

Cloud Computing: An Overview

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Abstract. In order to support the maximum number of user and elastic service with the minimum resource, the Internet service provider invented the cloud computing. within a few years, emerging cloud computing has become the hot-test technology. From the publication of core papers by Google since 2003 to the commercialization of Amazon EC2 in 2006, and to the service offering of AT&T Synaptic Hosting, the cloud computing has been evolved from internal IT system to public service, from cost-saving tools to revenue generator, and from ISP to telecom. This paper introduces the concept, history, pros and cons of cloud computing as well as the value chain and standardization effort.

Keywords: Cloud computing, Cloud Storage, Virtualization.

1 Definitions of Cloud Computing

Similar to e-commerce, cloud computing is one of the most vague technique terminologies in history. One reason is that cloud computing can be used in many application scenarios, the other reason is that cloud computing are hyped by lots of companies for business promotion. From the Hyper Cycle published by Gartner Group in 2008, we can see that the cloud computing is in the phase of fast growing.

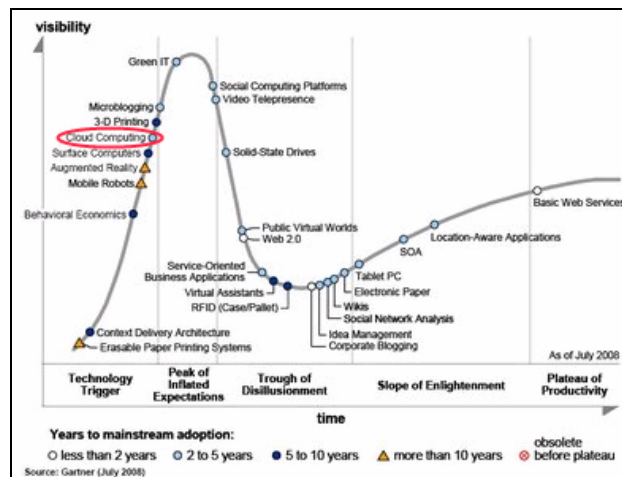


Fig. 1. Cloud computing is in the phase of fast growing

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In the MIT Centennial talk in 1961, John McCarthy said that “... The computer utility could become the basis of a new and important industry”, which implied the underlying concepts of cloud computing. However the “cloud computing” as a whole is probably first introduced by Eric Schmidt in his talk on Search Engine Strategies Conferences in 2006[15].

Now there are lots of definitions and metaphors of cloud computing. From our points of view, *cloud computing is a kind of computing technique where IT services are provided by massive low-cost computing units connected by IP networks*. Cloud computing is rooted in search engine platform design. There are 5 major technical characteristics of cloud computing: (1) large scale computing resources (2) high scalability & elastic (3) shared resource pool (virtualized and physical resource) (4) dynamic resource scheduling and (5) general purpose.

2 History and Status

With the explosion of the Internet, tight pressure is put to the existing storage and computing facilities. The Internet service providers start to use the cheap commodity PCs as the underlying hardware platform. Various kinds of software technologies are invented to make these PCs work elastically, which has led to 3 major cloud computing styles based on the underlying resource abstraction technologies: the Amazon style, Google Style and Microsoft style.

- Amazon’s cloud computing is based on **server virtualization** technology. Amazon released Xen-based Elastic Compute Cloud™ (EC2), object storage service (S3) and structure data storage service (SimpleDB)[12] during the 2006 – 2007, under the name Amazon Web Service™ (AWS)[9]. On-demand and cheaper AWS becomes the pioneer of Infrastructure as a Service (IaaS) provider.
- Google’s style is based on **technique-specific sandbox**. Google published several research papers from 2003 to 2006[1-5], which outline a kind of Platform as a Service (PaaS) cloud computing. The platform, which is called Google App Engine™ (GAE), is released to public as a service in 2008.
- Microsoft Azure™ [10] is released in Oct. 2008, which uses Windows Azure Hypervisor (WAH) as the underlying cloud infrastructure and .NET as the application container. Azure also offers services including BLOB object storage and SQL service.

It’s hard to judge which one is better, but apparently server virtualization is more flexible and compatible with existing software and applications; while the sandboxes put more restrictions on programming languages but less abstraction overhead. Currently, server virtualization is the most popular resource abstraction technique in cloud computing.

Except these public cloud services, lots of companies has experimented and/or implemented internal cloud computing systems. Cloud computing is already key strategy for IT vendors, ISP and telecom service providers. Even further, United States of America and Japan have made cloud computing the national strategy. The following table lists some of the adopters for each style.