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The Analyses on Dynamic and Dedicated Resource Allocation on Xen Server

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Abstract

Data center today challenges is not only serve the users, in same time need to establish scalable resources. Data Center manage the resources such as processor, storage, network, and memory in appropriate way to handle to load. In the big data era, load will increase and come in rapid way with large volume data, many type of data, can be stream and batch data, and unknown sources. Resources need to manage with comprehensive strategies to face the characteristic of big data load. Data Center have capabilties on allocate the reosource in dynamic and dedicated ways. The research investigate in the performance of dedycated and dynamic resource allocation to define the reliable strategies on Data Center. The research work on XenServer platform as Data Center. The research define 18 Virtual Machiens both on dedicated and dynamic strategies, use the shared storage mechanism, and resource pools. The research analyze on CPU performances on XenServer1 and XenServer2 that design as cluster Data Center.The test has run on XenServer and resulting the 2 phase of process when Data Center allocate the resources, there are intiation phase and process phase. The research shown that in the intiation phase both dynamic and dedicated strategies still not running, and use the initial resources to establish Data Center. The process phase shown that dynamic and dedicated strategies run and generating the load process. In the process phase it shown the use of memory and CPU Performance stream line into the balance positions. The research result can use for allocating resources is need to define different strategies in inititon and process phase.

Keywords*: Data Center, Virtualization, Virtual Machines, CPU Index, Memory Usage*

1. Introduction

Cloud Data Center is needed for company that has challenge in the resources and services [1]. Data Center has capabilities to handle huge traffic of services, large volume of data transfer and scalable resource management [16]. Data Center combines the infrastuctures, platform and application into services that can be access through the networks. Several approaches, Data Center develop with standard and security parameters. Data Center infrastructures also need to meet with the hardware standards and also the scalable hardware management. In the hardware confuguration, its also need to eassy to manage the resources. The technology to manage the hardware from cluster, gird, high performance computing and cloud establish for address the hardware problems [13].

The technology to easy manage hardware in Data Center is Virtualization. Virtualization provides the technology for cloud computing and hosted services cloud computing [2, 14]. When applied to the data center, then virtualization can improve IT efficiency of an enterprise [17]. In this case, virtualization can reduce the need for physical server so that it can save the cost of procurement and maintenance of computer infrastructure. In addition to these advantages, the virtual data center has a problem that is not necessarily the capacity of the available resources can serve the needs of the data center. If a data center resource shortages, the existing solutions are likely to add hardware. Whereas the concept of virtualization is trying to streamline existing resources with growing information needs [3, 4].

Data center physical ability to store incoming data continuously has the limitations. Hardware is owned by the data center has a life span of about 3-5 years. Data centers also require a stable source of electric power and an enormous investment costs to build it.

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Substantional cost reduction must be made without reducing the efficiency of data center performance. One method to improve the effectiveness and efficiency of the data center is using the Virtual Data Center [5]. Each server has many virtual machines running on layer VMM (Virtual Machine Monitor). With the VMM, multiple virtual machines can run on a physical server. Each virtual machine contains the operating system and applications that are governed by Virtual Center Management Server. With the virtual data center management and maintenance can make the data center more efficient [13].

Resource allocation in the data center can be interpreted in several terms. Resource management is relates to manage resources well to create virtual machines (VM) to multiple resource pools and combine them in a VM group made [6, 7]. This will result in a more orderly VM and facilitate the distribution of access rights to a particular VM group. Resource Pools used to set up the hardware which is then used by the virtual machine in the data center. In the resource pools allows allocating unused resources to the VM that requires the support of resources much larger. VM prioritize certain processes can also be done easily. Built-in SSO is provided to manage users who can access the data center facility to set specific permissions. Users Policy/Rules, case management access based on groups of operational functions [12].

The research works on generate a virtual data center architecture implementation and Comparing needs CPU and memory resources on the virtual data center (XenServer) using dedicated and dynamic allocation of resources to organize. The paper will explain in several sections. Research method will explain about design and implementation. Results section will explain the result of research. Conclusion will summarize the research works.

2. Research Method

In this section, it is explained the research method consist of Data Center Projects and works, schedul hirarchy on data center, and the reseach process.

2.1. Data Center Projects

Some data center development projects resulted in some product applications are quite diverse seeprti OpenNebula, XtreemOS, FutureGrid, DIET, BEinGRID, ScienceForge, Dala Project, and GamaCloud. OpenNebula and ExtreemOS already discussed in the section virtualiasi.

FutureGrid is a test-bed for grid and cloud computing which is kerjama between Grid'5000 and TeraGrid. FutureGrid [8] built with a lot of cloud infrastructure with a broad demographic. At this infrastructure is done research on authentication, autoriasai, scheduling, virtualization, and cloud-based computing. FutureGrid integrate with some tools like Xen, Nimbud, Vine and Hadoop [1].

INRIA in 2000 introduced DIET that implements a distributed scheduling in grid and cloud infrastructures. DIET is a muli-agent system to the middleware. This infrastructure provides specific elements of the cloud and the allocation of resources based on demand, combined with economic factors cloud computing [8]. BeinGrid is a research project that provides a grid infrastructure for the purposes of the real business scenarios. At this infrastructure done some research on cost reduction, improved performance on the strength pemorsesan, business model development, and running SaaS. ScienceForge [9] is an infrastructure development cluster aimed at collaborative research data. Building research-based storage clusters that run on PC-based cluster. Research uses Application Framework that provides SaaS services to the application layer. Application Layer is built applications to perform data collection, the data processing and data archives.

DALA Project [10] is a continuation of ScienceForge infrastructure developed for the purpose of preservation of data. The research focuses on the preservation process data using cluster infrastructure. The research resulted in the process of data management model that consists of an input layer, layer remember, preservation layer and output layer, the data management layer, and archival storage layer. GamaCloud [11] implementing the infrastructure of scientific research with the model grids. GamaCloud constructed by arranging fabric components of the data center, network management and storage cluster. GamaCloud use menjembani Globus middleware services for the physical layer with the layer above it. GamaCloud run the data management services that previously built by DALA project as an

engine. Setting resources is through workload management with accessible through certain scientific applications.

2.2. Scheduller on Data Center

As the key characteristics of resource management, scheduling service makes cloud computing different from other computing paradigms. Centralized scheduler on the cluster system aims to improve overall system performance; while the scheduler is distributed in a grid system aims to improve the performance of specific end users. Compared to the others, the scheduling in cloud computing is much more complicated. On the one hand, a centralized scheduler is required, since each cloud provider, which promises to provide services to users without reference to the infrastructure of the host, had an individual data center. On the other hand, a distributed scheduler is also very necessary, because commercial property determines that cloud computing has to deal with the QoS requirements of customers distributed across dunia.Suatu important point of this discussion is to outline the scheduling problems associated with cloud computing. Because cloud services are actually virtual product in the supply chain, scheduling services can be classified into two basic categories: user-level and system-level [8].

User-level scheduling deals with the issues raised by the provision of services between the provider and the customer. This mainly refers to economic issues such as the balance of supply and demand, competition between the consumer and the minimization of cost to the consumer is elastic. Scheduling of system-level deals with the management of resources in the data center. From the customer standpoint, the data center is the system integration, providing uniform services. Actually, the data center consists of many physical machines, homogeneous or heterogeneous. After receiving many tasks of different users, the placement of a task to a physical machine have a significant impact on the performance of the data center. In addition to increasing the utilization of the system, certain conditions have to be considered, such as real-time satisfaction, resource sharing, and other fault tolerance [8].

2.3. Process

Data Center and Virtual Data Center is required as the foundation of this research is in the form of Data Center infrastructure is functioning as a virtual data center. Virtual Data Center itself will have the characteristics/minimum parameters, such as has a physical server resources management in resource management based IaaS. It is need to have a physical resource allocation management into Virtual Machines. It is ave the user management with user and group privileges pasa user. It is has the handling of the hand-over mechanisms for migration management server overlay within the Virtual Data Center.

Stages of Virtual Data Center analysis has been carried out preliminary research on the allocation of resources to the cluster infrastructure and virtual machine environment. Research analysis on the performance of the virtual server is focused on the isolation of resources, especially Virtual Machine Management [12]. This research compares the data center environment that is Proxmox, OpenStack and Eucalyptus. The research resulted in the allocation of resources to the isolation and virtualization models. This process produced a performance dedicated for every job that is run in a clustered environment.

In the Data Center required distribution pattern data center that can handle the needs of resource Alocation to adapt with the load. Determination of the burden will be based on the availability of data center resources, parameters and metadata preservation, as well as the category of big data. Determination of data center resources is designed to follow the pattern of the needs of the data. Resources that will handle computing needs include hardware parameters that can be set in IaaS data center services, namely the processor, storage media, network.

3. Results and Analysis

In this section, it is explained the results of research and at the same time is given the comprehensive discussion.

3.1. Implementation

Reseaech used infrastructure of the PC-based cluster. PC cluster each be operationalized operating system software that supports Virtual Data Center. Research

prepared CentOS operating system and Windows Server 2012 R2 Data Center. CentOS operating system has been known to be quite good in compatibility with multiple Data Center software, like Open Nebula, OpenStack, and Other. While Windows Data Center is a dedicated operating system for the data center. To support the operation of the infrastructure will be used as PC server hardware with the following specifications: Xeon Processor, 4GB Memory, Network Speed Gigabytes, Storage 500GB. PC servers will be prepared individually as server and cluster configuration will melaluui Data Center software respectively. Mechanism goes by Data Center will use the approach to handling large data. Data Center will be set multiple Virtual Machines and operated several operating systems therein. Virtual Machines on each cluster will be configured so as to allow each other to divide its resources. Mechanism of manufacture cluster will follow the nature of the software existing data center. At the Data Center, this has been implementing the cluster, and then implemented the mechanism of allocation of resources from the design of dynamic resource allocation. Implementation is placed at the level of application layer data center to facilitate the setting of dynamic resource allocation.

3.2. Test Results

System testing conducted to measure the performance of the system, in this case the XenServer. This performance parameter is the percentage of CPU resources and memory. Testing is done by running 19 VM gradually from initiation 3 VM, running 8-dedicated VM to run 8 VM-dynamic and CPU usage calculation using data averages from 4 core CPUs each host and use memory when the VM is executed. In these discussions, displayed an average usage of CPU resources either when initiation VM, VM-dedicated running and running VM-dynamic as well as the use of CPU resources as a whole. As for the memory to be displayed VM memory used in each test scenario, change the memory in Xen, as well as the overall use of memory for 925 minutes.

Table 1 . CPU *usage* XenServer1 dan XenServer2 (%)

Data Center Process	CPU Usage averages		CPU *usage gap*
	XenServer1	XenServer2	
Initiation	4,38	0,85	3,53
Dedicated1	4,10	0,93	3,17
Dedicated2	3,52	1,83	1,69
Dynamic1	3,16	1,76	1,4
Dynamic2	3,63	2,45	1,18
Averages	3,76	1,56	2,20

Table 1 shows the average CPU usage on XenServer1 and XenServer2 for all test scenarios. It is show that CPU usage on XenServer1 always higher than the CPU usage on XenServer2 well as the initiation of the VM, run-dedicated VM and VM-dynamic run. CPU uses graph on XenServer1 fluctuations, unlike the CPU usage on XenServer2 which tend to rise. Charts the average difference in CPU usage and XenServer2 XenServer1 are increasingly smaller.

Table 2 shows the changes in memory at the Xen VM when there is a run. That indicates changes in memory when the scenario initiation Xen VM, run-dedicated VM and VM-dynamic run. When a VM is not there run (idle) either on or XenServer2 XenServer1, Xen has a default memory of 953 MB on each XenServer1 and XenServer2. When there is a VM running on XenServer1 and XenServer2, Xen requires the addition of resources resulting in increased memory.

Table 2. Memory Test

Scenario	*Memory*	
	XenServer1	XenServer2
Idle	953	953
Initiation	1733	953
Dedicated1	2773	953
Dedicated2	2773	2000
Dynamic1	2773	3040
Dynamic2	3558	3308

Based on the test data, the average value of CPU usage on each host XenServer1 and XenServer2 are at 3.76% and 1.56%. The maximum value of the CPU usage on XenServer1 and XenServer2 respectively 46.93% and 32.71%, while the minimum value of the CPU usage on XenServer1 and XenServer2 respectively by 2.16% and 0.72%. Based on test data, 4055 MB of total memory used memory usage on each host XenServer1 and XenServer2 of 3558 MB and 3820 MB. While the use of unused memory or memory that is available on XenServer1 and XenServer2 each for 497 MB and 235 MB.

In terms of CPU and memory performance, XenServer1 and XenServer2 have good balancing process, which is indicated by the decline in XenServer1 CPU performance and increasing performance of CPU in XenServer2, in other words the difference between the CPU usage and XenServer2 XenServer1 has narrowed. The more virtual machine (VM) on a server and the more memory required impact on CPU performance. It is shown from the use of the CPU when the VM initiation scenario, dedicated VM and VM dynamic changes in the average value of both the XenServer1maupun XenServer2 with increasing memory.

4. Conclusion

The research has shown that the resource allocation use dynamic and deciated have several patern, there are initiation phase when the resource configure and set up for establisihing the services. The next process is the continuos phase establishing the services bith dynamic and dedicated. Base don the CPU index performance we can seen that along with the process both Xen Server 1 and Xen Server 2 streamline into the balance position. it is shown that the bload balancing through the dynamic and dedicated can works into the servers.

In the memory utilization can be seen that usability of memory increasing through the process. All of servers can allocate the memory for all the process, it can be proven by the increasing of memory using both on dynamic and dedicated. In the technical view, it is very important to allocate the resource match with the strategies, both dynamic or dedicated.

Based on the highligth, we can reach an conclusion that manage the resource on data center with define the resource into dynamic and dedicated both will significant have impact on the server performances. The resource have 2 phase to establishing the resources, the initiation phase and the process phase. A long with the process, both servers will streamline into the balance resources. The number of VMs even increase still can handle with the resources management. The VMs itself will be place as task/jobs in the resources allocation. Even that, the research still need to continue with the VM with data load on it. The load will more large in volume and investigating on it will be the future directions to establish the reliable cloud data center.

In the future, the research will discuss more in held further research on the performance of the CPU with a given load the data on each VM. The addition of VM for each dedicated and dynamic testing in order to produce data that is more varied. In the future add servers in the resource pool so that a larger amount of memory and can generate a lot of VM.

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