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MAIN MODELS FOR PROVIDING CLOUD COMPUTING SERVICES

A.A. Karazhanova¹, D. Kutlimuratova², D.K. Sipatdinova²

¹Nukus State Technical University

²Nukus City Technical School №1

ABSTRACT

This paper provides a systematic analysis of the deployment and implementation models of cloud computing infrastructure. Specifically, it explores the distinctive features, advantages, and limitations of private, public, and hybrid cloud systems through a comparative lens. Drawing upon the criteria established by the Gartner analytical company and NIST (National Institute of Standards and Technology), the study delineates the conceptual differences between cloud computing and mere virtualization. Furthermore, it thoroughly examines the five fundamental characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity, and measured service. The research insights serve as a methodological framework for enterprises and organizations to select the most appropriate cloud architecture.

Keywords

Cloud computing, private cloud, public cloud, hybrid cloud, virtualization, NIST standards, resource pooling, rapid elasticity, Gartner.

ANNOTATSIYA: Ushbu maqolada bulutli texnologiyalar infratuzilmasini joylashtirish va ulardan foydalanishning asosiy modellari tizimli ravishda tahlil qilingan. Xususan, xususiy (private), ommaviy (public) va gibrid (hybrid) bulutli tizimlarning o'ziga xos xususiyatlari, afzalliklari hamda kamchiliklari qiyosiy jihatdan yoritib berilgan. Gartner tahliliy kompaniyasi va NIST (Milliy standartlar va texnologiyalar instituti) mezonlariga tayangan holda, bulutli hisoblashlarning virtualizatsiyadan farqi hamda uning beshta asosiy fundamental xarakteristikasi (talabga muvofiq o'z-o'ziga xizmat ko'rsatish, keng tarmoqli kirish, resurslarni birlashtirish,





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tezkor elastiklik va o'lchanadigan xizmatlar) batafsil asoslab berilgan. Tadqiqot materiallari korxonalar va tashkilotlar uchun eng maqbul bulutli arxitekturani tanlash bo'yicha metodologik tavsiya bo'lib xizmat qiladi.

According to the deployment model, clouds are divided into private, public, and hybrid [2, 4]. Private clouds are the enterprise's internal cloud infrastructure and services. These clouds are located within the corporate network. The organization can manage the personal cloud independently or delegate this task to an external contracting organization. The infrastructure can be located in the client's premises or with an external operator, or with the client and the operator.

The ideal option for a private cloud is one located on the organization's premises and managed by its employees. Private clouds have the same advantages as public clouds, but with one important feature: the company itself deals with cloud installation and support. The complexity and cost of creating an internal cloud can be very high, and the cost of its operation can exceed the cost of using public clouds.

It should be noted that private clouds have advantages over public clouds: additional control over various cloud data provides the company with practical configuration options. Additionally, private clouds are ideal when you need to perform tasks that you cannot rely on the public cloud for security reasons.

Public clouds are cloud services provided by a provider. They are located outside the corporate network. Users of these clouds do not have the ability to manage or maintain this cloud, and all responsibility rests with the owner of this cloud. The cloud service provider assumes the tasks of installation, management, provisioning, and maintenance of software, software infrastructure, or physical infrastructure. Customers pay only for the resources they use.

Any company or individual user may be a subscriber to the services provided. They offer an easy and inexpensive way to host websites or business systems with large-scale



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capabilities that are not practical in other solutions. Examples: Amazon EC2 and Amazon Simple Storage Service (S3), Google Apps/Docs, Salesforce.com, Microsoft Office Web. At the same time, public cloud services are provided in the form of standard configurations, i.e., based on the terms of the most common use cases. This means that the user has fewer options for choosing a configuration compared to systems where the buyer manages the resources themselves. It is also important to remember that because buyers have little control over the infrastructure, processes that require strict security measures and compliance with regulatory requirements may not always be suitable for implementing a public cloud.

Hybrid clouds are a combination of public and private clouds. They are typically created by the enterprise, and the responsibility for managing them is shared between the enterprise and the public cloud provider. Hybrid clouds provide services, some of which are public and some of which are private. This type of cloud is typically used when an organization has seasonal operating cycles. In other words, although the internal IT infrastructure will not be able to handle the existing tasks, some capacity will be transferred to the public cloud. Additionally, private clouds are ideal when you need to perform tasks that you cannot rely on the public cloud for security reasons.

According to Donkey Bittman, vice president and lead analyst at the American research and consulting company Gartner [5, 6], among the three cloud distribution models mentioned above, private clouds are currently the most relevant for business. Bittman's exploration of the private cloud hardware identifies five key ideas that will help to properly understand its essence.

The cloud is more than virtualization. Server and infrastructure virtualization is a necessary foundation for a private cloud. Cloud computing, virtualization, and virtualized environment management are not yet private clouds. Virtualization allows you to improve, optimize, and dynamically provide infrastructure resources: servers,





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desks, storage capabilities, network equipment, middleware, etc. However, virtual machines, operating systems or integrated software containers, operating systems, network computing programs, software for abstracting storage resources, scaling and clustering tools to consider the environment technically cloud-based.

- *Key features of cloud technologies.*
- *NIST (National Institute of Standards and Technology, USA) defines the following characteristics of clouds in its document "NIST Definition of Cloud Computing" [5]:*
 - the possibility of highly automated self-service of the system by the provider;
 - availability of a broad network access system;
 - accumulating resources on separate sites for efficient distribution;
 - high-dimensionality (resources can be allocated indefinitely and issued at high speeds according to requirements);
 - managed service (a cloud management system automatically monitors and optimizes resource allocation). Self-service on demand (self-service on demand). The buyer does not interact with the staff of each service provider, but has the ability to automatically use the computational resources provided unilaterally when necessary.

Broadband access. The provided computing resources are served via the network via various platforms, thin and thick (standard mechanisms for mobile phones, tablets, laptops, workstations, etc.).

Resource pooling. The provider's computing resources are combined to serve multiple customers using a multi-input model. Sets include a variety of physical and virtual data that can be dynamically assigned and assigned according to customer requirements. The buyer does not need to know the exact location of their resources, but their location can be specified at a high level of abstraction (for example, a state, region, or data center). Examples of such information include storage systems, computing power, memory, and network bandwidth.



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Rapid elasticity (fast flexibility). Resources can be allocated and released, in some cases automatically, for a rapid volume proportional to demand. The availability of resources for the buyer is considered unlimited; that is, they can be assigned in any quantity and at any time.

A measured service. Cloud systems automatically manage and optimize resources using measurement tools implemented at the abstraction level for various services (e.g., external storage management, processing, network bandwidth, or active user sessions). Operational resources can be monitored and managed, ensuring transparency in how the service is used for both the supplier and the buyer.

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