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VIRTUAL MACHINE OPTIMIZATION USE DYNAMIC RESOURCE ALLOCATION ON XENSERVER

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ABSTRACT

Virtual machines as mechanism of virtualization have several problems on resource allocation and optimization. VM needs to be define to handle the resource need for computation and services. The failure can be happen when the transaction on virtual machines increase without the scalable resource capacities. Virtual machines mostly run in multiple virtual machines to handle different services. The research works on optimization on Virtual Machines use dynamic resource allocation on XenServer 6.5 infrastructures. The optimization implement two strategies there are resource allocation and topologies. Resource allocation analyze and benchmark between dynamic and dedicated resource allocation. Both of allocation strategies implemented on several core and processor topologies. The results show that dynamic resource allocation have more stable performance and show the optimization has reached by stability. The stability supported by 4 VCPU with 1 socket with core topologies. This result is important to define the resource need on Data Center or Infrastructures in term of design and maintenances.

Keywords: *Virtual Machines, Resource Allocation, XenServer 6.5, Topologies, Dynamic*

1. INTRODUCTION

Virtualization is a technology that allows to create a virtual version of something, such as operating systems, data storage or network resources [1]. The application of virtualization to cloud computing, among others, the physical machine is replaced by a virtual machine (virtual machine), as well as the network and the physical storage is replaced with a virtual network and virtual storage [2]. The data center was replaced with a virtual data center in the cloud.

Characteristics of a good virtual data center one of which is when a virtual machine can run with CPU and memory usage stable and high availability. According Data center is divided into 4 levels of the so-called Tier, data center best found in Tier 4, one of which has amounted to 99.995% availability [2]. The value of high availability refers to a system or component that has a value of life to operate at a desired time period [3].

Infrastructure is also a safety factor for creating a good virtual data center. Virtual data center in which there are many virtual machine. If all the virtual machines were made arbitrarily without regard to existing resources, the virtual data center can not function properly, so that the creation of virtual data center critical attention to security is based on the design configuration of the virtual machine will be created.

Currently there are several tools that can be used to support virtualiasai of network, storage or machines that can provide high availability value. XenServer is a provider of infrastructure virtualization system is good [4]. XenServer is a powerful and secure virtualization platform that is able to provide a virtual application or operating system in accordance with the original [5]. This research will be used to build a XenServer virtual machine to each virtual machine has a different configuration in resource allocation, the number of vCPU and topology, then determine the performance of the virtual machine with the parameters that the CPU and memory usage. The purpose of this study was to determine the allocation of resources, the number of vCPU and more optimal topologies in a virtual machine by using the parameters of CPU usage and memory usage

2. VIRTUALIZATION AND VIRTUAL MACHINES

The study on analyze the performance of the operating system on a XenServer Hypervisor.

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has compared three different operating systems, namely Windows 2008 R2 64-bit, Red Hat Enterprise Linux 5 (RHEL 5) 64 bits and Ubuntu 10.04 Lucid Lynx 64 bits [5]. These three operating systems are installed on XenServer 6.0 hypervisor using CloudStack private cloud environment. The parameters used by the researchers is the use of CPU, network performance and I / O read write performance. Experimental performance of the operating system be based on workload. Workload divided into three parts, namely low, medium and high. SIGAR investigators use to obtain system information. The conclusion from these studies is the value of Para virtualized Linux guests a little better than the other two operating systems.

The research that study analyzing the impact of VM granularity in use [6]. The study aims to find the relationship between the virtual network configuration and the use of cloud computing workloads. Cloud computing workload consists of three categories, namely the distance starts computing, web 2.0 and the heat distribution system. The parameters used in this study is vCPU per VM, and the VM memory allocation amount of each VM.

The research that compares several approaches with native virtualization [7]. Virtualization approach used is operating system / virtualization level, Para virtualization, hardware-virtualization and full virtualization assisted. In this study, using virtualization software Microsoft Hyper-V, Linux-VServer, OpenVZ, Sun xVM, VirtualBox, Microsoft Virtual Server, VMware ESX / ESXi, VMware and Xen server. Metrics in this study is the use of the CPU, a long single file compression process and lam compilation process. From this study we concluded that the difference in the average percentage of CPU usage, long compilation and compression on each approach as compared with the native sequence from low to high is operating system-level virtualization, Para virtualization, hardware-assisted virtualization, full virtualization.

XenServer is a complete server virtualization platform from Citrix. XenServer uses the Xen hypervisor [8]. XenServer runs directly on the hardware without requiring the operating system underneath, resulting in a system that is efficient and scalable. According to Berry XenServer has to present a default vCPU with one core per socket, but in XenServer can set the number of cores to be present in the socket. When using 4 vCPU virtual machine will display one of which is a socket with 4 cores. There are two benefits of using XenServer, which can reduce the cost and increase flexibility [9]. The research on resource allocation especially in high performance and data center infrastructure are needed to define well design and scalable infrastructures resources.

3. RESEARCH WORKS

In this study, using a virtual data center with the ability that has been mentioned in Section 4.1 and will be applied to the local network. Virtual data center will be created using XenServer 6.5. Some virtual machines created with different configurations. Here is the design of a virtual machine to be created, shown in Table 1.

Table 1. Virtual Machine Configuration

VM	Resource allocation	vCPU	Topology	Memory	Sistem Operasi
VM 1	Dynamic	1	1 socket with 1 core	256	Debian Server Wheezy
VM 2	Dynamic	2	2 socket with 2 core	256	Debian Server Wheezy
VM 3	Dynamic	2	1 socket with 2 core	256	Debian Server Wheezy
VM 4	Dynamic	3	3 socket d with 3 core	256	Debian Server Wheezy
VM 5	Dynamic	3	1 socket with 3 core	256	Debian Server Wheezy
VM 6	Dynamic	4	4 socket with 4 core	256	Debian Server Wheezy
VM 7	Dynamic	4	2 socket with 4 core	256	Debian Server Wheezy
VM 8	Dynamic	4	1 socket with 4 core	256	Debian Server Wheezy
VM 9	Dedicated	1	1 socket with 1 core	256	Debian Server Wheezy
VM 10	Dedicated	2	2 socket with 2 core	256	Debian Server Wheezy
VM 11	Dedicated	2	1 socket with 2 core	256	Debian Server Wheezy

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VM 12	Dedicated	3	3 socket with 3 core	256	Debian Server Wheezy
VM 13	Dedicated	3	1 socket with 3 core	256	Debian Server Wheezy
VM 14	Dedicated	4	4 socket with 4 core	256	Debian Server Wheezy
VM 15	Dedicated	4	2 socket with 4 core	256	Debian Server Wheezy
VM 16	Dedicated	4	1 socket with 4 core	256	Debian Server Wheezy

Each virtual machine operating system Debian Wheezy Server in order to use 256 MB of memory, because of limited memory on the host. Topology depends on the number of virtual machine vCPU. One vCPU by default it will appear as one socket with 1 cores per socket, written as 1 socket with 1 cores per socket. Two vCPU by default it will appear as a 2 socket with 1 cores per socket, written as 2 sockets with 2 cores. In XenServer can set the number of cores that appears in the socket, for example to 2vCPU then emerged as one socket with two cores per socket, written as 1 socket with 2 cores. Each virtual machine APF-firewall applications installed as operating system security.

Testing by running a virtual machine in accordance with a predetermined pattern and agreed upon, namely 4 dedicated VM, VM dedicated 4, 4 and 4 VM VM dynamic. Each run 4 virtual machine, then conducted to collect data by observing CPU usage and memory usage are displayed in XenCenter. A virtual machine that has been run, are required to keep it running during the data capture is done, because this will affect the performance of the virtual data center. Data were taken and analyzed to draw conclusions.

Testing is done to see the CPU usage and memory of 16 virtual machine. Tests conducted on 16 virtual machine that is made in accordance with the list of virtual machines in Table 1. This test will produce data that is looking how much CPU usage and memory usage of each virtual machine. Monitoring CPU and memory usage on each virtual machine is done manually through the graph of CPU usage and memory usage shown by XenCenter. Graph CPU usage and memory usage by virtual machines with dedicated resource allocation is shown in Figure 5.22 and graphs of CPU utilization and memory usage by a virtual machine with dynamic resource allocation

4. RESULTS

The result will explain on several terms, there are CPU usage in virtual machine with dedicated resource allocation, CPU usage in virtual machines with dynamic resource allocation.

4.1 CPU usage on a virtual machine with dedicated resource allocation.

Seen that each virtual machine requires higher CPU first run, this is because the virtual machine will boot the operating system when it first starts. The CPU usage is not stable in the tenth minute by VM9 virtual machine, seen a spike in CPU usage is very high, reaching 67.18%.

Table 2. CPU usage on Dedicated Resource Allpcation

Virtual Machines	CPU Average (%)
VM9	3,2992
VM10	1,0862
VM11	0,8703
VM12	0,5570
VM13	0,2453
VM14	0,2438
VM15	0,2100
VM16	0,1249

The average CPU usage on a virtual machine with dedicated resource allocation. The average CPU usage ranges between 3.2992-0,1249% shown in Table 2.

4.2 CPU usage on a virtual machine with dynamic resource allocation.

It appears that the CPU usage of each virtual machine a great first run, this is because the virtual machine will boot the operating system when it first starts. The CPU usage of the entire virtual machine is almost stable. Performance CPU highest first run seen in the virtual macine VM1, which is based on Table 3 configuration using dynamic resource allocation, 1 vCPU and topology 1 socket with one core, because the process that is only done with one core.

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Table 3. CPU Usage with Dynamic Resource Allocation

Virtual machine	Average CPU (%)
VM1	1,8773
VM2	1,0451
VM3	0,7903
VM4	0,7382
VM5	0,6515
VM6	0,5178
VM7	0,5628
VM8	0,5109

The average CPU usage on a virtual machine with dynamic resource allocation. The average CPU usage ranges between 0.5109 to 1.8773%.

The use of virtual machine memory to the allocation of resources dedicated tested for 180 minutes. The memory consumption of the entire virtual machine will be unstable at kenol minutes until the fifteenth minute. It is due to the initiation of the first time the virtual machine, so the memory usage becomes unstable. Collecting data after the fifteenth minute, showed a stable memory usage on each virtual machine, but there is a great range in the use of virtual machine memory with dedicated resource allocation, that shown in Table 4.

Table 4. Memory Usage with Dedicated Resource Allocation

virtual machine	Average Memory (MB)
VM9	85,54
VM10	83,38
VM11	83,84
VM12	180,73
VM13	78,81
VM14	83,30
VM15	181,38
VM16	182,08

The average memory usage on a virtual machine with dedicated resource allocation. The average memory usage ranges between 78,81-182,08MB.

The use of virtual machine memory with dynamic resource allocation being tested for 180 minutes. The data on kenol minutes until the fifteenth minute will not be stable, the same as memory usage by virtual machines with dedicated resource allocation. This is due to the initiation of virtual machines that need more memory the first time you run a virtual machine. Then after a minute fifteenth memory usage will become stable. The range of virtual memory usage by macine on dynamic resource allocation is not as big as the allocation of dedicated resources as show in Table 5.

Tabel 5. Memory Usage with Dymnamic Resource Allocation

virtual machine	Average Memory
VM1	106,62
VM2	129,95
VM3	130,24
VM4	132,16
VM5	119,32
VM6	81,73
VM7	80,22
VM8	82,68

The average memory usage on a virtual machine with dynamic resource allocation. The average memory usage ranges between 80,22-132,16MB.

CPU usage ratio of 2 pieces of virtual machines with topology 1 socket with 1 core, the VM1 and VM9. VM1 virtual machine is configured with dynamic resource allocation and VM 9 is configured with dedicated resource allocation. The first time you run a virtual machine for VM1 show CPU usage at 68.61%, VM9 shows CPU usage of 35.9%. In the virtual machine VM1, from the fifth minute shows CPU usage is stable, while in the virtual machine VM9 decrease CPU usage in the fifth minute and go back up in the tenth minute until it reaches 67.81%, then the number will decrease and CPU usage shows a steady start ninetieth minute. CPU usage ratio of 2 pieces of virtual machines with 2 socket topology with two cores, namely VM2 and VM10. VM2 virtual machine is configured with dynamic resource allocation and VM10 configured with dedicated resource allocation. The first time you run a virtual machine for VM2 show CPU usage at 37.71%, VM10 shows CPU usage at 39.44%. On a virtual machine VM2 and VM10, started the fifth minute shows CPU usage is stable.

CPU usage ratio of 2 pieces of virtual machines with topology 1 socket with 2 cores, namely VM3 and VM11. VM3 virtual machines configured with dynamic resource allocation and VM11 configured with dedicated resource allocation. The first time you run a virtual machine to VM3 show CPU usage at 27.005%, VM11

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shows CPU usage of 31.4%. On a virtual machine VM11 start the fifth minute shows CPU usage is stable. VM3 stabilized at the thirty-fifth minute, but up to the minute surge keseratur eighty-small spike CPU usage.

CPU usage ratio of 2 pieces of virtual machine with 3 socket topologies with three cores, namely VM4 and VM12. VM4 virtual machine is configured with dynamic resource allocation and VM12 configured with dedicated resource allocation. The first time you run a virtual machine to VM4 show CPU usage at 26.62%, VM12 shows CPU usage at 20.02%. On a virtual machine and VM12 VM4 start the fifth minute shows CPU usage is stable.

CPU usage ratio of 2 pieces of virtual machines with topology 1 socket with three cores, namely VM5 and VM13. VM5 virtual machine is configured with dynamic resource allocation and VM13 configured with dedicated resource allocation. The first time you run a virtual machine to VM5 show CPU usage at 23.583%, VM13 shows CPU usage of 8.54%. On a virtual machine and VM12 VM4 start the fifth minute shows CPU usage is stable.

CPU usage ratio of 2 pieces of virtual machine with 4 socket topology with 4 cores, namely VM6 and VM14. VM6 virtual machine is configured with dynamic resource allocation and VM14 configured with dedicated resource allocation. The first time you run a virtual machine for VM6 show CPU usage at 18.7775%, VM13 shows CPU usage of 8.54%. On a virtual machine and VM12 VM4 start the fifth minute shows CPU usage is stable.

CPU usage ratio of 2 pieces of virtual machines with topology 1 socket with 4 cores, namely VM8 and VM16. VM8 virtual machine is configured with dynamic resource allocation and VM16 configured with dedicated resource allocation. The first time you run a virtual machine to VM8 show CPU usage at 18.32%, VM16 shows CPU usage of 3.07%. On a virtual machine VM8 start the fifth minute shows CPU usage is stable and VM16 stabilizing the tenth minute.

Based on the comparison of the eighth topology that has been done, in terms of the number of vCPU seen the CPU usage will be lower in accordance with the addition of vCPU. A virtual machine that uses 4vCPU will have lower CPU usage compared to other virtual machine. In terms of topology with 4vCPU, topology 1 socket with 4 cores have lower CPU usage than the other topologies.

Tabel 6. CPU Usage with dynamic resource allocation

Topologi	Average CPU
1 socket 1 core	1,88
2 socket 2 core	1,05
1 socket 2 core	0,79
3 socket 3 core	0,74
1 socket 3 core	0,65
4 socket 4 core	0,52
2 socket 4 core	0,56
1 socket 4 core	0,51

The average CPU usage in every topology with dynamic resource allocation. The average CPU utilization on each virtual machine with dynamic resource allocation. Shown in the Table 7 that the CPU usage has a specific pattern in which the CPU usage on a virtual machine vCPU influenced by the number, the more vCPU the CPU usage will be smaller. Virtual machine VM8 (1 socket with 4 cores) have an average smallest CPU usage.

Tabel 7. CPU Usage with Dedicated Resource Allocation

Topologi	Average CPU
1 socket 1 core	3,30
2 socket 2 core	1,09
1 socket 2 core	0,87
3 socket 3 core	0,56
1 socket 3 core	0,25
4 socket 4 core	0,24
2 socket 4 core	0,21
1 socket 4 core	0,12

5. CONCLUSION AND DISCUSSION

After implementation and testing obtained the following conclusions Based on the test data, the CPU usage on the dedicated resource allocation produces the smallest value of 0.1249% and 3.2992% greatest value. While the use of CPU resource allocation dynamic produces the smallest value of 0.5109% and 1.8773% greatest value. From these results it appears that dynamic resource allocation is more stable, so the dynamic allocation of resources is more optimal than the dedicated resource allocation.

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Based on test data, memory usage on the dedicated resource allocation produces the smallest value of 78.81 MB and the greatest value 182,08MB. Meanwhile, dynamic resource allocation, memory usage produces the smallest value of 80.22 MB and the greatest value 132,16MB. From these results it appears that dynamic resource allocation is more stable, so the dynamic allocation of resources is more optimal than the dedicated resource allocation.

Based on test data and a comparison chart shows that the virtual machine with the topology 4vCPU 1 socket with 4 CPU cores require smaller when compared to the others, so that the virtual machine that uses 4vCPU with 1 socket with 4 cores will be optimized in CPU usage.

For their next study needs to be conducted studies using two resource pool, with one resource pool to run a virtual machine with dedicated resource allocation and resource pool the other one to run a virtual machine resource allocation dyammic.

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