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Organizing E-Learning using Cloud Technologies

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ABSTRACT

The requirements for improving the quality of training of modern specialists necessitate the adoption of appropriate measures by the management structures of higher educational institutions. Such measures, in connection with the development of scientific and technological progress and the widespread introduction of electronic resources in the educational sphere, include the use of cloud computing. The purpose of the article is to review the experience of implementing cloud computing in the work of higher education institutions for the organization of project activities. A computing resource cloud is a collection of hardware nodes that are combined by software into a shared resource pool that shares space for long-term storage. Virtual computing nodes are formed in the cloud. They run operating systems and run software. With the help of clouds, electronic personal accounts are built for project participants (teachers and students), thematic forums are created for the exchange of information. Participants can solve various issues both in the absence of a teacher and under his guidance. The advantages of cloud services are that they allow you to manage large infrastructures and provide services to different groups of users within a single cloud. This article discusses the capabilities of such cloud providers as Amazon, the Rackspace, Google, and Microsoft.Using the capabilities of cloud computing in the work of higher education institutions will not only structure information and make it available at any time for all participants of the educational process, but also organize the operational collaboration of students at a distance from each other.

Key words: Cloud computing, project activities, cloud provider, virtual computing node.

1. INTRODUCTION

With the development of electronic technologies, remote interaction has become possible, which allows you to perform project activities outside of the educational institution [1]. As a result of scientific and technological progress, the concept of using cloud computing among students was proposed.

The introduction of new electronic technologies and e-learning support systems has been developed in a number of domestic educational institutions.

Cloud technologies are beginning to be actively used by educational institutions in the organization of project activities. Using clouds, electronic personal accounts are built for project participants (teachers and students), and thematic forums are created for information exchange. Participants can solve various issues both in the absence of the teacher, and under his guidance.

The advantages of cloud services are that they allow you to manage large infrastructures and provide services to different groups of users within a single cloud [2]. The following features are also available in the cloud [3]:

- payment is made only for the service that is necessary [4];
- cloud computing allows you to save on purchasing, maintaining, and upgrading software and hardware [5];
- clouds are scalable, fault-tolerant, and provide proper security. The software is maintained and updated by the service provider [6];
- access to cloud data from any point where there is Internet access [7].

Using the capabilities of cloud computing in the work of higher education institutions will not only structure information and make it available at any time for all participants of the educational process, but also organize the operational collaboration of students at a distance from each other.

2. THEORETICALFRAMEWORK

The term "cloud computing" can be applied to any services that are presented via the Internet [8]. Their essence is to provide remote access to services, computing resources and applications via the Internet [9]. A cloud of computing resources is a collection of hardware nodes that are combined by software into a common pool of resources that has a common space for long-term storage [10].

Based on the research of L. S. Galkina, T. S. Pivovarova, N. I. Chuprakov and others, cloud technologies are understood as a set of methods, methods and tools for storing, managing and distributed shared access to information resources, software and hardware that are located on remote servers for processing large amounts of data.

Cloud computing features include:
- provision of storage and access to data of information systems [11];
- performing distributed processing and analysis of large amounts of data [12];
- implementation of resource-intensive computing through the use of computing hardware capacity;
- implementation of collective development of information systems [13];
- programming information system modules in different languages [14];
- creating applications based on the main modern technologies [15].

The computing cloud is formed from a certain number of hardware computing nodes that are connected to each other by high-speed communication channels to implement unified management and transfer large amounts of data [16].

Cloud computing is also understood as an information technology concept integrated into a single pool (a set of shared pools) together or under a project of configurable network complex and detailed ordinary computing resources using distributed systems infrastructure [17].

Cloud computing resources are accessed using virtualization software and cloud structure generation [18]. Each node represents three types of software resources to the cloud:
- RAM, (short-term storage data);
- long-term storage (HDD);
- computing power (CPU), (mathematical operations) [19].

Virtual computing nodes are formed in the cloud [20]. They run operating systems and run software [21]. In this case, one computing node can have the number of resources equal to or less than one hardware node.

Multiple virtual environments with operating systems (virtual servers) run on the same hardware node. Computing resource clouds are divided into private (built within the same organization) and public (if the cloud structure provides for its use by third-party companies).

These Internet services can be divided into several types:
- infrastructure as a service;
- platform as a service;
- software as a service.

Infrastructure-level cloud services allow you to use virtualization to implement cloud servers.

3. RESULTSANDDISCUSSION

Choosing a platform for cloud computing is difficult because of the many options available. The list we are considering is not exhaustive. The choice is often based on programming languages and open source technologies that are supported on each platform [22]. To make the choice of the platform is divided into:
-base;
- specialized.

The underlying platforms offer virtual hardware and operating systems. They are quite flexible due to a small number of restrictions.

Specialized platforms are an environment for developing applications and their own services in addition to the basic platform [23].

Among the well-known cloud providers are:
- Amazon;
- The Rackspace;
- Google;
- Microsoft;
- Joyent and others.

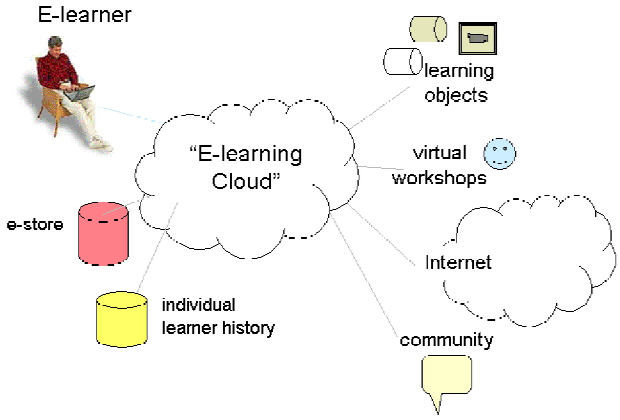

Figure 1: Cloud technologies in e-learning

Figure 1 shows us cloud technologies in e-learning.

Google Apps supports all operating systems and client programs used by students and educational institutions [24]. You can work with documents from any device that supports working on the Internet. Google Apps Education Edition tools are free of charge, so they gain a certain advantage. Students and teachers use a variety of devices in their work: laptops, smartphones, tablets. Google Apps tools are supported by different devices, so it is a public and universal IT technology in the educational environment [25].

Google groups are used to organize project activities [26]. This is a tool that allows you to manage group work based on moderated forums and mailing lists [27].

Google documents is a free set of web services in the form of software as a service, as well as an Internet service for cloud data storage with the implementation of file sharing functions. Documents that are being developed are stored on the server or exported to a file. This feature allows students to work on a project remotely, and allows the teacher to remotely control and manage this work. Google Docs - this is a kind of online office that contains tools for creating text documents, spreadsheets, manuals, PDF files and presentations, as well as sharing and publishing on the Internet.

The Google Sites service allows you to design sites with the ability to publish videos, images, and documents [22-28].

Google video is a service that combines video hosting of user videos and a search engine for them.

Google Apps in the implementation of project activities in educational institutions are fine-tuned applications for communication and collaboration, which, thanks to the cloud, allow you to avoid many of the problems and costs associated with maintaining software and hardware.

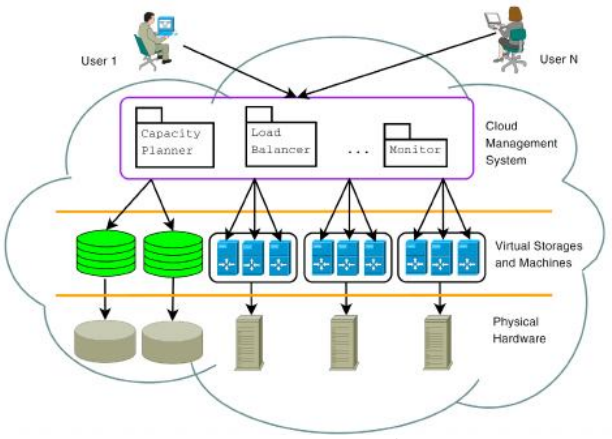

Figure 2: Cloud architecture for E-learning

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The cloud service from the Corporation Micrisoft-Live@edu for performing project activities within the educational institution is extremely important, because it provides the ability to create personal calendars, photo albums, documents and workspaces, as well as the ability to use free Internet storage.
Live@edu is used for active messaging and collective discussion of various educational issues. This is an online service for collaboration and document transfer. It provides an opportunity to [20]:
- organization of a personal workspace for storing and working together on Microsoft Office documents online;
- storage of more than 1000 documents that can be password protected;
- expanding the possibilities of collective work on documents;
- using the free office in Kotormo, you can freely edit Word, Excel, PowerPoint documents and share them using the Office Web Apps web application in the SkyDrive service.

Table 1: E-Learning Services Provided by Various Cloud Systems

	Google Groups	Google apps	Microsoft Live @ edu
Email availability	+	-	+
Sending instant messages	-	+	+
Audio and video conferencing	-	-	-
The presence of a group storage of documents	+	-	+
Personal document storage	-	+	+

The Microsoft Live@edu platform is a set of Web services based on the domain of the educational institution, which were developed in order to organize a single information space for the implementation of complete interaction between students, teachers and administration. The service provides an opportunity to implement remote project development and gain experience in operational collaboration in a modern communication environment [24].
As part of our survey among programmers, it was found that the most popular among cloud providers are Amazon, Google, and Microsoft. The results are shown in figure 3.

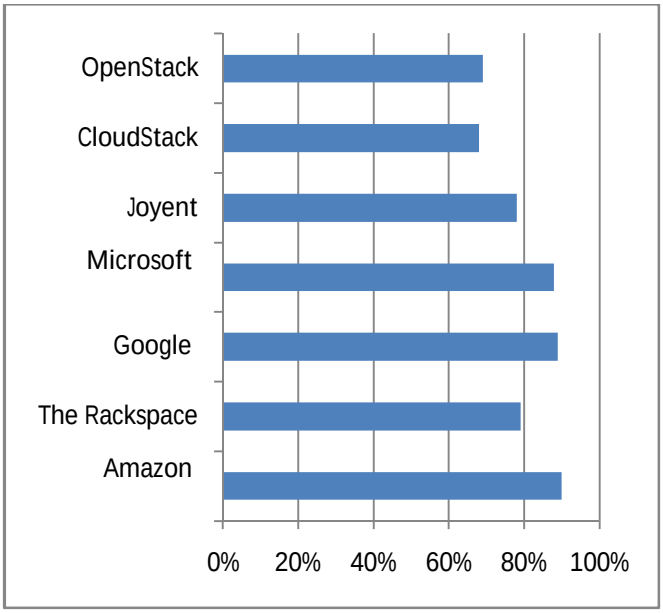

Figure3: Results of a survey to identify the most relevant cloud provider

Amazon has reliable, scalable cloud computing services. Amazon supports a variety of platforms. It has the most extensive functionality:
- runs program codes without allocating servers and managing them;
- acts as a reliable storage with high scalability capabilities;
- fast, flexible database service.
The Rackspace is a Suite of cloud computing products and services. Offers include web hosting applications or platforms as a "site Cloud" service, virtual private servers, load balancing, databases, backup, and monitoring. The cloud service infrastructure allows you to deploy from one to several hundred clouds and create high architectural availability.

4. CONCLUSION

The implementation of cloud computing in higher education is a promising direction that allows you to make the process of learning and performing project activities, including more effective. Modern cloud service providers allow you to replace existing data centers, servers, and software applications of higher schools with a "cloud" presence, eliminating the traditional "physical" presence of this infrastructure in higher education. Cloud technologies both as a service and as a technical solution are implemented by various educational institutions. The use of cloud computing capabilities in the work of higher education institutions allows

not only to structure information and make it available at any time for all participants of the educational process, but also contributes to the organization of rapid collaboration of students in the framework of the project at a distance from each other.

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