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Performance Assessment of Virtual Machine Consolidation and Placement in Software Defined Network using CloudSim

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Abstract: Concerns regarding storage availability and accessibility are crucial for enterprise computing. Customary direct-connected plate organizations inside individual servers can be a basic and modest choice for the vast majority endeavor applications. The system speeds up IT virtualization by pointing out possibilities for server consolidation and ways to simplify IT management within the physical IT infrastructure. In addition, key application interdependencies will be identified, and implementation support for virtualization migration will be provided in its reservation, resulting in energy waste and increased costs. Conversely, request-based VM positioning unites VMs based on the genuine responsibilities request, which might prompt better usage. Then, a variety of algorithms are introduced to continuously adjust this parameter at runtime so that a provider can use as few PMs as possible while keeping the number of SLAVs boundary both at the cloud server farm level and at the VM level utilizing receptive and responsive approaches. CloudSim's empirical evaluation demonstrates that the proposed parameter-based VM placement method provides greater adaptability.

Keywords: *Storage Area Networks, VM Consolidation, Cloud Sim, Performance, Virtual Machine*

1. Introduction

Data storage can be centralized across multiple servers through storage consolidation, also known as storage convergence. The goal is to speed up data access and storage while also making it easier for all enterprise subscribers to backup and archive data. Storage infrastructure simplification, centralized and effective management, optimal resource utilization, and low operating costs are additional desirable characteristics [1]. A SAN can also improve storage availability. Because a SAN is essentially a network fabric of computers and storage devices that are connected to one another, a disruption in one network path can typically be overcome by enabling an alternative path through the SAN fabric. Consequently, even in the event of a single cable or device failure, enterprise workloads can still access storage. In like manner, the ability to view limit as a total resource can additionally foster accumulating utilization by taking out "dismissed" circles on underutilized servers [2][3].

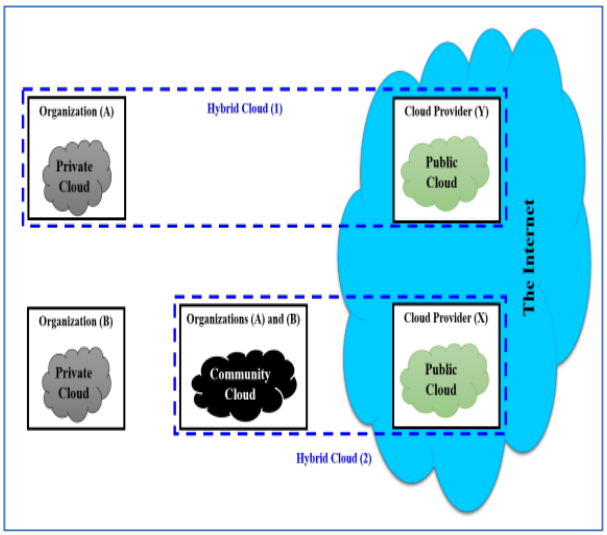

Fig 1: Cloud Models with various Community level service

All things being equal, a SAN gives directors a unified area for all capacity and allows them to pool and deal with the capacity gadgets together. A SAN works on a very basic level in an unexpected way. The plates are all associated with a specific stockpiling region network by the SAN. The normal neighborhood (LAN) and that committed organization are particular substances [4]. By regarding stockpiling as a solitary asset, this strategy makes it workable for any server associated with the SAN to get to any circle connected to the SAN. If different affiliations have shared concerns,They can build a typical cloud structure which is known as a neighborhood. The people group cloud can be overseen by any or the local area cloud's all's individuals or even by an outsider. The

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people group cloud's essential goal is to fulfill the common necessities of the taking an interest substances [5].Finally, the combination cloud sending model is a mix of something like two of the as of late referred to cloud models [6]. For example, in Figure 1, Blend cloud (1) is made from a private and a public cloud while Cross variety cloud is made from a neighborhood a public cloud. This paper only focuses on public or private cloud implementations.

2. Related Works

Distributed computing is a characteristic expansion of the advances that are now being used. Cloud computing was made possible by technologies like service oriented architecture (Cloud_Look11), utility computing (SAAS_11), Web 2.0, multi-tenancy (Amazon_8), automation (KREC_12), and virtualization [7]. Virtualization development is one of the basic construction hinders that help the dispersed processing establishment by making different virtual instances of hardware, amassing and frameworks organization resources.

Another type of network that connects computers and shared storage is called iSCSI. It is capable of operating at speeds of up to 100 Gbps and simplifies a number of data center operations. Where FC offers an exceptional and profoundly specific organization plan, iSCSI combines conventional SCSI block information and order bundles with typical Ethernet and TCP/IP organizing innovation. When optical fiber cabling and interfaces are utilized, FC is a high-speed network that is renowned for its high throughput and low latency [8][9].

It offers data rates of up to 128 Gbps over distances within a metropolitan area of up to approximately 6 miles or 10 kilometers. Block-level storage could possibly be consolidated in a single location with this kind of dedicated network, and servers could be spread out across campus buildings or a city [10-13].

When storage and servers are in the same location and the distance between them is less than 100 feet (10 meters), traditional copper cabling and the FC interfaces that go with it can also be used. To meet the varied requirements of cloud customers, for instance, Amazon EC2 provides a variety of VM instances1. Then, at that point, cloud clients can run any number and kind of uses on their VMs limited by the limit of the mentioned VMs [11].

Thus, the VM position arrangement is alluded to as "application-skeptic" since it has no earlier information on the applications that every client utilizes. This part presents a clever grouping of VM position arrangements following a basic writing survey. This clever grouping shows a make structure or way for specialists to follow while endeavoring to address any variety of the VM situation issues and features the pertinent issues in current arrangements. Our survey varies from past investigations of CDC asset the board and arrangement of virtual machines (VMs) in the accompanying ways and addressed in Figure 2:

1) From an IaaS perspective, it only focuses on the placement of virtual machines.

2) The existing research on VM placement is presented under a novel classification. The going with region gives a diagram of our work.

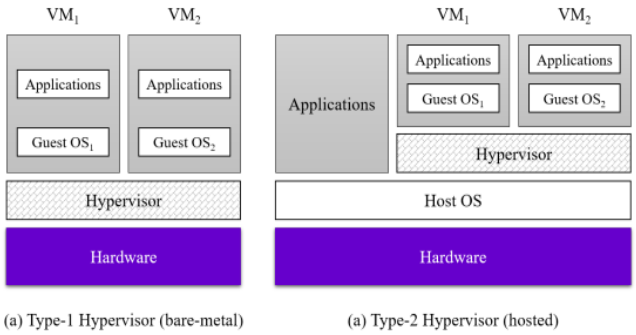

Fig 2: Types of VM Consolidated Hypervisor Levels

3. Proposed Methodology

3.1 Methodology

Multiple protocols are frequently supported by SAN technologies, facilitating effective communication between all layers, working frameworks, and applications. Setting up the capacity region organization. Before integrating all SAN components, an organization must first satisfy the vendor's hardware and software compatibility requirements.

Table 1: Representation of SAN establishment using IT resources

Host bus adapters (the patch list, driver version, and firmware version); The firmware switch; and storage (firmware, firmware for the host personality, and a patch list). The following steps must be taken in order to set up the SAN: Install the appropriate software and assemble and connect all of the hardware components. Examine the versions. Configure the HBA. Get the storage array set up. Make any necessary adjustments to the configuration settings. Test the joining. Test every operational process for the SAN environment, including backup, failure mode testing, and normal production processing. Lay out a presentation pattern for each part as well concerning the whole SAN. Record the SAN establishment and functional strategies. Utilizing resources from existing IT assets like servers, storage, and the network. Simplifying and centralizing management in order to improve IT professionals'

productivity. Increasing the availability of services and ensuring business continuity. Stop the expansion of data centers and underutilization of infrastructure shown in

Figure 2.

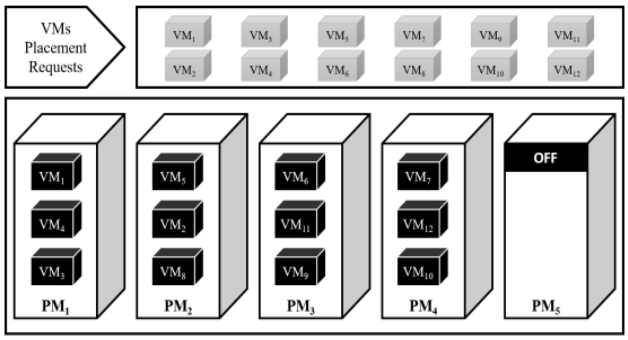

Fig 3: VM Placement and Consolidation

OpenStack is a local area created part based cloud stage like Amazon Web Administrations (AWS). OpenStack utilizes the NOVA2 part to robotize the creation and the board of figure occasions like virtual machines (VMs), as well as different administrations like the organization, security, and capacity. To allocate VMs to PMs, the NOVA part utilizes the NOVA Channel Scheduler [Fil], which is an outline of an underlying VM arrangement regulator. The Nova-schedule process receives a VM request and decides where to run it. To decrease the all out number of servers or server areas expected by an association, server union is a technique for really using PC server assets.

Table 2: VM Consolidation Conditions

VM Server Consolidation: We can assist you in expediting your IT virtualization project by pointing out possibilities for server consolidation and ways to simplify IT management within your physical IT infrastructure. Our specialists will likewise recognize key application interdependencies and give execution backing to your relocation to virtualization.
VM SAN Consolidation: Data storage can be centralized across multiple servers through storage consolidation, also known as storage convergence. The goal is to speed up data access and storage while also making it easier for all enterprise subscribers to backup and archive data. Storage infrastructure simplification, centralized and effective management, optimal resource utilization, and low operating costs are additional desirable characteristics.

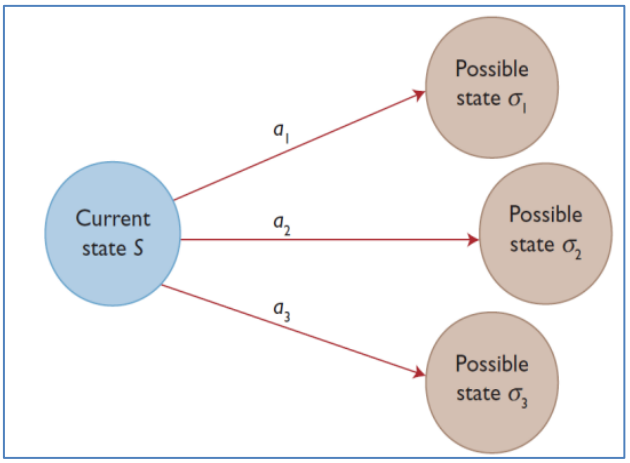

Fig 3: Status of each Cloud select input from VMs

The ongoing VMs-to-PMs planning has an effect on each state. The pseudocode that follows provides an illustration of a possible action-based (or rule-based) manager. Objective strategies, to lay it out plainly, group the conditions of the framework as either alluring or bothersome and do whatever it may take to change the unwanted state into a positive one. The pseudocode that follows provides an illustration of an autonomous manager based on goals and policies:

```
if (cpuUtilization >= 90%) then          ▷ Overutilized PM
    migrateSomeVMs()
else if cpuUtilization <= 40% then       ▷ Underutilized PM
    migrateAllVMs()
else
    do nothing
```

40% << CPU_UTILIZATION << 90%

The drawback of goal policies is that they only perform a kind of binary classification against the system's current state, making it impossible to express preferences in detail. As a result, even if there is a better state that should be taken into consideration, a goal policy will accept the current state as long as it falls within the range of the desired states. Supposedly, no VM situation arrangement in the writing depends on objective strategies for the unique position of the VMs.

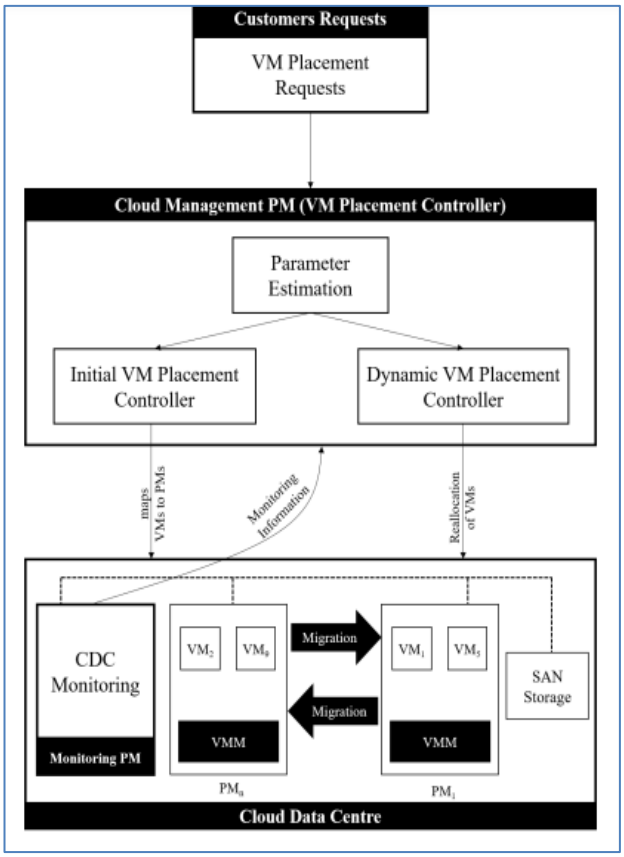

Fig 4: VM Data Selection and SDN Representations in Cloud Centre

4. Result and Discussion

In virtualized environments, the NVIDIA GRIDTM technology permits offloading graphics processing from the CPU to the GPU. This gives IT supervisors the opportunity to convey genuine PC graphics rich encounters to additional virtual clients interestingly.

GPU Virtualization: The first-ever hardware virtualization of the GPU is made possible by the NVIDIA® KeplerTM architecture. With NVIDIA GRIDTM vGPUTM, multiple users can share a single GPU, providing true PC performance and application compatibility at the same time. Remote Display with a Low Latency: The licensed remote presentation innovation created by NVIDIA essentially improves the client experience by lessening how much slack experienced by clients while interfacing with their virtual machine. This technology allows the virtual desktop screen to be received directly by the remote protocol. H.264 Encoding: The Kepler-fuelled GPU has a quick H.264 motor that can encode various streams at a better. By designating the computer chip to encoding capabilities and permitting these capabilities to scale with the quantity of GPUs in a server, this fundamentally works on the effectiveness of cloud servers.

VM placement strategies and policies, for instance, are used in the Cloud Services sublayer's VM provisioning component to assign VMs to PMs. We have implemented the necessary algorithms to develop this proposed parameter-based VM placement solution by expanding the fundamental VM provisioning functionality. Finally, CloudSim users are given the ability to specify the configuration of the cloud data center they want by using the user code layer, which is the top layer of the CloudSim architecture. For instance, it lets CloudSim users figure out the number of PMs, VMs, data centers, and applications' workloads represented by the Cloudlets. In this way, the client code layer empowers. CloudSim clients to test various situations which include explicit application necessities along with different server farm settings are shown in Table 3.

Table 3: Experimental result of capacity and bandwidth

Physical Machine	Virtual Machine	CPU	Capacity	Memory	Bandwidth
AWS GPU1	Small	5	1250	1TB	3Mbps
	Medium	5	2560	1TB	4Mbps
	High	5	4578	1TB	6Mbps
VMware_34	Small	10	3760	1TB	6Mbps
	Medium	10	6780	1TB	8Mbps
	High	10	9080	1TB	10Mbps
Oracle_Sye	Small	30	4578	1TB	5Mbps
	Medium	30	8890	1TB	10Mbps
	High	30	11300	1TB	15Mbps

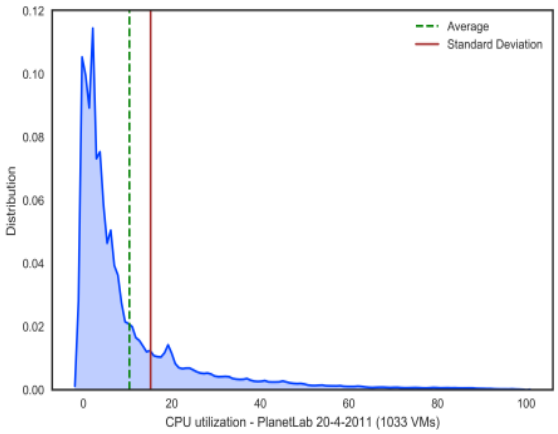

Fig 4: Distribution factor result of CPU utilization results

As shown in Figure 4, CloudSim traces are underutilized the majority of the time, as evidenced by their low average utilization (less than 15%). Figure 4, depicts the day-to-day variation in the CPU utilization of two selected CloudSim machines. According to the workload fluctuates from 0% utilization to nearly 100% utilization throughout the day. However, as shown in Figure 4, VM has been completely idle for more than eight hours due to its zero CPU utilization.

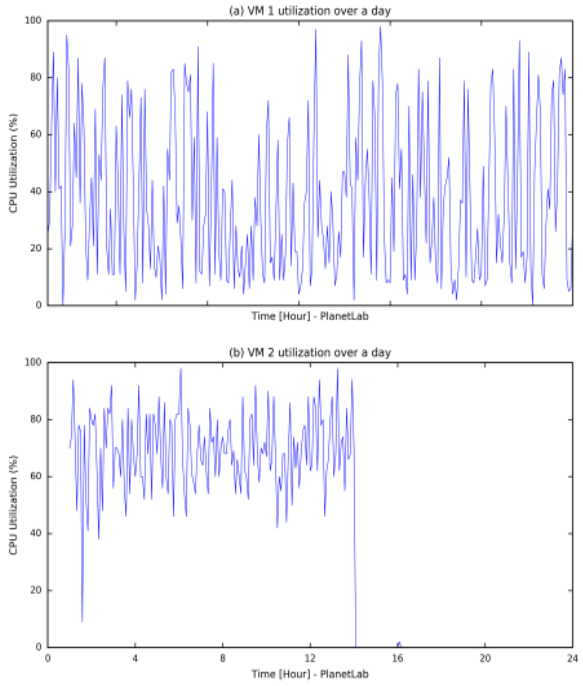

Fig 5: VM Utilization results

A PM's total power consumption is determined by the utilization of various resource types like the CPU, memory, storage, and cooling system. Notwithstanding, various investigations exhibit a direct connection between computer processor use and energy utilization. These workload traces show how much CPU each application or task in a VM uses. The Gaussian piece thickness gauge (KDE) of the engineered computer processor use of the 1033 VMs.

5. Conclusion

The parameter estimation component is introduced in order to work with the proposed parameter-based VM placement strategy. This boundary can be assessed powerfully or statically depending on the situation. Following that, the chapter discussed how crucial it is to make use of cloud simulators because in-vivo experiments are costly, limited, and challenging. The chapter then discussed the characteristics to look for in a simulator and went over three of the most widely used cloud simulators. The CloudSim simulation toolkit is utilized for the empirical evaluation of the proposed algorithms in this work. The settings of the reenacted CDC have been illustrated, as has the layered CloudSim design. The genuine responsibility follows results and the manufactured responsibility follows were then depicted. The trials are finished and transmission capacity are shown by utilizing different.

Author contributions

Author 1 and 2 implemented the concept and drafted the article with assistance of authors 3, 4 and 5, respectively.

Conflicts of interest

The authors declare no conflicts of interest.

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