PRIVATE CLOUD SOLUTION FOR AN ENGINEERING COMPANY

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Abstract: The paper presents a solution that implementation of private cloud into the working environment of company is benefit and not least advantageous. The main objectives of this paper are draw a proposal solution and compile a working system of private cloud. When drawing up the proposal solution it is necessary to take into account current conditions and requirements, backup and administration. The results is a functional method for assembling a private cloud, where the system has installed all necessary software solutions.

Keywords: Private cloud, Administration, Ubuntu Enterprise Cloud, Eucalyptus Machine Image

1 Introduction

Breakthrough of cloud computing in all aspects of life is more and more visibly and therefore there is interest raise of general public and companies about it. It is nothing unusual everyday using of cloud computing for individual needs. Less extended application of this technology is in the deployment of business customers, such as corporate solution. This is caused by companies concerns about the financial difficulty, complicated administration and weak data security. In our study, we decided to verify these reasons and provide a solution that will be suitable for the application in practice.

Companies puts great emphasis on security of data storage and access to them. The deployment such a security policy is understandable in view of the latest information on matters dealt with wiretapping and spying on the Internet. On the other hand, this security policy for corporate data is not very user friendly and cost-effective solution.

Our designed and implemented solution was provided by the company's own server, via the corporate network to the employees who work with thin clients. Employees are using preconfigured operating system with installed programs already and at the same time they have access to their stored data on the central data repository. There are available different options of system configurations which vary in the type of operating system, installed programs, in way of their utilization and last but not least, performance. Used platform include operating systems Microsoft Windows XP and Ubuntu Server. Installed programs on the Windows operating system include for example. Microsoft Office, Visual Studio, Python Engine, Eclipse. In operating system Ubuntu Server employees can use a package of programs for the application server WUCMAS.

1.1 Project WUCAMS

The character of the work on all departments in VUJE cause, that software deployment is not focused in one workplace. This fact causes unequal investment in the infrastructure development and the difference in the quality of available professional development environments. Due to this problem there was initiated a long-term project of building an information system for management of changes and version control software based on proven open source tools – project WUCAMS. The word WUCAMS is an acronym of the words - automated system of the configuration management projects. Today is the project WUCAMS in the upcoming phase of the third generation.

In the first generation were implemented monitoring the changes and versions of the software, the second generation added monitoring implementation of project management tasks and deadlines, and the third generation of system is made up for full configuration from the local administrators computers.

Project WUCAMS increased ensure the quality of projects, brought a better view about the project objectives and significantly improve the preparation of project documentation. Third generation in the production environment indicates that the system WUCAMS be even more important for management and implementation of projects in VUJE company. [Hrehuš, 2010, p. 70]

2 Deployment model of cloud computing

As we mentioned above, we chose private cloud as deployment model. This decision had several reasons. In public cloud are service providers and the resource manager as a third party, the owner of the infrastructure through which offers to users the resources as data storage, virtualized computing power or applications. This facts are not acceptable for companies, due to using a common infrastructure causes a reduced level of security, limited configuration and variable quality of availability. However, loss of data and security of stored data can come also with government interference as case Megaupload in 2012.

Due to our requirements in the company we had review the decision of the availability computer resources to be able physically build a private cloud. Costs of building private cloud are on the beginning of the project higher as implement a solution in the public cloud. We had to provide the required equipment, personnel for system administration and appropriate service spaces. Available computer resources are largely virtualized and located in our own company's data center.

The difference between a simple virtualization and private cloud is in automation and scalability. The advantage for us was own design of the system, compatibility with established platforms and concrete specification of the required hardware. Because of used company infrastructure, private data do not leave the restricted area network of enterprise. At the same time it is coming a reduction the risk with respect to safety of the data, which are in this type of environment under greater control. By this we met laws, ordinances or regulations which emphasize to make specific data cannot leave the territory of the country. Of course, the various departments at work may have and had different requirements for data protection within the private cloud storage and access to them. [Winkler, 2011, p. 40]

2.1 Infrastructure as a service

Our private cloud is based on distribution model of infrastructure as a service. From employee's side of view it may appear as desktop as a service. Employees have scalable infrastructure that includes traditional computing resources, network elements and platform for deploying their or delivered applications. The size of processing power which is equivalent to a physical processor is chosen by the user from available options. [Rittinghouse, W., J., Ransome, F. J, 2010, p. 34]

2.2 Implementation plan

The term implementation is understood as placing a plan, program or strategy in the production environment. The implementation plan includes a list of people responsible for the project, pricing strategy, scheduling and objectives. Integrated management system and security policy of VUJE company required the establishment of implementation plan for deployment project of private cloud WUCAMS-CLOUD.

The key points include system architecture, describe of system, describe of implementation, questions about contact persons, main tasks, schedule of implementation, privacy and safety.

Next one are resources of implementation which include requirements on safety, hardware and software. Hardware, what is private cloud based on, table 1.

Table 1: Hardware resources

Name/ ID	Type	Model
Switch	Switch	TP Link TL-SG1008
Cloud-controller-0530	Server	IBM Station
Node-controller1-0530	Server	IBM System x3550 M3
Node-controller2-0530	Server	TYAN Tank GT20 B5372
Node-controller3-0530	Server	TYAN Tank GT20 B5372

Source: Author´s elaboration

The physical hardware Node*-Controller-0530, together 3 servers, contains this following virtual machines - wucams.img, elastic.img, programming.img, pdm.img, winxp.img and acrobat.img. Individual virtual machines are based on the operating system image files Ubuntu Server 10.10 and Windows XP SP3.

The most important created virtual machine in WUCAMS-CLOUD project is connected with pre-pared image files wucams.img what is used as an application server WUCAMS. The operating system is Ubuntu Server 10.10 and contains all the necessary open source software, with proper setup it will deploy to the production environment. Open source software include Apache Ant, Apache Forrest, Subversion, Trac and Taskjuggler.

3 Experimental part

3.1 Building of private cloud

To build a private cloud and the achievement of main tasks defined in the implementation plan was necessary to meet the sub problems associated with it. These were create and configure cloud-conroller-0530, node-0530 controller and the remote computer for testing.

In the figure 1 we can see network architecture of WUCAMS-CLOUD.

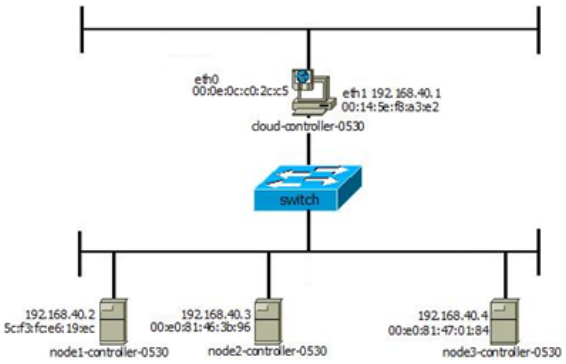

Figure 1: Network architecture
Source: Author´s elaboration

3.2 Installation of cloud controller

For better data security and system stability was necessary to have created disk RAID5 array type using hardware controller before installation. The operating system is Ubuntu Server 10.0.10, specifically chosen the option to install Ubuntu Enterprise Cloud. During the installation were selected following cloud modes: Cloud Controller, Walrus storage service, Cluster controller, Storage controller. Other important settings for the Eucalyptus included define a name for the new cluster and select the range of IP addresses for virtual machines. After the installation is complete and logon to the system, it was necessary to do an update of Eucalyptus package and set cloud controller as NTP server. Time synchronization with the server and other elements connected in the cloud is important, because if there were bigger time deviation, the system would not worked properly.

3.3 Installation of node controllers

Needed pre-requisites to start installation of three node controllers were had created disk RAID5 array type and configured cloud controller. Login details were same as those on the cloud controller. During the installation we had select component named Node Controller. The installation procedure was same for all three node controllers. The only difference was in define hostname and assign a static IP address. After the installation was complete we did an update of Eucalyptus package set NTP server to cloud controller address and configure the network adapters to the type bridge.

Now is important to check availability zones. When public key is installed on the node controllers we could check created availability zones (avail. zone) through cloud controller. Availability zones gave us information about cluster capacity for virtual machines in different configurations. First, it was necessary to create and acquired the right credentials. They were necessary for the security settings in the add-on Hybridfox by which we managed virtual machines remotely. Using command sudo euca_conf --discover-nodes we had connected all nodes in the cluster network. We can see output in table 2.

Column free/ max gave us information about total maximum number of created virtual machines in the various configuration. As we can see, the default configuration for the type of virtual machine is available m1.small max. 40 instances. For the best configuration c1.xlarge we have max. 18 of these virtual machines. If there were all zeros node controllers are not connected properly.

3.4 Remote computer for testing

The remote computer is used for testing our cluster network using a web browser interface. First it was necessary to set the operating system Windows environment network time synchronization with the cloud controller. Connect to Ubuntu Enterprise Cloud was using the IP address for the cloud controller, login by entering the default username and set the configuration of the first run what was required to activate Eucalyptus.

Next, we downloaded an add-on to the Mozilla Firefox browser called Hybridfox and installed it. Since we did not work with Amazon Web Services, when we were asked about the assignment to Hybridfoxu we select No. In the Hybridfox environment we had configured region, security and logon credentials.

3.5 Registering created images

As we talked before, we have created two image files: one for Linux image and one for Windows image. Linux image file was created in terminal, where we used local temporally virtual machine run by KVM. After installing operating system with our programs and setting attributes for network adapters we had to extract the kernel to external storage for later phase. As the last step was to set up access for users and their authorized login keys. In this process we had created a basic template image file for Ubuntu server.

Windows image file was created in the similar way. Compared to the creating image file for Ubuntu server it was necessary in Windows XP environment create a boot disk, install a new network card which was supported by Eucalyptus tool and finally allow access via remote desktop.

When we had prepared image files we could start their registration. Registration into Eucalyptus took place on cloud controller. The required files for Ubuntu Server were initrd.img-2.6.32-38-generic-pae, vmlinuz-2.6.32-38-generic-pae and linux.img. For vmlinuz-2.6.32-38-generic-pae and initrd.img-2.6.32-38-generic-pae do not forget write down generated the eki and eri number, which are required for the registration linux.img. Required files for Windows XP were memdisk, win-boot.img

Table 2: Hardware resources

AVAILABILITYZONE	Cluster1	192.168.40.2			
AVAILABILITYZONE	|- vm types	free / max	cpu	ram	disk
AVAILABILITYZONE	|- m1.small	0040 / 0040	1	192	2
AVAILABILITYZONE	|- c1.medium	0040 / 0040	1	256	5
AVAILABILITYZONE	|- m1.large	0020 / 0020	2	512	10
AVAILABILITYZONE	|- m1.xlarge	0019 / 0019	2	1024	20
AVAILABILITYZONE	|- c1.xlarge	0018 / 0018	4	2048	20

Source: Author´s elaboration

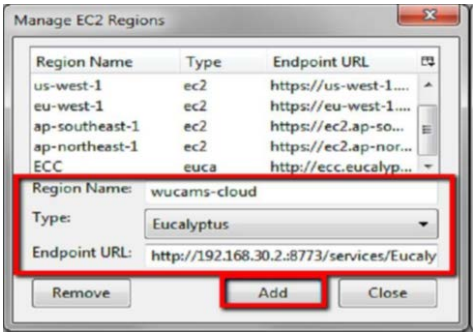

Figure 2: Manage regions
Source: Author´s elaboration

and winxp.img. Procedure is the same as registration Ubuntu Server and we had to also write down eki and eri numbers.

3.6 Creating and connecting to instance

On the remote computer run Hybridfox, went to Images tab, select the required image file by emi number and click on the icon Launch Instance(s), see figure 3.

In the new window we typed in New Instance (s) Tag, where we entered a name for the instance and changed Instance Type. When we got State as Running in tab Instance we were ready to connect on our prepared instance. IP address of virtual machine were shown in Public DNS column. Connect on instance with Ubuntu Server operating system we use ssh connection. It was necessary to had imported private key on computer from which we were connecting. Connect into virtual machine with Windows XP operating system required remote desktop application.

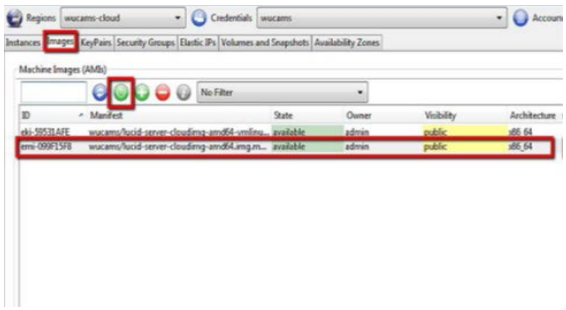

Figure 3: Creating instance
Source: Author´s elaboration

4 Conclusion

As mentioned at the beginning, the main objective was to simplify the computing infrastructure, make it more efficient of using computing resources and not least to increase employee productivity by using cloud computing. For this purpose there were available a number of solutions among which we were taking into account the required criteria for choosing a private cloud. Select this distribution model was that we meet regarding requirements, such as data security, reliability, availability and use of own free computer resources. The system consists of four servers, where one is a cloud controller and the storage controller, the other three are node controller.

After successful installation we got a new cluster ready to provide services of private cloud. Performance of cluster was expressed by ability to run a virtual machine, 18 virtual machines in the best and 40 virtual machines in the lowest configuration.

The implementation of private cloud for the needs of the department in the company VUJE Trnava has brought the expected benefits. With current available cloud infrastructure we are able to replace 20 physical computers for virtual. The released computer resources can be used for other purposes. The employees have access to the virtual machine through thin clients and using remote desktop. The benefits are improved work of users, reduced demands on system administration, simpler technical management and total cost optimization.

There is still space for better use of private computer, for example increase number of node controller and its hardware configuration. This could bring us possibility of running more virtual machines.

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