'Cloud Computing' Integration into the Training Process of Higher School

1. General formulation of the problem and its currency

Integration into European educational sphere demands implementation the new methods based on the information technology use into the higher school training process. Decree of the Ukrainian President 'About Measures of Priority Education Ukrainian Development Providing' №926/2010, adopted on 30th September, 2012 [1].

Nowadays one of the important tasks of the education system is providing free and open possibility of knowledge acquiring for everybody, taking into account their demand, skills and interests.

To improve the training process is necessary to use such powerful technologies, as 'cloud computing'. Supporting traditional training forms, it's the new epoch of education development. It's also economic, effective and flexible way to satisfy the needs of taught in new knowledge getting. With the help of existent technologies and tools it is easy to create the local 'computing cloud' for the institution to use its resources according to the modern educational requirements.

'Cloud' use can be inner and external, it depends on the pattern of its realization, firstly. 'Cloud' can embrace geographically regions, cities, areas, making all the infrastructure according to the one standard. It's important for the education entirely, because it provides the convenient control and reduces of service expenditures.

External 'cloud' has more advantages, because education system reduces capital and operating costs in such a way. And services can be sizes according to the demands, that is connected with the educational seasonality.

'Cloud' conception is one of the most frequently discussed themes. It has followers and opponents. Like other new ideas, 'cloud computing' technologies change the training process of any subject fundamentally, providing information optimization of gathering, search, saving, processing and presentation without any changes to the educational plans of the institutions.

Today it's too difficult to clear, who was the first to represent the clouds on the schemes. But this idea is caught on, becomes an integral part of 'cloud computing' theory and practice thanks to professor Ramnath K. Chellappa from the Goizueta Business-School of Emory University, Atlanta, Georgia. He proposed to consider the calculations economic, but not technic event, naming them Cloud Computing, well-known and widespread now.

The general definition of this technology looks in such a way:

'Cloud Computing' is dynamically sized way of external resources access for calculation in the form of service, providing with the help of Internet. User doesn't need special knowledge about the 'cloud' infrastructure or skills to manage this 'cloud technology'.

Naturally, 'cloud' isn't Internet, but such hardware and software, that is necessary to solve the definite tasks.

Idea on 'Cloud Computing' was firstly introduced in 1960s the inventor of the Lisp machine language, Stanford University professor John McKarti. The first technology like modern 'Cloud computing' was created in 1999 by

Salesforce.com Company. 'Software as a Service', 'SAAS' appeared at that time. Its success promoted the necessity of research pursuance in 'cloud computing' sphere.

'Amazon Web Services' Business-Decision was adopted by Amazon.com Company in 2005. SAAS services 'Google Apps' were supposed in 2006, the models of providing platform as the service (PAAS) 'Google App Engine' later. The offer from the Company Microsoft 'Azure Services Platform' was supposed in 2008.

So, thanks to the interest of 'cloud computing' the most powerful companies in the information technologies sphere created for them trend status in 2009-2010 and provide their performance on the new level.

2. Main problem solution

Requirements of the education system change our understanding of the educational process organization. The personal computer became an integral part of many tasks fulfillment recently. But even PC isn't helpful in growing requirements of the educational process. The real tool for the student is software connecting to the PC and making it an agent between user and a definite information system.

Computer processors with the optimal capacity and rather low price appeared on sale. To increase the processor capacity more is necessary to use non-traditional methods of its cooling, expensive and complex technological operation. So to increase the capacity of calculating center is to increase the quantity of its computer modules, without taking into account its efficiency. It was the transition to a multiprocessor and later to multicore computer systems in such a way. Today there are multiprocessor systems that work with more than four processors. Moreover, scientists developed and produced processors with 8 and more equivalent in efficiency cores, too. Because of it, the quantity of slots for connecting RAM memory modules, its storage and response time.

Growing number of calculating modules in computer center leads to the revision of approaches to place its servers, necessity of large cost expenditures for data processing, their service and power supply.

As the result, 'cloud computing' is future technology, students using them get the access to their data, but neither control them, nor think about their infrastructure, operating system and software.

It's necessary not only to observe the development of new technologies. We must be involved in this process. So it's obligatory to tell the future specialists about the progressive and perspective technologies, 'cloud computing' particularly, in the higher institutions.

Before start of the work using these technologies, it's necessary to explain students that 'cloud computing' services, in general, are online applications, that can be operated with the help of standard browser. It does not matter what one of them user wants to get, i.e. a toy or a specialized application for scientific research. The scheme is the same. Without any powerful and efficient computer for specific software tools, it is enough to apply to the definite ISP and pay for the service. Sure, it is better to get it absolutely free of charge, even if it demands, for example, to see ads from sponsors etc.

'Cloud computing' can be divided conceptually on providing infrastructure as a service - IAAS, platform as a service - PAAS, or software as a service - SAAS and some other Internet technologies for remote calculations.

Data processing model with the access to calculating resources is represented as a cloud (see Figure 1).

For people using cloud capabilities, it does not matter what's hidden in it. The main thing is a request to the cloud, which must be executed on its return. So it doesn't matter what inquiry will be to show forms of site or window to fill in or application to show a video. The one important thing is fulfillment all the actions 'in cloud' and getting the definite result quickly and without any addition expenditures. The perfect variant is immediate and free result.

Fig. 1.

Students must understand that 'cloud computing' is a model of easy access that combines servers, networks, applications and other components for data processing. This model characterized such features. The user does not need its own resources and connects the 'cloud' of operating systems or software services. Here the term 'cloud' is used as a metaphor.

To use correctly the terms connected with the 'cloud computing' is necessary to define the notions. Let's consider the basic terms and concepts of 'cloud computing'.

Wikipedia provides the following definition of 'cloud computing':

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction for the complex infrastructure it contains in system diagrams. Cloud computing entrusts remote services with a user's data, software and computation.

'Cloud Services' is a special client-server technology, where the resources required for the work user takes as a virtual server. So such situation allows him to use the resources rather easily consumption and change their extents.

In a word, the 'cloud system' is a system with the following feature:

• virtual resources getting on the first user's demand;

• flexibility and ease of getting resources for user to solve the original problem;

• easy change of system capacity in it's increasing and decreasing;

• variety of ways to provide the resources for calculating and services for users;

• quality of services provided by automatic internal resource leveling.

The next step is definition of the criteria and correspondent groups of 'cloud computing' classification.

Today they distinguish the following three types of calculations in the 'cloud':

- Infrastructure as a service, IAAS, which combines virtual servers, networks, applications and storage facilities that are required to run data centers. The user can install his software, control the operating system work, the network connections, data storages;

- Platform as a Service, PAAS, unites a group of virtual servers, where users launch applications without spending money and time to operating systems, other computer resources work and balanced traffic. The user can't control the platform and cloud infrastructure, but he can create, test and fulfill his applications using the suggested platform;

- Software as a Service, SAAS is one of the most popular forms of 'cloud computing'. It support all the functions of applications with the access through Web-browser. The user can't control the internal provider systems, where can be only exception as control of access to the service.

After describing characteristics of the 'cloud system' and types of providing services, it's necessary to define the classes of possession cloud models:

• Public Cloud is a cloud system, created by one of the providers selling services via Internet, where the infrastructure is available to everybody who pays for it.

• Private Cloud is a cloud system for definite one organization.

• Hybrid Cloud is a cloud system (private or public), integrated with the other cloud system (private or public).

The next step in interpretation the 'cloud computing' content is characteristic of great providers that give services in this sphere and including the followings.

Azure Services Platform allows to store data and launch web application on a remote 'cloud'.

Amazon Web Services are services to implement scalable applications, information saving on remote Amazon servers, provided all SAAS, IAAS and PAAS models.

Google Apps Engine is a service that is under public testing. Application in 'cloud' is fulfilled on virtual servers. First, it's the possibility to make 5 million reviews a month free of charge and then every review will be paid.

Salesforce.com is one of the largest providers, which offer mostly SAAS and PAAS. Providing a monthly subscription, the company is known as a provider of a new type of customer relationship management. This service is translated into 16 languages and has more than 1.5 million subscribers.

'Cloud' technology is very complex notion. So it's necessary to teach students how to distinguish contiguous concepts, such as 'outsourcing' and 'virtualization' from 'cloud computing'.

'Outsourcing' means the use of external resources, serving an organization and provides access to the consolidated database or computer center.

'Virtualization' separates the logical server component of its hardware, which becomes important during the physical crash of one server and use a virtual machine on another one to avoid idle time.

Convenience of calculations in the 'cloud' lies in possibility to be organized directly in the separate institution, where students and their teachers use necessary services for their work without involvement and help of other organizations service.

'Cloud' services are realized either with the help of virtualization or without it. Virtualization provides such essential advantages as server consolidation, availability and stability of its infrastructure improve.

To avoid confusion during selecting of the calculation type it's necessary to define, what features are not typical for 'cloud computing'.

Firstly, it is the calculating independence when users need a capacity computer and modern software. He pays the electricity expenditures and spending personal time enable the platform to his own needs and fulfills the installation and configuration of software. Then he begins the work saving the results using his own local resources.

Secondly, it's so-called 'utility computing', when thirdmen are ordered services to fulfill complex calculations or great quantity information storage. Payment for this service can be compared with the charge for public utility services after the work fulfillment.

Thirdly, it's collectivity or grid computing, when large computing task is distributed for fulfillment between several computers, joined in a network.

Practically, there is no clear border between all these types of calculations. Today 'cloud systems' are based on distributed computing models according to utility payment and fees or independent systems. Moreover, their combination can be different.

Nevertheless, the future of 'cloud computing' is more wide and perspective than the utility and distributed systems one. Also not every 'cloud' service requires high power for calculation with the one managing infrastructure or centralized payment process. It's a very important fact.

'Cloud' services and 'cloud' itself exists for a long time. It's connected with the e-mail and online services for photos storage and listening to the music.

Thus, MS Office software is installed on every computer separately. Moreover, it's necessary to buy a license for every of them. Today this problem can be solved in another variant. Access to the rented software module Cloud Computing is helpful to use more flexible work scheme, which is based on the use of software in conditions that are necessary for the user today.

Then it's necessary to explain the advantaged of 'cloud' calculations in all spheres of life. Thus, backup service is a very important one during 'cloud technology' using. To realize the effective backup and recovery it's obligatory to have a lot of time and expenditures. In the use of calculation in the 'cloud' this service can be got in less than a day.

Another important service provided by 'cloud' is the use of the database as a service.

Demand to create a virtual office and cabinet is also growing rapidly.

The teacher can look after the process of academic material learning by students using interactive receiving rooms, offices, teacher pages with materials for self-training and hours of additional training and guidance with the help of

such communicative abilities providing by the 'cloud computing'. Also it's useful to work with forums and chat rooms where student can get the necessary information according to his order and convenience.

One of the examples of modern services that must be considered during the classes, which are based on 'cloud computing' is the e-mail services Gmail, Yahoomail, Webmail, Hotmail.

Just a little time ago to receive the mail and processing of the letters with the help of computer it was necessary to have the correspondent software. Now postal services are placed on famous platforms to do more comfortable and easier the user's work with them thanks to the familiar interface (see Figure 2).

Fig. 2.

Earlier 'cloud computing' technologies were used in the educational institutions only as a free postal service.

But soon, thanks to Google, Microsoft and Amazon proposals text and table processors with the presentation builders began to use during learning [3, 145].

Now they can use during the learning not installed on the computer offline office suite Microsoft Office programs, which requires its regular updates, but one of the word-processors, such as Zoho Writer in Google thanks to the 'cloud computing. This program can not only format the and save documents, but also provide export / import items of other formats to it and will check the spelling in a foreign language (See Figure 3).
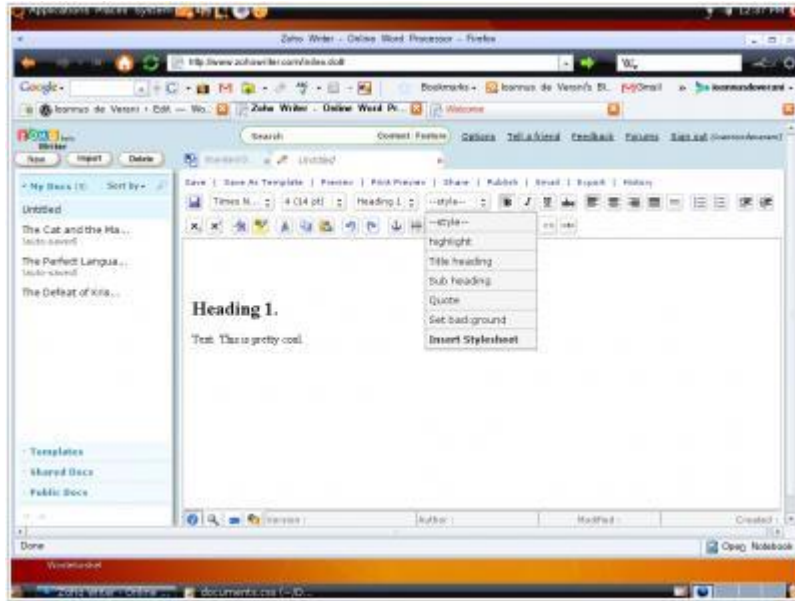
Fig. 3.

One more fact is very important. Use of 'cloud computing' technology helps to avoid the technical support software, as well as control and management for its operation, including data storage, coping, protection from the computer viruses and Internet attacks etc. is made by the provider.

The student does not need high-power computers with a great amount of memory, CD and DVD-drives during the learning in such a way. All information is saved in the 'cloud'. It's enough to have, for example, a standard laptop or compact netbook. The main thing is connection to the Internet for such kind of learning.

3. The conclusion and ways of further researches.

So, the organization of the educational process with the use of 'cloud computing' technologies has the following advantages:

- the use of modern achievements in the sphere of information technologies to illustrate educational material;

- division of educational material into the logical parts;

- personalization of the learning process based on the skills and capabilities of the student;

- teacher's control of the training process during all of the stages;

- student's self-selection of learning methods, which are the most useful for him;

- self-control from the student's side;

- student's habituation to independent work.

Users face the modern 'cloud technology' every day. On subscribing online to the desired, often free or inexpensive service he get the possibility to avoid the power improvement of the computer, expensive software purchase, configuring of these complex systems, saving money on electricity.

So, in our opinion, it's necessary to set aside some time to study new kind of calculations in 'clouds' during the process of course 'NIT and TMT' learning

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