Journal of Robotics, Networking and Artificial Life, Vol. 1, No. 2 (September 2014), 155-159

A Study of Open Source Cloud System for Small and Medium Enterprise

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Abstract

Cloud computing services have not been yet deployed widely by the SMEs in Japan. Due to its many advantages, special skills and support techniques for the SMEs need to be developed in order to implement cloud computing services. A research of the relevant literature reveals that virtually no published academic research has focused on the rational relationship between cloud computing services and the SME's information infrastructure. Accordingly, to bridge this gape in our understanding of cloud computing, this paper proposes and designs a special system framework of cloud computing for the SMEs. Moreover, we devise a prototype model and identify the possibility of the system implementation. Services that deliver functionality equivalent to Amazon EC2 which is representative cloud service but delivered through other technologies are called EC2 clones. OpenStack is not an EC2 clone, and is a typical open source project for providing Infrastructure as a Service (IaaS) type cloud services. OpenStack is used in this research to implement a basic cloud service model.

Keywords: cloud, open source, small and medium sized enterprise, OpenStack

1. Introduction

Today's information systems must be able to continue stable operation even during crises such as the recent Great East Japan Earthquake, or can be quickly restored to operation. This is true even for the information infrastructure of small and medium sized enterprise (SME). This suggests that an ICT department business continuity plan (BCP)[1], designed to continue operations under disaster and other emergency situations, is essential to ensure preventative measures to minimize impact and to quickly restore the most important and most essential operations.

A survey based study on the the state of cloud usage by small and medium sized enterprises (2011)[2], showed that about 10% of SMEs "use cloud computing," highlighting the urgent problem for R&D and technological support for SMEs. Even so, there have been almost no academic studies on the relationship between cloud computing and SME information infrastructure, or on the future direction of this.

A previous investigation on open source information system research and development for supporting the IT

Published by Atlantis Press

strategy of small and medium sized enterprise([Grant-in-Aid for Scientific Research (C))(2008-2010), and proposed a model open source information system to support the IT strategy of SMEs, and together with developing a prototype, considered usage-related problems. Based on the our findings from that research project, in this study, we consider and design a cloud system framework appropriate for small to medium sized enterprise, and investigate and consider the issues related to operation and administration.

2. Cloud Systems

2.1. *Cloud computing*

The United States National Institute of Standards and Technology (NIST) defines "cloud" as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources, that can be rapidly provisioned and released with minimal management effort or service provider interaction[3].
Cloud computing includes the following five characteristics:

- On Demand and Self Services
- Broad Network Access
- Resource Pooling
- Rapid Elasticity
- Measured Services

Services can be categorized into the following three service types:

- SaaS (Software as a Service: Functionality is delivered over the network)
- PaaS (Platform as a Service : Application development environment and customization features are delivered over the network)
- IaaS (Infrastructure as a Service: Even virtual machines and operating systems are delivered over the network)

2.2. *Cloud research trends*

"Above the Clouds: A Berkeley View on Cloud Computing"[4] , a report on the Reliable Adaptive Distributed Systems Laboratory (RAD Lab) of the United States, highlighted ten obstacles facing cloud computing, including availability of service, data lock-in, and data confidentiality and auditability.

In another study of Gartner report called "Survey of 2,014 global CIOs,"[5] when asked to predict when more than half of the information processing of the computers of their companies will be moved to the cloud, 53% of global respondents said "by 2015," but for Japan, only 25% gave the same response. Nineteen percent of global respondents said "after 2021" or "not possible to migrate," while the response was 43% for Japan. This shows that Japan is very late to the game in areas such as cloud research and cloud implementation.

On the subject of research trends in Japan, other than a cloud and public infrastructure study by the Information-technology Promotion Agency[6], most are studies related to security[7].

2.3. *Cloud systems*

Cloud systems can be categorized as shown in Fig.1. In particular, depending on the cloud system service architecture, they are configured according to the following three subsystems: SaaS (Software as a Service: functions are provided over the network), PaaS (Platform as a Service: application development environment, customization functions are provided over the network), and IaaS (Infrastructure as a Service: even virtual machines and operating systems are provided over the network). For open source cloud system implementations, OpenStack Compute (Nova) is an example of a resource toolset, while OpenStack Object Storage (Swift) is an example of a cloud storage toolset. Even SMEs can easily use these open source projects to develop tools that provide functionality similar to (functional compatibility) Google Apps or Amazon EC.

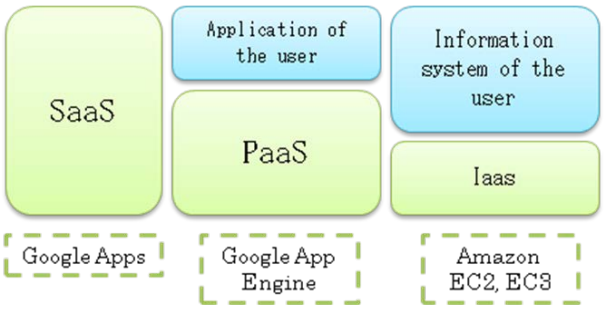

Fig.1. Cloud systems

2.4. *Amazon EC2*

Amazon EC2 is a good example of IaaS. Amazon EC2[8] stands for "Amazon Elastic Compute Cloud." It refers to a web service that presents computing capabilities in the cloud and that are easily scalable. It can be used according to the following processes.

- Immediately launch and execute by selecting a preconfigured template image. Or, create an Amazon Machine Image (AMI) that includes applications, libraries, data, and related settings.
- Configure security and network access on Amazon EC2.
- Select the desired instance type and operating system, and using web service APIs or the various administration tools that are provided, start, stop and monitor the AMI instance as much or as little as needed.
- For each instance, decide whether to run from multiple locations, use a fixed IP end point, or add robust block storage.
- Pricing is based on actual resources consumed, such as total time the instance was run or amount of data transferred.

Of these processes, the AMI selection process is shown in Fig.2.

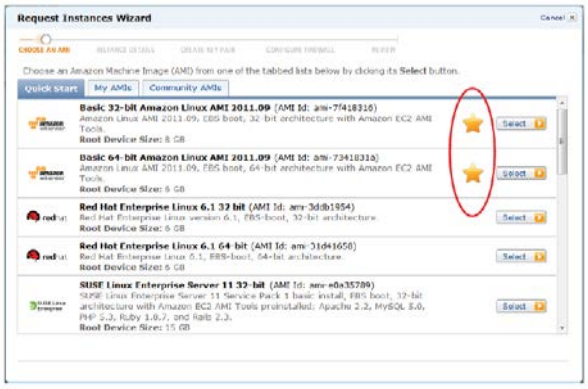

Fig.2. AMI selection

2.5. *OpenStack*

OpenStack[9] is a representative open source to offer IaaS type cloud service. OpenStack is IaaS cloud computing project begun in 2010 by Rackspace Inc[10] and NASA (National Aeronautics and Space Administration)[11].
In 2012, nonprofit organization "OpenStack Foundation"[12] was established. A component to operate it in GUI includes OpenStack Dashboard (horizon) to show it in Fig.3, and OpenStack manages compute, storage, and networking resources. The most recent version at the time of 2013-11-21 of OpenStack is “OpenStack 2013.2 (Havana)”.

Fig.3. OpenStack Dashboard

3. RDO

RDO[13] is a community of people using and deploying OpenStack on Red Hat and Red Hat-based platforms. Community site openstack.redhat.com of RDO was established like Fig.4.

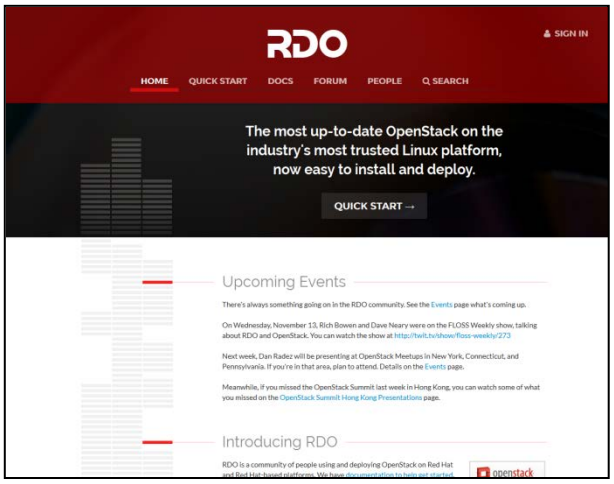

Fig.4. Openstack.redhat.com of RDO

4. A basic cloud model based on OpenStack

4.1. *Prototype system*

Table 1 shows the specifications of the prototype system tested in this study.

Table 1. Prototype system specifications

Form factor	Space saving desktop
CPU	Intel Core i3 processor (with virtualization support)
Memory	4GB
Hard disk	200GB
OS	CentOS 6.4（x86_64）
Linux kernel	2.6.32
Cloud platform software	OpenStack 2013.2 (Havana)

4.2. *Installation of the RDO*

By installing RDO, the cloud environment can be used as follows.

- Install of Software repository

sudo yum install -y http://rdo.fedorapeople.org/openstack/openstack-grizzly/rdo-release-grizzly-3.noarch.rpm

- Install of the Packstack Installer

sudo yum install -y openstack-packstack

- Install of OpenStack using Packstack

packstack –allinone

Now its single node OpenStack instance is up and running.

- Visit the Dashboard

Log in to the Openstack dashboard at http://localhost/dashboard - the username is "admin".

- Enabe SSH

Adding Port "22" on the default security group

- Key pair

Create or impor a key pair

- Add an image

"Fedora19" in the "http://cloud.fedoraproject.org/fedora-19.x86_64.qcow2"[14]

- Launch the instance

In the main portion of the screen, click the "Launch" button for the "F19" image.

- Associate Floating IP

In the main portion of the screen, followed by the "Associate Floating IP" link for the instance you just launched.

- SSH to the Instance

$ ssh -l root -i my_key_pair.pem floating_ip_address

The above steps enable an instance to be presented (see Fig.5).

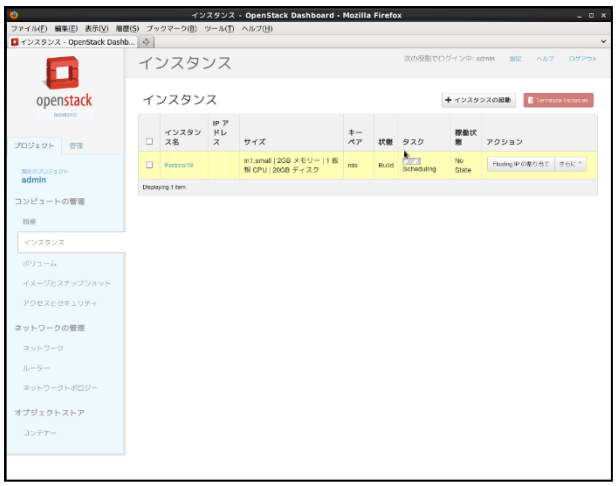

Fig.5. A running instance

5. Conclusion

An effective cloud system framework suitable for the SMEs has been proposed in this paper. The validity of system implementation and operation has been tested. It is required to investigate the characteristics related to operation and administrative issues and to run the prototype system in the near future.

Acknowledgements

This work was supported by JSPS KAKENHI Grant Number 24530444.

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