

Cloud services and models

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Abstract¹

The purpose of this paper is to analyze the opportunities offered by cloud services for developing a cloud platform and make the informed choice of the service model. The second section covers the basic definitions related to cloud services. The third section is classifies different models of cloud services. The service models for cloud services and some examples are discussed in the fourth section.

1. Introduction

Cloud computing has been the subject of attention of scientists and professionals working in the area of information technology for the last five years. Cloud technologies are discussed within scientific and practical conferences and exhibitions, including the recently conducted Cloud Expo, 11-14 June 2012, New York City; IEEE CLOUD 2012, The 5th International Conference on Cloud Computing, 24-29 June 2012, Hawaii, USA; Cloud Computing WORLD FORUM 2012, 12-13 June 2012, London; Cloud Asia 2012, the articles on this topic are published in various journals. The question arising is why both professionals and academics are discussing actively the topic of cloud computing.

The growing popularity of the concept of cloud computing is due to a combination of related technological features and economic factors. Cloud computing attracts specialists as it may be a revolutionary new technology that can completely change, for example, the business model of service providers [1], there are

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good reasons to move to the cloud computing paradigm - both from business and information technology perspectives.

2. Cloud services

Currently in the area of cloud computing there is no established definition of terms. Major research agency uses own definitions, which are often complex, ambiguous and confusing. To make further discussion more clear let us choose the suitable notation of cloud computing.

We will consider cloud computing as a technology of distributed data processing which provide the user with computing resources and capacity as a Web service [2]. The services like the Internet service are the key despite the fact that the goal can be achieved also through ordinary local area network using web technologies.

A cloud service should be understood as any kind of IT services provided to client based on the cloud computing model.

A cloud service is a client-server technology when the client uses the resources (CPU time, memory, disk space, network channels, specialized controllers, software, etc.), a group of servers on the network, interacting in such a way that:

- For a client the whole group looks like a single virtual server;
- A client has the flexibility to change the amount of resources consumed in case their needs change (increase / decrease the capacity of the server with a corresponding change in payment).

The existence of multiple points of resources used, on one hand allows to increase the availability of client-server system due to possibility of scaling with increasing load (increase in the number of sources used the resource in

proportion to the demand for it and / or migration of virtual servers to a more powerful source of "living migration"), on the other hand - reduces the risk of inoperability of virtual server in the event of failure of any server in the group, serving the customer, since instead of the failed server can automatically reconnect the virtual server to resources of other (backup) server.

The National Institute of Standards and Technology in the US highlights the following features characterizing in the cloud system [3]:

- Dynamic allocation of resources to meet the needs of users in the computing resources and services;
- Emulation of an "infinite" virtual pool of resources available on demand;
- Elasticity, i.e. the ability to dynamically perform the horizontal scale, as in the direction of increasing the power systems, and towards its reduction;
- A wide range of ways to deliver computing resources and services to the user;
- Measured quality of services. Maintaining a stable quality of service provided at the expense of automatic reallocation of internal resources.

3. Classification of cloud services.

Currently, cloud computing can be characterized by three different models: public, private and hybrid [3]. While all three models have common features, they also have a variety of key characteristics that can make one of these models more preferable for IT business. Figure 1 shows the cloud computing models.

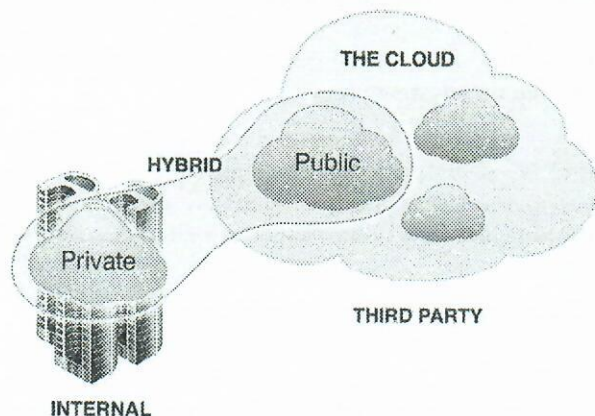


Fig. 1. Cloud computing models

The public cloud model refers to IT infrastructure used simultaneously by many companies and services. Members of such clouds are not able to manage and maintain this cloud, the responsibility for these matters rests with the owner of the cloud. Among the subscribers of proposed services can be any company or individual user. They provide an easy and affordable way to deploy web sites and business systems offering high scalability, the feature that isn't available. In other solutions there

are some examples of such online services as Amazon EC2 and Simple Storage Service (S3), Google Apps / Docs, Salesforce.com, Microsoft Office Web.

The private cloud model refers to a secure IT infrastructure, controlled and operated for the benefit of a single organization. The organization can manage their own private cloud or outsource this task an external contractor. Infrastructure can be placed either within the premises of the customer, or partially within those of external operator. An ideal private cloud is the cloud deployed within the organization and maintained and controlled by its employees.

The hybrid cloud model refers to IT infrastructure, which employs the best features of public and private clouds when resolving the task. This type of cloud is used when an organization is characterized by seasonal activity peaks. As soon as the internal IT infrastructure can't cope with current challenges, some facilities are transferred to a public cloud (e.g. large amounts of statistical information, which in its raw form does not represent value for the enterprise), as well as to provide the users with access to enterprise resources (to a private cloud) through a public cloud.

To implement the assigned task of developing the cloud platform it is necessary to determine under what model it will be available to serve its customers. Within this classification in terms of providing services to clients, the developed cloud service will be a public cloud, i.e., it will be provided to customers via the Internet as a service.

4. Service models

Currently the majority of cloud infrastructures are deployed on servers of data processing centers (DPC) using virtualization technology, which actually allows any user application to receive the computing power without thinking about the technological aspects. In this case the cloud provides a uniform access to computing resources by the user.

With the cloud computing term different service-providing terms are associated as "Everything as a Service" ("EaaS") technologies such as "Software as a Service" ("SaaS"), "Infrastructure as a Service" ("IaaS"), "Platform as a Service" ("PaaS"), "Hardware as a Service" ("HaaS"), "Working place as a service" ("WaaS"), "Data as a Service", "Security as a Service". Let us consider each of these technologies in more detail.

EaaS – under this type of service the user will be provided with this software and from hardware to business processes management, including the interaction between users; the user only need access to the Internet. This type of service is a more general concept is comparison with services described below, which refer to more special cases [4].

IaaS is a model of providing the computer infrastructure as a service when the user is provided with the computer infrastructure, typically the virtual platforms (PCs) connected to the network, which the users can set up to suit their purposes.

PaaS is a model of providing through the network of computing platform as a service that offers to deploy and support web applications and services without having to buy and manage corresponding hardware and software layers.

SaaS is a model of application deployment, which involves the provision of end-user applications as services on demand, this software is deployed on remote servers and the user can access it via the Internet, and all updates and licenses for this software are maintained by the provider of this service. The payment in this case is made for actual use of the software.

HaaS is a model of providing the equipment as a service. In this case, the user of the service is provided with the equipment which he can rent for own purposes. This option allows to save on maintenance of this equipment, but in general it is slightly different from the "Infrastructure as a service" type of service except that you have the bare hardware on which to deploy your own infrastructure using the most appropriate software.

WaaS is a model of the network based provision of the work place. In this case, the company is using the cloud computing for organization of work places of its employees by setting up and installing the necessary software required for personnel's activities.

DaaS is a model of providing the storage space as a service. The main idea of this service is that the user is provided with the storage space, which may be used to store large amounts of information.

Security as a Service is a model of providing the security as a service. This type of service enables users to quickly deploy software, allowing to ensure the safe use of web technologies, security, electronic correspondence, as well as the safety of the local system, which allows users of the service to save on deploying and maintaining its own security system.

Among these models three main ones can be distinguished - IaaS, PaaS and SaaS; their relationship is presented in Figure 2. Cloud computing can be presented as a pyramid.

These technologies when used together allow users to take advantage of cloud computing capabilities and data warehouses, which are provided to them by virtualization and high-level abstractions as services.

To implement the assigned task of developing the cloud platform it is necessary to determine under what service model it will be available to serve its customers. Within this classification of service models the developed cloud

service will use two models, in terms of the client will be provided through the Internet as a service, maintained under SaaS model. This service in turn will use another cloud service within the PaaS service model, to accommodate the service. The service model maintenance under IaaS model was rejected in comparison with PaaS due to a number of reasons, some of which relate to the cost of maintaining and administering the service.

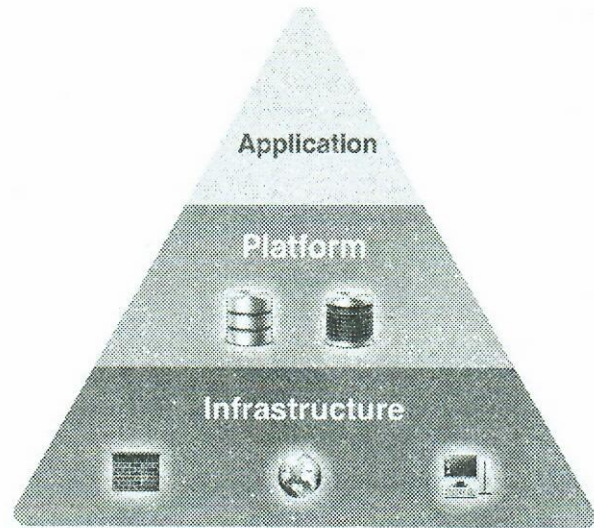


Fig. 2. Layers of service models

4.1. Examples

The example of the implementation of IaaS service model refers to any company that provides hosting service, when the capacities required for the client are provided dynamically when needed, for example, Amazon Elastic Compute Cloud (Amazon EC2).

The example of implementation of PaaS model are Windows Azure platform, which provides the ability to develop and run applications and store data on servers located in distributed data centers, as well as Google App Engine.

There are many examples of SaaS such as:

- Google Docs - free online office offering text, spreadsheet processing and service to create presentations, as well as Internet service for cloud storage of files with file-sharing features;
- Youtube - service providing video hosting services. Users can add, view and comment on video recordings;
- Twitter - system that allows users to send short text notes;
- Instagram - photo-sharing service that allows users to take photos, apply filters to them, and distribute them through its service and other social networks;
- And many many more.

Examples of DaaS model include popular cloud services for storing files such as DropBox, Google Drive, Yandex Drive, Sky drive, Bitcassa, etc. While on the other hand with certain degree of assumption they can be referred to representatives of IaaS model.

5. Conclusion

To implement the assigned task of developing the cloud platform the features of cloud services were analyzed for the purpose of developing cloud platform and making the informed choice of the service model that allowed to choose the service model for the created cloud service. The service will be implemented as a public cloud, under the SaaS model and will use another cloud service under the PaaS service model. The interaction of the cloud service with other platforms and systems appears to be important, rather than its isolated existence; so the further study will look at selection of approach for organizing the interface for interaction between cloud services. There are risks, challenges and fears using cloud services, but the perspectives offered by the emerging technology of cloud computing, which many analysts placed at the top of key technologies and trends in information technology field will be of strategic importance to most organizations.

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