Deployment of Private Cloud Infrastructure for UCS Taunggyi

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***Abstract*— This paper focuses on the design consideration for private cloud deployment infrastructure in University of Computer Studies, Taunggyi. Conceptual benefits of deploying private cloud system is to provide virtualized computing resources to students rather than accessing physical computing resources. Normally the students need to test on multiple servers/operating systems environment for project and assignment. At that situation, university could not provide physical servers for each individual student. However, if we have deployed the private cloud environment in campus, we could solve this issues. That is the reason why UCS Taunggyi needs to deploy private cloud system in campus. The users of private cloud in campus consist of faculties and students in the UCS Taunggyi. They would access computing resource as they need to utilize elastically and flexibly on demand. For deployment model for academic cloud environment, first we plan for equipment budget in advanced and purchase Cisco UCS Servers to deploy UCS,Taunggyi private cloud system. VMWare Technology has been utilized to build private cloud as well as to manage the network, storage, and compute nodes for cloud Infrastructure. This system is expected to increase the efficient usage of computing resources, utilization of servers and decreasing the power consumption for physical machines by accessing virtual machines from cloud servers. Another goal is to minimize the operation and maintenance cost for computing resources.**

Keywords: **Academic Cloud, Virtualization, Cisco UCS Servers.**

I. INTRODUCTION

University of Computer Studies Taunggyi (UCST) has situated at Taunggyi where the biggest and capital city of Shan State. UCST has been offered Bachelor and Master degrees in Computer Science and Computer Technology as well as post-graduate Diploma in Computer Science. UCST, as a ICT specialized university, it plays a vital role to carry out ICT higher education and related researches for the socio-economic development of local people.

UCST has designed the computing environment as a centralized system in campus since 2015 by connecting from user's desktop to the servers to access at anywhere in the campus. More than 160 PCs connected with campus network system including Wi-Fi connection. Every year, operation and maintenance cost of campus computer are costly. Moreover, some related researches in Cloud computing and Networking technology are planned to do in UCST.

For that reason, we plans to deploy an academic cloud system to support more computing resources for parallel computing experiments as well as multiple network configuration and installation. By deploying an academic cloud system, the necessary computing resources could be supported to users on demand as virtually and elastically. It leads to be cost effective, easy to maintain the computing servers and networking resources in the campus.

Deploying Private Cloud System will support computing resources for university becomes challenging in terms of academic and research. In order to deploy private cloud environment, first we planed equipment budget in 2015-2016 financial year to purchare powerful servers for cloud back-end. VMWare ESXi Server version is configured on underlying servers pool. Those virtualization services from VMWare generates the virtualized computing resources.

II. LITERATURE REVIEW FOR ACADEMIC CLOUD SYSTEM WITH VMWARE TECHNOLOGY

As the literature survey, we reviews VMWare technology in academic cloud environment. One of the academic university in Japan called JAIST has established a private cloud system[3,4] that is one of the significant examples of VMWare based academic cloud deployment. They has deployed an academic cloud system by combining of virtualization products such as VMware vSphere, Citrix XenApp, and Microsoft Application Virtualization with more than 130 servers of Fujitsu PRIMERGY RX200 S2 and BX620 S2. The significant advantage of JAIST private cloud system is that could be saved 48% of power supply and 70% of room space. For that result, JAIST was awarded the green technology by Ministry of the Environments in Japan 2011. However, the total amount of license fees becomes higher. Northwestern University Deploys Private Cloud Infrastructure with VMWare technology is another significant example[5]. Tintri VMstore™ T540 dual-controller 13.5TB storage appliance have been used for each private cloud pod. As the same result like JAIST, license fees becomes increasing according to usage of expensive virtualization products.

III. OVERVIEW OF THE SYSTEM

Before explaining overview of the system, let us describe how the ICT Infrastructure has configured in University of Computer Studies, Taunggyi. There are two parts of backbone infrastructures separated: (1) University Private Cloud System (2) High speed WiFi Campus Network.

By accessing the existing network infrastructure, teachers and students from UCS Taunggyi can be testing the following research area:

a) Wireless Farming Research for Rural Development
b) Cloud and Virtualization Technology Research

Figure 1.1 shows the network infrastructure of UCS, Taunggyi as following:

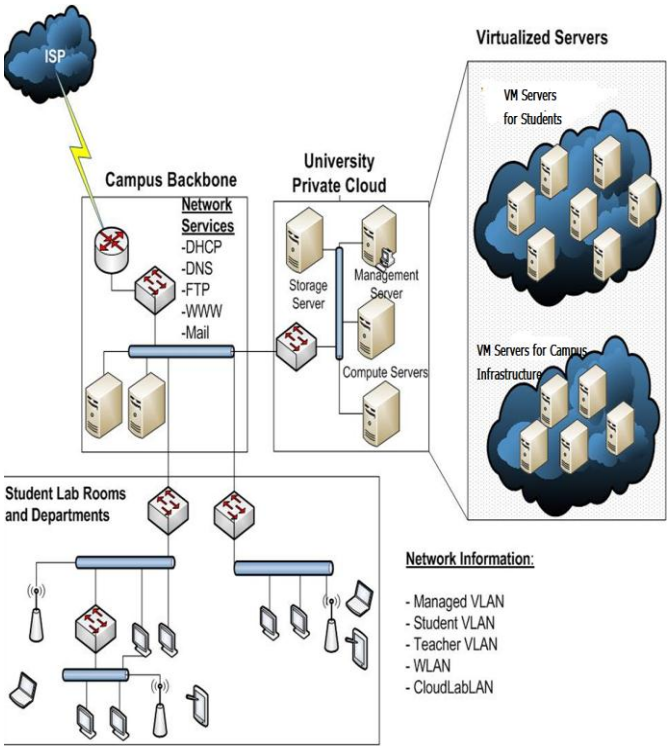

Figure 1.1

UCS,Taunggyi' Campus Wifi network is connected using Cisco switches and Wifi appliances. The figure 1.2 shows the Wifi distribution around the whole campus of UCS,Taunggyi. Cisco network components have been deployed into Campus Wifi Distribution. Server named "***UCS3"*** is Cisco UCS server and it is installed for network simulation for Network Lab . The students can test on that simulation. Cisco Appliances VMs are deployed into UCS3 server.

UCS,Taunggyi Private Cloud System is deployed with two more Cisco UCS servers and NetApp Storage. Server named ***"UCS1"*** is another Cisco UCS server and it is installed for VMs creation (Windows, Ubuntu, Cent OS, etc.,) and testing purposes. Another server named "***UCS2***" is also Cisco UCS server and it is installed and deployed the Virtualization

Technology for Servers such as LMS (Moodle) Server, Active Directory(AD) Server, Exchange server and Email Server for UCST Infrastructure.

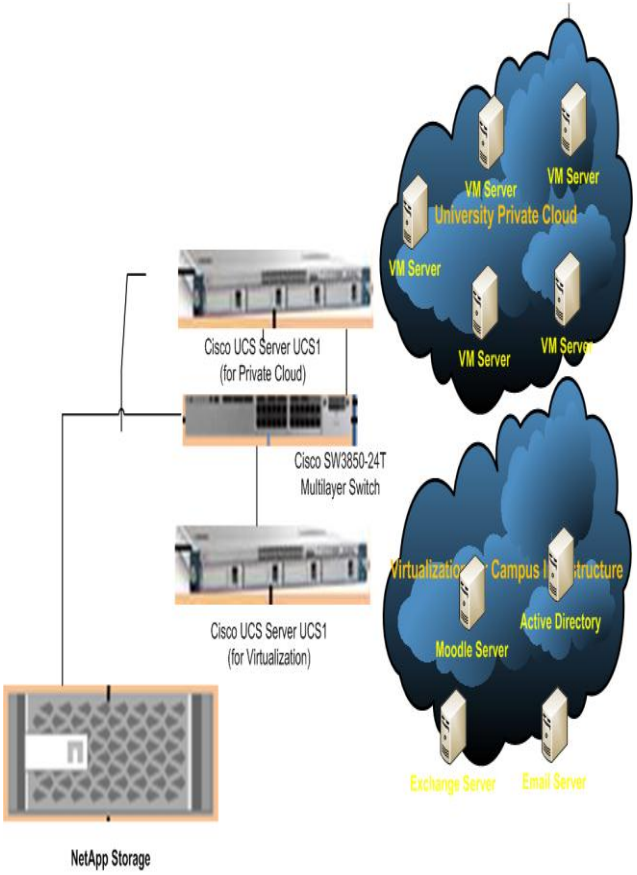

Figure 1.2

IV. Server Specification

The detail spectification and physical deployment server rack of Academic Cloud System is showed in Table I , II and figure 1.3.

TABLE I
Detail Specification of UCS1 , UCS2 and UCS3

Capability/ Feature	Description
Chasis	One rack unit (1RU)
CPU	1 Intel®Xeon E5-2600 v4
Memory	4 x 32GB DDR3/1600-MHz/ LR /DIMM
Hard Disk	2 x 1TB(SCSI)
Installed OS	VMware Hypervisor (ESXi 6.0)

TABLE III
Detail Specification of NetApp Storage

Capability/ Feature	Description
Chasis	4 rack unit (4RU)
Hard Disk	6 x 2TB
Controller	Single
Installed OS	Data ONTAP

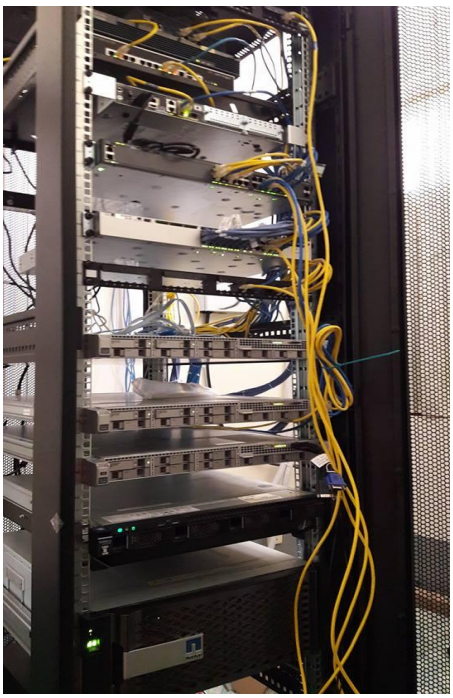

Figure 1.3

V. Implementation Plans

Phase 1(Procurement and Installation) : To deploy academic cloud system to provide IaaS (Infrastructure as a Service) which can instantiate virtualized computing resources including virtual machines, virtual switches, and virtual storage and so on. In this phase, equipment procurement will be prepared and private cloud installation and configuration will be done.

Phase 2(Testing): To establish virtualized labs which can be involved to provide computing services for particular subjects such as application implementation and testing for Database Systems, High Performance Computing, Mobile Computing, Distributed System and Multimedia System. In this phase,

the necessary surveys and researches will be done.

Phase 3 (Implementing and Evaluation): This phase will evaluate the efficiency and effectiveness of academic cloud system and virtualized labs.

Phase 4 (Research Presentation): This phase will present the result and outcome of academic cloud system and virtualized labs.

VI. USABILITY OF THE CLOUD SYSTEM

According to configured servers and hardware specification, we plan to instantiate more than 50 virtual machines at the same time, it means that maximum 50 students could access the cloud system simultaneously. It is easy to extend by attached with extra compute node server as well as clusters and zones. We expect to enhance for more cluster nodes configuration into the existing cloud system after testing processes have been completed. Moreover, system testing and performance testing will be planned after component testing as well.

VII. ADVANTAGE AND DISADVANTAGE OF CLOCKSTACK BASED PRIVATE CLOUD SYSTEM

There are several advantages of deploying private cloud system in the campus: (i) first, the students could gained the knowledge and experience to access cloud system even in their university campus; (ii) the related researches of Cloud Computing such as *Cloud Services*, *Cloud Storage* and *Cloud Security* could be tested on the existing private cloud system; (iii) the experience gained by deploying private cloud system can be applied in other applications such as e-Government, e-Banking and other universities; (iv) *the green technology* could be realized by accessing virtual computing resources rather than accessing physical computers. On the other hand, there are several disadvantages in deploying academic cloud system; (i) VM images and virtual machines are only relied on Linux OS because Windows VM images are lincensed version, for that reason, Virtual Machines provided on Virtual Labs are only available Linux distribution OS and students will be encouraged to utilize Linux VM for their testing environment;(ii) Since we choose open source Cloud platform, several issues will be introduced in terms of Security that is critical challenges to be solved as other related researches.

VIII. CONCLUSION

UCS,Taunggyi now has started to deploy an academic cloud system to support more computing resources that could be supported to users on demand as virtually and elastically. This is cloud research to leads for cost effective, easy to maintain the computing servers and networking resources in the campus. As we mentioned in previous section, there are several advantages gained in this research: cloud research extensibility, utilized experience in other projects, realizing green technology, cost and effectiveness in terms of hardware and software, then easy to integrate with other cloud system.

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