Cloud computing, when it's Smarter to Rent than to buy

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Abstract

This paper focuses on various features of cloud computing. Starting with its concepts it also elaborates on the various features of cloud computing such as why it is used and its application. The main objective of the paper is to cover SaaS (Software-as-a-Service) a way to provide services under the banner of cloud, how SaaS works, maturity model of SaaS, its challenges and finally the conclusion.

Cloud computing is a computing paradigm in which tasks are assigned to a combination of connections, software and services accessed over a network. This network of servers and connection is collectively known as 'the cloud'.

Significant innovations in virtualization and distributed computing, as well as improved access to high-speed Internet and a weak economy, have accelerated interest in cloud computing.

KEYWORDS Software-as-a-service (SaaS), Platform-as-a-service (PaaS), Infrastructure-as-a-service (IaaS), Software licence, Maturity Model of SaaS.

Introduction

If an organization wanted to computerize a certain function, it first bought the hardware, then the licenses for the software, and finally hired the services of a third company to customize and implement the application according to its specifications. Naturally, it was an expensive and time-consuming process.

Smaller companies were the hardest hit because most of them didn't have the budgets for expensive hardware and even more expensive software licenses.

But now a day we can outsource all these requirements to a single provider which handles all these tasks, which is much simpler and less expensive known as *cloud computing*.

Cloud computing is an evolving technology that brings together all the elements of hardware, software and services in a single package. Cloud computing is a loosely defined term that can refer either to infrastructure, services or applications.

What is cloud computing?

Cloud computing is a general term for anything that involves delivering hosted services over the Internet. Typical cloud computing providers deliver common business applications online which are accessed from a web browser, while the software and data are stored on servers.

It is called cloud computing because the data and applications exist on a "cloud" of Web servers. It is used to depict the Internet in computer network diagrams as an abstraction of the underlying infrastructure it represents.

Cloud computing can be defined as:

1) An emerging computing technology that uses the internet and central remote servers to maintain data and applications.

2) The technology which allows consumers and businesses to use applications without installation and access their personal files at any computer with internet access.

3) The technology which allows for much more efficient computing by centralizing storage, memory, processing and bandwidth.

4) A new supplement and delivery model for IT services based on the Internet, which typically involves the provision of dynamically scalable and often virtualized resources as a service over the Internet.

Cloud computing is broken down into three segments: "*applications*," "*platforms*," and "*infrastructure*." Each segment serves a different purpose and offers different products for businesses and individuals around the world.

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.

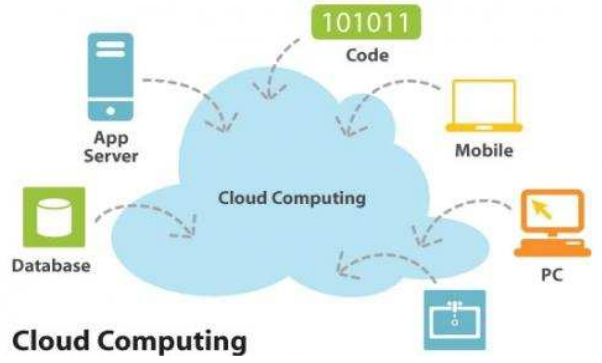


Fig1.1: fundamental units in cloud computing

Why cloud Computing?

Cloud computing is required for the following features it provides:-

1. Software as a Subscription

Users would not have to buy software as it resides on a service provider's servers.

2. Reduced Software Maintenance

We can easily update, modify software in clouds. Users don't have to install it on personal PC.

3. Increased Reliability

The cloud provides some form of redundancy. A cloud computing systems make a copy of its entire client's information and store it on other devices.

4. Increased Scalability

Cloud can store and manage very huge data by adding servers or shifting load from one server to another.

5. Cost Reduction

Expenditures are reduced because the service provider provides the services like load, storage and maintenance at a lower cost.

6. Environmentally Friendly

We can use older hardware to deploy software. This in turn lessens the amount of electronic waste dumped.

7. Matches Current Computing Trends

It is easily matched the latest technical trends and newly introduced software.

8. Portability/Accessibility

Cloud computing can use grid computing by sharing and accessing of data over a grid with all possible security measures

9. Efficient Use of Computer Resources

Companies can efficiently use their computer resources with the advent of virtualization. Users no longer require separate servers for different applications

10. Version less Software

It refers to the elimination of software upgrade projects. Changes and updates to software would be constant and version numbers would be transparent to the user.

Application of cloud computing:

The applications of cloud computing are practically limitless. With the right middleware, a cloud computing system could execute all the programs a normal computer could run. Potentially, everything from word processing software to customized computer programs designed for a complicated task.

These applications are broadly divided into the following categories: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

1) Software as a Service (SaaS)

It is used widely in the market. In this the provider allows the customer only to use its applications. The software interacts with the user through a user interface.

It often eliminates 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:

- Web applications (Facebook, Twitter, YouTube,)
- Security as a service (MessageLabs, Purewire, ScanSafe, Zscaler)
- Software as a service (Google Apps, Salesforce,Nivio,Learn.com, BigGyan.com)
- Software plus services (Microsoft Online Services)
- Storage [Distributed]
    - Content distribution (BitTorrent, Amazon CloudFront)
    - Synchronisation (Dropbox, Live Mesh, SpiderOak, ZumoDrive)

Software as a Service is further divided into:

a) On Demand software

The software is hosted directly from the software providers' servers and is accessed by the end user over the internet.

Example:

Salesforce.com (CRM) ,Google (GOOG)
NetSuite (N),Taleo (TLEO)
Concur Technologies (CNQR)

b) Traditional Software

Traditional Software companies sell licenses to their users, who then run the software from on premise servers.

Example:

SAP AG (SAP)
Oracle (ORCL)
Blackbaud (BLKB)
Lawson Software (LWSN)
Blackboard (BBBB)

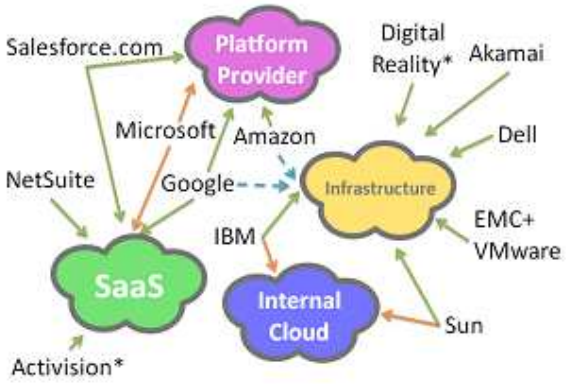


Fig1.2: Services provided by cloud computing

2) Platform as a Service (PaaS)

It is a set of software and development tools hosted on the provider's servers. Developers can create applications using the provider's APIs. Developers should take notice that there aren't any interoperability standards (yet), so some providers may not allow you to take your application and put it on another platform.

But some providers facilitate deployment of applications without the cost and complexity of buying and managing the underlying hardware and software layers. For example:

- Services
  - Identity (OAuth, OpenID)
  - Payments (Amazon Service,Google)
  - Search (Google Custom Search, Yahoo!)
  - Real-world (Amazon Mechanical Turk)
- Solution stacks
  - Java (Google App Engine)
  - PHP (Rackspace Cloud Sites)
  - Python Django (Google App Engine)
  - ColdFusion (Adobe)
  - .NET (Azure Services Platform)
- Storage [Structured]
  - Databases (Amazon SimpleDB, BigTable)
  - File storage (Amazon S3, Nirvanix)
  - Queues (Amazon SQS)

a) Active platforms –

Certain companies have developed platforms that allow end users to access applications from centralized servers using the internet which is known as active platforms. Next to each company is the name of their platform.

Google (GOOG) - Apps Engine
Amazon.com (AMZN) - EC2
Microsoft (MSFT) - Windows Live
Salesforce.com (CRM) - Force.com
NetSuite (N) - Suiteflex
Metrisoft - Metrisoft SaaS Platform

3) Infrastructure as a service

It provides virtual servers with unique IP addresses and blocks of storage on demand. Customers benefit from an API from which they can control their servers. Because customers can pay for exactly the amount of service they use, like for electricity or water, this service is also called utility computing.

It is the backbone of the all services provided by cloud computing. Infrastructure vendors provide the physical storage space and processing capabilities that allow for all the services described above.

It includes services such as managed hosting, and development environments (such as Google gears) that allow users to build applications. Cloud storage, such as Amazon's S3, is also considered to be part of the infrastructure segment.

Major Infrastructure Vendor are-
Google (GOOG) - Managed hosting, development environment
International Business Machines (IBM) - Managed hosting
SAVVIS (SVVS) - Managed hosting
Terremark Worldwide (TMRK) - Managed hosting
Amazon.com (AMZN) - Cloud storage

What is SaaS?

SaaS is a way of delivering applications over the Internet-as a service, which is based on a "one-to-many" model whereby an application is shared across multiple

clients. SaaS is simply defined as: *"Software deployed as a hosted service and accessed over the Internet."*

Instead of installing and maintaining software, we can simply access it via the Internet, freeing our self from complex software and hardware management. SaaS applications are sometimes called Web-based software, on-demand software, or hosted software. The provider manages access to the application, including security, availability, and performance

The two major categories of SaaS:

1) *Line-of-business services*: These services are often large, customizable business solutions which are offered to enterprises and organizations of all sizes. It facilitates business processes such as finances, supply-chain management and customer relations. These services are typically sold to customers on a subscription-basis. 2) *Consumer-oriented services*: These services are sometimes sold on a subscription-basis which is offered to the general public. But are often provided to consumers at no cost, and are supported by advertising.

A successful SaaS application can be determined by following key points:

1) *Scalability:* Scaling the application means maximizing concurrency and using application resources more efficiently.

2)*Multi-tenant efficient***:** SaaS architecture should maximizes the sharing of resources across tenants and it should be able to differentiate data belonging to different customers.

3)*Configurable:* The task of configuring applications should be simple and easy for the customers, without incurring extra development or operation costs for each configuration.

Ways of hosting an application on the SaaS architecture (maturity models of SaaS):

1) **Ad-hoc/Custom:** It is similar to the traditional application service provider (ASP) model of software delivery, dating back to the 1990s. Each customer has its own customized version of the hosted application, and runs its own instance of the application on the host's servers.
2) **Configurable:** The vendor runs a separate instance of the application for each customer (or tenant). It allows the customer to change the application looks and functions. Despite being identical to one another each instance remains wholly isolated from all the others.
3) **Configurable, Multi-tenant-efficient:** The vendor runs a single instance of the application that serves every customer. It allows much more efficient use of computing resources and there is no need to provide separate server space to individual customers. A significant disadvantage of this approach is that the scalability of the application is limited.
4) **Scalable, configurable, Multi-tenant-efficient:** The vendor hosts multiple customers on a load-balanced farm of identical instances, with each customer's

data kept separate, and with configurable metadata providing a unique user experience and feature set for each customer.

How cloud - saas works

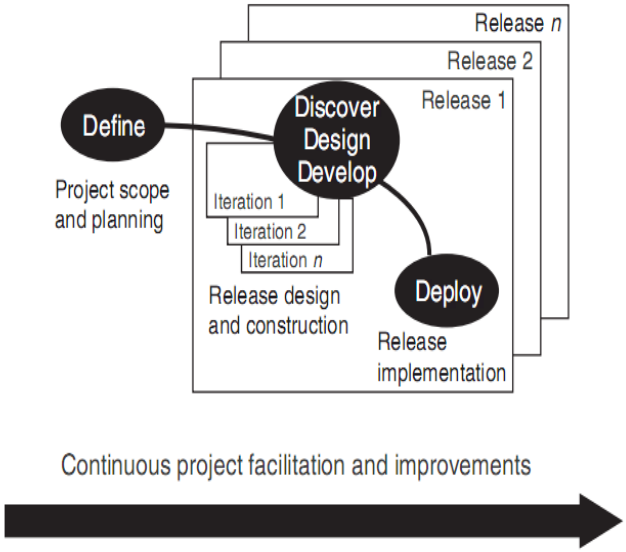


Fig 1.3: Phases of working of SaaS Model

The working of SaaS is divided into five phases:

1. Define
2. Discover
3. Design
4. Develop
5. Deploy

Following the structure of the software and the requirement of the service, the components required by the customer for that service are loosely coupled as independent modules. The approach of the model in Saas will not have the provision to cater to customized requirements of the user.

Also that according to the architecture of the software service delivered to the customer will follow an iterative and continuous approach for development. Therefore deployment of the software as service will be a release implementation. The release thus obtained can be auto enhanced. There will be no provision for versioning in the system.

These services allow non-technical end users to customize and deploy integration through menu driven wizards configuring data sources and targets, mappings, transformations, integration process and the scheduling of jobs. The service provides a natural model for cloud to cloud integration, a simplified model for on premise to cloud integration. It also presents a platform for easily incorporating new connectors and value added services such as data validation etc...

Cloud SaaS - challenges

1. Security:

Data Security has the highest priority in IT. Clients could possibly loss their data if they are careless with data. Users will also need to include provisions that directly specify how cloud computing protects the data.

2. Performance with Reliability:

This could be a problem for companies that rely on the cloud to keep critical business functions up and running. Some companies plan for hosting non-critical processing to be done through a cloud vendor.

Companies that are interested in working with a cloud vendor may want to look into the vendor's back up plans. Companies want to know where the data is stored geographically as it would be helpful, but many cloud providers are reluctant to give out sensitive information. You could insist on obtaining the geographical information from a potential provider.

3. Control with Sustainability:

The company which is implementing cloud computing in delivering or purchasing software as a service will also look out for rate of energy consumption to maintain data servers and to transfer the data.

Also the migration of data from one cloud to another will require following a sequence of protocol or it has to migrate through some authenticated system.

4. Support & Configuration:

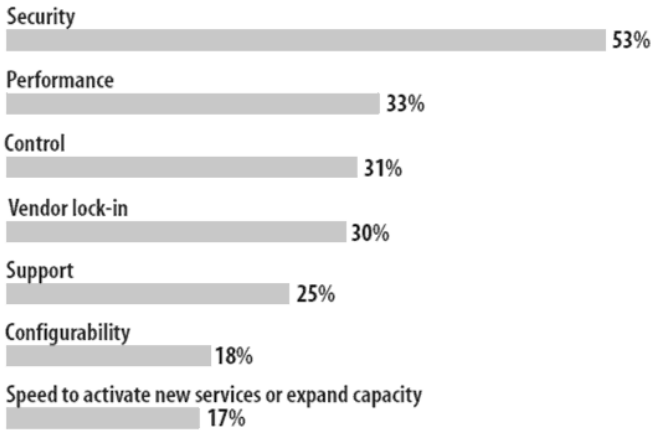
If the service provided on demand does not match to the virtual configuration hired by the vendor then there will be major loss of data and the brunch once lost in the cloud will be very difficult to recover.

SaaS methodology requires system architecture capable of supporting peak usage demands and the ability to process large numbers of transactions in a secure and reliable environment.

5. Speed & Expandability:

Since everything will be on the cloud form docs to the desktop and as the data transfer from numerous users cloud to cloud, it will face a problem of speed.

Also that the expansion of the cloud will require an acknowledgement of all the loosely coupled vendors, users and stakeholders placed at different geographical locations using the same software as a service delivered through and over the cloud.



% of various Challenges with Cloud Implementation

Conclusion:

Cloud Computing builds on decades of research, virtualization, distributed computing and more recently web, networking and software services. A Cloud offers the delivery of software applications, platforms and infrastructure as a service to IT Departments.

SaaS implies service oriented architecture, reduced information technology overhead for the end user, great flexibility; reduce total cost of ownership, on demand services and many other things.

The goal of cloud computing is to provide easy, scalable access to computing resources, IT services and to provide cloud security to businesses and corporations taking advantage of cloud computing

The future of Cloud Computing is very bright as people and organizations throw traditional way of data accessing and security practices in a cloud environment and started accessing it from anywhere in the world.

References:

1) http://www.economist.com/ displaystory .cfm?story_id=14637206
2) http://www.infoworld.com/article /08/04/07/15FE-cloud-computing-reality_1.html.
3) Techtarget.com
4) http://www.gridbus.org/~raj/ papers/hpcc2008
5) http://meetings.informs.org/ Dallas97/TALKS/C20.html.
6) www.wikipedia.org