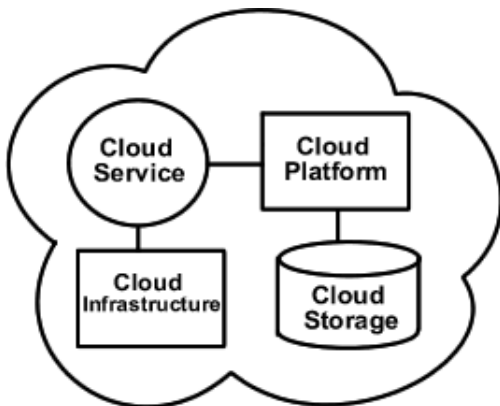


Fig 2. Cloud Computing Sample Architecture

**Cloud architecture**, typically involves multiple *cloud components* communicating with each other over application programming interfaces, usually web services.

### Roles in Cloud Computing

**1. Provider:** A *cloud computing provider* or *cloud computing service provider* owns and

operates live *cloud computing* systems to deliver service to third parties.

**2. User:** A user is a consumer of *cloud computing*.

**3. Vendor:** A vendor sells products and services that facilitate the delivery, adoption and use of *cloud computing*.

## V. CONCLUSION

Cloud computing offers real alternatives to IT Markets for developing the delivery of software applications, platforms, and infrastructure as a service over the "cloud". These services are readily accessible on a pay-per-use basis and offer great alternatives to businesses that need the flexibility to rent infrastructure on a temporary basis or to reduce capital costs.

## VI. REFERENCE

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