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THE INTRODUCTION OF CLOUD COMPUTING BASED ON CONTAINER DATA CENTER AS WELL AS OPTIMIZATION OF ICT IN UZBEKISTAN

5A230102 – Economy (by industry)

For the academic degree of Master

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ABSTRACT TO MASTER’S THESIS

Relevance of the dissertation. Uzbek leadership considers a priority the implementation and use of information and communication technologies in various sectors of socio- economic life of society. For effective and targeted development of communications necessary to develop the legislative, regulatory and legal framework, the creation of independent channels of communication with international operators to begin modernization of telecommunication networks based on digital technologies involving significant investment to implement reforms in postal services.

Main goals of the research. The aim of my thesis is to improve the quality of information technology services, as well as an increase in economic efficiency from the use of cloud computing services and services by improving public and private management systems through the introduction of technology of "cloud computing".

Object and subject of the research. The object of investigation was chosen Data Center of JSC "Uzbektelecom". The subject of this study is the economic efficiency of the use of cloud computing services.

Technique and methodology. During the study actively used the technique of comparative analysis through graphs, charts, tables, statistics.

Scientific and practical significance. Calculation of economic efficiency of cloud technologies can be adapted into all areas of the Republic of Uzbekistan. The practical significance is characterized by the fact that adoption of cloud technologies will not only create additional services, but also help improve the assimilation of information. In particular, in the learning process cloud computing services will play a huge role for both students and teachers.

Structure and scope of the thesis. The dissertation consists of an introduction, three main chapters, conclusion and bibliography.

The main conclusions of the work done. The significance of the use of cloud computing; advantage of the introduction of container data center; efficient use of cloud computing services; analysis of the payback period from the introduction of cloud computing infrastructure and traditional computing systems; proposal introducing container data center Tier-3 of Huawei.

Supervisor **Ph.D. Teshabaev T.Z.**

Master **Radjabov R.A.**

ГОСУДАРСТВЕННЫЙ КОМИТЕТ СВЯЗИ, ИНФОРМАТИЗАЦИИ И ТЕЛЕКОММУНИКАЦИОННЫХ ТЕХНОЛОГИЙ РЕСПУБЛИКИ УЗБЕКИСТАН

ТАШКЕНТСКИЙ УНИВЕРСИТЕТ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ

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АННОТАЦИЯ К МАГИСТЕРСКОЙ ДИССЕРТАЦИИ

Актуальность темы исследования: Сегодня доминирующий подход к использованию информационных технологий характеризуется низким использованием активов, фрагментированным спросом на ресурсы, дублирующими системами, трудностями в управлении, и большими тратами времени на ведение закупок. Облачные вычисления имеют потенциал, обеспечивающий возможность устранения этих недостатков и улучшения информационного обеспечения на всех уровнях компетенций как основной, так и обеспечивающей деятельности участников социально-экономических процессов.

Цель исследования является повышение качества информационно-технологических услуг, а также увеличение экономической эффективности от использования услуг облачных вычислений и услуг за счет улучшения государственных и частных систем управления за счет внедрения технологии «облачных вычислений».

Объект и предмет исследования. Объектом исследования является дата центры АК «Узбектелеком» и спектр предоставляемых услуг, а субъектом исследования является рассчитать экономическую эффективность использования услуг облачных вычислений на примере переноса 1С в облако.

Методика и методология исследования. Во время проведения исследования активно пользовался методикой сравнительного анализа через графики, диаграммы, таблицы, статистика.

Научная и практическая значимость. Расчёт экономической эффективности использования услуг облачных технологий можно адаптировать во все сферы деятельности Республики Узбекистан. Практическая значимость характеризуется тем, что внедрение облачных технологий не только создаст дополнительные услуги, но также способствуют улучшения усвоения информации. В частности, в учебном процессе услуги облачных вычислений сыграют огромную роль, как для учащихся так и для преподавателей.

Структура и объём диссертации. Диссертационная работа состоит из введения, трех основных глав, заключения и списка использованной литературы.

Основные выводы по проделанной работе. Значимость использования облачными вычислениями; преимущество внедрения контейнерного дата центра; эффективность использования услуг облачных вычислений; анализ срока окупаемости от внедрения инфраструктуры облачных вычислений и традиционных вычислительных систем; предложение внедрения контейнерного дата центра Tier-3 компании Huawei.

Научный руководитель **к.э.н. Тешабаев Т.З.**

Магистрант **Раджабов Р.А.**

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INTRODUCTION

Justification of dissertation and its relevance. Uzbek leadership considers a priority the implementation and use of information and communication technologies in various sectors of socio- economic life of society. From the first days of independence the country's leadership focuses on improving the scope of services, while also providing them with intensive development.

For effective and targeted development of communications necessary to develop the legislative, regulatory and legal framework, the creation of independent channels of communication with international operators to begin modernization of telecommunication networks based on digital technologies involving significant investment to implement reforms in postal services. With these tasks, and began a rapid development of the industry.

Today, the dominant approach to the use of information technology is characterized by low asset utilization, a fragmented demand for resources, duplicative systems , difficulties in management, and spend more time to conduct procurement. These inefficiencies complicate government and business activities towards the achievement of their goals.

Cloud computing has the potential to provide the possibility to eliminate these deficiencies and improve information security at all levels as a core competency, and support activities participants in socio - economic processes. The cloud computing model can significantly help quickly achieve high reliability of innovative services, despite the limited resources available.

In accordance with the Law of the Republic of Uzbekistan "On informatization" , in order to improve the efficiency of government and economic management, public authorities in the field, to ensure wide use of modern information and communication technologies.[1]

[1] President of the Republic of Uzbekistan March 21, 2012 adopted Resolution "On measures for further implementation and development of modern innovative information and communication technologies » № PP - 1730.

Innovation plays a huge role in the implementation of the tasks of socio-economic development , protection and improvement of the intellectual potential, the introduction of new industrial and financial technology , the expansion of activities in the sphere of production , improve product quality and ensure its export orientation . Therefore, in our country attaches great importance to the development of innovation, which are an important factor in decisions of our President "On measures to improve coordination and management of science and technology" on August 7, 2006 , "On additional measures to stimulate innovative projects and technologies in production " of July 15, 2008 , " on the priorities of industrial development of Uzbekistan for 2011-2015 " dated December 15, 2010.

Currently cloud computing technologies are becoming increasingly popular, and the concept of Cloud Computing is one of the world's most fashionable trends in information technology.

Since the perfect job for cloud technologies required fiber cables and this at a meeting of the Cabinet Ministers on the results of socioeconomic development in 2013 and the most important priorities of economic program for 2014, the President of Uzbekistan Islam Karimov spoke about the issues of ICT implementation in all spheres of economy of Uzbekistan. " Exceptional importance in the past year was given widespread adoption of information and communication technologies in all spheres of the economy and in our daily lives . "Development of optical broadband access network technology FTTx».[2]

Cloud computing is a market response to the systematic specialization and strengthening the role of outsourcing in information technology (IT). In a broad sense , the transition to cloud computing is outsourcing processes traditional IT management professional external suppliers. Most modern solution providers of cloud computing provides the opportunity to use existing cloud platforms , but also to create their own , corresponding technological and legal requirements of the customers.

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[2] Report of President Islam Karimov at the meeting of Cabinet Ministers. 18.01.2014

Object and subject of the research. The object of investigation was chosen Data Center of JSC "Uzbektelecom". The subject of this study is the economic efficiency of the use of cloud computing services.

Goals and objectives of the research. The aim of my thesis is to improve the quality of information technology services, as well as an increase in economic efficiency from the use of cloud computing services and services by improving public and private management systems through the introduction of technology of "cloud computing".

- Reducing the cost of owning the possibilities of modern computer technology by eliminating the IT assets in favor of IT services ;
- Increase the speed run the newly created web resources and services ;
- Compliance with information security requirements in the implementation of cloud technologies , including the transparency of security policies due to their centralization ;
- Definition program of transition to cloud technologies , or 9 steps up to the clouds;
- Determination of the basic parameters of a single coordination service (competence center cloud technologies).

The main objectives and research hypothesis:

- definition of cloud computing
- theoretical and practical use of cloud computing
- economic efficiency of the use of cloud computing
- the current state of the services provided by JSC “Uzbektelecom”

Short list of literature

Mell, Peter and Grance, Timothy. The NIST Definition of Cloud Computing (English). Recommendations of the National Institute of Standards and Technology.NIST (20 October 2011). Hunsberger, Kelly. Both Sides (in English) . PMI (May 1, 2011). Andrei Krupin . Cloud Computing: high clouds . Computerra (25 September 2009). Vladimir Romanchenko . Cloud computing

every day. 3DNews (6 September 2009). Igor Terekhov . Whether early Cloud Computing to the masses ? . Computerra (19 October 2009). Alexander Samojlenko. Cloud Computing: what's the virtualization? . CNews (23 December 2009). Anton Bulusov . IT leaders have so far avoided the "cloud" technology. CNews (21 April 2010). Leonid Chernyak . Integration - the basis of clouds . Open systems . DBMS (16 September 2011). Cloud Computing Group. Who invented the term Cloud Computing? (in English). Google Groups (20 October 2011).

Brief characteristics of the study using the methods. During the study, I used the annual reports Uzbektelecom studied statistics leading manufacturers of cloud computing in the calculation of the main indicator is the payback period from the introduction of cloud services. Based on reports zarubehnyh analytical companies in cloud computing infrastructure to identify the best implementation of cloud technologies in the Republic of Uzbekistan.

Theoretical and practical significance of research results. The calculations can be adapted into all areas of our country: business, education, environment, infrastructure development, etc. A practical significance characterized by the fact that the introduction of cloud computing you can save not only money, but also facilitate the use of information technology. In particular in the educational process of higher education institutions, cloud computing will play a huge role development progress, visit and encourage students to acquire the necessary knowledge.

Scientific novelty of the research.

- provide the essence of cloud computing;
- use of economic efficiency calculation from the use of cloud computing services of international companies;
- capital expenditures in transition operating through the use of cloud computing services.

A summary description of the dissertation.

Dissertation consists of introduction, three parts, conclusion and list of literature. the total volume of the dissertation consists of _____ sheets.

PART I. CURRENT THEORY AND PRACTICE OF CLOUD COMPUTING AND DATA CENTERS

1.1. Theoretical foundations of cloud computing and data center

Revolution is defined as the change in the mode of thinking and behavior, substantial in nature and broad in scope . If we follow this definition , the cloud computing are undoubtedly revolution. Cloud computing is fundamentally changing the architecture of computers and software development tools and, of course , methods of storage, distribution and consumption of information.

Over the past few years in the field of information technology (IT) has evolved a new paradigm - cloud computing. Although cloud computing - it's just a special way to provide computing resources, not a new technology, they have caused a revolution in the methods of providing information and services.

Initially dominated IT mainframes. Over time, this gave way to a rigid configuration of the client-server model. Modern IT industry is becoming increasingly mobile , pervasive , and naturally cloudy . But this revolution,[3] like any other, contains the old components from which it evolved .

Thus, to properly understand cloud computing, we must remember that they are essentially genetically inherit the previous system. In many ways a turning point change means "back to the future" and not the final completion of the past. In this amazing new world of cloud computing there is a place for innovative co-cloud technology and the proven effectiveness of previous systems such as powerful mainframes . This is a genuine change in the approach to computing provides IT staff a huge opportunity , allowing changes to take control over and use them for the benefit of yourself and your organization .

Cloud computing - is a comprehensive solution that provides IT resources as a service. It is based on Internet technologies solution in which public resources are

[3] Mell, Peter and Grance, Timothy. The NIST Definition of Cloud Computing (English). Recommendations of the National Institute of Standards and Technology.NIST (20 October 2011) M., 45p

provided similar to the distribution of electricity through wires. Cloud Computing configured to work together , and various applications using the total computing power as if executed on a single system.

Flexibility of cloud computing depends on the ability of resource allocation on demand. This distribution allows the use of total resources without specific allocation of hardware resources to a particular task. To cloud computing Web-sites and server applications run on individual systems. With the advent of cloud computing resources are used as a combined virtual machine . This configuration provides a unified environment in which applications run independently without reference to any particular configuration.

To move to the cloud computing paradigm, there are good reasons - both from a business perspective and from an IT perspective. Here, the same basic arguments as to implement outsourcing.

• Reduced costs. Cloud computing can reduce both capital expenditures (CapEx), and current expenditures (OpEx), as resources are purchased only when necessary and only paid for the use .

• Optimal use of personnel. Using cloud computing frees up valuable employees, allowing them to concentrate on increasing profits rather than on supporting hardware and software .

• Proven scalability. Cloud computing provides instantaneous scaling up or down at any time without long-term commitments .

The cloud computing model consists of an outer (front end) and inner (back end) parts. These two elements are connected via a network, in most cases, via the Internet. Through the outer part of the user interacts with the system; interior - it is actually very cloud. The outer part consists of a client computer or a network of computers and enterprise applications used to access the cloud. The inner part provides applications, computers, servers, and storage of data, creating a cloud service.

The concept is based on cloud levels, each of which provides a specific functionality. Such stratification components clouds leads to levels of cloud

computing resource utility, similar electricity, telephone or natural gas. Commodity "cloud computing" - a cheaper and less costly for the user computing resources. In cloud computing has the potential to become another communal resource.

Cloud might be provided in three types:[4]

• The level of infrastructure - the foundation of the cloud. It consists of a physical asset - servers, network devices, disks, etc. There are suppliers of infrastructure as a service (Infrastructure as a Service - IaaS), such as IBM ® Cloud. When interacting with IaaS you really do not control the underlying infrastructure, but an operating system , data warehousing , and deploy applications to a certain extent , the selected network components .

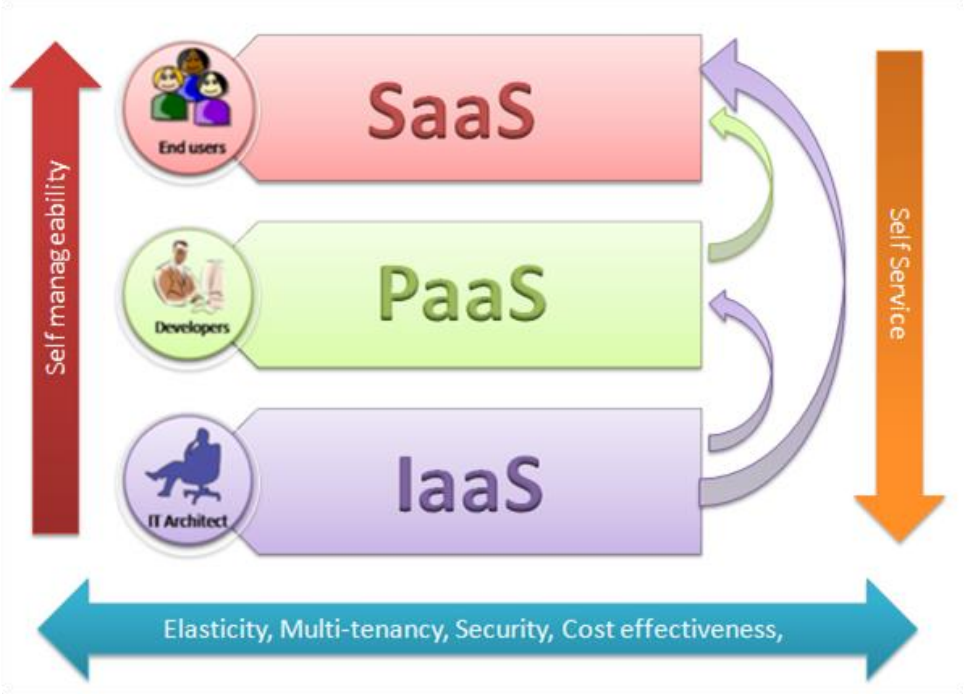
An example of organizations that can benefit from IaaS, services are on-demand printing (Print On Demand - POD). POD model is based on the sale of goods, the design of which is adjusted according to customer requirements. POD allows individuals to open stores and sell products designs . Shopkeepers can upload as many designs as will be able to create . Many thousands of designs charged . With the power of cloud storage POD can provide an unlimited amount of disk space.

• The intermediate level is the platform. It provides application infrastructure . Platform as a service (Platform as a Service - PaaS) provides access to the operating system and related services. It gives way to deploy applications in the cloud using programming languages and tools supported by the provider . You do not need to manage or supervise the use of its infrastructure , but you have the ability to manage deployed applications and , to a certain extent , application hosting environment configurations .

There are suppliers of PaaS, such as Elastic Compute Cloud (EC2) from Amazon. Perfect user PaaS - is a small private company for software development . With a fleet of such a platform , you can create world-class products without the overhead inherent in the development of its own resources.

[4] Cloud computing every day. 3DNews (6 September 2009).

• Upper level - a level of application which is usually depicted as a cloud. Applications running in it available to users upon request. There are software vendors as a service (Software as a Service - SaaS), for example , Google Pack. Google Pack contains accessible through Internet applications - Calendar, Gmail, Google Talk, Docs and many others (Pic1).



Picture. 1. Types of cloud computing[5]

By the nature of ownership of cloud structures are divided into three types: closed (private), open (public) and hybrid.[6]

• **Public clouds** are available to the general public or a large industry group ; they are owned and maintained organization selling cloud services . Under the " cloud " usually refers to just the open cloud ; Web-based applications by third party vendor provides dynamically via the Internet resources sharing and bills depending on their use.

• **Private clouds** are behind the enterprise firewall and managed by the enterprise . This cloud services created and managed within the enterprise. Private

[5] http://mahameeditpro.blogspot.com/2012/03/saas-software-as-service-essentially.html
[6] Igor Terekhov . Whether early Cloud Computing to the masses ? . Computerra (19 October 2009).

clouds offer basically the same advantages as open ; their main difference is that the responsibility for setting up and supporting the private cloud with the company.

• **Hybrid cloud** - a combination of public and private clouds, which uses the services located in both open and closed space. Responsibility for the management of such services is distributed between the public cloud provider and enterprise. Using the hybrid cloud , organizations can define goals and requirements to create services and get them based on choosing the most appropriate option.

Due to the increased volume of code will require a lot of management and automation of administration which, in turn, will lead to a change in the tasks of the personnel responsible for writing administration scripts . Consolidation of IT resources , allowing you to reduce the number of hardware and software units, simultaneously leads to the emergence of new structures . Shifting will occur in the direction of highly skilled in the field of analysis and processing. In the new paradigm for technical specialists will lay a great responsibility for the improvement and modernization of the common business processes.

The growing use of mobile devices , the popularity of social networking and other aspects of the evolution of commercial IT processes and systems ensure the developer community , however, systemic and systematic process model configuration clouds deprive corporate developers of some traditional roles.

A recent IBM survey (see Resources, "A new survey reveals the dominance developer Works cloud computing and mobile application development ") demonstrated that the request for mobile technology will grow exponentially . These technologies along with the rapid spread of cloud computing around the world will lead to a radical increase in the number of developers who are knowledgeable in this area. To meet the growing need for mobile interactions need more developers to understand how cloud computing.

Cloud computing provides a virtually unlimited power, eliminating the problem of scalability. Cloud computing offers developers access to the software and hardware assets that most businesses are small and medium in size could not afford. Developers using controlled through the Internet and cloud computing

assets arising from this configuration, will have access to the resources of most of them in the recent past could only dream of.

Since administrators are legislators of IT systems, they are responsible for managing user access to the network. This means control over the creation of user passwords and be responsible for formulating the rules and procedures for such basic functionality common access to system assets. The onset of cloud computing will lead to the need to streamline this process as an administrator in an environment now engaged not only in domestic affairs , but also the external relations of the enterprise and cloud computing provider , as well as the actions of other users public cloud .

This changes the role of firewalls installed by administrators, and the general nature of the procedures of information security company. The need for protection of the system disappears. With the introduction of cloud computing is even increasing responsibility . The administrator must not only ensure the integrity of data and systems within the organization , but also to monitor and manage the cloud , ensuring the safety of systems and data throughout.

The function of architecture is effective modeling a given system functionality in the real IT world. The main task of the architect is to develop an architectural model of cloud computing infrastructure of the organization. Cloud computing architecture consists essentially abstracting three levels (IaaS, PaaS and SaaS) so that a specific company using cloud computing has reached its goals and objectives . Abstraction levels of functionality are designed to responsible managers and ordinary employees could also use these abstractions for planning, implementation and evaluation of the effectiveness of procedures and processes IT systems .

Role of the architect in the era of cloud computing is to formulate a model of functional interaction level clouds . The architect must use abstraction as a means of enforcement IT system peculiar to her role in achieving the goals of the organization.

Governance is the most important responsibility of the owner of the private cloud and shared responsibility of supplier and customer service in the open cloud. However , taking into account factors such as international terrorism , DOS-attacks, viruses, worms , etc. , which can be closed clouds are beyond the owner or service provider and the consumer public cloud , there is a need for greater coordination of joint activities , especially at the global , regional and national levels. Naturally, such coordination of joint activities should be organized so as not to weaken and do not in any way violate the control of the owner of the process or a public cloud users.

Important questions for those who want to use cloud computing are security and privacy. Companies providing cloud computing services are aware of this and realize that without reliable protection of their business collapse. Therefore, security and privacy are of the highest priority for all stakeholders of cloud computing.

If you are going to implement cloud computing infrastructure , the strategy development is necessary to evaluate the capacity and its potential bottleneck. In the article " Thin straw: the bottleneck of cloud computing and its elimination ," published on CIO.com, states:

Designers of virtualization in the past know that the main bottleneck for increasing the density of virtual machines is memory; but now there are multiple servers , with a lot of memory , which eliminates this bottleneck . Cloud computing negate this bottleneck , eliminating the problem of density machines - her decision to become the responsibility of the cloud provider , which frees users from having to cloud take care of this .

Cloud bottleneck is the channel capacity to cloud providers and vice versa. the best solution for bandwidth on the market today such a decision is a blade-server.

Blade- server - a server optimized for minimal use of physical space and energy. One of the main advantages of using a blade- server to cloud computing is to increase the bandwidth. For example, the IBM Blade Center is designed to

quickly and effectively increase the speed of processing workloads HPC. The same way as increased memory eliminated the bottleneck for the density of virtual machines, you need to evaluate the capabilities of your provider and determine whether bandwidth significant problem for performance. With these blade servers creates data centers.

Wide coverage and volume of cloud transformations require the heads of federal departments significant changes in understanding this process. In those organizations where previously these transformations associated with the infinite multiplication of server capacity and work with applications and networks , now need to think of them as some kind of perfect single internal means of providing services, standardized products computational resources , the potential for the provision of flexible tools , eventually bringing benefit to end consumers - citizens of Russia . This new thinking will have a great impact on all stages of the life cycle of a newly established ministry or agency in IT services - from assessing the possibility of its creation to the operation.

Strategic perspective institutions - in terms of thinking and planning - is the following program of transition to the cloud (Table 1).

Table 1

The overall plan for the transition to the cloud institutions[7]

Choice - Identify what IT services move to the cloud and when: - Identify the cost components for cloud movement: efficiency, adaptability, innovation - determine readiness cloud: security, market access, and the readiness of the technology life cycle
Recourses - Rating aggregate demand at the level of the various departments - Ensure compatibility and integration with the IT portfolio - Contracts effectively meet the needs of the organization - definition you want to reuse or decommissioning of inherited assets and redistribution of resources freed
Control - Redirecting thinking of assets to services - The acquisition of new skills - Active monitoring of public opinion for the continuous improvement of services - Periodic evaluations of cost-effectiveness of cloud solutions and IT resources and services to maximize the benefits and minimize the risks

[7] Alexander Samojlenko. Cloud Computing: what's the virtualization? . CNews (23 December 2009)M, 88p

The program is flexible and can be adjusted tailored to individual needs institutions.

Logical consolidation applications leads to centralize the management of critical business systems and applications . Logical advantages of consolidation are obvious: first is the release of hardware resources that can be used on other areas of the information system. Secondly, a simple and logical structure of IT management makes it more flexible and adapted to future changes.

As experts on cloud technology - the consolidation of the IT infrastructure - is the first step to the cloud. To move to use cloud technologies , companies must first solve the problem of non-consolidated IT infrastructure. Without consolidation is impossible to build an effective process- oriented management , since there is no single point of service delivery .

So, bring your attention to the nine steps that will make the organization for a successful transition to the cloud.[8]

Step number 1. Task - to determine the list of necessary organization of IT resources and services and to select the most effective to transfer to the cloud

At this stage, the development of the audit program, enterprises and organizations under a single ministry or department to determine the list of required and properties involved in the work and expected to implement IT resources and services. It is necessary to develop a common methodology and basic algorithms of the audit program to identify significant features used in this segment of the industry or IT resources and services that will further their successful transference to the cloud and reduce the duration of the test developmental periods. Upon completion of the audit is preparing an opinion to the advisability of transferring the services used by the organization to the cloud with their list and share in total involved in the organization of IT resources . For effective delivery of IT services selected public institutions need to rethink their production processes and see their purpose in providing services , and not just in the concentration of assets . Organizations that have previously focused attention

[8] Draft law on the concept of cloud technologies. 2012 IBM report

on indicators such as the number of servers and the cost of maintaining the IT departments now have to focus on the quality characteristics of the final consumer of services rendered and the operation and development of the internal cloud IT environments . Institutions should also consider at what stage of the life cycle of the technology are owned or provided by external users of IT services and basic computing facilities available . Services that need updating or technical approach to deep modernization which caused inefficiency legacy software or hardware must when transferring to the cloud to get a relatively high priority . Services , technologies which have recently been refurbished or services , recently created and originally based on the effective advanced technologies can wait with the transition to the cloud .

Step number 2. Task - to define industry requirements to the IT environment, and choose on the basis of the optimal implementation model clouds

The second preparatory stage involves determining the industry requirements , program development and auditing of existing domestic cloud solutions for compliance with the safety requirements of the industry and to identify other unique features inherent in the traditional IT environment of the customer. Collects and ordering information , to develop a common methodology and basic algorithms of the audit program. Completed the audit stage directly existing domestic cloud solutions to meet all the previously identified features of the preparation to enter into the most efficient cloud solutions specific to a particular segment or industry.

Step number 3. Task - to determine whether the information available to the customer's hardware and network infrastructure cloud requirements , identify necessary improvements

Determined by the required technical capability and network characteristics of individual institutions , agencies and services for efficient operation intended to transfer to the previously selected subset of cloud IT resources and services. Created algorithms analyze the existing infrastructure in terms of its efficiency when moving IT resources and services to the cloud . Research is being conducted

on the existing infrastructure and the technical ability required network characteristics. According to the results the customer is issued an opinion on the conformity or suggestions to the existing at the time of the survey network and hardware solutions. Before moving to the cloud institutions should provide an opportunity to maintain their network infrastructure, the demand for more bandwidth and the availability of sufficient bandwidth redundancy for mission-critical applications. Institutions should consider the increased importance due to the high bandwidth as the internal Local Area Network (LAN) and the Internet service provider network.

Step number 4. Task - to close the issue of licensing used by the customer individual licensed applications

Here, a defined optimal use in each particular case, the licensing model. Analysis of existing practices regarding licensing of the use of the cloud of a previously defined list of IT resources and services for a particular consumer. Determines the optimal licensing model . Conducted the necessary patent-licensing activities .

Step number 5. Task - the ultimate optimization of the chosen model for the organization of the implementation of cloud

At this stage, the completion of the main system elements previously elected effective cloud solutions in order to bring it into full compliance with sectoral or industry safety requirements and other revealed features of the customer 's IT environment .

Step number 6. Task - to provide the customer with technical feasibility study of the proposed cloud deployments

At this stage, developed and presented to the customer a feasibility study on the cloud placement previously selected IT resources and services. During the move to the cloud institution should take measures to ensure the full realization of the expected advantages. In terms of efficiency , legacy applications and servers must be closed for decommissioning or other uses . Multiple server rooms previously used for the operation of traditional IT systems need to be refocused to

support more meaningful activities. Where possible, these systems serving staff should be trained and refocused to more meaningful activities . Furthermore , in terms of agility and innovation solvable problem on existing facilities may need to be clarified for their most effective use .

Step number 7. Task - to make the necessary improvements to the efficient transfer to cloud IT resources and services the customer

Undergoing adaptation to be relocated to the cloud platform of IT resources and services to the requirements of the security industry and other revealed features of the customer's IT environment. Creates the code needed to be relocated to adapt to the cloud platform of IT resources and services to the requirements of the security industry. Generated code is tested. It is also important to consider the fact that in the future the customer must ensure the effective integration of services provided in an expanding portfolio of applications. In some cases, may require technical expertise to assess the architectural compatibility provided by cloud services and other critical applications . This should not be a one-time event , this principle should be observed at all times , to ensure that , in developing as separate portfolio of IT services , systems remain compatible. If the application the applicant has clearly defined and understandable interfaces and algorithms , as well as limited and simple communication with other systems and databases , then the suitability of products it is a good candidate to move to the cloud. If the application has been accumulating for years , poorly documented algorithms embedded in the code , as well as subtle or obscure the relationship with other systems , the risks of " failure " when deleting or moving to the cloud of legacy applications make them unattractive for cloud adoption.

Step number 8. Task - to launch cloud and debugging components and applications

Commissioning and start-up stage adapted for specific customer implementation model clouds. Conducted the final performance debugging all migrated to the cloud IT resources and services, as well as software and hardware components of the cloud. Customer surrenders completed a workable solution .

Step number 9. Task - to support the implementation and maintenance of the cloud

In order to support a competent , timely decision-making on the need to build capacity and implement new IT resources and services to the cloud created by the customer , an appropriate competence center . We call it the center of competence cloud technology organization. In contrast, existing everywhere at the moment, significant in size and inefficient IT services competence center cloud technologies should become an effective "single window" to the full spectrum of issues in the organization's IT environment , ranging from support for modernization and clouds, the introduction of new cloud services and to ensuring performance virtual desktop ordinary employee .

Desktop Virtualization is a kind of logic in the description of the final advantages of cloud technologies and implies emulation user interface. Ie application the user sees and works with him on his terminal, although in fact the application is running on a remote server in the cloud, and the user is sent a picture of the remote application. Depending on the operating mode, the user can see the remote desktop and application running on it, or only the window itself application.

Government and business needs change our ideas about the organization of the working process. Personal computer, has become in recent decades an essential attribute of the office and means of meeting the majority of office tasks , not keep up with growing demand. Real tool user is software that is attracted to a PC, making it an intermediary for the corporate information system. World experience shows that as a result of active development of cloud solutions are obtained when users have access to their own data, but do not run and do not think about the local infrastructure of the workplace, and the actual operating system software with which they work.

Currently, the use of IT in the enterprise infrastructure of traditional desktop PC user causes more and more problems, such as:[9]

- large transaction costs to support the fleet of personal computers and the difficulties associated with their administration;

- to ensure users safe and secure access to the software and applications you need to work ;

- technical support for users;

- to install and update software licenses and maintenance;

- backup etc.

Escape from these difficulties and reduce the costs associated with their decision, perhaps through the use of virtualization technology jobs of employees on the basis of so-called virtual infrastructure PCs, allowing a user to separate the software from the hardware - a personal computer and access to client applications via terminal devices - so-called thin client.

Thin Client - a combination of compounds with remote desktop and virtualization technologies. Serving on servers running multiple virtual machines with client operating systems such as Windows 7 , Windows Vista and Windows XP or Linux. Users to remotely connect to their virtual machine desktop environment . Thin client virtual environment completely isolates users from other virtual environments because each user is connected to a separate virtual machine . Sometimes the use of a static thin client infrastructure, in which the user is always connected to the same virtual machine , in other cases, a thin client infrastructure dynamic , in which users are connected to different virtual machines and virtual machines are created as needed . When using any model , it is important to store user data outside of virtual machines quickly and deliver applications .

Along with centralized management and the provision of simple computers, thin client provides access to the desktop environment from anywhere, if users can remotely connect to the server .

[9] Leonid Chernyak . Integration - the basis of clouds . Open systems . DBMS (16 September 2011).M., 186p

Imagine that on the client there is a problem. Have to diagnose and possibly reinstall the operating system. Due to the thin client in case of problems you can simply delete the virtual machine and a few seconds to create a new environment using pre- created virtual machine template. Thin Client provides additional security because the data is not stored locally on your PC or laptop. Thin client actually virtualizes jobs desktop users: the user is not tied to a specific PC, and can access their files and applications that reside on the server from any remote terminal after the login procedure . All user commands and the image on the monitor session emulated via software control thin clients. This technology allows you to centralize customer service jobs and dramatically reduce the cost of their support - for example, to move to the next version of the client application, the new software needs to be installed only once on the server.

1.2. Analysis of the data centers' activity

Many companies create their own data centers, more and more companies (and individuals) rent or third party data centers or equipment in such data centers. Reliable IT- infrastructure now plays one of the most important roles in the success of most companies.

A large number of internal and external factors forcing companies to develop and expand such infrastructure. Some factors, such as the expansion of the company's business , lead to the need to expand the data center , other factors - the need to increase the reliability of their data.[10]

Good design of the data center with its subsequent sales - the key to successful operation of tens and hundreds of thousands of today's companies , both domestic and foreign.

The main data center efficiency criteria are:

[10] Effects of virtualization and cloud computing on data center networks - Technology brief. Journal 2012, 17p

Reliability. In this case, reliability refers to the ability of all systems to function as it was scheduled for a certain time . Calculate the degree of reliability of the data center can be indicators such as the average time safe operation (MTBF, Mean Time Between Failures) and MTTR performance (MTTR, Mean Time To Repair).

Needless to say that the creation of a truly efficient data center need appropriate equipment, including reliable power supplies, cooling system components , servers, storage, and so on and so forth.

Availability = system uptime / total time (work + simple)

As already mentioned Habré , the availability of the data center is classified as follows (one of the most popular classification systems) :

Tier 1: 99,671 % availability guarantee

Tier 2: 99,741 % availability guarantee

Tier 3: 99,982 % availability guarantee

Tier 4: Guaranteed 99.995 % availability

The draft of the data center should be considered the most important elements of availability of the system, including the above mentioned servers, storage , applications, and other cooling systems .

Criticality. Another important parameter that must be considered when planning for data centers is critical applications and services delivered to the end user . If the service is very critical , and simple will cost a considerable sum of , data center and all the infrastructure needs to be built properly , ensuring a high degree of system availability . If the service / application is not very critical , and the company did not lose much from the more or less long periods of inactivity , the availability of the data center may be lower than in the previous case .

Criticality desirable to estimate a 5-point scale, where 5 is the maximum criticality, and 1- minimal. Financial and banking applications / services should be

estimated , for example, 5 . Accordingly, all elements of the data center should be in this case is not just reliable, and maximum reliability.[11]

Capacity. The volume of the data center, its capacity - an important parameter , since it will depend on the amount of equipment that can be placed in a certain volume . - An important parameter in the planning of the productive enough cooling systems and power supply.

Development plans. Another important factor, which is sometimes not taken into account when designing the data center. For example, if the company plans to develop , it is necessary to schedule a greater volume of data center space than is needed at the moment.

Otherwise guide through time can get a headache in the form of an expansion failure of current problems capacity, despite the vital need for such an extension .

Scalability. This factor is "connected" with the two previous one. All of the data center : storage systems , network infrastructure, power, cooling , everything should be planned based on the need for scalability.

Scalability is divided into vertical and horizontal. Horizontal scalability - increasing system capacity by adding nodes to the cluster. vertical scalability - increasing processing power of the system by replacing the entire system or individual modules to more productive.

Coefficient of performance (COP). Thanks to the emergence of new "green" technologies , such as energy-efficient equipment , the efficiency of the data center , you can gradually increase . However, the planning process , it is desirable to fix the rate .

Density equipment. For each type of equipment that has its own index value. Usually density equipment remains more or less unchanged. This option is " connected" with the availability and efficiency.

Operability and usability. It all depends on the initial draft, as all the possible issues were addressed. Ideally, any problem that comes out should not cause problems with access to the equipment at the repair team , for example. In a

[11] Cosmano, Joe, Choosing a Data Center, 2009 M. 45p

good data center almost all problems should be resolved "on the fly ", without stopping the whole system.

Design, hardware , service system , the whole architecture of the data center should be planned based on the usability , ease of maintenance.

Controllability. Finally, another important factor, which shows how the data center and easily manage individual systems. This factor affects the ease of operating problems monitoring and analysis work.

Services provided by Data Centers are:[12]

1) **Shared Hosting** - a type of hosting in which many websites located on a web server. This is the most economical type of hosting is suitable for small projects . Typically, each site is located on its own section of the web server, but they all use the same software.

2)**VPS** (Eng. Virtual Private Server) or VDS (Eng. Virtual Dedicated Server) - a service in which the user is provided with a so-called Virtual Dedicated Server . In terms of operating system management for the most part, it corresponds to a physical dedicated server . In particular : root- access , private IP- addresses, ports, filtering rules and routing tables . Within a virtual server, you can create your own versions of system libraries or modify existing VPS owner can delete, add , modify any file , including files in the root and other service directories , and install their own applications , or configure / modify any user-accessible application software .

3) **Dedicated Server** - a type of hosting where the client is provided with entirely separate physical machine (as opposed to shared hosting) . Typically used to run applications that can not coexist on the same server with other projects or have high resource requirements .

4) **Colocation,** colocation (from Fr. Colocation - cohabitation , Eng . Collocation - location next in turn from the Latin . Collocatio (n-) - put together) - a service consisting in the fact that the provider puts customer equipment at its site (typically in a data center), it connects to the electricity service and provides

[12] http://en.wikipedia.org/wiki/Data_center_services

connections to the communication channels with a high bandwidth. Sometimes, this equipment does not belong to the client, and it is rented from the same provider , in this case the service is called " Dedicated servers".

Such an arrangement saves on the communication channel from the provider to the customer - (last mile) . Most often put on collocation servers designed to maintain websites and other network services with high traffic volume , as well as equipment which requires reliable access from many points , for example , VPN-concentrators , IP- telephony gateways .

5) Rental of telecommunication racks . Transfer to the client 's own racks for mounting or customer equipment . Formally, this is a special case of colocation, but the main difference is that the tenants are mainly legal entities .

6) The marked area (Dedicated area). In some cases, the owners of the data center allocate some technological areas for specific customers, usually financial companies with strict internal security standards. In this case, the data center provides some dedicated zone, maintenance of channels of communication, electricity, refrigeration and security systems , and the client creates its own data center in this space.

Transition to cloud computing offers significant economic advantages:[13]

• Placement of the IT infrastructure in the cloud allows you to achieve savings in total cost of ownership from 30% to 70%.

• Reduce capital costs by up to 70% of the purchase of equipment .

• Increased resource use and maintenance of up to 70 % monthly.

• Saving data center resources (electricity , cooling, space) to 50 % monthly.

• Reduce the cost of backup equipment at 50-70 % at the same level of availability per month .

• Reduced licensing costs by 30 % per month .

• Reduce the time to deploy new services to 90%.

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[13] www.SearchDataCenter.com, “Definition: data center services”

The main advantages of cloud technologies over physical servers:

• Availability - The clouds are available to all from anywhere where there is Internet access .

• Mobility - the company's employees become more mobile as one can get access to your workplace from anywhere in the world using a laptop , netbook, tablet or smartphone .

• Year-round reliably stable operation of the Company.

• Increased security by consolidating computing resources , minimizing the "human factor" and accountability users to unauthorized access to the system and download data.

• Data encryption , cryptography and data protection .

• Improving the quality of IT services with fewer highly qualified specialists.

• Lack of initial capital costs or substantial reduction.

• A tenfold reduction in the time cost of implementation and the effective redistribution of resources.

• Efficient selective capacity growth.

Using cloud technology will lead to:

• accelerate the introduction of new technologies.

• Reduction of costs for the acquisition of IT infrastructure.

• The efficiency of the company through the use of best practices.

• Lower cost of software by renting only what is necessary.

• reduce costs by standardizing software used.

• reduce the risk of data loss.

• Lower cost of IT staff.

As cloud computing data centers require placement of data on the server accordingly appears risks and disadvantages:

Permanent connection to the network - to gain access to services "cloud" need a permanent connection to the Internet. However, nowadays it is not such a big disadvantage especially with the advent of cellular technology 3G and 4G.

Software and its customization - there are restrictions on software that can be deployed to the "cloud" and provide it to the user . User software has limitations in the used software and sometimes is not able to configure it to their own purposes.

Privacy - confidentiality of data stored on the public " clouds " is currently a lot of controversy , but in most cases , experts agree that it is not recommended to store your most valuable documents for the company on the public " cloud " , as there is currently no technology that would guarantee 100 % confidentiality of stored data .

Reliability - With regard to the reliability of the stored information , it is safe to say that if you have lost the information stored in the "cloud ", then you have lost it forever.

Safety - the "cloud" itself is quite robust , but with the penetration of the attacker gains access to a vast data store. Another shortcoming is the use of virtualization , which is used as a hypervisor kernel standard OS such as Linux, Windows, etc., that allows the use of viruses.

Expensive equipment - to build your own cloud companies need to allocate significant financial resources that are not profitable just created and small businesses.

1.3. Research problem statement container data center

Modern data center (DC) solves complex problems in organizing storage. It comprises a data processing system, storage system, control system and the engineering system. There are several types of data centers. Some are owned by large companies, which are placed in their own data center building where established personal links. Smaller enterprises rent sites and data channels from organizations that specialize in such services , and very small firms use server

rooms . Recently added mobile data centers, which are also called container data centers.[14]

The main advantage of this project is its modularity independent. Mobile data center going as a designer of separate modules, which perfectly match each other. The first container data- center was established by Google in 2005 and was assembled from separate 45-containers, each of which was located approximately 1160 servers. A year later, the company became interested in the project Sun Microsystems, which re- implement the project, thereby Considered the world community.

For the year 2011 was built 80 mobile data center, which is two times higher than the previous year. Do not miss the novelty and Russian companies - now in Russia is about 12 container data centers. The popularity of this strategy is based on the needs of private companies in the expansion of Internet traffic and the need for constant, continuous operation -critical applications. And, most importantly, the safety and efficiency of the enterprise!

In addition, mobile data centers are popular due to their speedy resolution of critical problems and situations, since the modules are connected in a matter of days. This is due to the fact that the container requires less developed TsODu engineering structure . Cooling system and power supply of mobile data centers are easily provided additional supply container modules, which are mounted in special slots located on the perimeter of each module.

In Russia, mobile data centers are in demand among industrial enterprises, particularly in the oil and gas , energy and metallurgical industry. Another priority and promising direction is the use of mobile data center hosting container. This concept is being implemented through the creation of multi-user container hosting centers, areas which have successfully leased.

Mobile data center - a cost-effective and innovative solution , a further embodiment of this idea will contribute to the successful development of

[14] "Modular/Container Data Centers Procurement Guide: Optimizing for Energy Efficiency and Quick Deployment" Journal 2012

information activities. Russian companies are just beginning to adopt new technologies west, so most of them are guided by American standards , adopted in 2005 . But popularization projects such as container data centers can contribute to the implementation of the new standard ISO, which is entitled to become international.

From an engineering point of view of a container data center is a small self-contained ready to use module, which is equipped inside the server racks, SKS, uninterruptible power supply and air conditioning, fire protection and conditional access, infrastructure monitoring and management (Pic 2, 3). MDC is an important characteristic of resistance to environmental influences, because this can often make complex on the street.

Picture 2.Container Data Center - View from section[15]

[15] Solution center 2012

Picture 3. Container Data Center – View from Inside[16]

Such complexes are often placed in a standard 20 -minute or 40-foot metal shipping container (although this " relic " of initial orientation on mobility) . There are other versions that involve placement in special, larger containers. In one Mobile Data Center MDC placed several to ten or more full-size (up to 60Units) server racks and the power of the installed equipment ranges from a few tens to hundreds of kilowatts.

Now, according to Western companies, less than 5 % of customers indicate mobility as the main criterion for choosing MDC. Comes to the fore able to use modules as basic components for building and scaling data centers. Developers began to offer these systems as a substitute for traditional data center or as standalone modules. Some of the important advantages of MDC can include the fact that the customer gets rid of the need to develop and build their own facility with complex engineering infrastructure. No need for the construction work to accommodate complex, and as a result, reduces the number of necessary permits and approvals from government agencies.

[16] Solution center 2012

Instead, you can take a ready-made and tested solution that is also easy to scale - are added as needed, such as containers. Since the assembly and testing of all subsystems are performed at the factory, when you enter the modular data center in operation need only be performed on-site commissioning work, which, as practice shows overseas deployments, take from several days to a week.

Separate issue - the delivery complex customer. From demand generation to delivery to the job site in Ukraine may take four to six (in the case of special requirements , even up to eight) months. But it is still two to three times faster than the creation of a stationary complex. Due to the lack of real projects can not say with complete certainty about delivery of the complex and its introduction into service. But you can look at the experience of nearest neighbors. For example, in Russia , namely in St. Petersburg , the company " Technoserv " set for JSC "MTS" mobile data center Sun BlackBox. Project duration was just over three months - from July 9 to September 15, 2009 (Pic. 4).

Picture 4. Mobile Data Center BlackBox,
installed for Technoservis MTS in St. Petersburg[17]

Note that the "mobility" with which it all began , is highly conditional . MDC to enter into operation , it should be connected to the power supply and data transfer channels . In addition, if you use water cooling system , it is also necessary

[17] St. Petersburg , the company " Technoserv " set for JSC "MTS"

to ensure the supply of water and the presence of external chiller (chiller) . Theoretically possible that the MDC is powered by an autonomous diesel generator uses air cooling system (if the unit does not need one) , but with the current cost of fuel cost-effectiveness of such a solution would be very questionable.

Note also that the container (modular) and mobile data center options differ . Complex for transport will be much more expensive because it must be equipped with a special damper platform , to ensure safe loading and transportation.

Selecting complex integrated solutions, whether conventional or container data center is the need of detailed analysis of the needs , the formation of clear requirements and criteria for evaluating the effectiveness of the project.

For example, in large-scale projects where multiple containers are not always the best use for each individual system power or cooling. Cheaper connect these subsystems centrally, using the principle of container groups - especially if the data center is not supposed to move .

Also when selecting containerized data centers is extremely important to pay attention to adaptation solutions to our licensing system , including in matters of fire extinguishing systems , compliance NBU shielding etc. Must take into account local climatic norm ranges of temperature fluctuations, rainfall , because the complex will be located on the street all year round.

For example , Russia's AFK "System" purchased MDC production of one of western manufacturers. The complex had no air locks. On a hot summer day engineers worked there for about half an hour with the door open , and at night the water vapor received inside with outside air , fell on servers in the form of dew , and brought them out of order . Can not be discounted and connectivity issues of maintenance, which requires skilled technicians narrow focus, knowing the nuances of it mobile solutions. Such specialists in our country is a little bit.

Price per container data center is quite high. Its cost is higher than the steady-state data center similar capacity. Depending on the MDC will cost the customer in the amount of $ 300-700 million and more.[18]

Specific cost per kilowatt of capacity for the MDC is $ 10-15 thousand, while that of the traditional data center level corresponding figure is $ 10.07 . However, please note that this price does not include mobile data center organization cost external support systems - DSU , unit , transformer substation , fuel storage , be sure to ground , and so on (in each case is an individual set) , and the traditional data center at this value is contains all the subsystems that make up a significant share of the project.[19]

Staff need a separate room , the appropriate sanitary standards , and there should be an elementary sanitary not provided basic design MDC , therefore , it is necessary to make an addition . Fig . 3 clearly visible additional side space for staff and attached to the 20 - foot container from the ends , as well as the cooling system pipes .

In some cases, the large-scale use of the containers (in projects 1 MW and above), especially if the complex is produced in the same country , where it is planned to operate , the difference in cost can be reduced ; including the use of common subsystems uninterrupted power supply and air-conditioning . However, it is necessary to consider the point that the introduction of large , even based on containerized data centers , largely devoid of flexibility. Electrical power to be obtained once all future complex (as well as to develop a system of guaranteed power and cooling) , even if at first planned to install only a few containers and increase their numbers as needed. In addition, to serve a large number of MDC outdoor uncomfortable, therefore , it is necessary to build a shelter , and it is already working with an architect , BTI - in short, all the same construction.

Container data center - a direct investment in business development. In contrast to the construction of stationary data center , the process of creating a

[18] Uptime institute report in 2012

[19] Jew, Jonathan. “BICSI Data Center Standard: A Resource for Today’s Data Center Operators and Designers,” BICSI News Magazine, May/June 2010, USA 18p

more specific MDC . If in the process of investing in the construction of the traditional data center investor can adjust the timing , cost and technical solutions at each stage , until the transfer deadlines , when you create a mobile data center will need to agree on one specification of its content and place an order at the factory . From this perspective, the decision to acquire the data center container type must be justified by the stability of the business and prospects of its development. Step coordination with the customer specifications and equipment configuration takes two to three weeks. Taking into account the structural features of a particular destination and mobile data center time of manufacture can vary greatly.

Besides the undoubted merits , experts note some limitations in the construction of modular DC : in some cases, their price brings no advantages in comparison with conventional DC . In addition , many vendors do not have a unified approach to the standardization of units and modules directly , which sometimes causes potential customers return to the traditional solution. However , IMS Research believes that the imminent standardization of products and production growth in the future will significantly reduce the cost of modular DC .

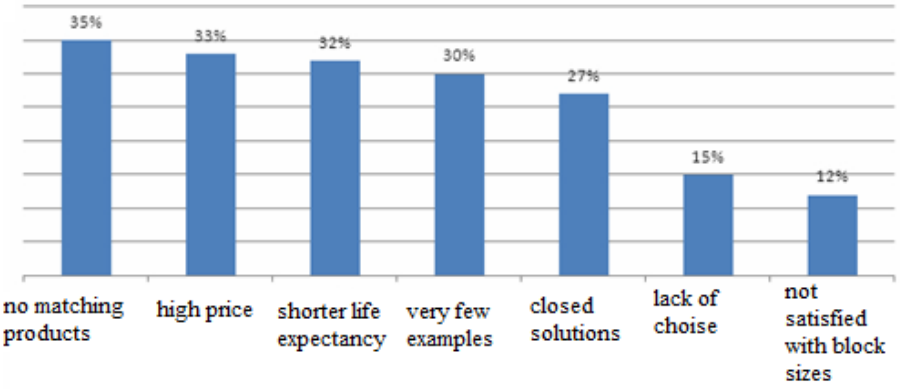
A barrier should be considered conservative thinking of the customer. For example, preventive and routine maintenance understood by the client . But how to behave in case of failure of new equipment ? Obviously, if necessary, repair the infrastructure standard will not be difficult , but the problems that may arise in case of repair modular DC , able to put the customer in a dead end , especially as their own it is unlikely to solve the problem quickly . The result is a nasty problem , depending on the vendor.

Speaking of large and very large DC , for example, belonging to such giants as Microsoft, Google or Amazon, the available options and advantages of modular DC make their choice as for scalability and cost optimization. But if we are talking about the projected small DC , for example, with a power consumption of 200-300 kW , then opt for the innovative solutions at least not obvious.

Another criterion - DC area under construction. According to experts, the threshold of profitability for modular DC is still at the level of 200-250 m. m Thus, by "power" and by the "area" we are talking about medium or large DC and small DC optimally direct construction.

Future owners of modular DC should consider the difficulty of their adaptation to the standard equipment , such as arrays of Hi-End with nonstandard form factors and atypical requirements to the cooling system . Integrate such equipment in a modular DC in some cases challenging it may require further refinement of the project. Palliative known as standard servers housed in a modular DC, and non-standard set in DC , which was built on the classical scheme .

In 2012, the Uptime Institute conducted among IT professionals survey tried to find out the essential , in their opinion , the disadvantages of modular solutions . The greatest number of respondents (35%) reported that vendors offer sufficient flexibility and does not meet their requirements (Pic. 5) . Another 33% believe that it is too expensive modular DC. 32% of respondents noted a small lifetime of such decisions , 30 % indicate that the novelty of the technology and the lack of a sufficient number of completed projects , and 27% are dissatisfied with that decision " is locked " by the manufacturer. In addition, 15 % of respondents complain about a small selection of products , and 12% are not satisfied with the size of blocks.



Picture 5. Uptime Institute poll results among IT professionals Source[20]

[20] Uptime Institute 2012

Even with the limitations discussed below , and no doubt the introduction of modular DC this decision certainly claimed in two cases: if necessary, replace the existing operational or construction of a new DC in limited areas (backup DC , DC in a remote branch office). Another area of use of modular DC - service colocation. DC to build a large-scale , not having confidence in the fact that its area will be in demand - a huge risk for the provider. Modular technology has maneuverability and minimizes capital expenditure is at the start.

When making DC a few of the designers suggests that 2-3 years after its commercial launch may be a situation that requires moving to another area of DC or even a region . In the case of stationary DC risks becoming his move for the hosts in pandemonium . In the case of modular DC disassembly / assembly and movement will take minimal time , and moving can be optimized : I / O DC " on the modular."

Modular DC handle virtually painless and with such a problem, as increasing power consumption of equipment in the racks and the need to increase the heat: the construction itself provides operational parameters change, place the apparatus.

Conclusion to the Part I

Cloud computing involves computing over a network, where a program or application may run on many connected computers at the same time. It specifically refers to a computing hardware machine or group of computing hardware machines commonly referred as a server connected through a communication network such as the Internet, an intranet, a local area network (LAN)or wide area network (WAN). Any individual user who has permission to access the server can use the server's processing power to run an application, store data, or perform any other computing task. Therefore, instead of using a personal computer every-time to run the application, the individual can now run the application from anywhere in the world, as the server provides the processing power to the application and the server is also connected to a network via internet or other connection platforms to be accessed from anywhere.

A **data center** is a facility used to house computer systems and associated components, such as telecommunications andstorage systems. It generally includes redundant or backup power supplies, redundant data communications connections, environmental controls (e.g., air conditioning, fire suppression) and various security devices. Large data centers are industrial scale operations using as much electricity as a small town[1] and sometimes are a significant source of air pollution in the form of diesel exhaust.

The Telecommunications Industry Association is a trade association accredited by ANSI (American National Standards Institute). In 2005 it published ANSI/TIA-942, Telecommunications Infrastructure Standard for Data Centers, which defined four levels (called tiers) of data centers in a thorough, quantifiable manner. TIA-942 was amended in 2008 and again in 2010. TIA-942:Data Center Standards Overview describes the requirements for the data center infrastructure. The simplest is a Tier 1 data center, which is basically a server room, following basic guidelines for the installation of computer systems. The most stringent level is a Tier 4 data center, which is designed to host mission critical computer systems, with fully redundant subsystems and compartmentalized security zones controlled by biometricaccess controls methods. Another consideration is the placement of the data center in a subterranean context, for data security as well as environmental considerations such as cooling requirements.

A modular data center system is a portable method of deploying data center capacity. An alternative to the traditional data center, a modular data center can be placed anywhere data capacity is needed.

Modular data center systems consist of purpose-engineered modules and components to offer scalable data center capacity with multiple power and cooling options. Modules can be shipped anywhere in the world to be added, integrated or retrofitted into the customer's existing data center footprint, or combined into a system of modules. Modular data centers typically consist of standardized components, making them easier and cheaper to build.

Part II. EVALUATING THE EFFECTIVENESS USAGE OF CLOUD COMPUTING AND DATA CENTERS

2.1. Analysis and study of the world leaders in cloud computing

World market cloud solutions and services is growing so rapidly that predict its rate of increase is quite difficult in practice, so the data analysis leading companies sometimes differ. Nevertheless, they all fixed the same trend : the rapid growth rate of spending on cloud computing, as well as the concomitant market services , data centers and data traffic in such systems.

For example, in **International Data Corporation** (IDC) expects that global spending on public cloud services will exceed $ 40 billion in 2012 , and by 2016 is forecast to IDC, can already reach $ 100 billion , compared with $ 40 billion in 2012 . Average annual growth rate of the market in the period from 2012 to 2016 was 26.4 %, which is five times the growth rate of the IT industry as a whole.[21]

Another analyst firm, Gartner, predicts that global revenues from sales software-as-a-service (SaaS) in 2012 will grow by 17.9% compared to last year and will reach $ 14.5 billion growth trend will continue until 2015 , when the market size will reach $ 22.1 billion.[22]

According to published in the pen quarter 2012 joint study Edge Strategies and Microsoft, over the next five years we can expect to double the number of paid cloud services, which are the consumers of the number of small and medium-sized businesses . Number of small companies using at least one paid cloud service will triple in the next three years.[23]

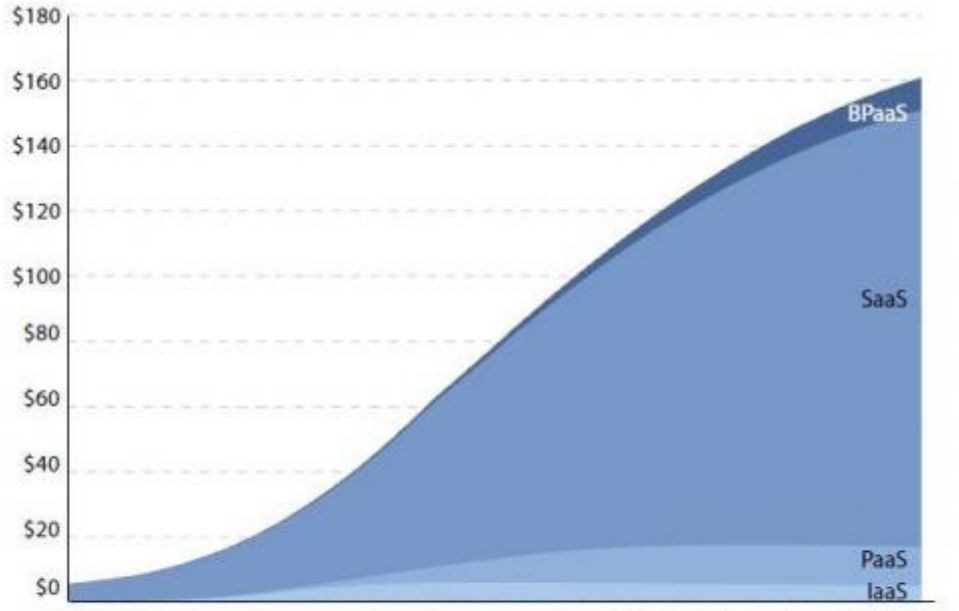
In April 2011, the analyst firm Forrester Research has published a forecast of the market development of public cloud computing by 2020 According to

[21] IDC experts' report 2012
[22] Gartner experts' report 2012
[23] Pen quarter 2012 report Edge Strategies and Microsoft

information from the report , by 2020 the volume of cloud market will be $ 241 billion or $ 200 billion more than in 2011 .

Among the most interesting outputs forecast report should mention that the peak will be in the IaaS market in 2014 , when its volume reached $ 5.9 billion market then will gradually shrink due to customer demand and the growth of competition.

Regarding segment SaaS, it will experience strong growth: in 2011 its volume will be $ 21.2 billion, in 2016 it will reach $ 93 billion this moment SaaS segment is close to saturation . As for the market PaaS, its volume will remain relatively small compared to SaaS, although in 2014 the segment in terms of PaaS surpass IaaS. In addition, analysts Forrester Research predicts that the market for virtualization will gradually shrink due to their replacement by newer technologies (Pic 6).



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BPaaS ($)	0.15	0.23	0.35	0.53	0.80	1.26	1.95	2.93	4.28	6.00	7.66	9.08	10.02
SaaS ($)	5.56	8.09	13.40	21.21	33.09	47.22	63.19	78.43	92.75	105.49	116.39	125.52	132.57
PaaS ($)	0.05	0.12	0.31	0.82	2.08	4.38	7.39	9.80	11.26	11.94	12.15	12.10	11.91

Picture 6. Forecast growth of cloud computing market segment[24]

[24] Forrester Research, 2011

It is noteworthy that segment BPaaS, which today is not all agree to refer to cloud computing is forecast to Forrester Research, by 2020 will surpass the traditional segment of infrastructure and cloud IaaS approach to segment PaaS. The main growth BPaaS have the period from 2015 to 2020.

By 2016, according to IDC on public cloud services will have 16 % of revenue in , five key technology categories : applications , infrastructure software , PaaS, servers and storage base . More significantly , cloud services will generate 41 % of the total growth in these areas.

On software as a service (SaaS) will have the maximum share of revenue for public cloud services market in the next five years , analysts predict IDC. But other categories , particularly basic storage and PaaS, comparable show a higher growth rate . Strengthening segment PaaS solutions will be maximized in the next 12-18 months , the study said .

From a geographical standpoint, the U.S. will remain the largest regional market for public cloud services will follow them for Western Europe and Asia-Pacific (excluding Japan) . But the maximum growth coming from emerging markets , whose collective share of total world will double by 2016 and reach 30%.

In Cisco are exploring cloud data traffic growth. In November 2011, Cisco has published its first report on the study of global trends in cloud computing - Global Index of cloud technologies in the period from 2010 to 2015[25]. He has forecast that by 2015 the annual volume of " cloud " traffic will grow 12-fold from 130 exabytes to 1.6 zettabytes , and the average annual growth rate of 66 percent.

One zettabyte is equal to one sextillion bytes or one trillion gigabytes. Traffic volume of 1.6 zettabytes - is:

- 22 trillion hours of streaming music ;
- 5 trillion hours of business Web conferencing with webcams;
- 1,6 trillion hours of online video streams of high resolution (HD).

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[25] Cisco Global Cloud Index 2010 - 2015

Cloud has become the fastest growing segment of traffic in data centers (DPC). By 2015, the total annual traffic data centers will grow 4-fold to 4.8 zettabytes , an average annual growth of 33 per cent of traffic . Currently, the proportion of " cloud " of traffic in total traffic data center is 11 percent. By 2015, it is expected to exceed 33 percent. Thus , the cloud becomes critical for the future of information technology , as well as for the delivery of video and content.

Transition to cloud-based services makes global cloud traffic to grow at twice the rate of growth of global data center traffic. In the period from 2010 to 2015. Global data center traffic will grow by 33 percent per year and will increase four times, while global cloud traffic will grow by 66 percent per year, and for the same period increased by 12 times.

The market leader in cloud technologies are American companies:[26]

- IBM
- Microsoft,
- Google,
- HP,
- AT&T.

Leaders in the development of cloud technologies and services in France are :

- Atos,
- Cap Gemini,
- Steria,
- Orange and
- SFR.

ATOS created Yunano - a joint venture with a Chinese company Ufida. Together they will produce in the " cloud-based " management software , as well as selling related services .

Company Systancia - a French software maker working in Alsace and in the capital region Ile-de -France. She is one of the European leaders in the

[26] Uptime Institute report 2013

transformation of user programs in the cloud services (application virtualization and the workplace) .

New players emerging in France, entering the market , which gives them the conditions to stimulate development. French law provides reliable data protection and processing ; and legislation on data encryption (L 2004-575 of 21/06/2004 and 05/02/2007 from D 2007-663) allows , in particular, take into account the degree of data privacy , trusted player.

Company Joyent, located in the Ile -de-France , since 2010 , supplying infrastructure services (IaaS) companies such as LinkedIn, Disney, CNN, Facebook, Yahoo or Vente-privee.com. She also delivers PaaS platform , open-source publishing , hosting , or specialized companies (Dell, First service). This company is a startup pioneer in the "cloud" applications , and it competes with groups such as Amazon EC2 and Microsoft Azure. Dell has signed an agreement in 2010 (Original Equipment Supplier) with Joyent in order to use its application «Smart Technologies». This allows Dell to offer customers "cloud" applications turnkey own servers.

Eight clusters (areas of competitiveness) , located in France , today engaged in "cloud" applications :

- Cap Digital et System @ tic (in the Ile -de-France)
- Elopsys (Limousin region)
- Images et réseaux (Brittany and the Loire)
- Imaginove et Minalogic (Rhone- Alpes)
- Solutions Communicantes Sécurisées (region PACA),
- TES (Basse-Normandie) .

In 2011, the French government held the first competition for the right to carry out a research project in the field of "cloud" applications under the "Investment Program in the future." Total state support will benefit five projects (19 million euros) :

- platform software engineering (project CloudForce, of Orange Labs),
- media applications (project CloudPort company Prologue),

• high-performance software infrastructure project (Project Magellan company Bull),

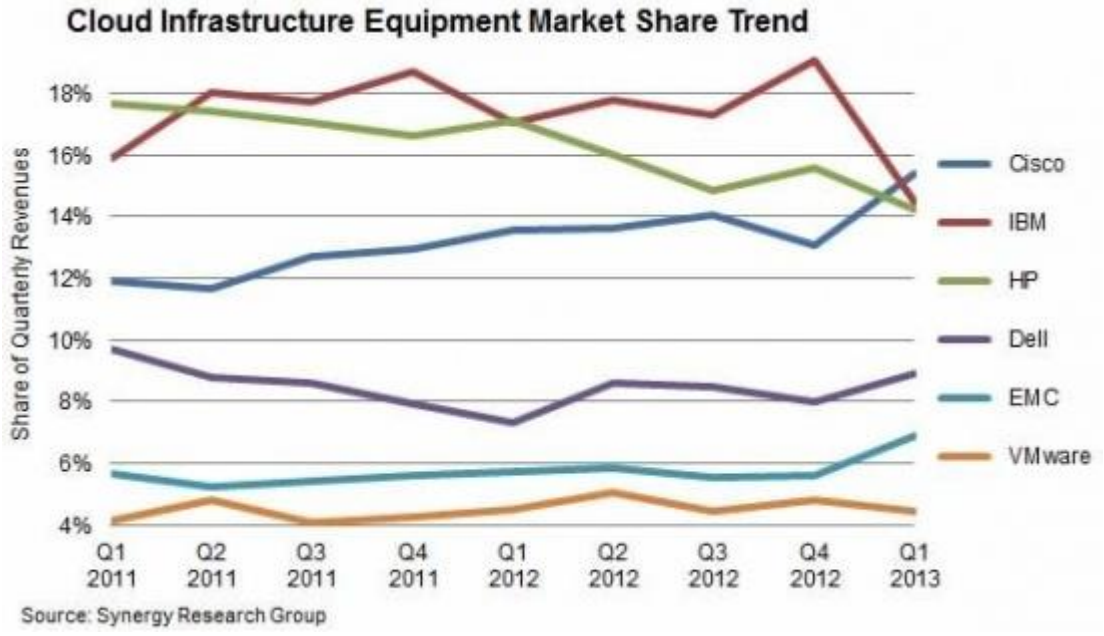
• The project "cloud" Community (Nu @ ge of Non Stop Systems) and

• Project cloud applications for higher education institutions (draft UnivCloud company INEO).

Internet site was created www.investirdanslenumerique.fr French Association of Software (AFDEL), to facilitate the procedure for submission of documents for the design.

In early 2013, Cisco was able to circumvent HP and IBM's share of proceeds from the sale of equipment for cloud solutions in the total income , and this despite the fact that the strongest players on the " cloud" are other vendors in the market . However , according to the report Synergy Research Group, published in June 2013 , in the first quarter of 2013, Cisco Systems earned on cloud computing 15% of the proceeds in the three months $ 9 billion

For comparison , the share of equipment for cloud solutions in total revenue in the first quarter of 2013 from IBM and HP accounted for 14 %, respectively , from Dell - 9 %, at EMC - 7% in VMWare - 4 %, at NetApp and Oracle - 4% and 3 %, respectively , said Synergy Research Group analyst John Dinsdale (John Dinsdale, Pic 7).



Picture 7. Equipment market for cloud computing, first quarter of 2013[27]

However, experts warn , Cisco will be difficult to maintain leadership in this segment since its rise at the beginning of 2013 the company owes poor results, which showed the server , HP and IBM.

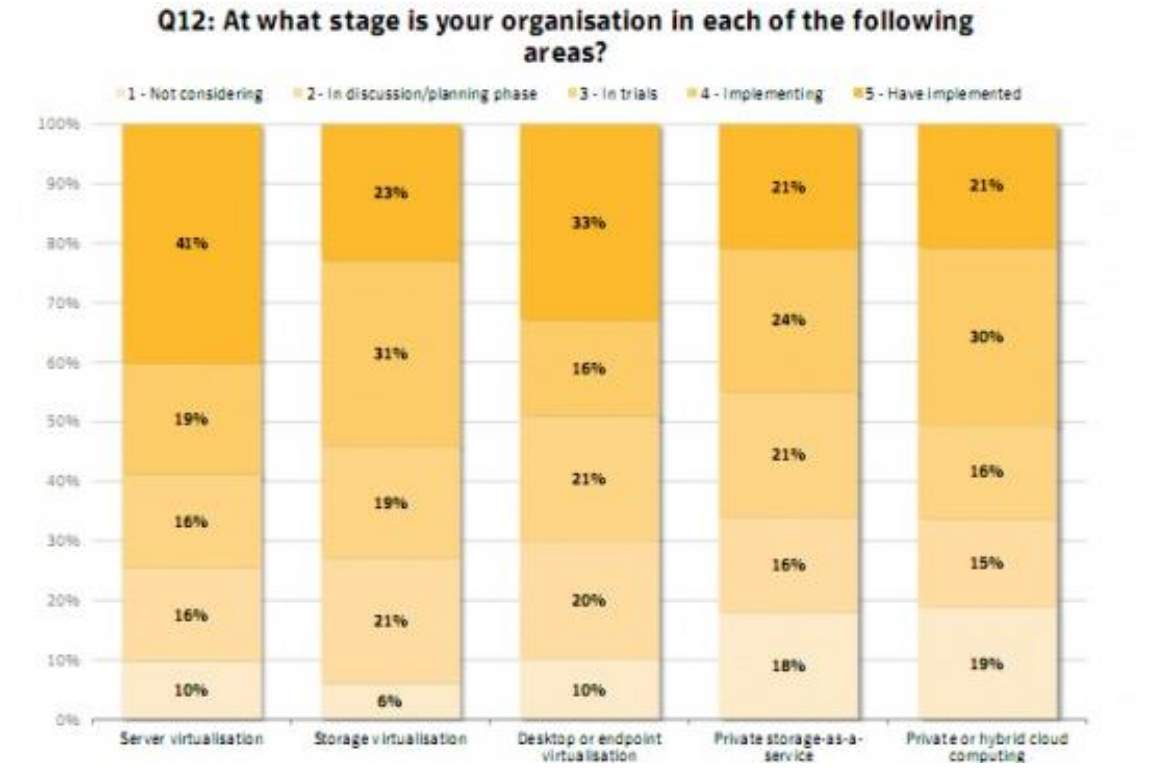
However, analysts have installed and another interesting fact : 30% of the costs of "cloud" equipment generally bypassed "pockets" megavendorov and sent to smaller suppliers. That's because the large Internet companies such as Google, Facebook, Rackspace, and others prefer not ready to buy servers and create their own negotiating directly with the manufacturers of components.

According to previously published forecasts IHS iSuppli, the delivery of cloud servers reached 875 thousand units in 2012 , an increase of 35% compared to 2011 and almost doubled compared with 2010. Experts expect high growth rates ranging from 23% to 30% in each of the next three years until 2015, when the total supply of cloud servers will reach 1.8 million units. Thus, the cloud server will be an increasing part of the total number of servers whose supply will grow from just over 5 % of the market in 2010 to 15 % in 2015 , to suggest IHS iSuppli.

Financial institutions in Europe more involved in the process of adaptation of new information technologies , including virtualization, cloud and mobile technology than other industries . In addition, banks and insurance companies have also EMEA sufficient IT budget for such experiments .

To such conclusion experts of Symantec in the new study, titled Evolution of IT in the Finance Industry in 2011. The survey of companies in the region were surveyed and it was found that 81% of financial institutions really discussing adoption of cloud technologies in other sectors this figure - only 70% (Pic 8).

[27] Synergy Research Group, 2013



Picture 8 Survey among companies in the financial sector[28]

Also EMEA financial institutions are more advanced in the application of virtualization , cloud computing than 60 % of financial institutions , or used , or have already implemented server virtualization , in other sectors , this figure - 45 %. However, the sector is more reserved in matters of private / hybrid clouds - only 17 % of respondents plan to move mission-critical applications in hybrid / private clouds in the next 12 months.

Budgets financial institutions willing to virtualization and cloud computing : in this sector is more of respondents noted that their company has the appropriate budget for virtualization and private / hybrid clouds than in other industries.

One of the main factors when deciding on the implementation of virtualization security issues remain . 64 % of financial companies that said they

[28] Symantec, February 2012

did not want to move into hybrid / private clouds , identified security as the main reason . This is in sharp contrast with the results of interviews with representatives of other industries , where only 31 % gave similar answers .

Survey results also suggest that there is an imbalance between what financial institutions expect from these technologies, and their actual capabilities , the report said . The most striking example is the service Private Storage-as-a-Service, which reflected all the signs of an immature market. Were the most realistic expectations in matters of server virtualization , where most of the financial corporations really achieved greater flexibility , reliability, and reduced the time of transition to the new.

Deliberate policy of the European Union in the field of development of the market cloud solutions will lead to the fact that spending on public cloud services in the region will grow from 35.2 billion euros to 77.7 billion euros in 2020, according to data of IDC.

Gabriella Cattaneo (Gabriella Cattaneo), vice president of IDC EMEA, said that the migration towards new IT paradigm will have a direct impact on economic growth in the European Union , as well as the creation of new jobs. According to IDC, if the government of the European Union should take in respect of the market position of non-interference of cloud solutions , that is, give him the opportunity to develop freely , the contribution of this market in the EU's GDP in 2020 will amount to 88 billion euros.[29]

However , if the authorities choose option Eurozone tighter management of the market , it will generate up to 250 billion euros to the region's GDP by 2020, which is 162 euros more than in the first scenario . The cumulative effect , calculated for the first and second scenario for the period from 2015 to 2020 is 357 billion euros and 940 billion euros respectively.

According to IDC, the main barriers for wide penetration of cloud services on the European market are still some legal uncertainty , anxiety potential users about

[29] Gabriella Cattaneo (Gabriella Cattaneo), vice president of IDC EMEA report

the possible level of security services for business unobvious economic effect of the transition to the cloud model .

In addition , the same number of experts consider the fears of users regarding the difference cloud approaches from vendors , transparency and control , guaranteeing access to data. To this should add problems with support locally , including in local languages , low speed internet connection in some areas and other factors.

In IDC believe that to overcome these barriers by the European Commission will require specific measures. In particular, lead to a common denominator regulations governing data protection in the entire European Union to develop common standards for the interaction of cloud systems , as well as uniform requirements for data protection for all providers , regardless of what kind of country they come from . Also need a pan-European certification of cloud vendors for security guarantees and protection of data that they can provide.

Third of the Western European retail companies planning to increase spending on cloud services by more than 25 %, according to another study , IDC.

According to experts IDC, the current level of adaptation of cloud computing among retailers in Western Europe is low, and , nevertheless , by 2014 this figure will increase by 300%.[30]

Already 61% of retail companies in the region are going to invest in the "cloud" in 2012, this is especially true for large companies with a staff of more than 500 people. Volume allocated to cloud services funds in this category of companies does not exceed 5 % of total IT budgets.

With regard to technological trends, it will be the most popular cloud solutions for social interaction , e-commerce , management and merchandisers control over the supply chain , noted in the IDC.

However, retailers in Western Europe still resist the use of the model public "cloud" , mainly for security reasons and difficulties with the organization of the "last mile." The most common practice is to use a hybrid cloud models.

[30] IDC report in 2013

The main drivers of consumption growth cloud computing in this industry in the near future will be the challenges of multi-channel interaction. Massive penetration of "cloud" services will also contribute to the formation of a broader business practices on the use of the "cloud" and the availability of such examples for the community.

Overall, the forecast IDC, investments by European retailers in cloud solutions will increase significantly in the next 2-5 years.

In discussing the economic impact of cloud computing often talk about the positive economic impacts that are associated with economies of scale (economies of scale). Owners of large data centers is due to the scale of their sites (numbering tens of thousands of servers) is able to achieve the specific advantages that are not available to holders of server platforms Small (up to 100 servers) and medium (about 1000 servers) size.

In contrast to their small and medium-sized competitors, holders of large data centers are able to achieve a 3 -7 -fold savings in electricity and network infrastructure , reducing the cost of multiple human staff when one person does not serve tens or hundreds or thousands of servers (Tab 2).

Table 2

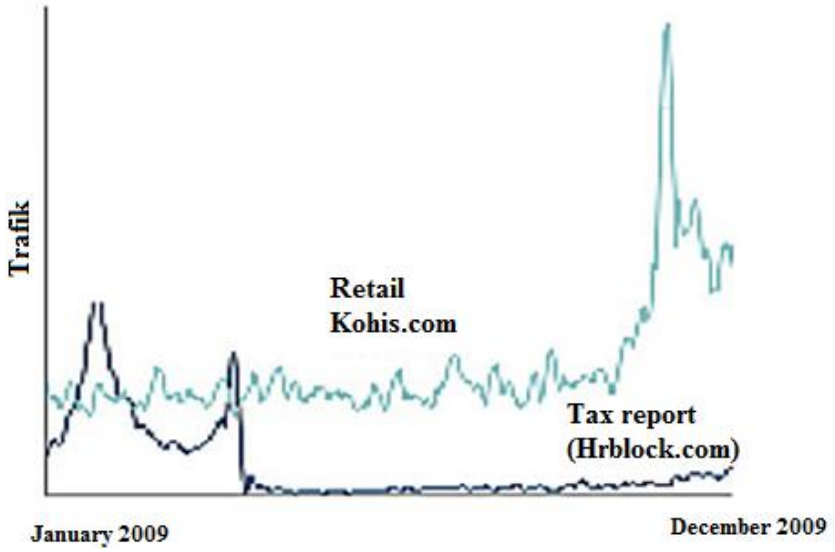
Scale of economy: a comparison of large and medium-sized data centers[31]

Item cost	Cost for medium DC	Cost for big DC	Saving factor
Network infrastructure	$95 for Mbit/s monthly	$13 for Mbit/s monthly	7,1
Хранение	$2,20 for Mbit/s monthly	$0,40 for Mbit/s monthly	5,7
Administration	140 servers for administration	> 1000 servers for administration	7.1

The second reason that large sites are more cost-effective due to the fact that they are much less likely to suffer from uneven load caused by the daily , annual

[31] IDC report 2013

and sectoral imbalances . While the particular sites are highly specialized in the calculation of the maximum peak load , large data centers can afford to distribute resources between users of the system which have different load cycles for computing resources. As a result, a large cloud provider can afford only one equipment to save up to 30-40% compared with a company that has a fleet of 1,000 servers (Pic 8).



Picture 8. Downtime caused by the use of computing resources and annual sectorial imbalances[32]

With all the convincing arguments about economies of scale , its real appeal is somewhat reduced due to one important factor : the owners of large sites do not just want to save, but also to earn . At this moment in their margins can reach 50 %. Probably in the future it will decline, however, given the high input threshold of entry (the construction of a large data center in the U.S. to 50,000 servers require about $ 200 million), perfect competition in this market is not expected and the market will be dominated by suppliers, in one way or another as users are able to dictate their own terms.

[32] Microsoft report, 2010

The best-known economic argument in favor of cloud computing - the ability to replace operating capital expenditures (CAPEX / OPEX). If economies of scale is directly related to the interests of operators data centers, the ability to get rid of the most attractive capital costs for tenants sounds datacenter capacity, class solutions for users and IaaS PaaS.

Indeed, cloud computing allows companies to get rid of the costs and risks associated with the operation of their own servers. If the company decides to fold an IT project or load on the servers drops by optimizing the software, the "extra " equipment does not hang on the dormant company - just released resources back to the tenant. Of course, this possibility is most convenient in the pilot implementation and the development, where the load on the resources of the least predictable and long-term fate of the projects - the most obscure. However, the credibility of the argument CAPEX / OPEX significantly reduced for industrial systems that are significantly more predictable and that , as a rule, contribute most to the IT cost companies.

We can conclude that cloud computing is the most beneficial to users in case of high-risk IT projects created from scratch: in this case the company does not bear the costs associated with the migration of existing IT solutions and significantly reduces the risks associated with the unpredictability of fate projects. In addition, the use of cloud eliminates the risks associated with the inability to determine in advance the degree of popularity of the newly established IT projects: even if the service will make a splash and ensure an influx of hundreds of thousands of users per day (which in a few days may fall to tens of thousands), then cloud provider is quite able to handle the load. To calculate the profitability of cloud computing researchers from Berkeley offered a simple formula (1):

(1)[33]

$$\textbf{Machine time}^{cloud} \times (\text{Income-price}^{cloud}) \geq \textbf{Machine time} \times \left(\text{Income} - \frac{\text{price}^{DC}}{\text{real loading}}\right)$$

[33] Microsoft report, 2010

According to this formula, the determining factor in deciding on the beneficial use of clouds is to download the corporate data center, if it is close to unity, the use of cloud becomes unprofitable. Conversely, if the load is significantly less than unity (which often occurs in case of service unpredictable load), it becomes preferable to use cloud computing.

However, this formula shows only an ideal model - a real implementation , of course, must take into account many more factors and risks that are difficult to quantify and therefore can not be put in an elegant formula . Among these factors are the risks of depending on the provider, the ambiguity of legislative regulation, immaturity of the technology itself , the unpredictability of the fate of many market participants. Responsible decision on the use of cloud computing today can only be based on a careful study of a variety of factors that can not be unambiguous quantification. Therefore, universal recommendations and simple methodology for assessing the economic efficiency of today still impossible.

2.2. Services provided by Data Center of "Uzbektelecom" JSC

Uzbektelecom JSC is the largest telecommunications operator, which network covers the entire territory of the Republic of Uzbekistan. Using its own telecommunications network, built on the basis of modern technologies, the Company provides wide range of telecommunications services.[34]

The main goal of «Uzbektelecom» JSC is to provide the modern and high-quality telecommunication services to people and government structures and departments all over the territory of Uzbekistan at any time of the day.

The basis for economic activity of the Company – provision of long distance and international telecommunication services to all consumers all over the territory of the Republic.

[34] Annual report of Uzbektelecom, 2014

At the same time along with traditional services of voice communication and Internet access, the Company provides modern services of data transmission through wired and wireless technologies.

«Uzbektelecom» Joint Stock Company is created as open joint stock company according to the Decree of the President of the Republic of Uzbekistan dated June 28, 2000 № DP–2647 «On measures for improvement of management in telecommunications sphere» and the Resolution of Cabinet of Minister of the Republic of Uzbekistan dated June 30, 2000 № 253 «On issues of organizational activities of «Uzbektelecom» JSC. Statutory fund of «Uzbektelecom» consists of 37 729 606,482 thousand sums, divided by the 32 694 633 shares, allocated as follows:

• *state share – 45% (14 712 585 units of shares);*

• *share of foreign investors – 49% (16 020 370 units of shares);*

• *share of legal and physical entities, residents of the Republic of Uzbekistan – 6% (1 61 678 units of shares).*

Uzbektelecom is the largest provider of telecommunications services for governmental sectors of Uzbekistan. Company has 3 subsidiaries and 22 affiliates, 14 of them are regional branches and 8 specialized. Uzbektelecom holds share of eight joint ventures that provide fixed services, services of international and long distance communications, data transfer and Internet access.

Within in frame of marketing strategy of 2012 year and taking into consideration of market situation in the market of rendering telecommunication services continuous monitoring of tariff policy and competitiveness products and services which rendered by UZONLINE and UZMOBILE trademarks. By the end of market monitoring and also for new customer acquisition and for increase of loyalty of existing subscriber base of the Company during the reporting period tariffs for services broadband Internet and mobile communication repeatedly were reconsidered.

For expansion of a distribution network of the Company and ensuring additional conveniences to the population in 2012 «Uzbektelecom» JSC set in

operation in addition 94 more sale offices operating by the principle «Single window» over all country. Thus the main emphasis in 2012 became on the organization of sale offices in the regional centers and rural areas. By the end of the reporting period the total of sale offices of UZTELECOM made 142 units.

As a result of the realization of a number of promising projects on further development and modernization of telecommunications networks, the telecommunications infrastructure has significantly improved.

Morally obsolete regional analog telephone stations across the country were

replaced by modern digital ones. High-speed digital networks were established using fiber-optic communication lines; measures on the network expansion and its reliability improvement are taken. The established infrastructure provides a background for rapid development of wireless technologies, in particular, of mobile communications.

As a result, the coverage of regional centers and cities of the country using digital telecommunications network has amounted 100 percent, the level of telecommunications network coverage of rural settlements – 96.4 percent.

2011 was peculiar year for us. Uzbekistan were celebrating 20th anniversary of Independence. According to the Decree of the President of the Republic of Uzbekistan №PP-1615 from April 6th 2011 “On the preparation and celebration of the twentieth anniversary of the Republic of Uzbekistan state independence”, Uzbektelecom JSC has opened 50 branded service offices all across the country, which works from the principle of “single window”, where the company’s clients can receive the full range of services from fixed telephony, Internet services to mobile services of CDMA-450 standard.

In 2012 Uzbektelecom are planning to set in operation 80 more sales offices throughout the country. In this case the biggest effort was given to organizing sales offices in regional centers and rural areas of our country.

With the view of development of telecommunication and Internet services, increasing of competition, the capacity of the International Packet Switching

Center of Uzbektelecom has been increased by 4 times and is brought up to 10Gbps;

rates for Internet services for providers have decreased from 849 USD to 529 USD per 1 Mbps.

Uzbektelecom JSC gives particular attention to social projects, implemented in our country, and takes an active part in its realization.

In 2011 specialists of the company has created high-speed network of data

transfer for branches of Tashkent University of Information Technologies (Qarshi, Fergana, Nukus, Samarkand and Khoresm). This project is secure basis for distance learning and data-interchange between branches of TUIT, including videoconferencing.

Uzbektelecom JSC has equipped research laboratory of Networks and data transfer systems sub department in Tashkent University of Information Technologies with modern telecommunication installations.

Networks and data transfer systems sub department in TUIT is one the leading sub departments, which performs training of specialists in telecommunication technologies.

On 2nd of December 2011 the Ministry of Higher and Secondary Special Education of Uzbekistan cooperating with Communications and Information Agency of Uzbekistan and Uzbektelecom’s specialists held press conference devoted to the launching of national network e-education.

As a result of this project in 2011 80 high education centers including Ministry of Higher and Secondary Special Education, Istedot foundation and 3 centers has been connected to the network. In 2012 84 centers of high education also will be connected to united cooperation network e-education which has 1Gbps data rate, and in every university will be created multimedia lecture halls.

First-priority in 2012 for our company will be implementation of programs outlined by Head of state. We wish to shareholders and staff of Uzbektelecom JSC success in the implementation of plans outlined for 2012.

Also it should be noted that the technical ability to access the Internet has increased in comparison with the beginning of 2011 to 16 times, and with the beginning of 2012 to 2.12 times.

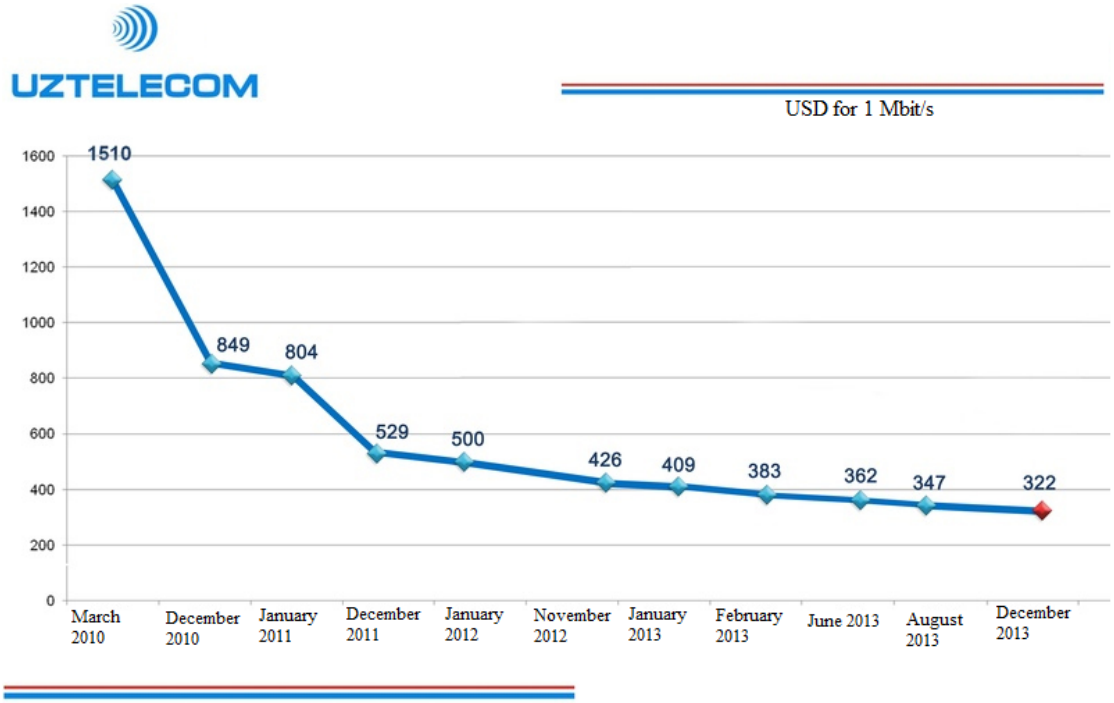


Fig. 9. Dynamics of service traffics of "Uzbektelecom" JSC[35]

Cost of 1 Mb / s Internet channel for providers since the beginning of 2013 decreased by 26% (or in comparison with the beginning of 2012 by 41 %, from the beginning of 2011 by 2.7 times), and currently stands at U.S. $ 312.58 per month.

Currently , if the needs of local Internet service providers , "Uzbektelecom" has the technical capability to increase the speed of external Internet channels in more than four times.

Currently "Uzbektelecom" work is underway to further increase the technical capabilities of the Internet access up to 100 Gb / s and reserve them on a territorial basis, as well as obtaining information resources from different world "Telehouse".

Also in conjunction with other operators, providers and content creators actively working on a sharp increase in the national information resources.

[35] Uzbektelecom report, 2013

Nowadays, the Data Centers of “Uzbektelecom” provides following services:[36]

1. **Internet**
2. **VPN (virtual private network)**
3. **IPTV**
4. **Domain**
5. **WEB-hosting**
6. **Co-location**
7. **Virtual flesh-drive**
8. **Video conference**
9. **Telephone**
10. **Real IP-address**
11. **Sip Trunk**

According to relevant orders of Government of the Republic of Uzbekistan, the State Committee of Communications, Information and Telecommunication Technologies of the Republic of Uzbekistan, «Uzbektelecom» JSC implemented a number of investment projects for further development of telecommunications network.

Total volume of investments amounted to 121,9 billion sums, the increase relative to 2011 was 2,9 times.

2.3. Economic efficiency of usage 1C in cloud computing

The rapid emergence of computers, tablets, smart phones and other electronic devices , the difference between them have almost no noticeable change all spheres of life .

No exception , and business management . Created many software options to automate business management and accounting . Today, the most progressive and

[36] www.brm.uz

is considered optimal automation software business 1C. It can help you to solve all problems arising in any sector of activity.

Head of every rank , from the CEO to the field teams , needs timely, correct and full information about the state of affairs . Any delays in the information flow can bring great harm , affecting the speed and accuracy of decisions.

Often, interruptions in the flow of information from the bottom up and in the opposite direction give rise to irreparable, financial aspect, situations. There is the need to create a complex system that ensures stable operation of the company or enterprise. Such systems are prone to a number of risks that must be considered in their construction .

We consider in more detail each of the risks and how to protect against them :

• The human factor, which is the accidental or intentional change to the database 1C any data. The surest way to protect against such actions - backup . For this there are two options: the first - the easiest - Create a backup of the entire database , the second - a more reliable - use two database servers , one of them will be the primary backup and the second - it will automatically kopirovatsya all changes made to the main database.

• Physical damage. Any hardware, even the branded may at the most inopportune moment to break. So for example, when using the HDD capacity is more than 1 GB and RAID 5, the probability that the re-build'e second hard drive array winning increases exponentially . Consequently, the concept of redundancy should be seen not only as a backup , but also as a hardware component. The most excellent option is the availability of the second server - mirrored the core, which will run the backup procedures .

• Failure of the software. Any software product can contain a variety of errors , moreover, each of them is constantly being improved and updated. Enough unreported variable or the slightest discrepancies versions of files , and the system starts up or is very unstable or stop working completely . Avoid this is realistic enough to hold pre- testing on a test stand with a copy of "live data ."

• It is also worth considering one of the existing , although very rare , risks in the country - and the illegal seizure raider attacks . Unfortunately, these problems can not be solved within the office . Here is likely fantasy - someone makes a server in the next office , someone has all the equipment on the machine and in the case of such problems , the car just goes . Here, of course , one could argue - " And how encryption partition data ? Cryptography ? ". But the reality is that intruders will be gentlemen and would not use moral suasion and physical strength , it is very unlikely .

But all these are partial solutions to the local problems. There is a way to avoid them all in one package. It consists in the transfer of all accounting and control system in the "cloud ." The term " cloud " or " cloud system " refers to a complex storage infrastructure with the ability to access and operations at any time.

Parameters such systems strictly comply with SLA, SLA service provided. You only have to rent the required service , such as " Business - server" , and all of the above problems can be solved by themselves. Use of information and data flows of the system are able to only within your company. Intrusion into the database , or removal of any - any information without your permission excluded .

For equipment such a complex system requires a special room and trained staff . The optimal solution is the creation of data centers in areas with limited access. This eliminates potential problems in parallel with Internet access , electricity supply , cooling work items. Terminal Server and virtual server 1C placed on iron servers in data - center has a level of Tier 3 . This principle resiliency level N +1. N - the number of necessary working equipment.

To decide on the appropriateness of the system using a remote server 1c important to familiarize yourself with some economic calculations , which do not apply to the full feasibility study , but may provide guidance in the main figures.

For the calculation we take a sample configuration for the primary and backup server: 2 * Intel Xeon E5607 2.26 GHz, 4 * 8 GB DDR3 1066 ECC, LSI 9240 -4i - 2 * 500 GB SATA WD RE4 (array RAID1), 2 * 300 GB SAS Hitachi (array RAID1). Just do not forget about software licenses . We need 2 server license and

20 client licenses for the server on the network, 20 CALs to connect to the server via Terminal Services. 20 people 1C usually not enough free databases such as Microsoft SQL Express and must use full . Just lay the uninterruptible power supply and telecommunications closet to isolate servers from the external environment . Not take into account the cost of internet , lights and other current expenses .

There's what happens:

Table 3.

Cost of necessary equipment[37]

Name	Price (USD)	Quantity	Amount
Server	2 424	2	4 848
Uninterruptible power supply	757	1	757
Backup system	363	1	363
Rack for 24 Units	757	1	757
Server license	818	2	1 636
Client access license	31	20	636
Terminal access license	90	20	1 818
License for SQL server	833	1	833
License for SQL users' access	196	20	3 939
TOTAL			15 587

Cost of 1C, such as "Trade Management" in the client-server connection with 20 users will cost (Tab 4):

Table 4

Costs of licenses and software[38]

Name		Price (USD)	Quantity	Amount (USD)
1C Platform	1C Trade management 8 Basic edition	139	1	139

[37] Tab 3. Cost of necessary equipment made by the author
[38] Tab 4. Cost of licences and software made by the author

20 licenses	1C Enterprise 8. User license for 20 users	1 969	1	1 969
Server license applications to work with SQL	Server license 1C Enterprise 8.2	2 181	1	2 181
TOTAL				4 289

Overall, we go out 15,587 U.S. dollars for the purchase of hardware and software and IT 4289 U.S. dollars for application software 1C , for reliable operation of the organization 20 users in the office.

The average salary of a system administrator to maintain the system in working condition - 454 U.S. dollars per month, there is an incoming administrator , not a staffer salary is naturally much higher.

Just do not forget the costs of electricity to power the servers and their cooling and space rental (approximately 3 m2) for equipment that would be approximately $ 60 $ / month. Given that the term obsolescence servers and software 4-5 years (take 5 years , since we all cheap hosts) , and then add $ 99 per month ($ 5969 / 60 months) .

For the use of "Corporate cloud" for 20 users monthly payment is 757 dollars , and this price includes 20 licenses MSOffice Standard! Not carry out complex calculations to assess the payback . For clarity, all the numerical indicators shall bring to the table and draw a simple calculation period (tab 5):

Table 5

Economic profitability calculation server lease[39]

Name	Expenditure on own possession (USD)	Rent charges
Depreciation charges	99	0
Costs for power and cooling	60	0
IT Outsourcing per month	454	Server maintenance per month 757

[39] Tab. 5 Economic Profitability calculation server lease made by the author

Equipment (server + UPS + monitor)	5 969	0
Software Microsoft + MS SQL	4 772	0
1C	4 290	5% of the retail price 214
License for MS Office Standard	7 272	0
Total costs per month	620	946
Total one-time costs	27 154	0

The difference in monthly payments is $ 332 / month. Therefore, the payback period is 62.4 months

We can consider another option when 1C license will be purchased independently, and MS Office will be replaced by a free Open Office or even will not demand. What then happens (Tab 6):

Table 6

Economic calculation excluding 1C and MS Office[40]

Name	Expenditure on own possession (USD)	Rent charges
Depreciation charges	99	0
Costs for power and cooling	60	0
IT Outsourcing per month	454	Server maintenance per month 757
Equipment (server + UPS + monitor)	5 969	0
Software Microsoft + MS SQL	4 772	0
1C	0	0
License for MS Office Standard	0	0
Total costs per month	620	757
Total one-time costs	15 590	0

The difference in monthly payments is $ 137 / month. Therefore, the payback period is 75.2 months.

Given Moore's Law says, that the number of transistors placed on an integrated circuit chip doubles every 24 months. and the growing needs of the

[40] Tab. 6 Economic calculation excluding 1C and MC Office made by the author

production facilities, for this time, our system morally outdated and can not provide adequate performance.

To be objective, we can consider another option when the server is the only one without a reservation. System backup and uninterruptible power supply, we reserve. Let's see what will they say in this case the numbers (Tab 7):

Table 7

Economic calculation based on one server[41]

Name	Expenditure on own possession (USD)	Rent charges
Depreciation charges	59	0
Costs for power and cooling	60	0
IT Outsourcing per month	454	Server maintenance per month 757
Equipment (server + UPS + monitor)	3 545	0
Software Microsoft + MS SQL	3 954	0
1C	0	0
License for MS Office Standard	0	0
Total costs per month	574	757
Total one-time costs	7 500	0

The difference in monthly payments is $ 183 / month. Therefore, the payback period is 40.9 months, which again proves the economic viability lease IT structure.

Based on the above calculations, we can safely say that the use of cloud computing will play a major role in the development of information and communication technologies. Cloud computing not only to save money, create a

[41] Tab.7 Economic calculation based on one server made by the author

Safety barrier against loss of information, accelerate information revolution, but will also be initiated to launch new services.

Conclusion to the PART II

In 2012, thanks to cloud computing at the disposal of a new, a better way to manage IT resources: thousands of companies and organizations prepare for their transfer to the cloud.

Benefits clouds for any enterprise, from huge corporations to government agencies and small websites, obvious, and suppliers are rushing to meet the needs of its customers.

In 2013, more vendors and solution providers will offer consumers an easy to use service with high reliability , low cost and more advanced control functions . In 2013, the cloud will be widespread , we will see a revolutionary new application of this technology , which was hard to imagine until recently.

Uzbektelecom JSC is the largest telecommunications operator, which network covers the entire territory of the Republic of Uzbekistan. Using its own telecommunications network, built on the basis of modern technologies, the Company provides wide range of telecommunications services.

Within in frame of marketing strategy of 2012 year and taking into consideration of market situation in the market of rendering telecommunication services continuous monitoring of tariff policy and competitiveness products and services which rendered by UZONLINE and UZMOBILE trademarks. By the end of market monitoring and also for new customer acquisition and for increase of loyalty of existing subscriber base of the Company during the reporting period tariffs for services broadband Internet and mobile communication repeatedly were reconsidered.

Currently , if the needs of local Internet service providers , "Uzbektelecom" has the technical capability to increase the speed of external Internet channels in more than four times.

The rapid emergence of computers, tablets , smart phones and other electronic devices , the difference between them have almost no noticeable change all spheres of life.

No exception , and business management . Created many software options to automate business management and accounting . Today, the most progressive and is considered optimal automation software business 1C. It can help you to solve all problems arising in any sector of activity.

To decide on the appropriateness of the system using a remote server 1c important to familiarize yourself with some economic calculations , which do not apply to the full feasibility study , but may provide guidance in the main figures.

PART III. PRACTICAL RECOMMENDATIONS FOR THE IMPLEMENTATION AND OPERATION OF CLOUD COMPUTING-BASED CONTAINER DATA CENTER

3.1. Creating a strategy for the implementation of cloud technologies based on Cisco

Companies considering using cloud technology solutions for their most pressing business and technical issues, including the reduction costs, increased efficiency and the introduction of innovative business models. To choose the best cloud model should define the objectives and needs business and based on them to decide where to start conversion center data processing , networks, and storage systems. You can imagine cloud that works equally in any enterprise , but each implementation cloud model is unique , whether it is private , accessible , hybrid cloud or community clouds for different markets , including the scope health, finance and governance.[42]

With the right approach chosen cloud model will simplify and improve the efficiency of the enterprise without compromising security, flexibility and functionality. Fit model clouds , whether private or public cloud services providing access to resources or infrastructure the software offers companies the flexibility to reduce total cost of ownership (TCO) and attractive conditions return on investment (ROI) with reduced payback periods regardless of geographic location and characteristics of operations.

Nevertheless , many organizations using separate cloud services face challenges that affect their activity and affect security , reliability, performance and tuning applications as well as interaction with internal applications and systems. As a result, These problems create barriers to migration to the cloud critical business applications , such as collaboration systems , video , control relationship with customers , payroll , data management and staff.

[42] Cisco Services for the preparation and implementation of cloud technology to deploy cloud environments, 2011, M. 25p

Often, companies are focusing only on technology –related with the introduction of cloud models. Instead, you should focus on the following questions: what goals the company , implementing cloud technology , which cloud models allow us to achieve these goals , as virtualization and automation various cloud models affect existing data centers and which business applications should be or can be transferred to different clouds types. In short, the customer needs a strategy implementation of cloud technologies.

To ease the transition to cloud models and services that promise to obtain additional revenue, Cisco provides services for the preparation and implementation cloud technology to deploy cloud environments , allowing to solve problems, on strategy, structure , people, processes and systems. The purpose of these services - provide customer support , level and type of which comply with the requirements cloud model , as well as the requirements for planning and management for successful migration to the use of public cloud.

Cisco Services for the preparation and implementation of cloud technologies to deploy cloud environments, provide expert assistance that is needed to accelerate the development of the cloud model, taking into account features of the working environment and business objectives of the customer. These services provide the preparation for the introduction of cloud technology, in which changes are made to the package of business applications centers data processing and network infrastructure without Borders (BN), revised architecture data centers, networks, and storage systems.

These services help customers understand:

- what is the degree of readiness of the enterprise to introduce cloud model and whatproblems, consequences and benefits entail a transition to the cloud model;
- as a cloud model is consistent with the activities of the customer , and what effect it has on the goals of information technology and operating activities;

- impact cloud model has on partners , including manufacturers, vendors, resellers and customers ;
- what opportunities cloud model provides for the creation of new user services with optimal provision of services or for use new services from other providers.

To facilitate decision-making on the transition to cloud-based technologies under Cisco Services for the preparation and implementation of cloud technologies to deploy the cloud service offers two models: the development strategy introduction and implementation planning cloud environment.

Services to develop an implementation strategy

Services to develop a strategy for the implementation of cloud formation provide strategy under the guidance of experts and preparing feasibility studies based on the requirements of business and financial needs and other factors of success.

These services include:

Seminar on strategies for implementing cloud technologies for deployment modeling XaaS: Cisco at the seminar on strategies for implementing cloud technology uses a process of joint discussion for the study and evaluation of industry-leading solutions for the implementation of cloud technologies and identify domains and important aspects for the successful deployment of the cloud model . Duration of the seminar - from two to four hours. It can be carried out in a virtual environment or in personal meetings with experts Cisse on cloud technologies , as well as partners, if necessary. Seminar helps determine the range of substantive issues and to understand the current situation, existing problems , consequences and benefits before migrating to the cloud model . The seminar will also be presented Cisco recommended approach to the transition to the cloud allowing for the working environment of the customer, its business needs and goals.

Services to develop a strategy for the implementation of cloud technologies and feasibility study for the adaptation model XaaS: the provision of this services

using the format conversation, during which the estimate and analysis architectural applications, networks , computer resources and storage customer data . Particular attention is given to a set of applications , moreover, collects data on success factors , usage scenarios, clouds, financial, business and technology requirements of the various divisions and IT department of the enterprise . In addition to collecting these data service provides preparation of feasibility study of migration to cloud-based technologies and identification of any commercial and / or technical effects that may arise during the implementation of the cloud model . Finally, this service helps identify risks and analyze the dependency of the cloud model.

Cisco Services for implementation planning cloud environment. These services help companies adopt an integrated approach, providing for selection of applications, infrastructure components and network dependency mapping, modeling and performance delays applications, project analysis server consolidation and virtualization and evaluation security infrastructure to simplify the migration to cloud-based technologies.

These services include:

Service estimates for the implementation of cloud applications XaaS. When providing this service, Cisco experts and specialists working group customer analyzed and selected existing applications , infrastructure components and network characteristics , and develop use cases future of cloud applications . Understanding of the working environment , as well as explicit and implicit relationships between the physical and logical components and business applications is essential for any project migration center data processing in the cloud , because it avoids unforeseen consequences or events. The resulting model performance and delays Applications developed on the basis of end-user perspective , can be used as a reference source when porting applications to the cloud or accessing applications through provider of cloud services .

Cisco uses its own and third-party tools to detect infrastructure components analysis and display characteristics of applications dependencies between applications and servers, and between servers and the network. This service also

allows you to proactively identify problems , associated with a response time of applications, providing rapid diagnosis and resolution of problems , which reduces the impact of such problems on the job enterprise. Report the results of analysis can be used as source of reference and recommendations for changes infrastructure of local / global networks , as well as to interact with public cloud services provider to ensure acceptable Response time for cloud models , and provides

Software as a Service (SaaS). Results of the data analysis characteristics of dependency analysis applications and in conjunction with the technical contribution Cisco experts in specific fields are used to generate recommended approach to the definition of dependencies between components network infrastructure and the transition to the cloud.

Service evaluation for the implementation of cloud infrastructure XaaS When providing this service, Cisco experts and specialists working group customer analyzed and selected existing applications , infrastructure components and network characteristics , and develop use cases future of cloud applications . Understanding of the working environment , as well as explicit and implicit relationships between the physical and logical components and business applications is essential for any project migration center data processing in the cloud , because it avoids unforeseen consequences or events. Cisco helps the customer to successfully implement Projects server virtualization in the data center migration to cloud technologies by analyzing the consolidation and virtualization servers. Based on this analysis, the script can be developed future needs of cloud virtualization by identifying existing physical (autonomous) loads (P2V) and rebalance the existing virtualized workloads (V2V).

Cisco uses its own and third-party tools to detect infrastructure components analysis and display characteristics of applications dependencies between applications and servers, and between servers and the network. This service also allows you to identify potential cost of server virtualization for the best coefficients virtualization based on the characteristics of workloads. Furthermore, this service reveals compatibility of components across the enterprise and level workflow to

move to the cloud model that helps avoid problems or the occurrence of unforeseen events. Findings data collection , analysis, application performance , server consolidation and virtualization in conjunction with the technical contribution Cisco experts in specific areas are used to generate a recommended approach for definition of dependencies between applications , infrastructure components, virtualization and network components when migrating to the cloud.

Service evaluation of the security in the cloud for implementation XaaS This service involves the use of specialized tools Cisco to evaluate and compare hardware infrastructure management security at a predetermined operating concept. The concept of governance defines independent providers set of controls based on industry best practices and international standards and solutions . Cisco provides detailed documentation including the results of the current analysis omissions , as well as advice and guidance on safe migration of existing infrastructure to the cloud model. As a result of this interaction Develops an understanding of the needs and risks associated with the integrated security system , as well as the measures needed to reduce security threats and the protection of business assets in the implementation of migration to the cloud.

Cisco Services for the preparation and implementation of cloud technologies to deploy cloud environments meet the needs of businesses that need support expert analysis and recommendations on strategy cloud deployment model.

Cisco Services for the preparation and implementation of cloud technologies to deploy cloud environments help:

quantitatively and qualitatively assess the economic rationale for the project and for implementation of public cloud environment to the unique business situation and objectives of the customer;

- improve the quality and provision of access to applications and services by selecting the most suitable applications for migration to the cloud;
- improve the performance of services by determining the impact of migration on the cloud data center infrastructure in terms of virtualization, dependency and delays in job applications;

- improve performance and fault tolerance infrastructure through understanding of the impact of migration to the cloud infrastructure and global local area networks;
- ensure the safety of users and enterprises, as well as compliance regulatory requirements when migrating to the cloud.

Today's data centers are strategic assets. World changing rapidly: there are new cloud model, and users want access to information services on request. Cloud changes ways of doing business , teamwork and use of information. Cisco offers solutions for private , public and hybrid clouds, which combined expert services, unified functionality Cisco data center flexibility and intelligent network Cisco. These solutions provide uniformity and convenience, as well as the safety of users, regardless their location and number of clouds.

3.2. Economic efficiency of cloud computing for example VMware vSphere

With the economic crisis and reduce IT budgets sharply raises the question of optimization of the entire IT infrastructure and increase its effectiveness . Research results have shown that the vast majority of cases, downloading servers is not more than 5-10%. At the same time the demand for new services and jobs , is constantly increasing. It speaks about the irrational use of equipment and facilities undue costs money and energy . In this regard, particularly relevant today was the concept of " server virtualization".[43]

Doing virtualization can not only increase performance computing resources, but also get more powerful tools, combining power, separated geographical position. Implementing virtualization is used in two cases:

- when you need to partition a physical server into multiple virtual;
- when you need to merge several existing servers into a single virtual summation of the purpose of their capabilities.

[43] VMware report, 2013

Cloud computing is a model for providing convenient on-demand network access to a common pool of configurable computing resources that can quickly identify and provide with minimal management effort or minimal intervention by the service provider.

Pros cloud computing: rapid deployment, flexibility, cost reduction. This model allows us to fully control the physical infrastructure, and users typically do not need to adapt to new applications when working in the corporate cloud usual application software. Essentially a private cloud means achieving elasticity, flexibility of resource use public clouds, but there is a corporate firewall (Tab 8).

Table 8

Benefits of virtualization technology[44]

Classical solution without virtualization	Virtualization solution
1. A large number of servers allocated according to the principle " to each application a separate server ." This leads to a lack of space in the server room , increase the cost of electricity and cooling .	Server consolidation. Running applications inside isolated from each other virtual machines. Average consolidation of 5:1 .
2 . Slow load average physical servers 5-10%. Inability to load powerful servers . Most servers run at idle .	Running different virtual machines on a single physical server, allows maximum load and control the consumption of resources.
3 . Extremely low speed settings and the launch of new IT services . For each new business problem you need to buy new equipment , introduction drags on for months, years .	Having some reserve resources in virtual infrastructure allows you to quickly deploy new services .
4 . Due to a set of drivers and specific settings , the OS is tied to the server , which results in labor costs and downtime when migrating to another server OS . And in case of an accident such "binding" is fatal.	The virtual machine can freely move between servers , because no binding to a specific " hardware" . Have the technology " live migration " without shutting down the virtual machine.
5 . Each server is managed separately and requires personal attention administrator.	All virtual machines are managed centrally via a special application

[44] http://www.salesforce.com/uk/socialsuccess/cloud-computing/why-move-to-cloud-10-benefits-cloud-computing.jsp

6. A low level of fault tolerance . Long recovery in the event of an accident . Very high probability of data loss.	Technology high availability virtual machine restarts in a very short time on the server running in the event of an accident.
7. Inconvenient backup heterogeneous environments (Windows, Linux) long recovery from backups.	It does not matter what OS , as virtual machines are backed up at the file level VM. Restore from a backup power VM startup time.

VMware vSphere, a platform for virtualization and cloud infrastructure, ensures stable operation of critical applications and the ability to respond faster to changing business requirements. vSphere accelerates the journey to cloud computing for existing data center and provides connection to compatible public cloud, forming the basis for the industry's unique hybrid cloud model.

In a private cloud IT infrastructure is provided as a convenient and accessible service . VMware vSphere delivers uncompromised control over all IT resources while maintaining the highest efficiency and choice in the industry :

- **Reducing costs and improving the efficiency of the IT infrastructure**

Reduce capital and operating costs and minimize losses associated with downtime, work stops and failures.

- **Increasing the availability and manageability of applications**

Automation of application service level agreements to ensure availability, security and scalability of enterprise applications .

- **Greater choice for the IT department**

Providing applications and IT services on demand with a choice of hardware , application architecture , OS (Tab 9).

Tab.9

The main benefits of implementing[45]

№	The benefits of virtualization	Implementation Results
1	Server consolidation and containment server park for a production system by placing the software applications on fewer physical servers. .	Index Server consolidation is 15:1
2	Running different virtual machines on a single physical server , allows maximum load and control the consumption of resources.	Using cluster resource : CPU : 10-15% ; RAM: 70 % ; Storage : 70%.
3	Having some reserve resources in virtual infrastructure allows you to quickly deploy new services .	When entering a new service is from 1-8 hours of working time
4	Simplify the creation and testing of applications by combining the development, testing , demonstration, perhaps with different operating systems on a single physical server.	Virtualized OS x86/x64: Windows 7/2003/2008, CentOS 6 , Debian 6 , Ubuntu 10/12 , FreeBSD 8/9
5	Ensuring continuity of service and high availability mission critical applications at a lower cost .	VMware ESXi cluster consists of two servers and one storage .
6	Technology high availability virtual machine restarts in a very short time on the server running in the event of an accident.	Technology VMware High Availability, VMware Storage vMotion
7	It does not matter what OS , as virtual machines are backed up at the file level VM. Restore from a backup power VM startup time .	Restore from backup in minutes .
8	Migrate legacy applications to virtual machines running on new hardware for better reliability .	11 "old" servers decommissioned.
9	Reduce energy costs by 80%	Approximately 75-80 %.

Return on investment (ROI) or Calculation of economic efficiency

1. Initial costs of equipment and software

• Acquisition of server hardware

• Acquisition of data storage systems (DSS)

• Purchase of switching equipment

[45] VMware report, 2013

• Acquisition of an uninterruptible power supply
• acquisition conditioner

2. direct costs

• Administering Servers
• Installation / Configuration / Deployment

The cost for the organization administrator USD /Month :990 USD.

3. Indirect costs

• downtime
• Loss of time to solve the problem

The average cost for an employee organization USD/Month: 628 USD

Operational lifetime of the server and switching equipment - 5 years, 3 years manufacturer's warranty .

Based on the value of one hour administrator and employee held costing. Due to the complexity of calculations deliberately omitted the cost of electricity, rent space, cooling the server hardware (Tab 10 and Tab 11).

Table 10

The costs of implementation and operation of VMware vSphere[46]

№	Name	Price per unit	Quantity	2010	2011	2012	2013	2014	TOTAL
	Server and switching equipment								
1	Server	9 374	2	18 748					
2	RAM 8GB	120	30		3 618				
3	Storage system	12 088	1	12 088					
4	HP Pro Curve Switch	2 892	6	14 462	2 892				
5	Rack 42 Units	2 650	1	2 650					
6	UPS	7 830	1	7 830					
7	Air conditioning	3 954	1	3 954					
	Software								
1	License for Enterprise 1 processor (max 6 core)	3 018	4	12 073					
2	License for Foundation up to 3 hosts	1 594	1	1 594					
3	Tech support for 1 processor (max 6 core)	957	4	3 828	3 828	3 828	3 828	3 828	
4	Tech support Foundation up to 3 hosts	686	1	686	686	686	686	686	
5	Shield per virtual server	45	15			685			
6	Kaspersky security	90	15			1 364			
7	Keys for Kaspersky (1-14 licenses)	54	15				764	764	
	CAPEX			**80 808**	**11 025**	**6 564**	**5 333**	**5 333**	**109 064**
	Services	**USD/h**	**h/w**	**9**	**10**	**10**	**10**	**10**	**49**
1	Administrating	46	0.5	1 214	1 214	1 214	1 214	1 214	
2	Service repair	46	8				4 484	4 484	
3	Full installation of OS and software	46	2	840	1 144	1 377	1 611	1 845	
4	Installation and setting	46	2	4 857	4 857	4 857	4 857	4 857	
5	Time wasting	29	0						
6	Wasting time on solving problems	29	50	77 793	77 793	77 793	77 793	77 793	
	Direct and indirect costs			**84 706**	**85 010**	**85 243**	**89 961**	**90 195**	**435 117**
	TOTAL								**544 182**

[46] Tab. 10 The cost of implementation and operation. Prepared by the Author in example of VMware technologies

Table 11

The costs of implementation and maintenance of traditional architecture[47]

№	Name	Price per unit	Quantity	2010	2011	2012	2013	2014	TOTAL
	Server and switching equipment			9	5	5	5	5	29
1	Server 1	2 424	29	21 818	12 120	12 120	12 120	12 120	70 296
2	Server 2	5 624	2			11 248			
3	HP Pro Curve Switch	2 892	6	14 462	2 892				
4	Rack 42 Units	2 650	1	2 650					
5	UPS	7 830	1	7 830					
6	Air conditioning	3 954	1	3 954					
	Software								
1	Kaspersky security	47	13	239	191	191	191	191	
2	Keys for Kaspersky (1-14 licenses)	28	13		143	258	373	13 103	
	CAPEX			**53 847**	**15 349**	**18 971**	**12 686**	**12 830**	**108 230**
	Services	**USD/h**	**h/w**						
1	Administrating	46	3	7 286	7 286	7 286	7 286	7 286	
2	Service repair	46	8				4 484	4 484	
3	Full installation of OS and software	46	8	3 363	2 709	3 176	3 643	4 110	
4	Installation and setting	46	4	9 715	9 715	9 715	9 715	9 715	
5	Time wasting	29	2000				718 095	718 095	
6	Wasting time on solving problems	29	100	155 587	155 587	155 587	155 587	155 587	
	Direct and indirect costs			**175952**	**175 298**	**175 766**	**898 812**	**899 279**	**2 325 109**
	TOTAL								**2 438 795**

[47] Tab. 11 The costs of implementation and maintenance of traditional architecture. Prepared by the Author in example of VMware technologies

Based on the above calculations, we can conclude that the use of infrastructure virtualization is largely financial savings of company.

3.3. Use of cloud computing on container data center Tier-3 type of Huawei

Representatives of the company Huawei, which is a world leader in the field of information and communication technologies (ICT), announced that its container data center for cloud computing has been certified by Uptime Institute. Experts confirmed its compliance with the level of security Tier III. This is the first container data center in the world which has passed a similar certification. Recognizing the achievements of the vendor by industry experts strengthens leading position Huawei as one of the key providers of cloud data centers. The company aims to create efficient, reliable and efficient solutions through continuous implementation of client-oriented innovations.[48]

Experts of the Chinese company, which is headquartered in Shenzhen, started work on this project in 2012. When designing its cloud data center container they initially focused on the requirements laid down in the standards Uptime Institute Tier. Design features of this product make use of architecture 2N (dual system redundancy) in the elements of power and cooling distribution , which reduces the risk of downtime due to damage to local infrastructure elements .

Currently based container data center for cloud computing can be organized computing infrastructure for virtual machines , which can simultaneously use more than 10 thousand clients. The new data center Huawei boasts the ability to quickly configure and deploy within one week. It is also equipped with advanced automated intelligent system operation and maintenance.

Container data center with basic Chinese energy efficiency technologies , including advanced uninterruptible power supply (UPS), "hot" / "cold" corridors ,

[48] www.huawei.com

efficient in-row cooling system , server racks with support for high-density arrangement of equipment and intelligent control system . All these functions and features allow data center container Huawei demonstrate an extremely low coefficient of energy efficiency (Power Usage Effectiveness; PUE) - even at high temperatures.

From the outset, container sales cloud data center Huawei enjoyed high demand on the world market. The product is widely used in the context of different businesses and industries , including telecommunications , research and education, health , e-government , mining and energy. Large-scale projects for the deployment of this solution were implemented in China, Europe, Asia, Latin America, Africa and the Middle East.

Complete series of products, flexible expansion, suitable for data center of different scale and construction level.

- 20/40ft All-in-one singe container and multi-container cluster solution, covering small, medium and large data centers (30~1000kW) with different rated power consumption (3.5~21kW/R).
- Independent power and cooling containers for flexible configurations, could be updated fromTier3 construction level to Tier4.
- Customized multi-function ICT containers, making outdoor data center suitable for both living and officing needs.

Highly integration, one-week fast deployment and mobile data center.

- One-stop solution, integrating racks, monitoring, cabling, power, fire control and air-conditioning systems.
- Pre-engineering design, one-week fast deployment, no building required, only construction field, power and network connection needed.
- High impact shock absorption system to meet needs of mobile scenes such as the military, disaster relief, exploration, field operations.

Due to the unique features - such as rapid deployment (within one week), high range of allowable temperatures (from -40 ° C to +55 ° C) and PUE ratio at

1.25 (using the automated system of cooling (freecooling)) - cloud data center container Chinese company allows its owner to save up to 30% of the total cost of ownership . This makes this product one of the most popular in the data center sector.

According to analysts the company Huawei, in the near future we can expect further growth in the sector of cloud data centers. Such products will become even more difficult and complex , allowing vendors to meet customers' changing needs . Containerized data centers , which offer greater flexibility and have more advantages compared with traditional objects (rapid deployment , help with disaster recovery , redundancy , tolerance to harsh weather and compactness) . Therefore, they are expected to be in demand . Certification of the first cloud data center container conforms TIER III demonstrates the uniqueness of this particular decision, and describes the overall trends in the construction and use of data centers.

Conclusion to the PART III

VMware vSphere, a platform for virtualization and cloud infrastructure, ensures stable operation of critical applications and the ability to respond faster to changing business requirements. vSphere accelerates the journey to cloud computing for existing data center and provides connection to compatible public cloud, forming the basis for the industry's unique hybrid cloud model.

In the previous chapter, we examined the efficiency of the use of cloud computing services and revealed how much money the company saves on the use of data services in Example 1C. this time we considered how much to save the introduction of cloud computing compared to traditional computing systems.

Company Huawei, which is a world leader in the field of information and communication technologies (ICT) and is a major supplier of IT technology in the territory of the Republic of Uzbekistan for several years , has announced that its

containerized data centers for cloud computing have been certified by Uptime Institute. Experts confirmed its compliance with the level of security Tier III.

This is the first container data center in the world that have passed such certification. Recognizing the achievements of the vendor by industry experts strengthens leading position Huawei as one of the key providers of cloud data centers. The company aims to create efficient, reliable and efficient solutions through continuous implementation of client-oriented innovations.

CONCLUSION

IT innovations are transformed business performance and revolutionary increased productivity, convenience and customer service efficiency . In our daily life we can track the status of the cargo; order a pizza or a pair of shoes ; make a trip to stay , restaurant ; collaborate with colleagues and friends - all online, anytime and anywhere. However, when dealing with the authorities at all levels , we too often have to queue , contact by phone or by mail in paper form. For many reasons, such as the requirement of protection of personal data and other restrictions and government less involved in the process of internal innovative reforms , rather than the business environment , and therefore the state shortfall of many benefits available at the present stage of evolution of information technology.

Cloud computing and provide indirect benefits of increased productivity whole variety of IT services. For example, teams have the right to use applications that require little effort to install and deploy the equipment of its production software testing at a fraction of the cost required for the separate use of this application. Projects based on cloud computing can be justified , developed and tested with a smaller initial investment than traditional IT projects . For the new project will not have to conduct painstaking construction to build a data center computing resources; necessary facilities will be gradually increase through the use of cloud computing technologies . After a small initial investment project can be evaluated to provide additional investment or cancel it. About promising projects can provide valuable information for further evaluation process. Less promising projects can be canceled with minimal losses. This approach - " start small " - a collective reduces the risk associated with the development of new application projects . Reducing the minimum required investment will also contribute to the creation of " more experimental " development environment in which innovation can flourish.

Unlike traditional on-premise software applications, cloud applications are located and managed remotely and built with a single code-base customized to the company's needs. Cloud applications also differ in that the cloud provider, not the customer, is responsible for the maintenance, operations, and bandwidth of the software. Finally, cloud applications are typically accessed through standard web browsers, providing scalability and agility to the customer. Six top benefits of cloud are:

1. Increased speed in responding to unforeseen events

With cloud deployments, capacity and location planning are no longer in the hands of the customer, but are the responsibility of the cloud vendor. This allows companies to respond quickly to any business changes that may arise unexpectedly because operations are handled by the cloud vendors.

2. Easy to get the latest and greatest updates

Software updates and renewals are also handled by the cloud vendor and occur several times a year at no cost to the customer. This ensures that the user interface remains modern and up-to-date with business demands.

3. Adoption is quick and simple

As mentioned earlier, users access cloud applications on standard web browsers anytime, anywhere. Using web style user interfaces, like that of eBay or Yahoo, allows for more widespread adoption across the company without the need for detailed training.

4. Improved information security

One of the top concerns of cloud skeptics is the fear of sacrificing data security when allowing company data to exist outside the internal firewall. Well according to SuccessFactors, security is actually increased when using cloud solutions due to strict ISO security standards that cloud providers must adhere to, in addition to the regular security audits. This means no more worrying about lost laptops with confidential data and treacherous hacking threats.

5. Deployment time decreases from years to months

Time to value with cloud solutions is significantly lower than with on-premise applications. A “go live” for cloud solutions takes typically 2-3 quarters, whereas on-premise solutions require 2-3 years to implement. Not only is implementation time reduced, but the IT resources required to roll-out cloud solutions are much less.

6. Lower risk with subscription based cost model

With a pay-as-you-go, subscription-based cost structure, cloud services require a lower initial investment and typically much lower overall costs than on-premise. In addition, cloud solutions provide an “easy out” if the customer is dissatisfied with the product. Therefore, the business risk is in the hands of the cloud vendor and not the company itself.

According to Success Factors, “**software will never be the same again**.”

Increased strategic agility, short deployment times, lower risk and costs – the advantages of cloud computing are compelling. And yet, companies still struggle with the decision to purchase cloud solutions and therefore, miss out on a massive business opportunity.

Cloud computing promotes innovation as enable organizations to quickly and cost- effectively explore the potential of new opportunities for streamlining operations, based on IT technology due to their flexible zooming with virtually no restrictions . Cloud computing - an innovation designed to eliminate the problems associated with traditional deployment complexities of integrated information systems. Need for widespread implementation of cloud technologies is emphasized at the highest government level, as evidenced by the allocation of information technology systems to the priority areas of science , technology and engineering in the Republic of Uzbekistan, as well as incorporating information technology in the list of critical technologies Uzbekistan.

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