Experimental Cloud Using Commodity Hardware

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by

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CERTIFICATE

*This is to certify that the work contained in this thesis entitled "**Experimental Cloud Using Commodity Hardware**" is a bonafide work of **Kaushal Kishore** (**Roll No. 111601008**), carried out in the Department of Computer Science and Engineering, Indian Institute of Technology Palakkad under my supervision and that it has not been submitted elsewhere for a degree.*

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Chapter 1

Introduction

1.1 Cloud

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet.

Cloud services refer to any IT services that are provisioned and accessed from a cloud computing provider. This is a broad term that incorporates all delivery and service models of cloud computing and related solutions. Cloud services are delivered over the internet and accessible globally from the internet. There are three basic types of cloud services:

- Software as a Service (SaaS)
- Platform as a service (PaaS)
- Infrastructure as a service (IaaS)

1.2 Cloud Services

1.2.1 SaaS

SaaS is a software distribution model in which applications are hosted by a vendor or service provider and made available to customers over a network, typically the internet. Examples include G Suite – formerly Google Apps, Microsoft Office 365, Salesforce and Workday.

1.2.2 PaaS

PaaS refers to the delivery of operating systems and associated services over the internet without downloads or installation. The approach lets customers create and deploy applications without having to invest in the underlying infrastructure. Examples include Amazon Web Services' Elastic Beanstalk, Microsoft Azure – which refers to its PaaS offering as Cloud Services – and Salesforce's App Cloud.

1.2.3 IaaS

IaaS involves outsourcing the equipment used to support operations, including storage, hardware, servers and networking components, all of which are made accessible over a network. Examples include Amazon Web Services, IBM Bluemix and Microsoft Azure.

1.3 Experimental Cloud using Commodity Hardware

The objective of this project is to create an experimental cloud by repurposing commodity hardware. The cloud we create would be made available to students as virtual desktops which may be used to host web services which can vary from simple static page to complex web applications.

1.4 Organization of The Report

This chapter provides an overview of cloud computing and cloud services. In the next chapter we will introduce MaaS(Metal as a Service), which is a relatively new approach for cloud based service. In chapter 3, we will discuss some of the tools that we need to be familiar with to break the ice. In chapter 4, we will discuss the approach by which we can create a MaaS based cloud environment. And finally in chapter 5, we conclude with some future works.

Chapter 2

MaaS : Metal as a Service

IaaS customers are given access to servers which can be dedicated or, more often, virtual and free to install the OS and applications of their choice. The customer doesn't host or manage the underlying infrastructure but is able to use the resources as they wish.

As with all 'as a Service' computing models, customers benefit from access to the resources they need without having to invest in expensive hardware upfront, instead they pay monthly and only for what they use.

2.1 Bare metal cloud

Bare metal cloud is an environment in which physical, dedicated servers can be provisioned to customers with cloud-like ease and speed. Bare metal cloud customers are given access to the entire processing power of individual servers, as well as any storage, networking or other services they require.

Within a bare metal infrastructure there is **no multi-tenanting** (sharing of machines) and the servers provisioned are not virtual ones created on top of any hypervisor.

Customers of bare metal cloud are free to use their dedicated servers in any way they want, including running any OS and applications as well as installing hypervisors to create their own virtual machines if they want. And bare metal cloud is provided as a service.

2.2 IaaS vs. MaaS

Is there any difference between IaaS and Maas?

This depends on your view point. Many define IaaS as the provision of virtual resources only. Some include dedicated servers in their definition. In our view, bare metal cloud is the true IaaS whereas virtualised versions are really a form of Platform as a Service (PaaS).

In all scenarios you gain access to a server on which you can install and run you chosen OS and applications. In this sense, IaaS and bare metal cloud are the same.

On a virtual IaaS however, you have no knowledge of or control over the actual infrastructure on which your services are built. The provider has control of these and your services are abstracted from them.

With bare metal cloud on the other hand, you are provisioned full dedicated servers, with no virtualisation or sharing. It's up you how you use these and, in the case of installing a hypervisor, how many virtual machines you run on each.

With bare metal you get control of the full stack, from the tin right up to the user interface, and can optimise utilisation and performance to a granular level, something you simple cannot do in a virtualised environment.

2.3 Canonical's MAAS

https://maas.io/

Metal-as-a-Service (MASS) is a provisioning construct created by Canonical, developers of the Ubuntu Linux-based operating system. MAAS is designed to help facilitate and automate the deployment and dynamic provisioning of hyperscale computing environments such as big data workloads and cloud services.

Chapter 3

MAAS in VENV - I

In this chapter we will discuss some of the tools that we will be using in the next chapter to create a MAAS based virtual cloud environment.

3.1 Software Requirements

- libvirt
- QEMU
- OpenSSH
- Ubuntu 18.04 Server ISO

3.2 Hardware Requirements

It is recommended to have atleast 16 GB RAM and 100 GB free space in the host system for deploying virtual cloud environment.

Chapter 4

Algorithm II

The algorithm presented in previous chapter has $O(n)$ time complexity. We further propose another distributed algorithm in this chapter based on xyz which has linear time complexity.

4.1 Construction

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4.2 Improved Method

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4.3 Conclusion

In this chapter, we proposed another distributed algorithm for XYZ. This algorithm has both time complexity of $O(n)$ where n is the total number of nodes. In next chapter, we conclude and discuss some of the future aspects.

Chapter 5

Conclusion and Future Work

write results of your thesis and future work.

References