Free and open source cloud technology based on the type Software as a Service

Nataliya Mihailivna Kiyanovska
Department of higher mathematics, Kryvyi Rih National University,
11, Vitalii Matusevych Str., Kryvyi Rih, 50027, Ukraine
kiianovska.nataliia@yandex.ru

Abstract. The *aim* of this study is to design and implement the cloud computing technology with types of the services Software as a Service (SaaS). *Objectives of the study* is to analyze the free and open source cloud technology based on the type Software as a Service. *The object of research* is the process of using of the cloud computing technology with types of the services Software as a Service in education. *The subject of research* is the use of free cloud computing technology with types of the services Software as a Service in education for students of university. This article covers the free and open source cloud computing technology and its application in Web-based IT education. One of the technologies that can be used in teaching online IT courses is cloud computing. In this work the analysis and systematization of research on the use of free cloud-based ICT in education, research and organizational activities. *Results of the study* is planned to use for the design of methods e-learning education with the free and open source cloud technology.

Keywords: cloud computing; learning ICT; cloud-based environment; Software as a Service (SaaS).

Н. М. Кіяновська. Вільна та відкрита технологія хмарних обчислень на основі типу «програмне забезпечення як послуга»

Анотація. *Метою дослідження* є розробка та впровадження технологій хмарних обчислень з типами програмного забезпечення як послуги (SaaS). *Завдання дослідження* полягають у аналізі вільної та відкритої технології хмарних обчислень на основі типу «програмне забезпечення як послуга». *Об'єктом дослідження* є процес використання технології хмарних обчислень за моделлю програмного забезпечення як послуги в освіті. *Предметом дослідження* є використання вільної технології хмарних обчислень за моделлю «програмне забезпечення як послуга» у навчанні студентів університету. Ця стаття охоплює безкоштовну технологію хмарних обчислень з відкритим кодом та її застосування у веб-орієнтованій ІТ-освіті. Однією з технологій, які можуть бути використані при навчанні ІТ онлайн, є хмарні обчислення. У цій роботі проведено аналіз та систематизація досліджень щодо використання вільних хмарних ІКТ в освіті, дослідженнях та

організаційних заходах. *Результати дослідження* планується використати для розробки методів електронного навчання з використанням вільної та відкритої технології хмарних обчислень.

Ключові слова: хмарні обчислення; навчання ІКТ; хмарне середовище; програмне забезпечення як послуга (SaaS).

Місце роботи: Кафедра вищої математики, Криворізький національний університет, вул. Віталія Матусевича 11, м. Кривий Ріг, 50027, Україна.

E-mail: kiianovska.nataliia@yandex.ru.

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn. Schools are struggling to keep pace with the astonishing rate of change in students' lives outside of school. Students will spend their adult lives in a multitasking, multifaceted, technology-driven, diverse, vibrant world – and they must arrive equipped to do so. We also must commit to ensuring that all students have equal access to this new technological world, regardless of their economic back-ground.

Moreover, we know more today than ever about how students learn. Researchers and educators in recent years have made great strides in mapping the remarkable territory of the human mind. We now have scientific insights that can inform educators about the cognitive processes of learning, effective teaching strategies for engaging students in learning and motivating students to achieve. We must incorporate this under-expand beyond basic competency to the understanding of core academic content at much higher levels [1].

Today, it is necessary for many organizations to develop and manage Internet based IT infrastructure. Through such IT infrastructure, an organization's employees across the world are able to access the software provided by the organization. Based on their needs, the organization's contractors are able to implement their own virtual IT infrastructure by using the resources provided by the organization. Internet based IT infrastructure can also provide a collaboration platform for developers to participate in an IT project anywhere and anytime [2].

Why do we use cloud in education environment? The following are some advantages of using cloud in education [3]:

– significant cost reduction;
– access to application from anywhere;
– support for teaching and learning;
– increase openness to students to new technologies;
– offline usage;
– opening to advance research.

Cloud computing is the technology that is designed to support such online

IT infrastructure. The cloud computing technology provides three types of the services, Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). These cloud services are designed to meet an organization's computing requirements [2].

Software as a Service – software that is rented rather than purchased. Instead of buying applications and paying for periodic upgrades, SaaS is subscription based, and upgrades are automatic during the subscription period. When that expires, the software is no longer valid. Ideal for Cloud Computing SaaS can be implemented with local applications that expire after a certain time, but it is ideally suited for cloud computing and applications that run in any desktop or mobile device, no matter the OS. In this model, the applications are maintained in the provider's datacenter, and every time users launch their browsers or apps and log on, they get the latest version. In addition, user data can also be stored in the cloud [4].

SaaS providers will usually offer multiple tiers of service, ranging from a highly limited free account to a well provisioned or even "unlimited" paid account. There are two key advantages of SaaS. Firstly, it completely removes the administrative overhead of deploying software. Usually a few clicks of a web interface is all it takes to "install" your SaaS instance, and the provider takes care of the computing and storage resources required. Secondly, you can access the software from anywhere. As long as a machine has an Internet connection and a web browser, no further setup is usually required for end users [5].

There are of course potential issues to be considered. Unlike having software deployed locally, or a web application deployed in-house, you are unlikely to have direct access to your data (and depending on the terms of service, you might not even own it). All data will be stored by your SaaS provider and presented through the application. This makes backing up or archiving data locally difficult if not impossible, and requires absolute trust and confidence in your provider and their security policies. When considering SaaS solutions, a key factor to look for is the portability of data. Open source software appears in the SaaS world in several guises. Some SaaS products may be built using permissively-licensed components, but with some proprietary code sticking it all together [5].

There are many free and open source cloud technologies available to education institutions. Although some of these free cloud technologies have some time limit, they are still valuable resources for education institutions. A class assignment usually does not last more than one semester. Some of the free trial cloud services are good enough for students to complete their assignments [3].

Apple iCIoud (*apple.com*). Some of the apps free on new iOS devices.

iCIoud provides the app iWork for free. iWork: Documents, spreadsheets and presentations. With everybody's best thinking. Pages, Numbers and Keynote are the best ways to create amazing work. Real-time collaboration allows your team to edit a document, spreadsheet or presentation together on a Mac, iPad or iPhone – even on a PC using iWork for iCloud. And Touch ID lets you unlock password-protected documents in an instant.

Datadog (*datadoghq.com*). Up to 5 hosts for free or free 14 days many servers. It is business intelligence SaaS. It provides the data analytic platform designed for IT operations and development teams of all sizes. It allows multiple teams to work collaboratively on IT infrastructure issues. See across systems, apps, and services. With turn-key integrations, Datadog seamlessly aggregates metrics and events across the full devops stack: SaaS and Cloud providers; automation tools; monitoring and instrumentation; source control and bug tracking; databases and common server components.

Desk Away (*deskaway.com*). 30-day free trial or free for 1 project with 2 users and can store files up to 25MB. DeskAway is a smart web-based project collaboration software that provides teams a central place to organize, manage & track work. Nothing to download, install or configure. 100% Web-based. Try it Free before you buy it. Easy to use. Get started in minutes. Feature-rich.

Easy Projects (*easyprojects.net*). Free for one user or 15-days for group users. All our projects in one place. It lets replace all spreadsheets, emails and whiteboards with a simple workspace for everyone to collaborate together. Automation of incoming requests, portal for customers to review and approve work, templates for recurring projects, file sharing and real-time collaboration... Project management: interactive Gantt Chart, Portfolio Management, Resource Loading, what-if simulations – all the tools you need to deliver your projects on time and on budget. IT and software development: bug and issue tracking, powerful reporting, multiple assignees, API and built-in integrations. Single platform to manage projects, resources, timelines and budgets. Know status of all your projects and tasks. Free guest access to: submit work or change requests, track progress, communicate with the team. Collaborate and communicate: post messages, attach files, approve work results and new requests. Integrate with the tools you use: out-of-the-box integration with Excel, MS Project, MS Outlook and Quickbooks. Integration with 500+ apps via Zapier.

Google Apps for Education (*edu.google.com*). Free for education. Tools that we entire school can use, together: Classroom; Gmail; Drive; Calendar; Vault; Docs; Sheets; Forms; Slides; Sites; Hangouts; Introducing Classroom. Free Unlimited Storage: store an unlimited number of any type of files, up to 5TB each. We can store Google Docs, Microsoft Office files and more. And with Office Compatibility Mode, we can open and edit documents in their

native format. Support student and faculty engagement with secure storage that delivers real-time, multi-user editing and syncing-available anywhere, any time, on any device. Google's systems are world-class data security, it is amongst the most secure in the world, and it is committed to the absolute privacy and security of us data. Decrease help inquiries and save on maintenance with one simple and reliable solution for email, calendars, and more. Google Cloud Platform enables developers to build, test and deploy applications on Google's highly-scalable and reliable infrastructure. It collected resources and webinars for help us get started. Increase G Suite usage and impact organizational change. Create, share, and grade assignments with ease. Classroom was designed for help us save time and keep classes organized.

IBM Cloud Academy (*ibm.com*). Over 20 free software packages for professors. The IBM Cloud Academy is a collaborative global community to advance the development and deployment of cloud computing technologies in educational institutions providing services from early childhood through higher education. Build student projects in the cloud with IBM: students can use IBM's Bluemix Cloud for free. Students can explore Watson, IOT, data analytics, Blockchain services, and more on the cloud. The software IBM Cloud Academy includes Rational Application Developer for WebSphere, Rational Team Concert for collaborative management. Rational Software Architect for unified design, modeling and development platform, DB2 and Informix for database management.

Microsoft Windows Azure (*azure.microsoft.com*). Five months free for education, $200 for general public. Microsoft Azure is a growing collection of integrated cloud services that developers and IT professionals use to build, deploy and manage applications through our global network of data centres. With Azure, you get the freedom to build and deploy wherever you want, using the tools, applications and frameworks of your choice. Choose how you deploy Azure – connecting cloud and on-premises with hybrid cloud capabilities and using open-source technologies – for maximum portability and value from your existing investments. Use the tools and open-source technologies that you already know and trust, because Azure supports a broad selection of operating systems, programming languages, frameworks, databases and devices. Take the investment you've made in open-source technology, data or apps, and extend it to the cloud. Seamless hybrid cloud capabilities in Azure span infrastructure, data, user identity, apps and management. Bring Azure capabilities to your data centre with Azure Stack. Leverage the Azure portal, PowerShell and DevOps tools experience and app model across the cloud and on-premises.

Open Office (*openoffice.org*). All is free. Apache OpenOffice is the leading open-source office software suite for word processing, spreadsheets,

presentations, graphics, databases and more. It is available in many languages and works on all common computers. It stores all your data in an international open standard format and can also read and write files from other common office software packages. It can be downloaded and used completely free of charge for any purpose.

OpenStack (*openstack.org*). Open source software for creating private and public clouds. OpenStack software controls large pools of compute, storage, and networking resources throughout a datacenter, managed through a dashboard or via the OpenStack API. OpenStack works with popular enterprise and open source technologies making it ideal for heterogeneous infrastructure. Hundreds of the world's largest brands rely on OpenStack to run their businesses every day, reducing costs and helping them move faster. OpenStack has a strong ecosystem, and users seeking commercial support can choose from different OpenStack-powered products and services in the Marketplace.

Yurbi (**5000 Fish**) (*yurbi.com*). Community edition is free. It provides business intelligence software and database management system software. Yurbi is a solution that connects your 2 biggest assets; Flowdot provides a powerful workflow based solution for integrating data between applications, automating processes, and building data repositories without complex code or long projects. MailSync allows Help Desk Analysts to access CA Service Desk data and BMC Remedy data through Microsoft Outlook. Monitor and measure the lifecycle of your ITSM processes. InsightWorthy integrates with your existing Service Management software so you can discover trends and potential improvements.

Zoho (*zoho.com*). Free for personal use. Zoho has a list of applications such as Zoho CRM (3 users free), Zoho Project (1 project free), Zoho Mail Suite (3 users free), Zoho Meeting (one-on-one free), Zoho Reports (free for 100,000 rows and 2 users), Zoho Discussions (2 forums free). Zoho Docs (1 GB free), Zoho People (up to 10 users free), and more. Give students easy ways to connect with their teachers and peers to keep them more involved in their classes. Make it easier for teachers to find instructional resources, track grades, and communicate with the parents. Facilitate students to access crucial learning materials, campus resources and guides all from one place. Create a virtual classroom for students to actively participate, share contents and brainstorm on new ideas. Allow for issues to be resolved quickly and more efficiently as students can get together and analyses data. Maintain online schedules and calendars for students to track project / assignment deadlines.

Of course, a complete open source software product may be offered as a service. The benefits of choosing an open source product when selecting SaaS is perhaps not as clear-cut as for lower layers of the "cloud" stack. If the product is not released under a "cloud-aware" license such as the AGPL, the service

provider does not have to distribute the source code. If the software is released under a different open source license, you will probably be able to download the software elsewhere and run your own instance locally as a contingency. However, without access to your data, the utility of this contingency is limited. SaaS solutions using a combination of open source and proprietary components, as far as the customer is concerned, may as well be entirely proprietary. The provider may be developing and releasing the open source components, and these may be useful in other systems. However, in terms of the service being provided, the fact that some parts are open source does not directly benefit the customer, only the provider [5].

References

1. Kiyanovska N. Using LMS for Supporting Training Mathematics in Higher Education [Electronic resource] / Natalia Kiyanovska, Natalya Rashevska // Metallurgical and Mining Industry. – 2015. – No. 9. – P. 593-598. – Access mode : http://www.metaljournal.com.ua/assets/Journal/english-edition/MMI_2015_9/095_Natalia-Kiyanovska.pdf

2. Barhate S. M. Cloud Based Teaching and Learning Environment for SMART Education / S. M. Barhate, Snehal Narale // International Journal on Recent and Innovation Trends in Computing and Communication. – 2015. – Vol. 3, Issue 2. – P. 38-41.

3. Chao L. Free and Open Source Cloud Computing Technology / Lee Chao // Handbook of Research on Cloud-Based STEM Education for Improved Learning Outcomes. – Hershey : Information Science Reference, 2016. – P. 141-157.

4. Definition of: SaaS [Electronic resource] // PC Magazine Encyclopedia. – 2016. – Access mode : http://www.pcmag.com/encyclopedia/term/56112/saas.

5. Wilson R. Open source and the cloud [Electronic resource] // Rowan Wilson / OSS Watch. – University of Oxford. – 2014. – Access mode : http://oss-watch.ac.uk/resources/opensourceandcloud.