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ECONOMIC ASPECTS OF CLOUD COMPUTING

Cloud computing, the new trend that grows in the last years, has significant positive aspects when talking about company's economy. In this paper there will be a short description of cloud-based solutions in terms of the application hosting and listing key factors of introducing cloud computing in businesses.

Keywords: cloud computing, application hosting, cloud-based solutions.

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ЕКОНОМІЧНІ АСПЕКТИ ХМАРНИХ ОБЧИСЛЕНЬ

У статті показано, що хмарні обчислення — новий актуальний тренд, який має значні переваги для оцінювання економіки компанії. Подано короткий огляд рішень на базі хмарних технологій у рамках розміщення додатків і список ключових чинників впровадження хмарних обчислень в бізнесі.

Ключові слова: хмарні обчислення, розміщення додатків, рішення на базі хмарних технологій.

Лит. 11.

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ЭКОНОМИЧЕСКИЕ АСПЕКТЫ ОБЛАЧНЫХ ВЫЧИСЛЕНИЙ

В статье показано, что облачные вычисления — новый актуальный тренд, который имеет значительные преимущества для оценки экономики компании. Дан краткий обзор решений на базе облачных технологий в рамках размещения приложений и список ключевых факторов внедрения облачных вычислений в бизнесе.

Ключевые слова: облачные вычисления, размещение приложений, решения на базе облачных технологий.

Introduction. "Cloud computing" is simply a delivering of compute and storage capacity as a service to end recipients. Name comes from using a cloud-shaped symbol as an abstraction for complex infrastructure (especially the Internet) in various system diagrams.

There are several types of cloud computing solutions, mostly Platform as a Service (PaaS) and Software as a Service (SaaS). PaaS is essentially renting a servers and server software to any use, while SaaS is renting also application software and databases. Whole management side is up to cloud provider. Infrastructure as a Service, IaaS is the "lowest" system, where clients are renting virtual machines, plain storage or networks (Mell and Grance, 2011).

The modern cloud computing is brought by few important innovations: ubiquitous availability of broadband networks, low cost of computers and storage and widespread adoption of virtualization. Availability of broadband networks allows people use computers located physically somewhere completely else than the company's own office. Thanks to mobile technologies Internet access is available also in wilderness with a relatively good performance. Computers (servers) and storage are pretty cheap, when ordered in large quantities, for cloud hosting companies. Using virtualization allows IT staff effectively and efficiently use hardware layer, and allows also isolation for every cloud client.

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Cloud efficiency as a key factor. The whole boom started because of efficiency and scalability. With growth of dot-coms in late 90s, and later popularity of start-ups, there was coined a phrase "digg effect". Such effect occurs when many people are trying to get to some (usually) web resource in one time, in one peak moment. "Digg effect" is called after the popular website digg.com, where a link placed could be visited millions of times in a very short time, if it becomes popular.

This is usually changing into a civilian version of DDoS network attack. So many requests from so many computers can easily fill up servers' network interfaces, so small companies cannot survive digg effect while serving their content to every customer.

Cloud is scalable — in many cloud solution providers' offers there is a possibility to dynamically allocate more computing power, more network throughput, more memory, more storage and so on, without a need to buy anything more — no need for a new hardware, everything is in cloud provider's hands. Scalability of course must be prepared earlier, when the software or resource is being developed, as it is impossible to scale some kind of software (Chou, 2011). Storage is practically infinite, unlike in traditional systems, where local SANs have to be built with significant cost (Van Vliet and Paganelli, 2011).

Cloud may be also useful for the systems being used highly but only in the short periods of time — like end of fiscal year for some companies, time of new students registration for universities etc. — thanks to dynamic costing and scalability (and agility discussed further).

Cloud is also "agile" — these additional resources (disk, memory, CPU power etc.) can be dynamically reallocated to a different place, different software or just turned off to be ready in later moment, and most cloud providers are charging only for working services. This — for cloud clients — is a cost optimization, and for cloud providers such possibility allows optimal use of existing hardware for many clients. Cloud applications can be moved from and to different physical servers or even physical locations, if cloud provider allows to distribute it this way. Devices and locations are independent — users are enabled to access cloud systems regardless location or device used, even mobile devices. This may be useful for mobile employees who need access to company data from anywhere in the world (Helbing, 2010).

Costs are claimed to be seriously reduced, with low barriers to entry, as the infrastructure is provided by cloud provider, and there is no need for complex IT skills for implementation. These elements of a cloud may be the most important factor when introducing cloud, as well as agility discussed earlier (Biesiada et al., 2010; Weinman, 2012). Cloud computing allows also small companies use serious computing power, earlier available only to large companies with large datacenters. With cloud, high performance computers can be simply "rented". Finance model is strictly associated with using model — there are payments for computing time, data transfer etc. (Biesiada et al., 2010; Weinman, 2012).

Additionally, most cloud computing systems typically use REST-based APIs, so it is possible to create own software cooperating with cloud or managing cloud systems, which also can be an important issue in large companies (Biesiada et al., 2010; Van Vliet and Paganelli, 2011).

Cloud productivity software. While we talk about IaaS/PaaS solutions, SaaS is an important second side of cloud computing. Sometimes, it may be more efficient not

to rent hardware/server solutions and build upon its own company infrastructure but to buy the whole application suites perfectly built for company's needs. SaaS is also called "application service provider" and Jostein Eikeland is credited with coining this acronym in 1996 (Bianchi, 2000).

The most popular SaaS available is hosting of e-mails. For small companies, without IT staff, is the most cost-efficient solution to buy e-mail hosting, managed by 3rd party. This eliminates the need for skilled system administrator, servers, backup strategies and sometimes is also cheaper. Also, most of cloud-based e-mail or office suites allows accessing data from anywhere, including mobile phones (or smart-phones) when employee is away from office.

Cloud-based e-mail hosting solutions, like Google Apps or Office 365, also delivers a company calendars, a place or small system for document exchange etc. for a small monthly fee, usually per employee. Cloud-based office suites, like mentioned Office 365, also eliminates the need for installing (and maintaining – upgrading for example) productivity software on every desktop computer in the office, as employees can work directly using the Internet browser. Or they can even work from home, with elimination of complex virtual private networks and with more security (Koulopolos, 2012).

Rented software (SaaS) also includes tax software, specialist software used occasionally or a software which self-hosted can be too difficult to handle and support, like CRMs or ERPs (Koulopolos, 2012).

Legal, privacy and security issues. The cloud systems are virtualized and isolated in different ways. Virtualization technology, apart from the ability to ease migration of applications between physical servers, allows users to be totally isolated and invisible to each other. However, as the cloud provider is common, there is a theoretical possibility to gain access to every system hosted by a company.

Thanks to the possibility to access cloud control systems from anywhere in the world, anyone with sufficient knowledge can access control systems for company's cloud applications. If such systems aren't secured properly, this may be dangerous for a company. Introducing the cloud computing needs to be previously carefully considered, along with the creation of risk management documents and procedures.

Cloud computing is increasing its popularity, and there is a well-known fact if someone is popular it also will be interesting for criminals to find new ways to attack cloud systems, new vulnerabilities. Companies should invest in risk assessment to ensure cloud computing system security (Winkler, 2011).

There is also a possibility to use cloud systems for unlawful purposes, like password cracking or launching distributed and powerful attacks. Companies hosting cloud software should be aware of such possibility (Alpeyev et al., 2011).

Privacy is a serious concern when introducing cloud applications for a company. Cloud model is criticized, as the company hosting cloud services can monitor all transmission in and out to a cloud, even unlawfully. Because many cloud companies are based in the US, there are claims that secret US services may want access to the data hosted by cloud customers.

Data are also not located in one place, which may cause legal issues, like in the EU. Users' data, saved by cloud application, is saved somewhere in a cloud, where application can be moved between physical locations. Legislation in some countries

may require the data be stored in particular countries, which is hard to achieve in cloud environments (Helbing, 2010).

On the other hand, some cloud providers allow customers to select "zones", the physical locations (datacenters) in which your cloud data or application will be stored (Biesiada et al., 2010).

Such issues may delay cloud adoption, but it is needed to perform risk assessment and cost-gain analysis for every company thinking about introducing cloud applications or cloud storage.

Summary. Cloud computing, thanks to agility, scalability and relatively low costs will have serious impact on the economy of small and medium businesses. Cloud computing growth to 2015 will create up to 14 mln new workplaces all over the world (PC World Polska, 2012). This means that cloud solutions aren't only helping companies but also have serious impact on global economic growth and countries' economies.

Small and medium businesses which are going to introduce cloud solutions faster, and can have, thanks to cloud possibility, access to the computing power and technologies which cannot be accessed in the previous types of services.

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Стаття надійшла до редакції 8.08.2012.