International Journal of Advances in Computer Networks and Its Security– *IJCNS*
Volume 4 : Issue 3 *[ISSN 2250 – 3757]*
Publication Date : 30 September, 2014

Software Deployment using Infrastructure as a Service (IaaS) In Cloud: A Review

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***Abstract*—Day by day cloud computing is gaining popularity and people are connecting applications in cloud using any device in any location. Infrastructure as a Service (IaaS) is a vital service in cloud computing which is developing fast. It offers resources such as virtual machines, storage, firewalls and network devices to the client machines. Deploying applications and managing infrastructure services which supports multiple environments is becoming expensive in cloud. The third party providers have its influence in cloud environment for deploying and delivering applications over a distributed network. This advanced growth in cloud computing makes the computing infrastructure certainly available in a very adaptable and dynamic pay-as-you-go model. This paper presents the comparative study of deployment models in IaaS and features in it.**

***Keywords*—Cloud computing, IaaS, Deployment, Virtual Machines**

1. INTRODUCTION

Cloud computing combines the core technologies consist of virtualization, web services - to offer IT services to the people. According to the National Institute of Standards and Technology (NIST), U.S, the characteristics of cloud is explained as On-demand services, Broad network access, Rapid elasticity, measured services, Resource pooling [1]. Buyya has defined the cloud as, "Cloud is a parallel and distributed computing system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements (SLA) established through negotiation between the service provider and consumers" [2].

Cloud computing gives many opportunities for deploying and delivering applications using third party cloud providers in a lease computing resource manner. This makes Application Service Providers (ASP) to dynamically add or remove computing resources to their applications more efficiently and cheaply.

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Many applications are distributed across multiple locations and it provides application deployment environment with the help of server virtualization technology in clouds. There are three types of service models in cloud:

A. Infrastructures as a Service (IaaS)

B. Platforms as a Service (PaaS)

C. Software as a Service (SaaS)

There are numerous cloud management platforms used for the deployment and maintenance of both public and private clouds. Other management platforms are developed by the open source software community. Example: OpenStack, Eucalyptus, OpenNebula etc, [12]

The example of service models is given in Table 1. It lists some of the software tools developed by open source community.

TABLE I
OPEN SOURCE CLOUD SOLUTIONS FOR SERVICE MODELS

S.No	Service Models	Open Source Solutions
1	IaaS	Open Stack, Cloud Stack, Eucalyptus
2	SaaS	Cloud Foundry, T Platform
3	PaaS	Apache VCL, Google Docs

2. INFRASTRUCTURE AS A SERVICE(IAAS)

IaaS is becoming crucial for distributed applications, storage and networking resources. It gives entire software environment to run the applications. Its benefits includes accessing the shared resources whenever it is needed without disclosing the location of hardware, giving information about storage, processes and other resources and offers the server infrastructure. Computing environment is in related with handling virtual machines to allocate CPU and memory. Sunilkumar and Gopal [3] explains the technology and issues associated with IaaS in cloud systems are virtualization and multi-tenancy, resource management, network infrastructure, data management, API's etc

*1) **Virtualization and multi-tenancy***: It is the essential characteristic of cloud which hides the technological difficulties from user. In a multi-tenancy environment, multiple clients share the same applications running on the

same operating system. With the application design, distinction is achieved between users and it makes customers not to share or see other's data. However multi-tenancy is essential issue in cloud systems, where the location of code or data is unknown and the same resources may be assigned to multiple users. This may affect applications/services that are hosted on shared resources and potential issues like data protection, data security etc,.

2) Resource Management: Resources are allocated at any instant to handle the workload oscillations and it is shared efficiently in virtual manner. To perform resource management effectively, the concentration is needed in issues like resource allocation, resource mapping, resource provisioning and resource adaptation. The shortage of advanced virtualization tools prevents the growth of cloud computing and it should be examined for the future challenges in IaaS [4].

3) Network Infrastructure Management: Handling millions of network components like switches, hubs leads to administration costs and it requires automated mechanisms to monitor the management tasks, data size of several systems. It is suggested that putting network interfaces, switches and router in to sleep modes when they are idle will save the energy consumed by internet and customers.

4) Security and Privacy are crucial objectives when we have systems containing sensitive data and code. Authentication mechanisms, data confidentiality, integrity and session management are adopted to provide adequate security in cloud computing.

5) APIs are the essential part in cloud features. The developer should take care of scalability and autonomic capabilities in cloud environment. Interacting with technical experts, cloud gives complete tools and storage platform thus reducing problems faced by users in getting the whole product

3. IAAS DEPLOYMENT METHODS

3. 1. Method 1: Wrangler deployment model

Many services have been developed in HPC environments and such services have to be deployed in the cloud environment. Deploying such applications is not simply to develop a virtual machine (VM) images that runs the services and then deploy the images on several VM's in the cloud. The configuration of distributed services is not unknown until the nodes are provisioned and the parameter specified by the user. Even though users manually configure such complex deployments, it consumes times and prone to error. Gideon and Deelman [5] have developed the system called Wrangler, allows users to send a simple XML description of the desired deployment to a web service that manages the provisioning of virtual machines, installation and configuration of software and services. Complex deployments can be created by composing several plugins that set you services, install and configure applications software, monitor services on interdependent nodes.

The Wrangler system consists of components that include clients, coordinator and agents.

a) Clients run on each user's machine and send requests to the coordinator to launch query and terminate deployments. Command –line option is also used to interact with the coordinator

b) The Coordinator is a web service which manages the application deployments. It accepts requests form clients, provisions nodes form cloud providers and collects information about the state of a deployment and acts as an information broker to aid application configuration.

c) Agents run on each of the nodes to manage their configuration and monitoring process. It is responsible for collecting information about the node, reports the position of the node to coordinator, configures the node with the software and services specified by the user and monitors the node for failures

d) Plugins are user- defined scripts to implement the behavior of a node. They are invoked by the agent to configure and monitor a node. Each node in a deployment can be configured with multiple plugins.

In this way Wrangler provides functionality to deploy and configure software, monitor the running VMs and detect the failures. In Figure 1, the Wrangler system architecture is illustrated.

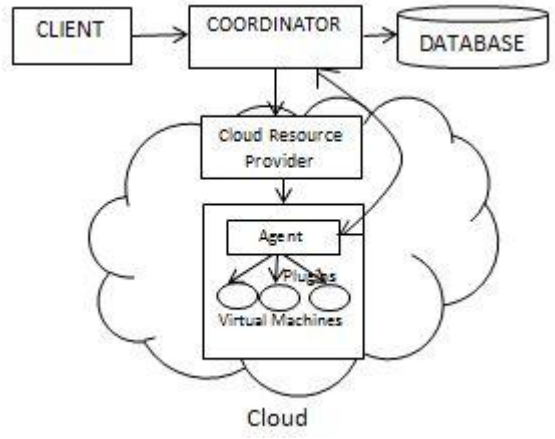

FIG.1. SYSTEM ARCHITECTURE OF WRANGLER

3.2. Method 2: PRECIP

Many software projects include computing services, data analysis, simulation of experiments and, researchers may not have adequate computing resources to deploy and test their applications in local computers. Cloud infrastructure is the best solution which provides configurability and flexibility to experiment the projects, and there are also challenges in

deploying and configuring application in IaaS. Sepideh Azarnoosh et.al [6] introduced PRECIP (Pegasus Repeatable Experiments for Cloud in Phython) API to run applications across the multiple clouds and migrate the experiments form one cloud to another. It is used to make easier the management of resources with the help of instance tagging features

3.2. 1. PRECIP: Design and Features

PRECIP is designed in such a manner it contains user interface layer, internal experimental layer and outer components layer that manages the resources. It is used for easy access to cloud infrastructures, communication between users and cloud, and gathering the virtual machine (VM) instances together. Some features are:

a) ***VM Images:*** We can use our own virtual machine images(VMI) without any specific software. Instances are used over SSH connections and it handles provisioning. For complex software, complex VMI has to be used and experimented API to run bootstrap scripts on the images

b) Instance Tags: It is the key feature in PRECIP and it reduces the interactions with bulk number of instances. A tag describes the logical group of instances and it is used to identify, manipulate and interact with instances.

c) ***Setting up Experiments:*** For experiment setup, we need to establish a new connection towards the cloud endpoint then, SSH keys should be registered for internal connections and fixing the default security group to perform the communications. PRECIP uses Boto [7] and Paramiko [8] to communicate with cloud providers and manages the SSH connections to VM instances. In the remote Cloud infrastructure, key pairs are registered and it receives the connections of the applications.

d) Resource provisioning: Here many instances can be started at the same time, for that we need to provide VMI identification number of instances and tags to identify the instances. During the initialization problems, PRECIP recovers form failures by maximum number or retries and it prevents the aborting of experiments.

e) ***Execution and Logging***: When all the instances are started and made ready, PRECIP run commands on the virtual machines and transfers the instances which is identified by tags. At the end, instances are de-provisioned. All the events are recorded in PRECIP using Python's standard logging framework.

PRECIP is used for testing software tools and techniques, for instances and for sending and receiving data from the cloud. The Fig.2 illustrates the PRECIP communicates with cloud infrastructure.

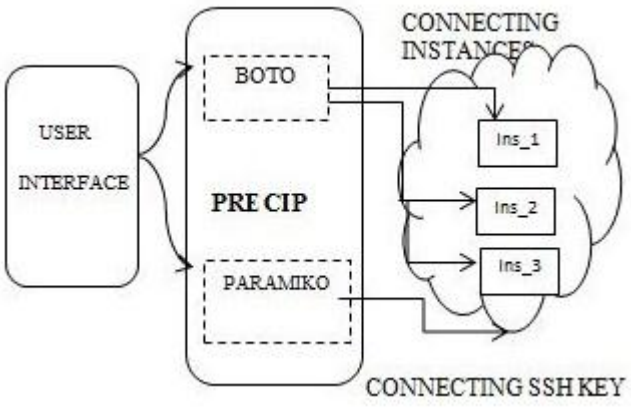

FIG.2. PRECIP COMMUNICATES WITH CLOUD INFRASTRUCTURES

3.3. OPEN SOURCE SOLUTIONS

There are number of testing platforms that provide IaaS to run applications in large scale infrastructures.

3.3.1.Eucalyptus [9] is open-source cloud package software which is used to build IaaS clouds from computer clusters. It emulates the proprietary Amazon EC2 SOAP and query interface, and thus an IaaS Infrastructure set up using Eucalyptus can be controlled with the same tools and software that is used for EC2. The open nature of Eucalyptus gives the community a useful research tool to experiment with IaaS provisioning.

3.3.2. There are two infrastructure models [10] ***Open Nebula***, a virtual infrastructure manager and ***Haizea***, a resource lease manager. To manage the virtual infrastructure, Open Nebula provides a unified view of virtual resources regardless of the virtualization platform manages the full lifecycle of the VMs and supports configurable resource allocation policies including for the times when the demand exceeds the available resources. Haizea can act as a scheduling backend for Open Nebula, and together they advance other virtual infrastructure managers by giving the functionality to scale out to external clouds, and providing support for scheduling groups of VMs. Another tool extends IBM data center management software to be able to deal with cloud-scale data center, by using a hierarchical setup of management servers instead of a central one.

3.3.3 The management ***CloudSim*** [11] modelling and simulation toolkit which has the goal lists to provide a generalized and extensible simulation framework. This extensible framework enables modelling, simulation, and experimentation for emerging cloud computing infrastructures and application services. These services allows users to focus on specific system design issues that they want to investigate without concerning about the low level details of cloud-based infrastructures and services.

4. DISCUSSIONS ON ANALYSIS REPORT OF METHODS

Deploying application in the cloud infrastructure has many advantages and we can use many services in it. The Wrangler system allows automatic configuration of virtual clusters in the cloud and it provisions the clusters for many applications. Wrangler needs an XML file to pre-define the configurations and it is not possible to modify the configuration easily like joining and eliminating the instances. Sometimes we need to install the services in virtual machine images and it is not fault tolerant. It gives burden to users. The comparison of deployment models Wrangler and PRECIP methods is illustrated in Table 2.

TABLE II

COMPARISON OF METHODS

SERVICES	WRANGLER	PRECIP
Tool	Automates the deployment of applications over the cloud Infrastructure	Deploys complex and distributed applications on Cloud Infrastructure
Instances	As we already described configuration in XML file, it does not allow to modify the configuration easily [13]	We can modify the configuration ie. number of instances and nodes
Fault - tolerance	It is not fault-tolerant	It is fault- tolerant and retries to boot the instance during failures
Security	Authentication of agents is done and coordinator sends key to each node	Communication is done over SSH connections

On the other hand, PRECIP concentrates in multiple cloud environments, management of instances via tagging, supervises the provisioning and usage of SSH key pairs. The tendency of running the applications again and again, obtaining the same results and fault tolerance makes the PRECIP a generic cloud experiment tool.

Open source cloud computing solutions on IaaS service models such as Eucalyptus, Open Nebula, XCP, Nimbus, Enomaly supports deployment facilities like VM, image, instances, volume, storage and networking. We can deploy HPC applications over the cloud platform, which reduces our processing time and gives maximum throughput. It manages larger number of virtual machines and manages the cloud resources.

5. CONCLUSION

The success of Infrastructure-as-a-Service in cloud computing indicates that cloud is becoming more important nowadays. In this paper, we have discussed about the software deployment models Wrangler and PRECIP over IaaS Clouds where resources are managed efficiently. Each Infrastructure models differ in own way and at the same time it provides different services to the users. This paper concludes based on the performance comparison of deployments models Wrangler and PRECIP emphasis that each model have merits and demerits on its own way, and these models can be effectively implemented based on the problem requirements.

ACKNOWLEDGEMENT

I would like to express my gratitude to Bharathidasan University Technology Park, for supporting and allowing me to apply my ideas independently in my project work. I extend my gratitude to research scholars in RCCS and my colleagues at Bharathidasan University, India.

REFERENCES

[1] Peter Mell and Timothy Grance, "Recommendations of the National Institute of Standards and Technology", Special Publication 800-145

[2] Buyya R, Yeo CS, Venugopal S, Broberg J, Brandic I, "Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility", Future Generation Computer Systems, Vol. 25, pp. 599- 616, 2009

[3] Sunilkumar S. Manvi, Gopal Krishna Shyam, "Resource management for Infrastructure as a Service (IaaS) in cloud computing: A survey", Journal of Network and Computer Applications, 2013.

[4] Pawar CS, Wagh R B, "A review of resource allocation policies in cloud computing", In: Proceedings of the national conference on emerging trends in information technology (NCETIT-2012), World Journal of science and technology, Vol.2(3), pp.165–67, 2012.

[5] Gidoen Juve and Ewe Deelman, "Automating Application Deployment in Infrastructure clouds", In 3rd IEEE International Conference on Cloud Computing Technology and Science (Cloud Com 2011), 2011

[6] Sepideh Azarnoosh, Mats Rynge, Gideon Juve, Ewa Deelman, Michal Niec, Maciej Malawski, and Rafael Ferreira da Silva, "Introducing PRECIP: An API for Managing Repeatable Experiments in the Cloud", In Workshop on Cloud Computing for Research Collaborations (CRC), November 2013.

[7] Boto API: http://boto.readthedocs.org/en/latest/

[8] Pegasus Repeatable Experiments for Cloud in Phython: http://pegasus.isi.edu/precip

[9] Daniel Nurmi, Rich Wolski, Chris Grzegorczyk Graziano Obertelli, "The Eucalyptus Open-source Cloud-computing system", In 9th IEEE/ACM International Symposium on Cluster Computing and the Grid, 2009

[10] Sotomayor B, Rubn S Montero, Ignacio MLlorente, Ian Foster, "An open source solution for virtual infrastructure management in private and hybrid cloud", In: Proceedings of the IEEE international conference on internet computing, Vol.10(6), pp.78–89, 2009

[11] Tarun Goyal,Ajit Sinsgh, Askanksha Agrawal, "Cloudsim: simulator for cloud computing infrastructure and modeling", International Conference on Modelling Optimization and Computing, Vol.38, pp 3566-3572, 2012.

[12] Gunjan Kotwani, Pawan Kalyani, "Applicability of Open Source Software (OSS) with Cloud Computing", International Journal of Inventive Engineering and Sciences, Vol. 1(10), Sep. 2013.

[13] Gideon Juve and Ewa Deelman, "Wrangler: Virtual Cluster Provisioning for the Cloud" in Proceedings of the 20th International Symposium on High Performance Distributed Computing (HPDC 2011), 2011

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