Cloud computing and web services

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Author: Suozhi Qi
NetId: sq6

The term "cloud computing" has been hot during the recent years. In this decade, we are using cloud computing techniques like iCloud and google cloud during our daily life and work. So what is this cloud computing? What are their specific types of services? How is it deployed? What are its advantages and disadvantages? How is it related to web development and web services?

The simplest explanation for cloud computing, in my opinion, should be "storing and accessing data and programs over the Internet instead of one's own computer's hard drive" [1][2]. Basically, instead of having to set up one own storage, own server and own data center, the users can have unlimited computing resources and capability from the "cloud", which is a metaphor for network elements of a cluster of servers providing rendered services [1]. This, of course, helps to save a great amount of money for users by eliminating their needs to set up their own services and to run and maintain their own data center.

There are three layers of cloud computing services: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS) [1]. The most basic layer is IaaS, where the physical servers and data center are provided by an external provider and managed for the user [3]. IaaS users are free to manage their own operating systems, data, runtime, middleware and applications [4]. Some very typical examples of IaaS include Amazon Web Services (AWS), Microsoft Azure and Google Compute Engine (GCE) [5]. The next layer of cloud computing services is PaaS, which is provided by companies like Apprenda, where the users get a layer of operating system and development tools provided by the provider in addition to all the contents from the IaaS [4][5]. PaaS users are free to build upon and customize their own applications. The top layer of services is Software as a Service (SaaS). In SaaS, everything from storage, data center, servers to middleware and finally to applications are provided for the users. This layer also represents the largest cloud market, and famous example for SaaS providers include Oracle, Salesforce and Adobe [6].

Cloud computing services can be deployed in three models: private cloud, public cloud and hybrid cloud [1]. Private cloud is the type of cloud infrastructure that is operated solely for a single organization. This type of deployment requires the users to buy, build and maintain the whole set of data center and services, but it is more secure when compared with public cloud system. Public cloud, on the other hand, is the type of deployment when cloud services are rendered over a network for public usage. Public service providers include Amazon Web Services, Microsoft and Google allow users to access and enjoy their services via the Internet. Since public services are for public use, they tend to be less secure than private cloud services. The most common one that is used is called hybrid cloud, which is a combination of public cloud service and private cloud service. For example, an organization may store sensitive and small sized data in their own private cloud, but would use public cloud resources for temporary capacity needs that could not be met by private clouds [1]. This mode of operation is also called

as "cloud burst", in which an application runs in a private cloud most of the times, but will "burst" into a public cloud for larger and better computing resources when the computing capacity demand cannot be met [7].

Cloud computing services, of course, have great advantages over traditional computing services, especially for individuals and small entities of organizations. First and foremost, cloud computing services help to save large amount of money invested on purchasing and dealing with hardware. Users do not need to establish their own data center and servers, and do not need to devote great time and effort to managing and maintaining the hardware.   Second, the users can have access to the servers, storage, databases and a broad set of application services via the Internet, at anywhere and at any time. And the speed we access these services is just as fast as we access local services. For example, we can edit our google docs and manage our storage in google drive whenever we are connected to the Internet. This, of course, provides great convenience and saves tremendous time and effort for all the users. What's more, cloud computing services provide unparalleled ability to scale up and down according to the demand. Both big and small organizations can scale their computing resources whenever necessary, which prevents the users from paying for resources that they are not utilizing. On the other hand, when small companies experience a sudden growth in demand, this great scalability in cloud services offers a huge advantage over a fixed plan [8]. Last but not least, storage of data on the cloud provides a way to restore or recover the data under all circumstances. The users do not need to worry about data loss since most cloud systems have automated backup systems [9].

Every coin has two sides. Cloud computing service, of course, has its disadvantages. The greatest concern for cloud computing service is its security. Storing data on a public cloud always opens up the possibility of facing security challenges on a routine basis. For example, Dropbox had been breached in October 2014 and leaked over 7 million of its users' information [1]. Also, some potential problems may come from crashes. For example, if a IaaS provider crashes, all related services will also go down. In 2014, outages of Amazon affected Dropbox, Gmail, Adobe and Microsoft. In 2015, outages hit Apple, Verizon and Google [2]. Besides, the service provider itself could gain access to your own private data, and this is the reason why large corporations are wary of cloud computing due to lack of trust between corporations and storage providers [10]. Potential problems in this aspect include what legal ownership of the data stored in the cloud, the user or the service provider.

For our web developers, in the meantime of taking advantage of the great convenience of cloud computing, we should also be aware of its potential disadvantages and resulting harms for our own web apps built. First of all, we web developers now have access to all applications and data hosted on cloud servers, and we will be able to host our applications using cloud components provided by service providers. All these together result in unlimited resources from all over the world, and these resources could be downloaded at very fast speed, saving us a lot of time and effort by eliminating the needs for ourselves to develop these tools, thus creating great convenience. Besides, a whole web-development team can take advantage of cloud techniques to manage tasks efficiently. Every one's progress will be synchronized in a common repository, and will be notified of the most recent updates for the project. For example, we have already enjoyed these great benefits on github.com, where we post our most recent code in a group project. On the other hand, we should also be cautious of copyright problems when using cloud techniques.

When we develop a web application using a public cloud, it is always better to be careful about the possible leakage of our own effort, either to the service provider or to mal-intended users.

References:

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