Bhujbal Knowledge City

MET's Institute Of Engineering

Adgaon, Nashik-422003.

ACADEMIC YEAR 2011-2012.

A

SEMINAR

ON

"Cloud Computing "

SUBMITTED IN

DEPARTMENT OF MCA

GUIDED BY

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PRSENTED BY

Mr. Jagdish Chopde

TYMCA

ROLL NO - 05

Bhujbal Knowledge City

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Affiliated to

University Of Pune

Department Of Master of Computer Application

CERTIFICATE

This is to certify that seminar entitled

"Cloud Computing"

Has satisfactorily completed by

Mr. Jagdish Chopde

In partial fulfillment of term work for

Degree in Master of Computer Application

For the academic year 2011-2012

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Seminar Guide

(Prof.Aruna Deogire)
H.O.D.

Acknowledgements

Every work is source which requires support from many people and areas. It gives me proud privilege to complete the seminar on *"Cloud Computing"* under valuable guidance and encouragement of my guide **Prof. Javed Attar**.

I am also extremely grateful to our respected H.O.D.(MCA Dept.) **Prof.Aruna Deogire** and **Prof.Remya Panicker**(Seminar Coordinator) for providing all facilities and every help for smooth progress of seminar.

I would also like to thank all the Staff Members of MCA Department for timely help and inspiration for completion of the seminar.

At last I would like to thank all the unseen authors of various articles on the Internet, helping me become aware of the research currently ongoing in this field and all my colleagues for providing help and support in my work.

Mr. Jagdish Chopde.
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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 entrusts services (typically centralized) with a user's data, software and computation on a published application programming interface (API) over a network. It has considerable overlap with software as a service (SaaS).

End users access cloud based applications through a web browser or a light weight desktop or mobile app while the business software and data are stored on servers at a remote location. Cloud application providers strive to give the same or better service and performance than if the software programs were installed locally on end-user computers.

At the foundation of cloud computing is the broader concept of infrastructure convergence (or Converged Infrastructure) and shared services. This type of data center environment allows enterprises to get their applications up and running faster, with easier manageability and less maintenance, and enables IT to more rapidly adjust IT resources (such as servers, storage, and networking) to meet fluctuating and unpredictable business demand.

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Introduction

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).

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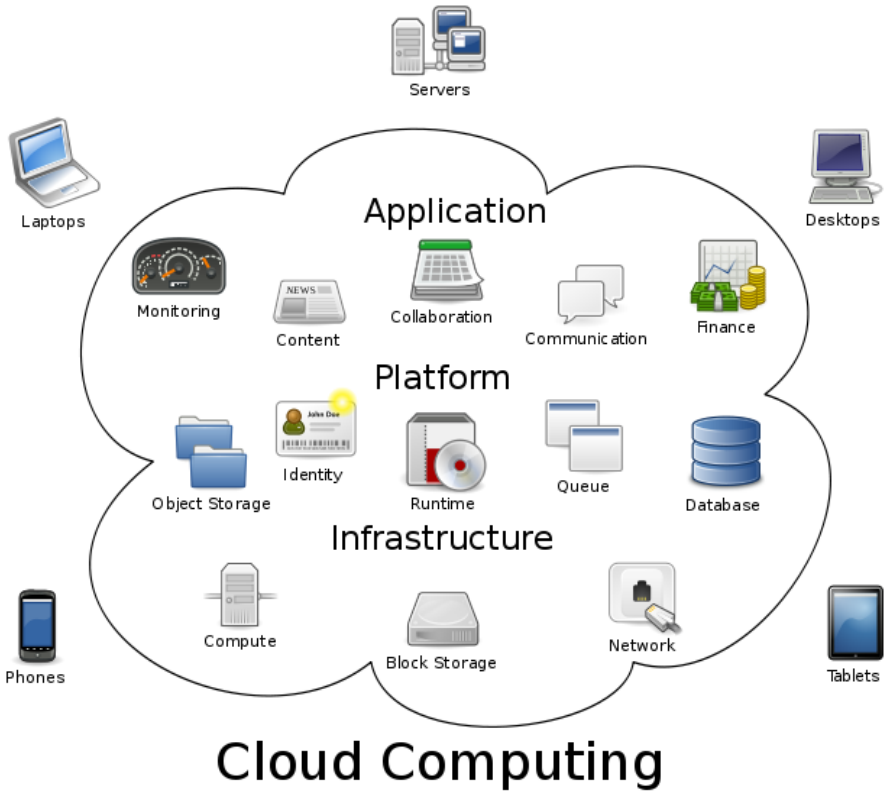

Figure 1.1: Introduction of cloud computing

Chapter 2

History

The term "cloud" is used as a metaphor for the Internet, based on the cloud drawing used in the past to represent the telephone network, and later to depict the Internet in computer network diagrams as an abstraction of the underlying infrastructure it represents.

The ubiquitous availability of high capacity networks, low cost computers and storage devices as well as the widespread adoption of virtualization, service-oriented architecture, autonomic, and utility computing have led to a tremendous growth in cloud computing Details are abstracted from end-users, who no longer have need for expertise in, or control over, the technology infrastructure "in the cloud" that supports them.

The underlying concept of cloud computing dates back to the 1960s, when John McCarthy opined that computation may someday be organized as a public utility. Almost all the modern-day characteristics of cloud computing (elastic provision, provided as a utility, online, illusion of infinite supply), the comparison to the electricity industry and the use of public, private, government, and community forms, were thoroughly explored in Douglas Parkhill's 1966 book, The Challenge of the Computer Utility.

The actual term "cloud" borrows from telephony in that telecommunications companies, who until the 1990s offered primarily dedicated point-to-point data circuits,

began offering Virtual Private Network (VPN) services with comparable quality of service but at a much lower cost. By switching traffic to balance utilization as they saw fit, they were able to utilize their overall network bandwidth more effectively. The cloud symbol was used to denote the demarcation point between that which was the responsibility of the provider and that which was the responsibility of the user. Cloud computing extends this boundary to cover servers as well as the network infrastructure.

After the dot-com bubble, Amazon played a key role in the development of cloud computing by modernizing their data centers, which, like most computer networks, were using as little as 10% of their capacity at any one time, just to leave room for occasional spikes. Having found that the new cloud architecture resulted in significant internal efficiency improvements whereby small, fast-moving "two-pizza teams" could add new features faster and more easily, Amazon initiated a new product development effort to provide cloud computing to external customers, and launched Amazon Web Service (AWS) on a utility computing basis in 2006.

In early 2008, Eucalyptus became the first open-source, AWS API-compatible platform for deploying private clouds. In early 2008, OpenNebula, enhanced in the RESERVOIR European Commission-funded project, became the first open-source software for deploying private and hybrid clouds, and for the federation of clouds. In the same year, efforts were focused on providing QoS guarantees (as required by real-time interactive applications) to cloud-based infrastructures, in the framework of the IRMOS European Commission-funded project, resulting to a real-time cloud environment. By mid-2008, Gartner saw an opportunity for cloud computing to shape the relationship among consumers of IT services, those who use IT services and those who sell them and observed that organizations are switching from company-owned hardware and software assets to per-use service-based models so that the projected shift to cloud computing... will result in dramatic growth in IT products in some areas and significant reductions in other areas.

Chapter 3

Characteristics

Cloud computing exhibits the following key characteristics:

- **Empowerment** of end-users of computing resources by putting the provisioning of those resources in their own control, as opposed to the control of a centralized IT service.
- **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.
- **Cost** is claimed to be reduced and in a public cloud delivery model capital expenditure is converted to operational expenditure. This is purported to lower 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 fewer IT skills are required for implementation (in-house).
- **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.

- **Virtualization** technology allows servers and storage devices to be shared and utilization be increased. Applications can be easily migrated from one physical server to another.

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

    1. **Centralization** of infrastructure in locations with lower costs (such as real estate, electricity, etc.)
    2. **Peak-load capacity** increases (users need not engineer for highest possible load-levels)
    3. **Utilisation and efficiency** improvements for systems that are often only 10 to 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 centralization 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. Security is often as good as or better than other traditional systems, in part because providers are able to devote resources to solving security issues that many customers cannot afford. However,

the complexity of security is greatly increased when data is distributed over a wider area or greater number of devices and in multi-tenant systems that are being shared by unrelated users. In addition, user access to security audit logs may be difficult or impossible. Private cloud installations are in part motivated by users' desire to retain control over the infrastructure and avoid losing control of information security.

- **Maintenance** of cloud computing applications is easier, because they do not need to be installed on each user's computer and can be accessed from different places.

Chapter 4

Service Models

Cloud computing providers offer their services according to three fundamental models: Infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) where IaaS is the most basic and each higher model abstracts from the details of the lower models.

4.1 Infrastructure as a Service (IaaS)

In this most basic cloud service model, cloud providers offer computers as physical or more often as virtual machines , raw (block) storage, firewalls, load balancers, and networks. IaaS providers supply these resources on demand from their large pools installed in data centers. Local area networks including IP addresses are part of the offer. For the wide area connectivity, the Internet can be used or - in carrier clouds - dedicated virtual private networks can be configured. To deploy their applications, cloud users then install operating system images on the machines as well as their application software. In this model, it is the cloud user who is responsible for patching and maintaining the operating systems and application software. Cloud providers typically bill IaaS services on a utility computing basis, that is, cost will reflect the amount of resources allocated and consumed.

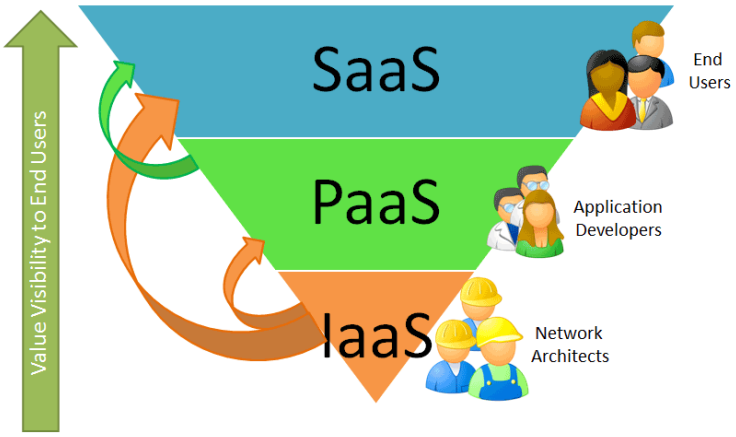

Figure 4.1: Service Models - value visibility to end users

4.2 Platform as a Service (PaaS)

In the PaaS model, cloud providers deliver a computing platform and/or solution stack typically including operating system, programming language execution environment, database, and web server. Application developers can develop and run their software solutions on a cloud platform without the cost and complexity of buying and managing the underlying hardware and software layers. With some PaaS offers, the underlying compute and storage resources scale automatically to match application demand such that the cloud user does not have to allocate resources manually.

4.3 Software as a Service (SaaS)

In this model, cloud providers install and operate application software in the cloud and cloud users access the software from cloud clients. The cloud users do not manage the cloud infrastructure and platform on which the application is running. This eliminates the need to install and run the application on the cloud user's own computers simplifying maintenance and support. What makes a cloud application different from

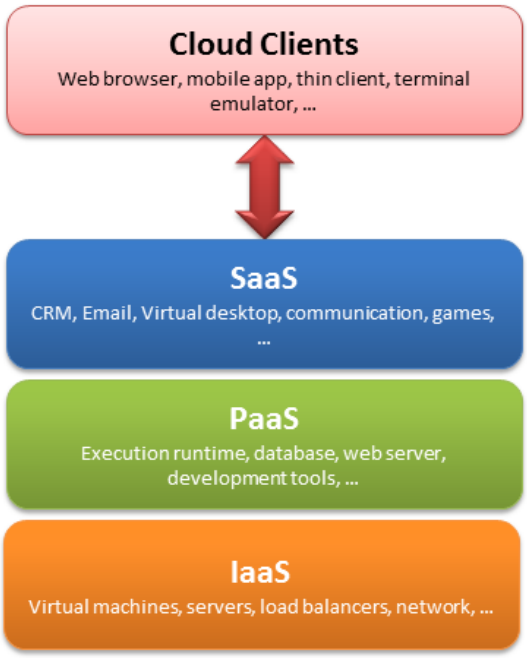

Figure 4.2: Service Models - Interdependency structure

other applications is its elasticity. This can be achieved by cloning tasks onto multiple virtual machines at run-time to meet the changing work demand. Load balancers distribute the work over the set of virtual machines. This process is transparent to the cloud user who sees only a single access point. To accomodate a large number of cloud users, cloud applications can be multitenant, that is, any machine serves more than one cloud user organization. It is common to refer to special types of cloud based application software with a similar naming convention: desktop as a service, business process as a service, Test Environment as a Service, communication as a service. The pricing model for SaaS applications is typically a monthly or yearly flat fee per user.

4.4 Cloud clients

Users access cloud computing using networked client devices, such as desktop computers, laptops, tablets and smartphones. Some of these devices - cloud clients -

rely on cloud computing for all or a majority of their applications so as to be essentially useless without it. Examples are thin clients and the browser-based Chromebook. Many cloud applications do not require specific software on the client and instead use a web browser to interact with the cloud application. With Ajax and HTML5 these Web user interfaces can achieve a similar or even better look and feel as native applications. Some cloud applications, however, support specific client software dedicated to these applications (e.g., virtual desktop clients and most email clients). Some legacy applications (line of business applications that until now have been prevalent in thin client Windows computing) are delivered via a screen-sharing technology.

Chapter 5

Deployment models

5.1 Public cloud

Public cloud applications, storage, and other resources are made available to the general public by a service provider. These services are free or offered on a pay-per-use model. Generally, public cloud service providers like Microsoft and Google own and operate the infrastructure and offer access only via Internet (direct connectivity is not offered).

5.2 Community cloud

Community cloud shares infrastructure between several organizations 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 cost savings potential of cloud computing are realized.

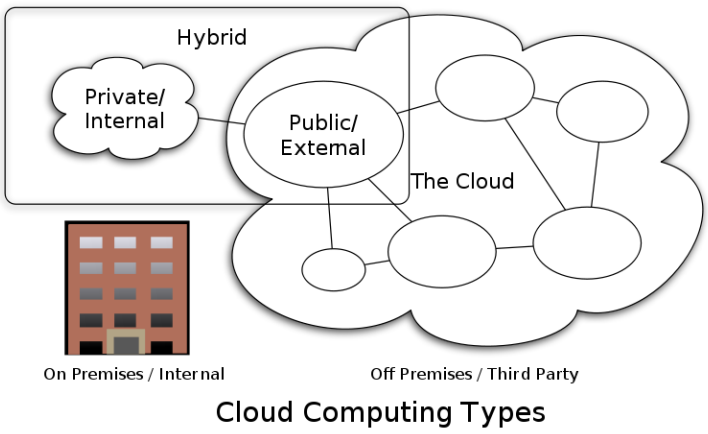

Figure 5.1: Deployment Models

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.

5.4 Private cloud

Private cloud is cloud infrastructure operated solely for a single organization, whether managed internally or by a third-party and hosted internally or externally. They have attracted criticism because users "still have to buy, build, and manage them" and thus do not benefit from less hands-on management, essentially "[lacking] the economic model that makes cloud computing such an intriguing concept".

Chapter 6

Software as a Service (SaaS)

Here are some examples/case studies of SaaS.

6.1 Windows Live Hotmail

Hotmail (also known as Microsoft Hotmail and Windows Live Hotmail), is a free web-based email service operated by Microsoft as part of Windows Live. One of the first web-based email services, it was founded by Sabeer Bhatia and Jack Smith and launched in July 1996 as "HoTMaiL". It was acquired by Microsoft in 1997 for an estimated $400 million, and shortly after it was rebranded as "MSN Hotmail". The current version was released in 2007. Hotmail features unlimited storage, Ajax, and integration with Microsoft's instant messaging (Windows Live Messenger), calendar (Hotmail Calendar), file hosting service (SkyDrive) and contacts platform. According to comScore (August 2010) Windows Live Hotmail is the world's largest web-based email service with 364 million members, followed by Gmail and Yahoo! Mail, respectively. It is available in 36 different languages. Hotmail is developed from Mountain View, California. When Hotmail Corporation was an independent company, its headquarters were in Sunnyvale.

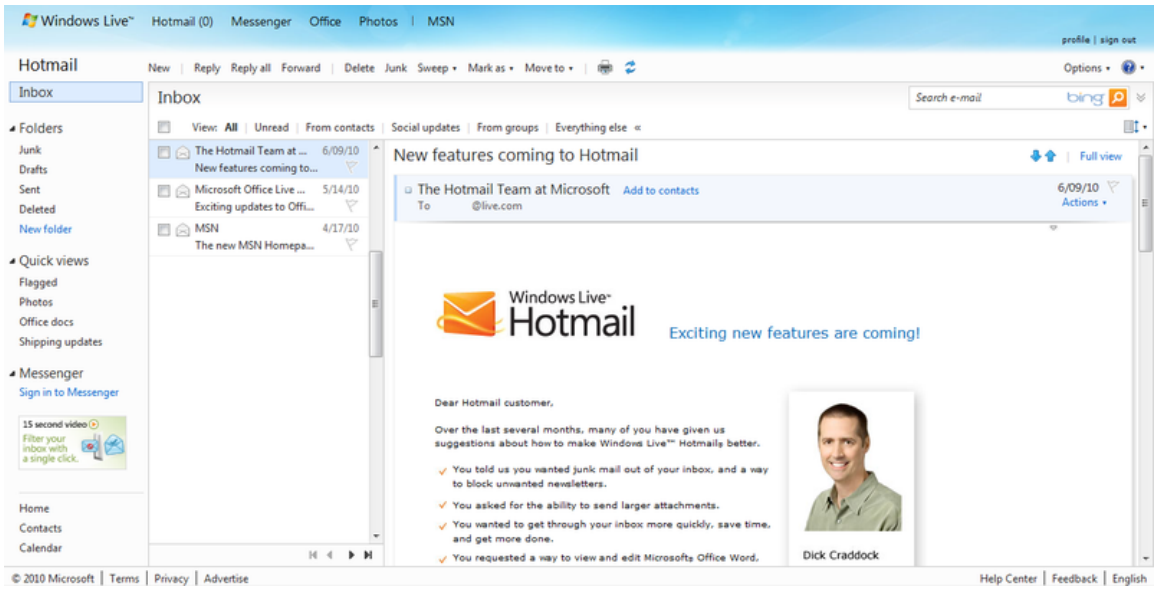

Figure 6.1: Windows Live Hotmail

6.2 Microsoft SkyDrive

SkyDrive (also called Microsoft SkyDrive or Windows Live SkyDrive) is a free-of-charge file hosting service that allows users to upload files to cloud storage and then access them from a Web browser. It is part of Windows Live range of online services and allows users to keep the files private, share them with contacts, or make the files public. Publicly-shared files do not require a Windows Live ID to access. The service offers 25 GB of free personal storage, with individual files limited to 100 MB. The service is built using HTML5 technologies, and files can be uploaded via drag and drop.

6.2.1 Features

Office Web Apps

Microsoft added Office Web Apps support to SkyDrive in its "Wave 4" update allowing users to upload, create, edit, and share Microsoft Office documents directly within a Web browser. Users can create, view and edit Word, Excel, PowerPoint and OneNote documents within the Web browser. In addition, Office Web Apps on Sky-

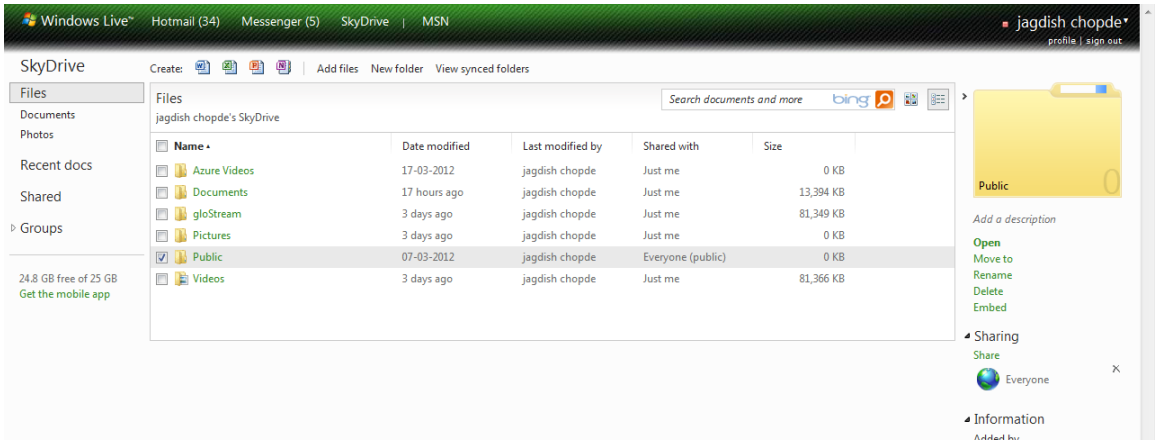

Figure 6.2: Windows Live skyDrive

Drive also allow multiple users to simultaneously co-author Excel directly within the web browser, and co-author OneNote documents with another web user or the desktop application. Users can also view version history of Office documents stored on SkyDrive.

Office Desktop App Integration

Users of recent versions of Microsoft Office (for Windows or Macintosh) can use the desktop applications to edit the same section of documents stored on SkyDrive simultaneously. Changes are synchronized when users save the document, and where conflicts occur, a user is given the selection to choose which version to keep. [14] This is a collaborative real-time editing suite as multiple users can use combinations of desktop applications and the web apps to edit a document.

Hotmail integration

SkyDrive integrates with Hotmail which allow users to:

- Directly upload Office documents and photos within Hotmail, store them on SkyDrive, and share them with other users.
- Directly save Office documents within Hotmail to SkyDrive and view or edit these documents directly within the web browser.

- Allow Hotmail users to edit Office documents within the web browser using Office Web Apps, and reply directly back to the sender with the edits made.

Bing integration

SkyDrive integrates with Bing's Save & Share feature, allowing users to save search histories into a SkyDrive folder.

Windows Live Groups integration

Each group within Windows Live Groups are provided with 5 GB of storage spaces on SkyDrive to be shared between the group members. Group members are allowed to access, create, modify and delete files within the group's SkyDrive folders, as well as other functionalities that SkyDrive provides.

RSS feeds

It is possible to subscribe to RSS feeds of the content of public folders. The feeds contain preview images of the added fileseither a thumbnail of an image or an icon representing the file typeand links to the file download pages.

Download as .zip file

Entire folders can be downloaded as a single .zip file with SkyDrive.

6.2.2 Future

On February 20, 2012, Microsoft announced that Windows 8 will be able to connect to and store files on SkyDrive. The announcement says that users will be able to connect their computers to SkyDrive accounts to increase their capacity. SkyDrive will also support files as big as 2 GB.

Chapter 7

Platform as a Service (PaaS)

Here are some examples/case studies of PaaS.

7.1 Azure Services Platform

Microsoft Windows Azure Platform is a Microsoft cloud computing platform used to build, host and scale web applications through Microsoft data centers. Azure is classified as platform as a service and forms part of Microsoft's cloud computing strategy, along with its software as a service offering, Microsoft Online Services. The platform consists of various on-demand services hosted in Microsoft data centers and commoditized through three product brands. These are Windows Azure (an operating system providing scalable compute and storage facilities), SQL Azure (a cloud-based, scale-out version of SQL Server) and Windows Azure AppFabric (a collection of services supporting applications both in the cloud and on premise).

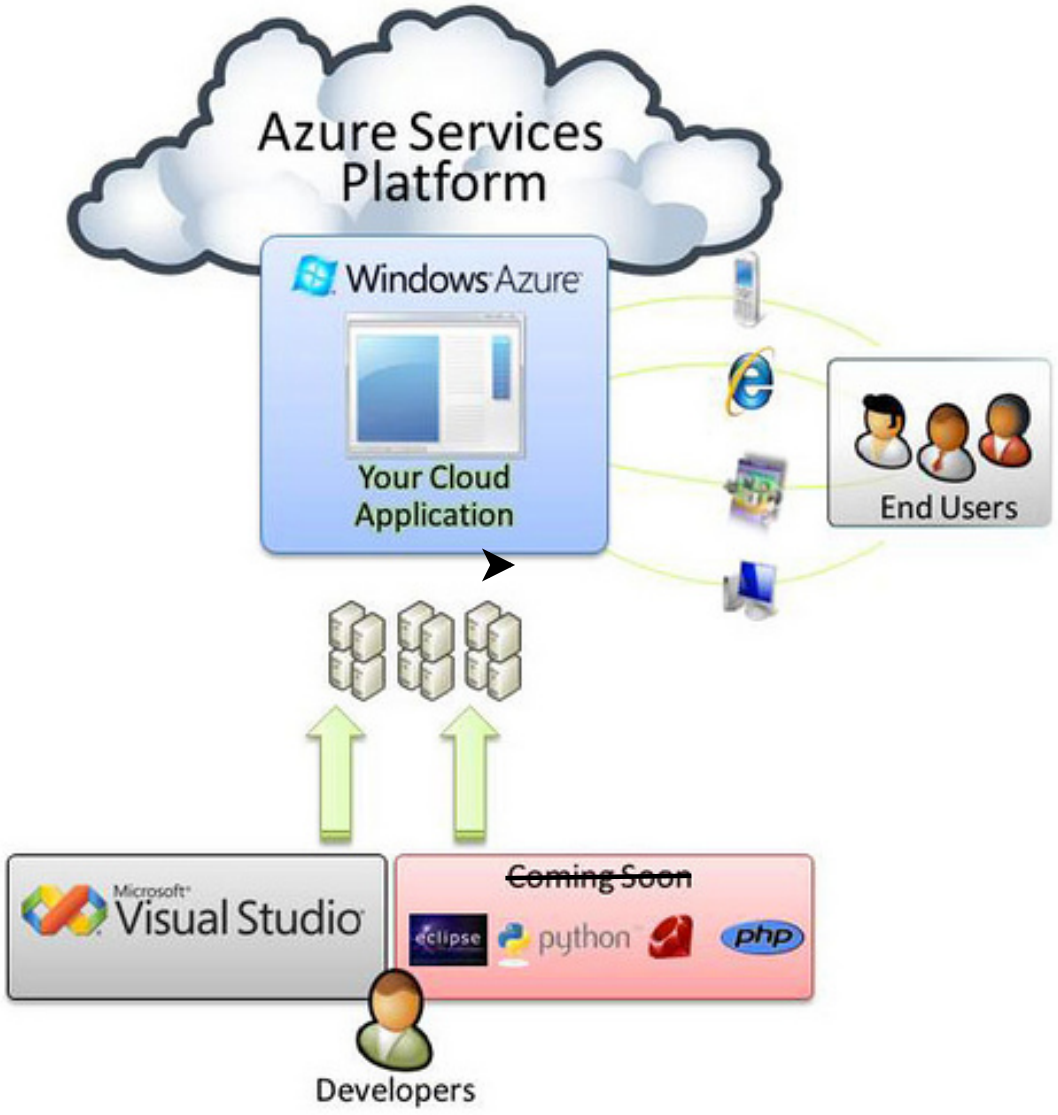

Figure 7.1: Azure Services Platform

7.2 Amazon Web Services

Amazon Web Services (AWS) is a collection of remote computing services (also called web services) that together make up a cloud computing platform, offered over the Internet by Amazon.com. The most central and well-known of these services are Amazon EC2 and Amazon S3.

Launched in July 2002, Amazon Web Services provide online services for other web sites or client-side applications. Most of these services are not exposed directly to end users, but instead offer functionality that other developers can use. In June 2007, Amazon claimed that more than 330,000 developers had signed up to use Amazon Web Services.

Amazon Web Services offerings are accessed over HTTP, using Representational State Transfer (REST) and SOAP protocols. All services are billed on usage, but how usage is measured for billing varies from service to service.

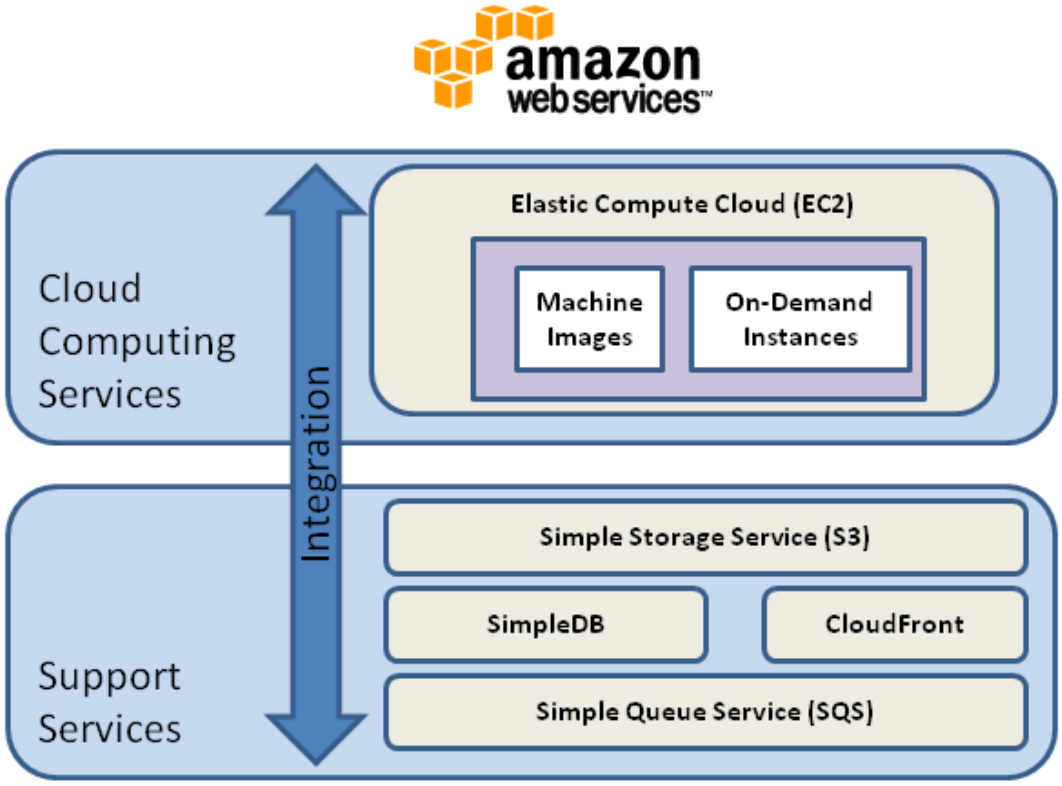

Figure 7.2: Amazon Web Services

7.3 Google App Engine

Google App Engine (often referred to as GAE or simply App Engine, and also used by the acronym GAE/J) is a platform as a service (PaaS) cloud computing platform for developing and hosting web applications in Google-managed data centers. Applications are sandboxed and run across multiple servers. App Engine offers automatic scaling for web applicationsas the number of requests increases for an application, App Engine automatically allocates more resources for the web application to handle the additional demand.

Google App Engine is free up to a certain level of consumed resources. Fees are charged for additional storage, bandwidth, or instance hours required by the application. It was first released as a preview version in April 2008, and came out of preview in September 2011.

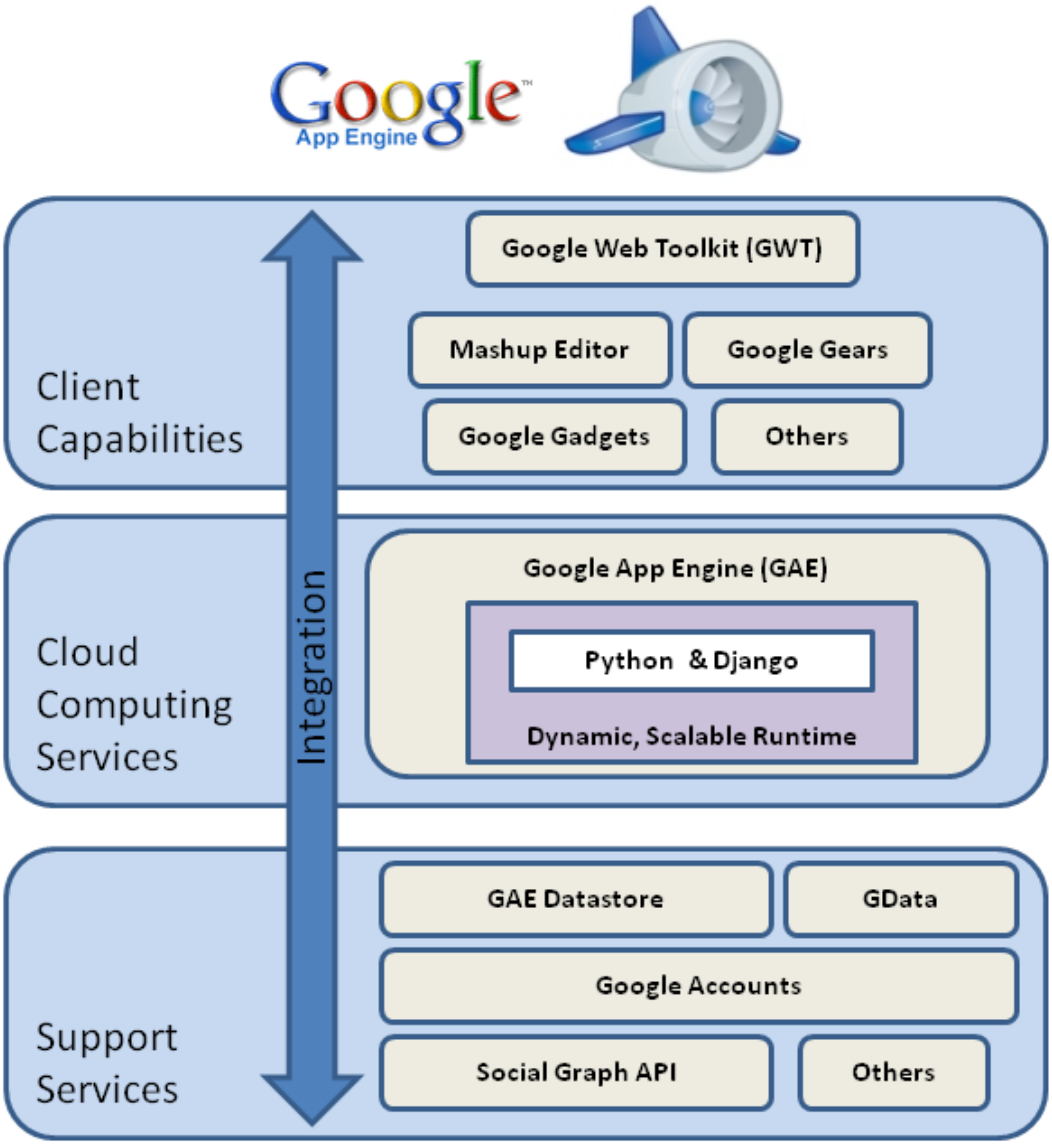

Figure 7.3: Google App Engine

7.4 Force.com

Force.com is a cloud computing platform as a service system from Salesforce.com, which developers use to build multi-tenant applications hosted on their servers as a service. The company pushes the "development as a service" phrase, but it has not gained acceptance outside the context of their offering. Other vendors use the phrase, "platform as a service."

According to a September, 2009 Gartner Group report, Force.com has over 1,000 customer accounts, in addition to tens of thousands that use Force.com in conjunction with Salesforce.com. The Force.com platform runs across eight data centers, with each customer fully contained in a single data center that is replicated for availability.

Several criticisms of force.com's IDE and developer friendliness have been made, including lack of support for multiple developers, speed problems with developing on the cloud, and a failure to properly separate Salesforce.com from Force.com. The platform has been described as having potential but currently only appropriate for Salesforce.com customers who want to extend Salesforce, not for independent developers who want to use Force.com as a standalone platform.

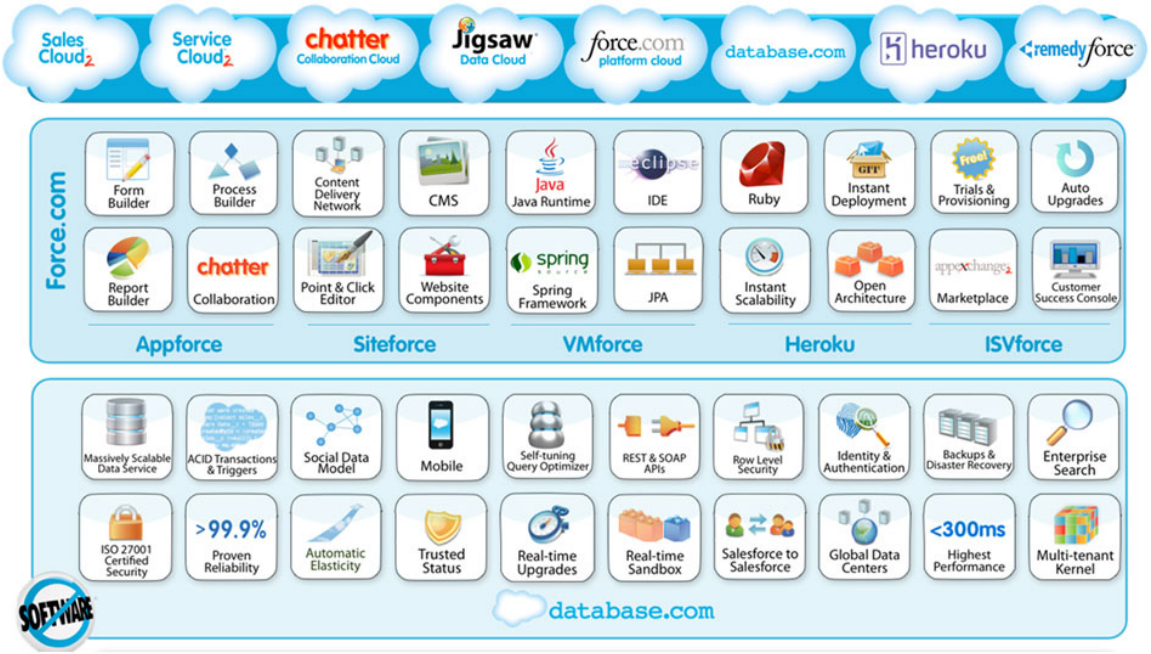

Figure 7.4: Force.com

Chapter 8

Applications of Cloud Computing

8.1 Easy access to data

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.

8.2 Reduction of costs

It could bring hardware costs down. Cloud computing systems would reduce the need for advanced hardware on the client side. You wouldn't need to buy the fastest computer with the most memory, because the cloud system would take care of those needs for you. Instead, you could buy an inexpensive computer terminal, enough processing power to run the middleware necessary to connect to the cloud system.

8.3 Convenience

Corporations that rely on computers have to make sure they have the right software in place to achieve goals. Cloud computing systems give these organizations company-wide access to computer applications. Instead, the company could pay a me-

tered fee to a cloud computing company.

8.4 Easy storage

Servers and digital storage devices take up space. Some companies rent physical space to store servers and databases because they don't have it available on site. 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.

8.5 No technical support required

Corporations might save money on IT support. Streamlined hardware would, in theory, have fewer problems than a network of heterogeneous machines and operating systems.

8.6 Solution to complex problems

If the cloud computing system's back end is a grid computing system, then the client could take advantage of the entire network's processing power.

Chapter 9

Advantages and Drawbacks

9.1 Advantages

1. Ability to scale to meet changing user demands quickly.
2. Pay by use.
3. Task oriented
4. Virtually no maintenance due to dynamic infrastructure software.
5. Application and operating system independent.
6. Easy to develop your own web-based applications that runs in the cloud.
7. Location of infrastructure in areas with lower costs of real estate and electricity.
8. Sharing of peak-load capacity among a large pool of users, improving overall utilization.
9. Separation of application code from physical resources.
10. Not having to purchase assets for one time or infrequent computing tasks.
11. Ability to use external assets to handle peak loads.

9.2 Drawbacks

1. Often limited or no technical support available.
2. Canned solutions such may not be full-featured or too task oriented.
3. When there are technical issues, you may lose access to your data or application.
4. No control.
5. You must have an internet connection.
6. If the company hosting the application goes out of business, you may lose access to your data or application permanently.

Chapter 10

Conclusion

Cloud Computing is a vast topic and the above report does not give a high level introduction to it. It is certainly not possible in the limited space of a report to do justice to these technologies. What is in store for this technology in the near future? Well, Cloud Computing is leading the industrys endeavor to bank on this revolutionary technology.

Cloud Computing Brings Possibilities..

- Increases business responsiveness
- Accelerates creation of new services via rapid prototyping capabilities
- Reduces acquisition complexity via service oriented approach
- Uses IT resources efficiently via sharing and higher system utilization
- Reduces energy consumption
- Handles new and emerging workloads
- Scales to extreme workloads quickly and easily
- Simplifies IT management

- Platform for collaboration and innovation
- Cultivates skills for next generation workforce

Today, with such cloud-based interconnection seldom in evidence, cloud computing might be more accurately described as "sky computing," with many isolated clouds of services which IT customers must plug into individually. On the other hand, as virtualization and SOA permeate the enterprise, the idea of loosely coupled services running on an agile, scalable infrastructure should eventually make every enterprise a node in the cloud. It's a long-running trend with a far-out horizon. But among big megatrends, cloud computing is the hardest one to argue with in the long term.

Cloud Computing is a technology which took the software and business world by storm. The much deserved hype over it will continue for years to come.

Chapter 11

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