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Decentralized, Energy-Efficient, Low Latency and Less Homogeneous Settings based Workload Management in Enterprise Clouds

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Abstract: ***The main objective of this paper is to present a decentralized approach towards energy-efficient and scalable management of virtual machine (VM) cases that are provisioned by large, enterprise clouds. In this proposed approach, the computation information's of the data centre are successfully organized into a hypercube constitution. The hypercube flawlessly scales up and down as resources are either added or eliminated in retort to changes in the number of conditioned VM instances. Without supervision from any central components, each compute node functions separately and manages its hold workload by applying a set of allocated load balancing laws and algorithms. For less Homogeneous setting, planned to add additional parameters in Load balancing algorithm. For Decreased Network Latency between Co-Located VMs, planned to combine communication-aware inter-VM scheduling (CIVSched) technique into Load balancing scheme to allow for a more fine grained selection of the VM instances to be migrated.***

Keywords: centralization/decentralization, Distributed systems, Energy-aware systems

1. Introduction

Nowadays, a large number of cloud-based services spanning the infrastructure platform, and software levels which reflects the long-term growth of cloud computing. The energy consumption of the service providers data centers provide the negative impact on the environment. A considerable part of their power consumption is lost due to both over-provisioned and idle resources . So it becomes most significant for cloud service providers to take on appropriate measures for attaining energy-efficient processing and utilization of computing infrastructure. The workload would be translated into a number of provisioned virtual machine (VM) instance in computation-intended data centers. And also, a dynamic VM consolidation has been developed to address these problems.

A dynamic VM consolidation [1] is used to reduce the energy consumption of the data center by stuffing the running VM instances to as few physical machines (PMs) as possible, and consequently switching off the unnecessary resources. Combined with the use of live VM migration which refers to the process of moving a running VM instance between different physical compute nodes without disconnecting the client, VM consolidation has become feasible in terms of cost and it can considerably improve the energy footprint of cloud data centers. The major purpose is decreasing the energy and increasing the throughput. For less Homogeneous setting, planned to add additional parameters in Load balancing algorithm. For Decreased Network Latency between Co-Located VMs, planned to combine communication-aware inter-VM scheduling (CIVSched) technique into Load balancing scheme to allow for a more fine grained selection of the VM instances to be migrated.

2. Literature Survey

In [22], they proposed a mechanism for the dynamic consolidation of VMs in physical machines as possible; and their aim is to reduce the consumed energy of a private cloud without jeopardizing the compute nodes reliability. They used sliding-window condition detection mechanism and depend on the use of a centralized cloud manager that carries out the VM-to-PM mappings based on information. A power-efficient VM consolidation is developed by Mastroianniet al. [15]. In this cloud, the placement and migration of VM instances are done by probabilistic processes by considering both, the CPU and RAM utilization. This cloud enables load balancing decisions would be taken based on local information, but it still depends on a central data center manager for the organization of the VM host servers.

The recently developed Green Cloud computing through VM is widely utilized but a data center operators struggle to minimize their energy consumption and operational costs.

The algorithms are implemented by a Green Cloud computing infrastructure ,which introduces an additional layer to the typical cloud architecture. This infrastructure comprises a set of centralized components,

1) Energy monitor which observes energy consumption caused by VMs and physical machines.
2) VM manager which is in charge of provisioning new VMs as well as reallocating VMs across physical machines on the basis of the information collected by the energy monitor.

- A Set-Based Discrete for Cloud Workflow Scheduling with User-Defined QoS Constrain[16] of Data processing: Latency high, Implementing cost also high.
- In Load Balancing in Cloud Computing Environment Using Evolutionary[18] : its has Unsecured data management, Complex computing models implement.

- Hybrid Particle Swarm Optimization Scheduling for Cloud Computing[19] : The Implementation cost is high and Slow Data processing modules.
- Task Scheduling for Hybrid IaaS Cloud[20] where the Data base management occupies more memory, Complex modules, High power consumption.

3. Existing System

a) Dynamic consolidation of VMs in Physical machines are used, is to reduce the consumed energy of a private cloud without compute nodes reliability.
b) The approach is implemented via a sliding-window condition detection mechanism relies on the use of a centralized cloud manager that carries the VM-to-PM mappings. This settings has the following drawbacks :
   - High Homogeneous setting.
   - Increased Network Latency.

4. Proposed System

The proposed system design implements active VM consolidation and relies on live VM movement. Specifically, the substantial machines of the information centre that are employed to host the VM cases are efficiently self-organized in a greatly scalable hypercube overlay network. For less Homogeneous setting , planned to add additional parameters in Load balancing algorithm. For Decreased Network Latency between Co-Located VMs, planned to combine communication-aware inter-VM scheduling (CIVSched) technique into Load balancing scheme to allow for a more fine grained selection of the VM instances to be migrated. The proposed system experiments aimed at examining the following main aspects:
1) Elasticity: adapting to random workload changes.
2) Eradication of under/over-utilized nodes: balancing underutilized and over utilized physical machines.
3) Power consumption: energy costs per hour for the data center.

5. Architecture Diagram

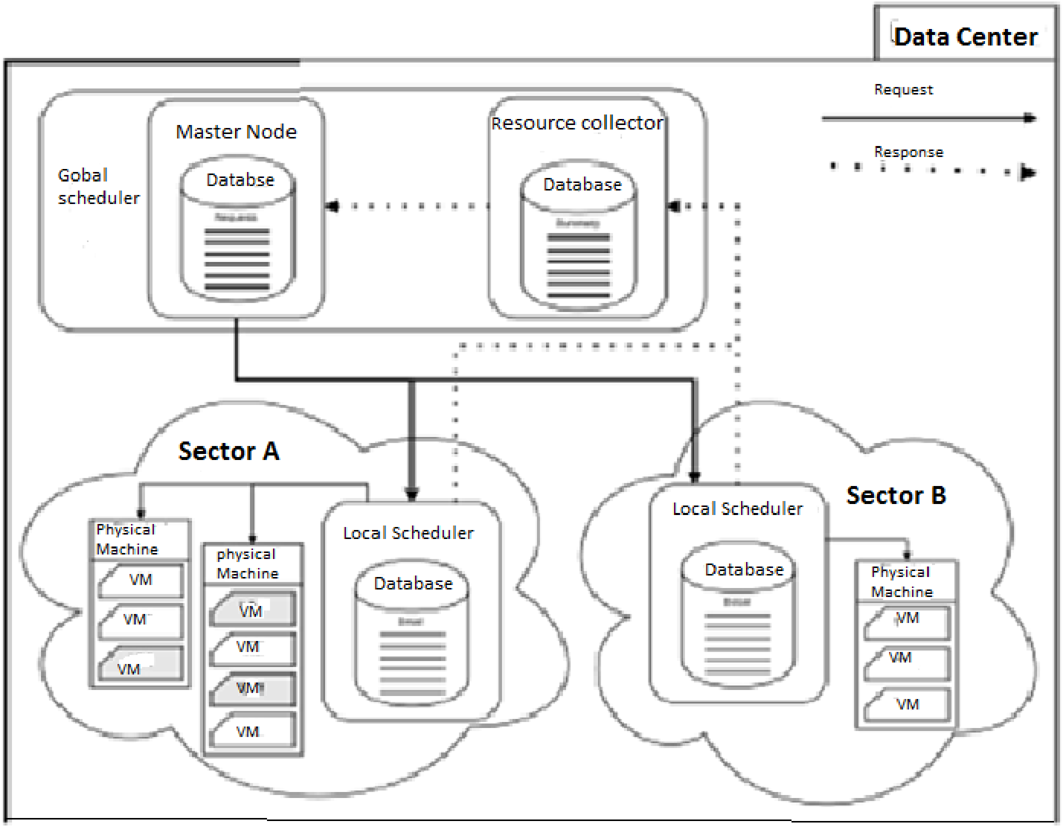

Figure 1: System Architecture

6. Authentication

6.1 Login

- Used to checking the cloud user
- Register user only use this application for the security purpose.
- All the information about the user are stored in the cloud server and maintain.

6.2 Registration

New user registers to the use this application.

6.3 Load balancing

Dependent tasks are those whose execution is dependent on one or more sub-tasks. They can be executed only after completion of the sub-tasks on which it is dependent. Therefore, scheduling of such task prior to execution of task dependency. Task dependency is modeled using workflow based algorithms.

6.4. Virtual machine

Workload gets fundamentally interpreted into a number of conditioned virtual machine. Reallocating VMs crosswise physical machines on the origin of the data collected by the energy scrutinizer.

6.5 Data centre

Finding the cloud user to keep away from the attacker, allocate the party to the cloud user for preserving the account and data privacy task are executed based on the algorithm for executing the action. A private, enterprise cloud data center typically consists of one or more physical controller nodes, whose purpose is to maintain the overall cloud-OS. Since our goal is to enable decentralized workload management, we organize the data center's compute nodes in an n-dimensional binary hypercube topology.

6.6 Compute Nodes

Compared to the other system resources of a compute node, such as memory and network, the CPU consumes the main part of its power, and its utilization is typically proportional to the overall system load.

- p_{idle} defines the amount of power consumed by the compute mode when idle, i.e., when the compute node is not hosting any VM instances.
- p_{min} defines the level of power consumption, below which the compute node should try to migrate all its locally running virtual machines and shut down.
- p_{max} defines the critical level of power consumption, above which the compute node's performance is significantly degraded as its hardware resources, particularly the CPU, are over-utilized.

6.7 Initial VM Placement

The data center clients can request the creation and allocation of new VM instances at any time, given that the data center has not exceeded its maximum capacity, i.e., at least one of its compute nodes is not in the over utilized state. In similar fashion, VM instances can be terminated at any time. In our approach, the data center is able to initially place VM instances to its compute nodes in a completely decentralized manner, by leveraging the hypercube topology.

6.7.1 Clustering

The file that user upload that should clustered in the form key and the indexing technique for allocate the task scheduling. It is the simple method to allocate the task to the server to avoid the load balancing and decentralized the server to the client

7. Algorithm Description

7.1 Decentralized load balancing algorithm

It depends on a priori information of the applications and static information about the load of the node.
Memory and storage capacity and recently known communication performance.
Distributed algorithms are basically suitable for homogeneous
It work in master–slave manner.

7.2 Centralized load balancing algorithm

The work load is distributed among the processor at runtime. In this method, master allocates new routes to the slaves derived from the new data gathered. Work is central. In non allocated manner one node perform the load balancing process and task of load is shared among them.

8. Class Diagram

The class diagram is the most important element of object-oriented modeling. It is employed both for common theoretical modeling of the methodical of the application, and for comprehensive modelling translating the replicas into programming code.

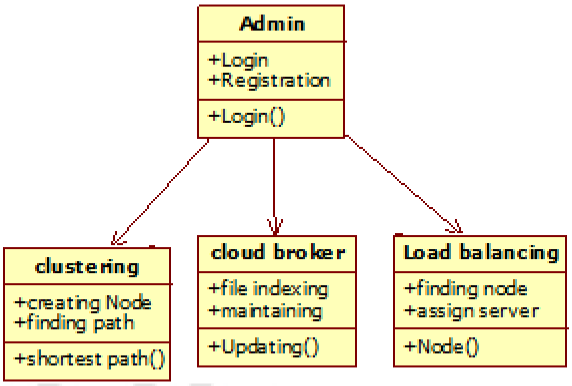

Figure 2: Class Diagram

9. Use Case Diagram

A use case diagram at its simplest is a depiction of a customer's communication with the scheme that shows the association flanked by the user and the different use cases in which the user is involved. A use case figure can identify the dissimilar types of users of a structure and the different use cases and will often be convoyed by other kinds of illustrations as well.

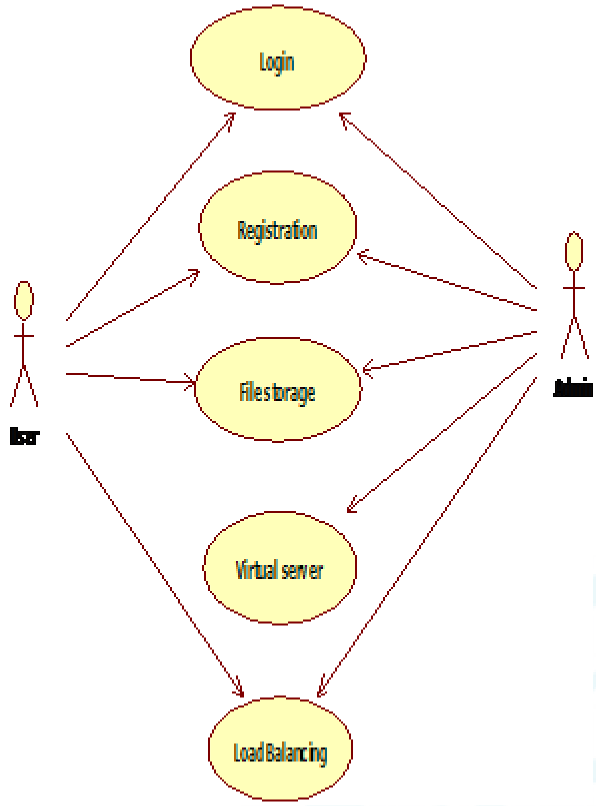

Figure 3: Use Case Diagram

10. Output & Result

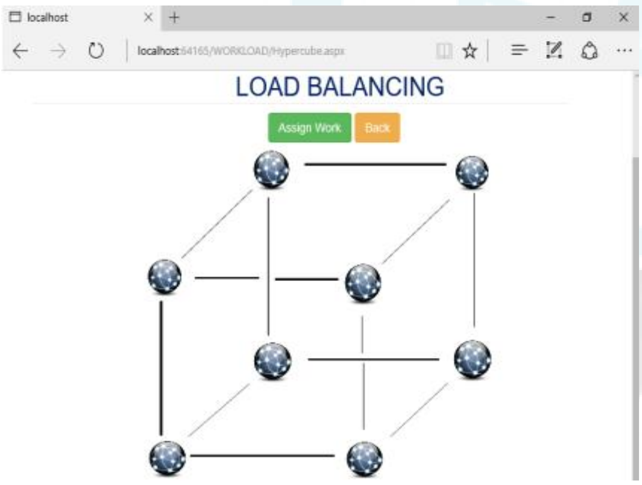

Figure 4: Node Creation

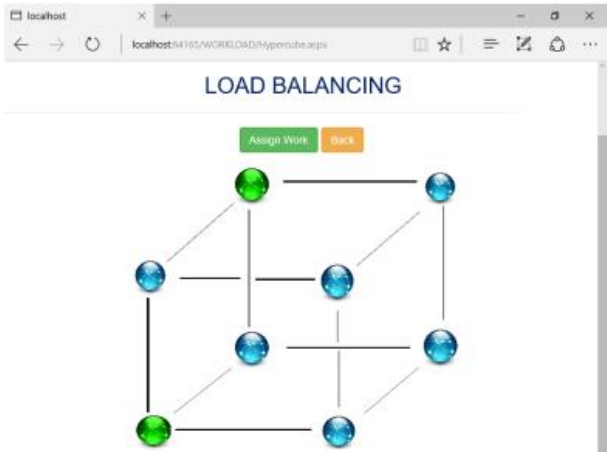

Figure 5: Already work assign to server

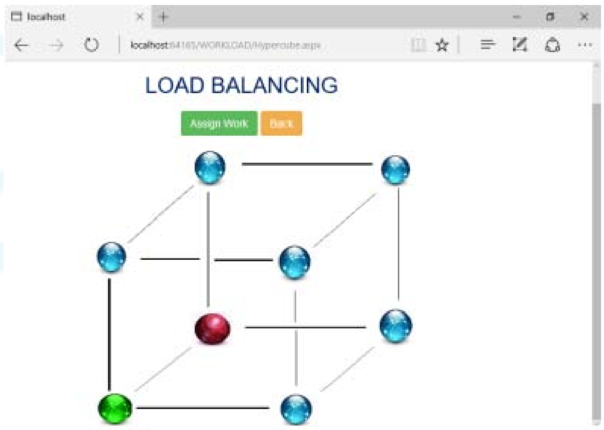

Figure 6: Data user

Table 1: Comparison evaluation

	Before Load Balancing			After Load Balancing		
Compute node	VM Instances	Power Consumption	State	VM Instance	Power Consumption	State
c1	20	240W	overutlized	17	235W	ok
c2	8	180W	ok	15	225W	ok
c3	16	220W	ok	17	235W	ok
c4	0	0W	switched off	0	0W	switched off
c5	2	160W	underutilized	0	0W	switched off
c6	3	165W	underutilized	0	0W	switched off
c7	0	0W	switched off	0	0W	switched off
c8	0	0W	switched off	0	0W	switched off
	49	**965W**		**49**	**695W**	

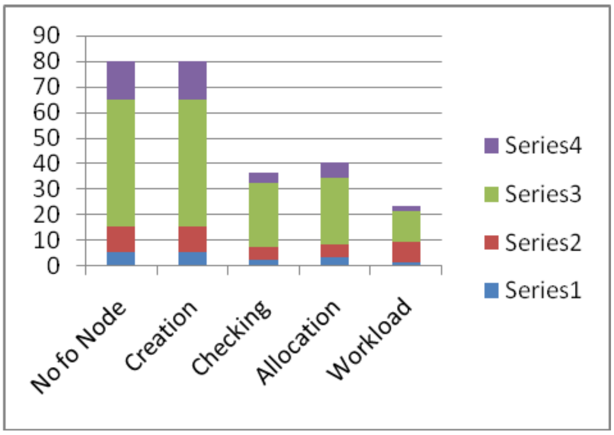

Figure 7: Performance Evaluation

11. Conclusion

In the proposed work include a hypercube overlay for the party of the data center's figures nodes ,and a set of distributed load balancing algorithms, which rely on live VM migration to transfer workload among nodes, with the dual goal to i) minimize the active resources of the data center , and thereby its energy utilization ii) avoid overloading of calculate nodes. We conducted a series of simulation-based experiments with the intention of appraise our proposed approach . The outcomes of propose that our decentralized load balancer is scalable, as it function in a related way regardless of the energy-proficient and data center size .Moreover, it enables computerized elasticity as the data centers compute nodes are switched on and off on require, in response to the changes in the data centers taken as a whole workload. Our new consequence also demonstrated that the collective cost of live migrations beside with that of switching on and off compute nodes is irrelevant evaluated to the energy savings achieved by our approach .In *future work*, we plan to execute and put together our decentralized workload manger in an open source cloud operating system.

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