**Establishing Modern Master-level Studies in Information Systems
561592-EPP-1-2015-1- FR-EPPKA2-CBHE-JP**

**ІT – infrastructure**

**Guidelines to perform laboratory works**

Laboratory work # 5

Topic: New technologies in the part of IT infrastructure

**draft version**



**Theoretical information**

Top 10 trends and forecasts how the corporate IT infrastructure up to 2020 will be developed by Riverbed, a leading global provider of solutions to increase the productivity and availability of enterprise applications and services.

Riverbed Company identifies three main areas for developing the IT infrastructure of companies and enterprises in the coming years:

• Movement - business moves towards cloud computing, transferring the entire infrastructure of corporate information systems into the cloud. Also, with the emergence of many suggestions, private and public IT infrastructures are increasingly being interconnected. The amount of data transmission between interfaces, applications, SaaS, data centers and clouds is increasing.

• Transformation - digital transformation remains critical for businesses. The more intensive exploitation of old network infrastructures allows for new and improved network capabilities and services. Containers and microservices bring new opportunities for users. Artificial intelligence (AI) and machine learning (ML) are expanding the boundaries of business intelligence.

• Consolidation - IT infrastructure is becoming increasingly hyperconvertible. Cloud computing and related services turn into mass products, and their cost is aligned throughout the market.

A more detailed list of the most significant trends in the corporate IT infrastructure by Riverbed company by 2020:

**1. Wide distribution of containers and microservices**

Just as cloud computing was perceived several years ago - innovative, changing old patterns and requiring careful study - today containers such as Docker and CoreOS, as well as the many microservices represented on the market, allow companies to use more innovative approaches. The main advantage of "packaged" environments is the ability of the company to focus on providing user experience, not simply providing access to products and services.

In the near future, existing and new providers of specialized services will expand the possibilities of their proposals. Thus, greater integration with public cloud infrastructures is expected, expansion and improvement of network capabilities, as well as further abstraction of services.

Despite the fact that the use of containers will be wider, the transition to a "containerized" world will continue for several years to come.

In addition, companies switching to the use of containers or microservices will inevitably have to solve a number of internal tasks related to security and compliance with regulatory requirements, as well as the need to optimize the corporate network, storage systems and provide quality monitoring for these types of services.

**2. The growth of the scale of digital transformation**

Digital transformation, the process of redefining / rethinking business processes in close proximity to technological innovation, will grow as a snowball. Enterprises are increasingly transforming their business, and those who have not yet begun implementing such initiatives will increasingly be pressured by competitors who have already done so. Those who are lagging behind technological progress will have to urgently do something to save their business.

The most important aspect of cloud computing is their ability to radically transform business and economic models. And the main task of any company is the concentration of attention is not on a certain technology, but on getting the opportunities that it can give to business.

The basic advice for those companies and corporations that are planning to build their digital transformation initiatives in the near future: remember that digital transformation is something much more than just a technology. Riverbed advises to consider digital transformation as a complex grid:

• technologies (cloud computing, Big Data, IoT, mobility, social networking, network solutions, unified communications, etc.);

• business processes (strategies, management, processes);

• people (partners, suppliers, customers, employees, competitors).

From a technical point of view, digital transformation is unique to each organization.

**3. The massive supply of cloud computing**

While major cloud computing providers with the public model, Amazon, Microsoft and Google will continue to fight for market share, smaller specialized cloud solutions providers will continue to grow, offering niche or vertical market opportunities.

Enterprises will continue to be careful about the new ultra-modern features offered by only one cloud platform, as they fear to become dependent on one vendor. Since cloud-based offers remain complex, companies that seek to diversify vendor dependency will largely choose some hybrid or hybrid solutions based on certain variants of the interaction of the private cloud and the local infrastructure of the data center.

In addition, analysts point out the tendency that a part of IT directors who initially chose to build a private cloud infrastructure for corporate information systems switch over time to cloud computing with the public model, since they now began to realize how laborious and costly they were to work with. belongs to

**4. The network will remain in the spotlight**

The focus of the market will be focused on cloud computing, microservices, containers and other innovative technologies. IT professionals will primarily be interested in such issues as building a network in the clouds, as well as connecting to the cloud private data center. But, as is often the case, most businesses will decide to rely on their already existing network technologies to "glue together" various new services and existing elements of the IT infrastructure.

According to analysts, the path to the search for hybrid cloud integration - where some services are launched in a private data center, while others in the public cloud - the market was not yet gone. One of the main reasons for this is that network elements in such hybrid domains should be ideally "linked" with each other.

As for container technologies, the container network is also significantly different from the traditional network. Containers are very dynamic and have a short life cycle, which leads to the creation of a large number of unpredictable traffic flows.

Therefore, any network technology used in the form of SD-WAN, NFV, or any other innovative network architecture concept should be flexible enough to cope with these changes.

**5. Further alignment of price policy in the cloud computing market**

For many years, cloud computing has become increasingly popular, and prices for various basic services have been decreasing. However, market analysts note that although prices continue to decline, this does not happen as quickly as expected.

For example, the 451 Research company in a study conducted for Microsoft noted that the most popular reason for changing cloud service provider was for the first time a price, which as a whole was named by 34% of respondents. But if price cloud wars and started, then we are at their very beginning. Ending users though think about the price, but most are still afraid to be deceived. Cloud service providers still have steady profits and are not eager to reduce gross margins to attract more users.

**6. Many new applications**

To improve the quality of service for end users (clients or employees), companies will continue to develop and / or reorganize their mobile and native applications, and also use more SaaS applications in their organizations. As employees and clients become more mobile, those companies and corporations that do not pursue mobility strategies will remain behind their competitors.

Analysts continue to strongly recommend that companies reorganize their applications to work in public cloud systems, and many public clouds offer migration services to migrate applications to the cloud. However, extreme caution should be exercised when developing applications that rely on several clouds, microservices and outdated hardware.

In the next three years, there will be even more companies that will take on this difficult task, but many will find that transferring to the cloud does not bring the same results as cloud architecture. Once applications are moved and / or reorganized into a cloud, it does not necessarily mean that they will work well, so in part of the company this task will temporarily remain unfulfilled. Even a large-scale transition to SaaS can be painful because access to these services makes the company dependent on slower, cheaper and less secure public networks (which, by the way, often do not have SLAs), compared to fast and expensive private networks ( MPLS).

As bandwidth is now more affordable and cheap, the implementation of SaaS and cloud-based applications can happen so quickly that the IT department will not always be able to accurately imagine which applications are being used and who uses them. They also have fewer opportunities for tracking user experience, as well as infrastructure management and application performance monitoring.

Therefore, by 2020, companies and enterprises will require more than ever monitored systems, analyze and manage the work of the network, applications and even end user experience to ensure that they obtain the expected positive outcomes from the use of new innovative technologies.

**7. Hyperconvergence of all**

Hyperconvergence will be relevant to virtually all current forecast points, whether within the framework of the Hyperconvergent Frontier IT Infrastructure philosophy for centralized deployment and management of Remote Territorial Offices offered by Riverbed and HyperConvergent Infrastructure (HCI) as a whole.

To implement successful hyperconversion companies must be sure that they fully utilize the capabilities of the software-defined infrastructure. As a result, businesses will increasingly focus on reliable, scalable and secure infrastructural environments to meet all their needs, whether they are exchanging data with the periphery, data center, or cloud. It sounds hard at first glance, is not it? In other words, it means that those companies that will think about providing the necessary level of visibility and control over their hyperconverting infrastructure will be successful.

**8. Mass migration**

By all indications, 2019-2020, they promise to become record-breaking in terms of the number of workload transitions from production facilities to platforms based on cloud computing. Providers of public cloud services are expected to offer better tools, and companies themselves will become more savvy in their use. But Riverbed warns that many companies will face unexpected bottlenecks in this way, in the form of the need to comply with the project's technical specifications, norms and safety requirements.

**9. Використання штучного інтелекту і машинного навчання**

The coming year will become an important year for artificial intelligence (II) and machine learning (MO). Artificial intelligence and machine learning have reached their critical mass, and their application will grow and expand in geometric progression for virtually every technology. , supported by services, speeches or applications. Developing intelligent systems that learn, adapt and potentially act autonomously, and not just execute specified instructions, will become the main battlefield for technology vendors, at least until 2020.

II and MO are critical elements for digital transformation; experts believe that business intelligence can be derived from the intelligent analysis of data, allowing systems to understand, study, predict, adapt and, in theory, run independently. As things (devices) become more intelligent, they will generate huge data streams. Analytical forecasts and solutions will significantly increase the load on data delivery processes, on the network, connected to these devices, as well as computing systems and data storage systems.

As companies focus their attention on the use of II and MO to differentiate their business, they will increasingly turn to cloud computing to achieve the desired result. Some analysts believe that cognitive cloud services will decline in the near future, as organizations will definitely decide to use them to solve their business tasks, in contrast to the general cloud computing and data services that are designed for more "rudimentary" tasks.

Thus, the load on the network to deliver analytical data and results close to real-time speed (a prerequisite for the successful use of II and MO) will be enormous. This will force companies using services II and MO to focus on optimizing and monitoring the availability and performance of the networks involved in these analytical business processes.

**10. Data movement**

In the coming years, an explosive increase in the transmission of information over the network is expected, provoked in a complex of several factors: corporate data exchange peripherals with a data center or cloud; ІІ and MO, generating petabyte of data; companies that migrate to the cloud from the local infrastructure; Reorganized with new corporate applications; as well as a multitude of devices connected to the Internet (IoT).

While peripheral IoT devices have limited computing capabilities, data from these devices should be transmitted, analyzed and stored in a centralized location, whether it's a traditional, or more-commonly occurring, data center in the cloud. Discussions about whether data for IoT devices to be closer to the periphery to meet the growing market demand for their faster processing or comparable performance can provide cloud or local processing and storage centers with optimized transport channels will continue and, judging by with all, the current state of affairs in the market will not change much in the near future.

Much more attention will be given to optimizing data transfer for artificial intelligence and machine learning, since they are potentially capable of generating a huge amount of data and immeasurably more traffic compared to the Internet of things. With a high probability, the solution to this problem will focus, as we have already mentioned, on optimizing cognitive cloud services and data channels in cloud-based IT infrastructure, rather than on the peripheral part of corporate networks.

**Task**

To review the promising technologies of IT infrastructure creation and analysis of their application possibilities for the enterprise (company), for which the IT infrastructure audit in the laboratory work #1 was performed, taking into account possible scenarios of the enterprise development.

Prepare report.

**LIST OF RECOMMENDED LITERATURE**

1. Олейник А. И., Сизов А. В. (2012) ИТ-инфраструктура [Текст]: учеб.-метод. пособие / А. И. Олейник, А. В. Сизов; Нац .исслед. ун-т «Высшая школа экономики». — М.: Изд. дом Высшей школы экономики. — 134 с.
2. ITIL - IT Infrastructure Library - Available at <https://www.axelos.com/store>
3. Bernard S. A. (2005) Introduction to Enterprise Architecture; Publisher: authorHOUSE™
4. Alter S., "Work System Theory: Overview of Core Concepts, Extensions, and Challenges for the Future" (2013). Business Analytics and Information Systems. Paper 35.
5. Adner R., Kapoor, R. (2016). Right Tech, Wrong Time. Harvard business review, 94(11), 60-67.