Towards Setting up IBM Cloud Computing VCL at Abdelmalek Essaadi University

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ABSTRACT
The need for adopting Cloud Computing in Morocco and the experience ongoing of VCL implementation at Abdelmalek Essaadi University are described in this paper. Students, Faculty and administrative staff can take great benefits from on-demand, flexible and real time services, provided by the IBM Cloud Computing initiative VCL. The installation process and configuration of VCL are ongoing. The next goal planed after completion is to export this experience to other Universities, and contribute accordingly to the establishment of Smarter Education in Morocco.

General Terms
Distributed Systems, Cloud Computing.

Keywords
IBM Cloud Computing, VCL, Smart Education, Grid Computing.

1. INTRODUCTION
Cloud Computing is a revolutionary concept. It encompasses a wide variety of offerings, including: SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service).

Cloud Computing can focus the power of thousands of computers on one problem and consequently makes simulations faster. This helps building smarter planet.

Cloud has many benefits for educational institutions. Students and faculties can take advantage of the ability to work and communicate from anywhere and on any device using Cloud-based applications. Cloud Computing helps scientists run data or compute intensive applications. Cloud Computing enables institutions to teach students in new ways and help them manage projects and massive workloads [1].

Using Cloud at University will help improving knowledge of parallel computing practices, and preparing students for real large-scale applications, like search engine and scientific programs.

In addition, Cloud Computing may help Universities go Green, save energy and money. In fact, Cloud infrastructure can provide additional computing resources when needed. Therefore, there will be no energy costs for running servers and associated costs the rest of the time. Cloud Computing is a reserve that can be allocated without the need to pay for the resource sitting idle.

Abdelmalek Essaadi University is one of the fourteen universities in Morocco [2]. It is composed of several Faculties and Engineering Schools, spreaded over four sites: Tangier, Tetuan, Martil and Larache. There are nearly 30.000 students in different majors in Science, Engineering, finance, and Literature. Most scientific research undertaken is based on simulation experiments.

The implementation of VCL will serve the University administration, education and research.

2. IBM CLOUD COMPUTING VCL
Virtual Computing Lab (VCL) is a Cloud Computing initiative launched jointly by IBM and North Carolina State University (NCSU) [3]. The concept of VCL was described by Vouk in 2003 [4] and by Averitt et al. in 2004 [5].

VCL is based on virtualized and distributed resources, including on-demand computing, storage and software resources provided through Internet (see Figure 1). VCL offers highly scalable computing environment ranging from offering infrastructure as a service (IaaS), to platform as a service (PaaS), to software as a service (SaaS), this is done through software images installed on demand by users, onto blade servers.

At NCSU, VCL technology is being used to implement and manage a flexible heterogeneous Cloud of computing resources that currently use more than 2000 computational platforms and more than 4000 cores, most of them IBM BladeCenter resources, as well as storage and applications. Today, NCSU VCL is serving a student and faculty population of more than 30 000 [6].

VCL is composed of: VCL manager, NCSU middle layer demon service (vcld), Apache Web Server and MySQL Database management System [7].

The job of VCL manager comprises checking the environments, managing computers and managing images.

NCSU VCL manager software contains IBM xCAT and VM loader. xCAT's role is to load the requested bare-metal image to a blade server. VM Loader serves as well to dynamically load the desired image.

The most important service in VCL is the "vcld" demon, which is used to make sure that the image has been correctly loaded and that is available for requests. It enables communication between database and Web interface, initializes xCAT or VMware commands and manages the image installation as well.

The PHP Web Application, deployed in Apache Web server, is the heart of VCL and provides tools to request, manage and govern all VCL resources. The major utilities provided by the Web interface includes: Image creation, Image revision control, Manage users and Manage resources.

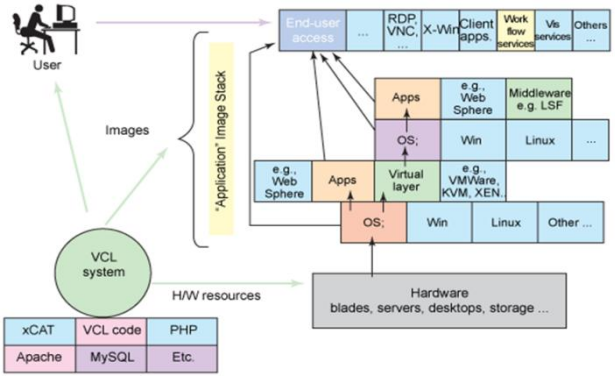

Fig 1: VCL Architecture

The VCL uses Remote Desktop access to allow users to connect to Windows images remotely.

Once connected on the remote system, manipulations can start. Before ending the session, the work can be easily copied on the personal computer.

The remote image will be acceded through SSH or X-Windows.

3. HIGH PERFORMANCE COMPUTING INFRASTRUCTURE IN MOROCCO

Grid computing is a collection of heterogeneous and distributed computing resources available over a local or wide area network that appears, to an end user, as one large virtual computing system.

In Morocco, a National Grid Computing platform, MaGrid, was implemented in 2006, by the National Center of Scientific and Technical Research (CNRST) [8]. MaGrid is one of the first Gird initiatives in Africa.

With this High Performance Computing platform, Morocco has actively participated in international projects, such as EumedGrid [9]. This initiative was co-funded under the European Commission's FP6.

The objectives of the project were to contribute to the creation of an e-Science community and to provide support for an interoperable e-Infrastructure that will enable Grid computing operations between Europe and the Mediterranean.

EumedGrid countries are interconnected through the pan-European GEANT, a multi-gigabit research network. Moroccan academic network MARWAN has been connected to GEANT since 2005.

Currently, MaGrid is used by national and international communities, and offers two Virtual Organizations: eumed and biomed.

Moroccan Grid platform helped to establish a number of collaborative projects between Moroccan scientists and counterparts from different countries such as Belgium, France, Italy, Spain and U.S. Research topics are related to bioinformatics, physics, chemistry and computer engineering. Several projects focus on the porting of applications to the Grid platform.

The adoption of Cloud Computing in Morocco will bring users to a new IT model that derives from the Grid concept, well known by most researchers and engineers. In addition, they will have access to more sophisticated on-demand services and scalable computing resources.

4. STEPS TOWARDS IMPLEMENTING VCL AT UNIVERSITY

The aim of this investigation is to provide Abdelmalek Essaadi University with IBM Cloud Computing technology, and to expand this experience to other universities.

When the VCL implementation at the University is complete, the next step will be to expand implementation through other Moroccan Universities, and then to link all of them with a public Cloud. Therefore, all Universities will be able to share information, computing resources and services. This structure will contribute to a smarter Moroccan education.

VCL Cloud will provide services to students and faculties of the University acting as a private Cloud. It will serve administration, education and research areas.

Using IaaS, PaaS or SaaS, students need not to install any specific infrastructure for their project assignment, they need not to physically set up any specific services or databases on their machine, and they can access remote applications through a Web browser. As such, e-Learning, e-Health, e-Science and e-Administration services can be provided.

The local implementation Testbed is composed of five dual-core Personal Computers, interconnected by a switch and a router. Processors support Virtualization Technology.

VCL implementation followed two steps:

- Configuration of a VCL standalone environment using just VMware server.
- Implementation of the bare metal provisioning using the IBM administration toolkit xCAT.

5. CONFIGURING A VCL STANDALONE ENVIRONMENT USING VMWARE SERVER

The VCL standalone environment is a testing and developing environment for the virtual computing lab. Using this environment requires installation, configuration and deployment of VCL on the same machine with VMware server as an administrating tool for virtual images.

We started the installation with VCL 2.1 version. But several configuration problems had been met, due to some release bugs. Meanwhile version 2.2 was almost ready for use.

The first step during the implementation is the web front end installation and MySQL database system configuration.

The second step consists on the configuration of the management node to start checking in with the database.

After the management node configuration, we installed VMware server 1.0.8, created a Windows XP image and configured it within the VCL database.

We started VCL daemon and created a new reservation for Windows XP image, but at this stage, several problems raised, basically because of the image capture and the management node database properties. The same result was obtained with Ubuntu Linux image.

The release of VCL version 2.2 was a good achievement; several bugs in the previous version were fixed. VLC development team was more available and helped us during VCL 2.2 implementation.

The new implementation strategy involves migration from the old version of VMware server to the new one, and the

modification of the VM host profile, which stands for the configuration of VMware server support within the management node.

The configuration of VCL was correctly set up, thanks to the VCL team support. The Image was successfully captured and image files were successfully saved. Planning is now ongoing to make reservations (see Figure 2).

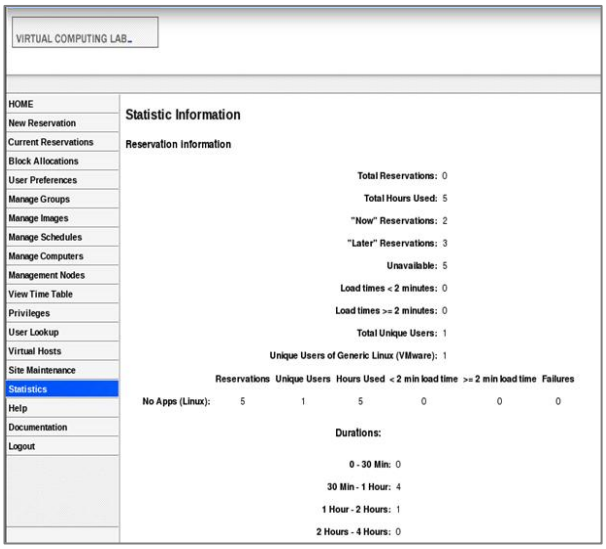

Fig 2: VCL Image Reservation

6. CONFIGURING A VCL USING XCAT

xCAT (Extreme Cluster Administration Toolkit) is a scalable distributed computing management and provisioning tool that provides a unified interface for hardware control, discovery, and OS diskful/diskfree deployment [10]. xCAT is the default systems management tool of the IBM Intelligent Cluster solution.

We are planning to install xCAT 2.1 version, which is supported now by VCL 2.2. xCAT 2.1 manages cloning and imaging Linux and Windows systems, and provides high scalability and flexibility.

However, the use of xCAT requires a sophisticated material such as IBM blade centers that support IPMI technology.

7. CONCLUSIONS

We have presented the IBM Cloud Computing VCL, and stressed its importance for providing on-demand services at University. The process of implementation of VCL at Abdelmalek Essaadi University is ongoing. Installation is made on a local Testbed composed of several Computers. Different configurations based on VCL components have been evaluated. VMware ESXi is preferably to be used, and deployment should be made on IBM BladeCenter which supports IPMI technology, in order to provide good performance and avoid material problems.

By adopting Cloud Computing VCL, Abdelmalek Essaadi University will be the first University in Morocco and Africa, to join the IBM Smart University program. This achievement will be expanded to other Universities. Joining all local initiatives with a public Cloud will form a national Cloud Computing infrastructure. These steps will lead to a Smart Education system in the Region.

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9. REFERENCES

[1] IBM Cloud Computing, Academic Initiative program website: https://www.ibm.com/developerworks/university/cloud/

[2] Abdelmalek Essaadi University website: http://www.uae.ma

[3] Virtual Computing Lab website: http://vcl.ncsu.edu

[4] M. Vouk, ''Support of Student Learning in a Technology-Rich Environment: Remote Application Access for Specialized and Collaborative Software,'' IBM Supported University Research Proposal, February 2003.

[5] S. Averitt, M. Vouk, H. Schaffer, E. Sills, and G. Howell, ''Support for Distributed Scalable High Performance and Grid-based Computing and Problem Solving with Emphasis in Science and Engineering,'' a UNCGA grant proposal submitted by NC State University to University of North Carolina General Administration, Raleigh, February 2004.

[6] M. A. Vouk, A. Rindos, S. F. Averitt, J. Bass, M. Bugaev, A. Kurth, A. Peeler, H. E. Schaffer, E. D. Sills, S. Stein, J. Thompson, M. Valenzisi, "Using VCL technology to implement distributed reconfigurable data centers and computational services for educational institutions", IBM J. RES. & DEV. VOL. 53 NO. 4 PAPER 2 2009.

[7] J. Moothoor, V. Bhatt, "A Cloud Computing Solution for Universities:Virtual Computing Lab. Case study of North Carolina State University's Virtual Computing Lab", IBM Corporation 2009.

[8] C. El Amrani, O. Bouhali and R. Merrouch, "MaGrid: The Moroccan Grid Computing initiative", IADIS International Journal on Computer Science and Information Systems, ISSN: 1646-3692, Vol. 4, No 1, pp. 85-92.

[9] EumedGrid Initiative website: http://www.eumedgrid.eu

[10] extreme Cluster Administration Tool (xCAT) website: http://xcat.sourceforge.net/man1/xcat.1.html