



УДК 004

## Creating a Cloud Computing Service for Semantic Data Store Virtuoso Universal Server

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*This paper describes main challenges for creating cloud computing services using Eucalyptus software.*

In the modern world has received widespread problem of high load systems. Today there are already solutions such as Amazon Cloud, Google Cloud, etc, but most companies are not interesting in placing their data into these services, as all information about the company and its activities stored on the servers of these companies. To solve this problem, we propose the creation of their own Cloud Computing Service.

Eucalyptus software based on the Linux kernel, which implements a scalable high-performance private and mixed Cloud Computing services within the IT infrastructure of company. Eucalyptus supports the “Infrastructure as a Service” (IaaS). It is one of many models of Cloud Computing Service. The software solution Eucalyptus is implemented for all major operating systems with Linux kernel: Ubuntu, CentOS, OpenSUSE, Debian.

Eucalyptus cloud has five top-level components: Cloud Controller (CLC), Walrus, Cluster Controller (CC), Storage Controller (SC) and Node Controller (NC). Each top-level component of the system has own web-interface and implemented as a stand-alone web-services. Each web-service provides a formalized API. Eucalyptus uses web-service for Security Policy (WSS) between components of the systems.

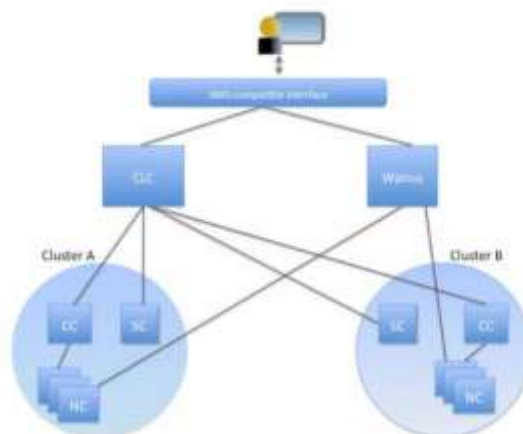


Fig. 1. Architecture of Cloud Computing Service

Installing of Eucalyptus cloud consists of five main components and if it is necessary, additional component can be installed. Cloud Controller and Walrus are the components of high level and for each Cloud Computing service, based on Eucalyptus, can be installed only in a

single copy. Cloud Controller has a standardized API compatible with Amazon EC2 SOAP. Also Cloud Controller performs the allocation of resources for top-level elements. Walrus is implemented data warehouse that is available in the system and outside it. Walrus uses Amazon S3 SOAP and REST for communication.

Cloud Controller and Walrus can combine resources for several clusters. Each cluster has Cluster Controller for cluster level planning and network control. Also each cluster has Storage Controller for organize a block of data storage. These two components of cluster level to be head of cluster node. Each node has a Node Controller for manage the hypervisor. Communication with these components is carried out by SOAP with WS-Security.

Each node must have already installed and configured Xen hypervisor. Hypervisor must be available to management by HTTP port. It is also necessary to establish support Xen hypervisor into kernel.

To install the high-level components necessary to performs commands, shown on Fig. 2.

```
[root@clc]# rpm -Uvh eucalyptus-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-common-java-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-cloud-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-walrus-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-sc-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-cc-${VERSION}eee-0.*.x86_64.rpm \
eucalyptus-gl-${VERSION}eee-0.*.x86_64.rpm
```

Fig. 2. Setup the top level components

To start Eucalyptus Cloud service execute commands represented on Fig. 3.

```
[root@clc]# /sbin/service eucalyptus-cloud start
[root@clc]# /sbin/service eucalyptus-cc cleanstart
```

Fig. 3. Start Eucalyptus Cloud service

To start the Node Controller to be performed commnds on Fig. 4.

```
[root@node1]# /sbin/service eucalyptus-nc start
```

Fig. 4. Start Node Controller

After a successful installation of all components of Eucalyptus Cloud must perform thr initial configuration. Figure 5 shows command that perform the initial configuration of main components.

```
[root@clc]# /usr/sbin/euca_conf \
--register-walrus <front-end IPAddress>
[root@clc]# /usr/sbin/euca_conf --register-cluster \
<clusterName> <front-end IPAddress>
[root@clc]# /usr/sbin/euca_conf --register-sc \
<clusterName> <front-end IPAddress>
```

Figure 5. Initial configuration of main components

To add a Node Controller to execute the commands represented on Fig. 6.

```
[root@clc]# /usr/sbin/euca_conf --register-nodes \
"<Node0-IPAddress> .. <NodeN-IPAddress>"
```

Fig. 6. Adding a Node Controller



After successful completion of all operations will be available a web-interface (<http://IPAddress:8443>) for management Eucalyptus Cloud. The main sections of the web-interface are: Credentials, Images, Users and Groups, Reports, Configuration and Extras.

Credentials – provides information about users of the system for administrator.

Images – a list of virtual machines prepared by administrator or users. User can select the image and start the virtual machine.

Users and Groups – page is designed to manage users and groups of the system. Administrator can create and delete groups; add and delete users.

Reports – allows administrator view information about user activity on the system, as well as statistic on the use of resources.

Configuration – allows administrator to set the parameters of the Cloud Computing service such as host address, DNS, Wlarus (bucket storage), clusters and SAN devices.

Extras – provides the ability to download various tools to work with Eucalyptus Cloud, as well provide to download certified images of virtual machines, prepared specially to work with Eucalyptus Cloud.

A distinctive feature of Eucalyptus Cloud is to support a virtual machines with Windows operating system (Windows Server 2003, Windows 7, Windows Server 2008).

For creating virtual machine with Windows operating system, administrator must be appropriate hypervisor, since not all hypervisors support virtual machines with Windows operating system. Xen hypervisor is recommended for running virtual machines with Windows operating system.

Installing the Windows operating system.

1. Create a blank hard disk image (8 Gb for Windows Server 2003, for Windows 7 and Windows Server 2008 need 15 GB or more). For creating hard disk image administrator must use command *dd*, as shown on Fig. 7.

```
[root@node1]# dd if=/dev/zero of=windows.ny2008Server.img \
bs=1M count=1 seek=16999
```

Fig. 7. Creation of disk image

2. Should be made available .ISO images for installation Windows CD or DVD.
3. Edit file “*libvirt-xen.xml*” add real path to .ISO image.
4. Start Windows installation using the command “*virsh create libvirt-xen.xml*”.
5. Connect to a virtual console using VCN: “*vinarge <machine-hosting-vm>:0*”.
6. Follow the instructions of standard Windows installer and complete the installation.

As a part of ongoing studies are supposed to be semantic data store in Cloud Computing Service.

Currently there are several products designed to store information in a RDF format. It is Semantic Server from Inellidimension Inc., AllegroGraph RDFStore™ from Franz Inc., BigOWLIM from Ontotext AD, PelletDB by Clark & Parsia, LLC, VUS by OpenLink Software.

In view of the problem, one of the storage requirements for it is the presence of the API for Microsoft.NET platform.

After a series of comparative tests, between metadata data storages was selected Virtuoso Universal Server. The main advantages of this system influenced the choices are:

1. The presence of a free version of the «Open-Source Edition». In contrast to the paid version, it don't supports integration with external databases (virtual database), and replication. But using the same format of database files, and it is possible to migrate to the paid version.
2. Support of Microsoft .NET.
3. The built-in SPARQL endpoint, the protocol implements a SPARQL query performance and support the standard serialization of SPARQL query results in JSON.
4. High-performance inference with dynamic materialization, supports following predicates owl: sameAs, owl: equivalentClass, owl: equivalentProperty, owl: InverseFunctionalProperty, rdfs: subClassOf and rdfs: subPropertyOf. Starting with version 6.0 are also supported predicate owl: inverseOf, owl: SymmetricProperty, and owl: TransitiveProperty.
5. Quad-based repository. The data in the semantic repository of VUS are stored as quads.
6. Ability to work with large volumes of data. For example, running one of the VUS works Linked Open Data storage with capacity of more than 9 million quads.
7. As part of ongoing research, VUS has been installed and configured on a server running Windows Server 2008 Standard 64 Bit, in accordance with the documentation on the official website of the developer. Access to storage is organized by the HTTP protocol using built-in SPARQL Endpoint.

#### Literature:

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### **Использование Kinect для обучения детей грамоте, языкам и фактам об окружающем мире**

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*It was shown how to apply Microsoft Kinect for Children's education.*

**Ключевые слова:**

*Kinect, SuperTomsk, Live Letters, Обучение детей*

**Keywords:**

*Kinect, SuperTomsk, Live Letters, Children's education*

Kinect – «контролер без контролера» - представляет собой новый способ ввода информации в компьютер, отличающийся от ставших традиционными мыши, клавиатуры и джойстика. Новый способ заключается в том, что человек без всяких датчиков и проводов на теле может управлять компьютером движениями тела, используя такие