

## Cloud IT as a base for virtual internship

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Jerzy Kotowski

Institute of Computer Engineering, Control and Robotics,

Wroclaw University of Technology,

11/17 Janiszewskiego Street, 50-372 Wroclaw, Poland

[jerzy.kotowski@pwr.wroc.pl](mailto:jerzy.kotowski@pwr.wroc.pl)

Mariusz Ochla

IBM Poland Sp. z o.o., ul. 1-sierpnia 8 bud. A,  
02-134 Warszawa

[mariusz\\_ochla@pl.ibm.com](mailto:mariusz_ochla@pl.ibm.com)

### Abstract

In the summer of 2010, IBM Poland and Wrocław University of Technology introduced the first University Cloud Computing Centre in Poland, a Centre that is funded by IBM's Multipurpose Cloud Computing Centre program. Wrocław University of Technology is the first University worldwide to collaborate with IBM for this initiative.

The Centre aspires to use the Cloud for education, to use the Cloud for a remote educational internship, and to promote research through in Cloud technologies and to offer services to other faculties and business partners.

### Introduction

The internship offered provides ten training modules within Cloud, which gives interns flexible dates and hours. The internship lasts one month, and all course modules are conducted in English. Wrocław University of Technology organizes the courses, and IBM Poland runs the teaching modules based on IBM Tivoli Software.

The Centre has the capacity to offer fifteen hundred students an internship each year. During its first summer, around four hundred students participated. Upon completion, graduates receive an industry recognized certificate awarded by the IBM Toronto Lab attesting to their mastery of database skills. The top graduates of these internships are awarded a scholarship for work at an IBM research lab.

In the following document, there will be presented in detail the concept of Cloud Computing, requirements concerning organization of internship at Polish Universities as a result of Bologna Agreement and such solution introduced successfully in The Wrocław University of Technology. The idea of internship lies in giving the students the access to virtual machines, activated for every person on the server of the Cloud, according to planned and agreed schedule.

In the next chapters of the following document, there will be described the basics of Cloud Computing, the virtual machines technology and practical application of that instrument, which

in the past two years, helped hundreds of students not only from the Faculty of Electronics of the University of Technology to accomplish the requirement of graduating the internship during their studies. As the summary, there will be shown the plans of future cooperation between PWr and IBM.

### Fundamentals of Cloud Computing

Cloud computing is a category of computing solutions in which a technology and/or service lets users access computing resources on demand, as needed, whether the resources are physical or virtual, dedicated, or shared, and no matter how they are accessed (via a direct connection, LAN, WAN, or the Internet). The cloud is often characterized by self-service interfaces that let customers acquire resources when needed as long as needed. Cloud is also the concept behind an approach to building IT services that takes advantage of the growing power of servers and virtualization technologies.

Cloud computing's importance rests in the cloud's potential to save investment costs in infrastructure, to save time in application development and deployment, and to save resource allocation overhead.

The flexibility of cloud computing is a function of the allocation of resources on demand. This facilitates the use of the system's cumulative resources, negating the need to assign specific hardware to a task. Before cloud computing, websites and server-based applications were executed on a specific system. With the advent of cloud computing, resources are used as an aggregated virtual computer. This amalgamated configuration provides an environment where applications execute independently without regard for any particular configuration [2].

The cloud computing model is comprised of a **front end** and a **back end**. These two elements are connected through a network, in most cases the Internet. The front end is the vehicle by which the user interacts with the system; the back end is the cloud itself. The front end is composed of a client computer, or the computer network of an enterprise, and the applications used to access the cloud. The back end provides the applications, computers, servers, and data storage that creates the cloud of services.

### Virtual Machine

A virtual machine (**VM**) is a "completely isolated guest operating system installation within a normal host operating system". Modern virtual machines are implemented with either software emulation or hardware virtualization. In most cases, both are implemented together.

A virtual machine is a software implementation of a machine (i.e. a computer) that executes programs like a physical machine. Virtual machines are separated into two major categories, based on their use and degree of correspondence to any real machine. A system virtual machine provides a complete system platform which supports the execution of a complete operating system. An essential characteristic of a virtual machine is that the software running inside is limited to the resources and abstractions provided by the virtual machine—it cannot break out of its virtual environment.

At the moment, there exists hundreds of application that support cooperation between server and user PC, which are being installed by user. Among them, we can distinguish such as: VMware, VM from IBM, etc.

### **The history of contacts between Wrocław University of Technology and IBM Corporation**

The company IBM was born in 1889 and it is one of the first IT concerns in the world. It hires about 400 thousand of employees in departments in 170 countries. The corporation conduct projects in almost every field of informatics market, beginning with computers and software, ending with nanotechnology and applying their own innovations in cooperation with many public organizations.

Presently, the most important initiative of IBM is "Smarter Planet" - the idea consisting of many different areas, among others: energy, traffic, food, education, health, public security and more. Its main assumption is an introduction of the newest technologies in order to improve and facilitate work of number of public sections as well as to reduce time of waiting for its results.

The first important agreement between PWr and IBM was signed in 2007. From that moment the cooperation began to develop incredibly.

30 September 2009, in the head office of Polish Information and Foreign Investment Agency in Warsaw, there was signed a contract between IBM Poland and Polish government, concerning the location of the new IBM Integrated Delivery Center in Wrocław.

The new Center is supposed to offer IT services for the clients of IBM that have their seats in Europe.

During the ceremony of signing the contract, the representatives of the Polish government and the directors of IBM emphasized many times the meaning of academic support, especially the University of Technology in Wrocław, while deciding about the location of IBM Center. It was assumed then, that at PWr, there would be created special team aimed for the cooperation with IBM. The University started the important obligations in the field of postgraduate training for employees and education for future IBM staff.

### **Multipurpose Cloud Center (mc<sup>2</sup>)**

In May 2010, the Faculty of Electronics and IBM Corporation prepared and interesting offer of internship for students of PWr.

Multipurpose Cloud Center (mc<sup>2</sup>) is the internship based on the newest IT solutions, which, apart from its educational character in the informatics area, gives the possibility to work from home in the flexible working hours (task work) and what is the most important, they gives the opportunity to prove oneself and demonstrate one's creativity.

To attending the internship, there are invited students especially from the 6th semester of Bachelor degree from any faculties and departments. Making such internship is necessary, according to requirements of the particular act, to graduation of Bachelor studies in all Polish technical Universities.

Internship lasts 4 weeks and they were conducted during three holiday's months: from July to

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September. It had a form compatible with IBM initiative, called Multipurpose Cloud Center (mc<sup>2</sup>) , similar to ESI (Educational Students Internship). In every period, almost 300 hundred students could have taken part in the event and every ten of them had been looked after by one mentor from IBM. Apart from that, the University of Technology in Wrocław selected several tutors for every 30 of trainees.

27 July 2010 IBM Poland and the Wrocław University of Technology announced signing an agreement concerning the first Multipurpose Cloud Computing Center in Poland.

Presently, in the Cloud, there are 10 modules divided by different scientific areas, from which trainees may choose those that are the most interesting for them. The possibilities of this technology will be consecutively increased in the next years.

The environment aimed to help in organization of remote internship currently enables an access to various numbers of practical workshops for students. The students might be divided into groups, every of which may have opened different combination of workshops, adjusted to the particular group's profile or interests of its members.

Students receive all essential information about internship through the special Web Site. With its help, it is possible for them to: reserve application, check the schedule, notes, and attached materials as well as to obtain current information concerning internship and tasks that should be executed. There is also planned to create a chat module, so that instead communicating via e-mail, students could also discuss with their mentors in the real time and keep conversation history in the same place. Such system facilitates internship management from the level of usual web browser.

Creating user account, rating their work, checking the schedule and statistics will be possible from an administration panel. The employees of the University might have the access to the various numbers of workshops using voucher system. For popularizing virtual machines on the server, there will be responsible Cloud Management System.

The newest environment for internship management will enable using composite systems consisting of several virtual machines with the requirement of constant network communication. Such solution will give the students possibility to implement multiple tasks basing on network

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services. In the consequence, there will be possible to prepare advanced topologies and popularize them via Cloud Technology.

### Events

During 1,5 year cooperation between IBM and PWr, there are many noteworthy events. Some of them, which took place just after first edition of internship, are presented below.

29.07.2010

Information about IBM in media: „IBM Opens the First Multipurpose Cloud Computing Center in Poland”

02.09.2010

An invitation of Wrocław University of Technology to IBM Cloud Academy

08.09.2010

An application of Faculty of Electronics to the Rector of PWr concerning creating a team called Cloud

07.12.2010

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CIRCULAR LETTER from the Rector of PWr concerning cooperation with IBM Cloud Academy

10.10.2010 – presently

Participation in every-month online conferences of all IBM Cloud Academy members with the help of L

10.03.2011

Presentation of PWr on the online conference

05.09.2011 -28.10.2011

Second edition of internship mc 2

01.10.2011

Nomination of mc 2

30.10.11 - 06.11.2011

Visit of the representans of PWr in IBM Haifa Research Laboratory.

03.04.2012

Common organization of science conference „World of Innovation”.

### Summary and future plans

In addition to the Multipurpose Cloud Computing Centre, IBM has invited Wroclaw University of Technology to join its two centers of Cloud excellence. The first is IBM's Academic Skills Cloud in which twenty (Q4 2010) academic units throughout the world collaborate to form a large educational Cloud project. The second is an association of elite higher education institutions working in the Cloud Computing technologies called the IBM Cloud Academy.

Wroclaw University of Technology and IBM Poland plan to continue collaboration in the field of education, PHD programs and research. IBM plans to initiate similar programs with other institutes, faculties and data centers in Poland, as well as to integrate with local business communities in the process.

World of Innovation – this is the title of the conference, concerning the latest achievements in the IT field, which took place 3<sup>rd</sup> April, 2012, in the Wroclaw University of Technology (PWr) and was organized in cooperation with IBM Global Services Delivery Centre in Wroclaw.

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During the conference, Wrocław University of Technology and IBM Haifa Research Laboratory signed the Declaration of Intent, concerning future cooperation. Israeli Center was represented by his director Oded Cohn, and the University by its Rector, Professor Tadeusz Więckowski. Collaboration will concern creating several laboratory groups for research and development of the latest IT technologies, in the field of Cloud Computing, IT modeling, as well as Optimization problems.

One may say that the future of co-operation between Wrocław University of Technology and IBM Consortium is wide open. And we may easily assume that Cloud Computing will play an outstanding role as the useful, flexible and effective tool to support this co-operation.

Cloud computing can provide organizations with the means and methods needed to ensure financial stability and high quality service. Of course, there must be global cooperation if the cloud computing process is to attain optimal security and general operational standards. With the advent of cloud computing it is imperative for us all to be ready for the revolution [2]. We will carry about this remark.

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