

OpenStack: Toward an Open-Source Solution for Cloud Computing

Omar SEFRAOUI
ENSAO UMP
BP 669 Al Qods,
OUJDA, MOROCCO.

Mohammed AISSAOUI
ENSAO UMP
BP 669 Al Qods,
OUJDA, MOROCCO.

Mohsine ELEULDJ
ENSAO UMP
BP 669 Al Qods,
OUJDA, MOROCCO.

ABSTRACT

Cloud computing is a quite new concept for which the resources are virtualized, dynamically extended and provided as a service on the Internet. In this paper, we present a comparative study between some of the IaaS (Infrastructure as a Service) commonly used to select the best suited one for deployment and research development in the field of cloud computing. The aim is to provide the computer industry with the opportunity to build a hosting architecture, massively scalable which is *completely open source*, while overcoming the constraints and the use of proprietary technologies. Then, we present the solution OpenStack retained by the comparative study. We discuss in detail its functional and architectural system. We finish by a discussion of the motivation of our choice of the IaaS solution.

General Terms:

OpenStack, IaaS

Keywords:

Opencloud, IAAS, OpenStack, Eucalyptus, OpenNebula, Virtualization, Scalableifx

1. INTRODUCTION

Cloud computing is relatively a new concept that brings together all the disciplines, technologies (Web services, virtualization, SOA: service oriented architecture, grid computing,...) and business models used to deliver IT capabilities (software, platforms, hardware) as a service request, scalable and elastic [21]. This is the new trend of computing where IT resources are dynamically scalable, virtualized and exposed as a service on the Internet [7].

Cloud computing is often associated with the supply of new mechanisms that allow providers to give users access to a virtually unlimited number of resources (*Resource Outsourcing*). It also uses billing mechanisms to use these resources on the basis of their consumption, allowing on-demand model: *pay-per-use* [7]. Warranties are offered by the infrastructure provider through tailored service contract: *Service Level Agreements* (SLA) [7].

Today, all major industry players offer cloud solutions, especially Amazon EC2, Microsoft Azure, Google Apps and IBM blue cloud [20].

Cloud computing consists of three levels of offerings: [7]

- (1) Infrastructure as a Service (IaaS), where the equipment is provided in the form of virtual machines. The client maintains the applications, runtimes, integration SOA (Service Oriented Architecture), databases, server software while the supplier maintains the Cloud virtualization, hardware server, storage, networks. Among the main actors of IaaS we find Amazon EC2, Rackspace, GoGrid.

- (2) Platform as a Service (PaaS), you can develop your own applications using the services provided. The client maintains only those applications while the supplier maintains the runtimes Cloud, SOA integration, databases, server software, virtualization, server hardware and the storage networks. We have among the key players: Google Apps Engine, Windows Azure.
- (3) Software as a Service (SaaS), the entire applications are available remotely. Among the providers we have GoogleApps, salesforce, facebook.

The three levels of cloud offering are shown in figure 1, the lower level is the computer hardware resources (computing, storage, network), and mechanisms called virtualization hypervisor, which virtualize access to the material resources of a physical machine (processor, memory and other devices). The interest of a hypervisor is to dynamically add or remove instances of virtual servers on one physical server. This is done using the tools of services and interfaces management. The upper level represents the interactions between the users of the services and the cloud. Currently, several proprietary and some open source solutions exist, but are not easily amenable to experimentation or instrumentation. Researchers interested in pursuing studies on Cloud Computing IaaS have few tools to work with.

In this paper, from a comparative study of existing IaaS solutions, we propose an open source cloud platform, modular and *totally open*, for any use including research. The paper is organized as follows. First, we compare the different IaaS solutions. Then, we present the OpenStack platform adopted by this comparative study. After that, we present the different works done on IaaS solutions. Finally, we conclude with a general summary and possible future works.

2. EXISTING STUDIES

The main studies about IaaS solutions focused on two sides, the study of middleware platforms and on the comparative studies of the different solutions. Eucalyptus [4, 13], OpenNebula [1, 14] and Nimbus[11] have been largely studied in the literature. In these works, the architecture and various components of these solutions were presented. There are also comparative studies of different solutions [18, 22]. In [1, 11, 13], it is essentially an overview of the solutions Eucalyptus, Nimbus OpenNebula and a presentation of their different characteristics. In [18, 22], comparative studies of Eucalyptus, Nimbus and OpenNebula, including characteristics, architectures and applications are done in order to provide more freedom of choice for the users of the cloud. Concerning OpenStack, little work has addressed this solution [10]. We find in [10] a comparative study of Eucalyptus, Nimbus and OpenNebula. This study, from 2011 is outdated. OpenStack has since then evolved, requiring an update. Recently, G. von Laszewski [5] outlined the differences between Eucalyptus IaaS platforms, OpenNebula, Nimbus and OpenStack. The focus is on the look and feel interface, storage