EFFICIENT VM SCHEDULING IN CLOUD ENVIRONMENT TO REDUCE POWER CONSUMPTION

[1]Khushbu Leuva, [2]Prof. Dhiren Prajapati
[1]PG Student, [2]Professor
[1]Computer Engineering
[1]Merchant Engineering College, Basna, Visnagar – Mehsana Highway, Gujarat, India

Abstract: Due to its expandability, resource-sharing and cost-efficiency, Cloud has been an inevitable part of day to day life and its usage has drastically increased in last decade. Because of this, number of data centers across the globe as increased severely which has resulted into huge energy consumption. Efficient mapping of virtual machines on physical machines may result into enhancement in resource utilization which in turn reduces number of active physical machines. Energy is directly dependent on number of active servers and other components. Hence, reduction in total number of active servers results into reduction in overall power consumption in data center. In this research survey, we aim to study various existing research addressing the issue of energy consumption in Cloud data center using efficient VM scheduling. This survey shall focus on various VM scheduling techniques, their pros and cons, and shall help the researchers in selecting the approaches approach for their work.

Keywords: Cloud computing, Energy Consumption, VM Scheduling.

I. Introduction

The Cloud is a network of servers which are used for many purposes including sharing computing resources, running applications and data storage. It offers services in various flavor viz. Infrastructure as a Service, Platform as a Service, and Software as a Service. Cloud computing offers pay-as-you-use model where computing resources (such as memory, processing elements, bandwidth, storage etc.) are provisioned over the Internet based on the user demand with elasticity and flexibility.[1] Concerns such as security and energy consumption have been prime motivations for many researchers for the domain of cloud computing. The issue of energy consumption can be addressed in many directions out of which proper distribution of workload across available resources in one of them.

To reduce power consumption can be address through efficient VM scheduling. There are many available to reduce Power consumption techniques in existence. For the efficient cloud workload management framework the categorized the workload based requirement.[4] dynamic job scheduling policy for power aware resources allocation in virtualized datacenter.[3] In this work, we aim to reduce power consumption based VM scheduling in cloud environment.

The paper has been organized as under. After this introduction session, we study various techniques pertaining to VM scheduling in section-2 viz. related work. We identify few research directions in the domain of energy efficiency through VM scheduling in section-3. In section-4, we propose our work which we wish to carry out to achieve energy efficiency. In section-5 we conclude our research followed by future work and list of references.

II. Related work

Singh et al [4] identify the issue of finding a best pair of resource and workload in such a way that it incorporates the dynamic nature of work load and also makes best utilization of available resources. Author propose an efficient cloud workload management framework the categorized the workload based requirement. Simulation using cloudsim toolkit, author claim to be achieving better result in terms of energy consumption execution cost and time of different workload.

Goiri et al [2] identify the issue of consolidation of multiple workloads in a smaller number of machines. Authors propose a dynamic job scheduling policy for power aware resources allocation in virtualized datacenter to achieve power-aware resource scheduling. To be specific, authors claim to achieve (a) preserve the quality of service, (b) turning off the spare servers, (c) reducing power consumption using the simulation testbed OMNet++. In the future work could be to extend the proposed policy by evaluating SLA or reliability in a real environment.

Takouna et al [3] identify the energy management of emerging high performance computing (HPC) clouds the host CPU-intensive job is more challenging. Authors (a) present an optimization solution to demonstrate trade-offs between energy and acceptance ratio of jobs (b) propose an energy model. Author claim to be achieve the Energy, SLA violation percentage, system utilization, and number of finished jobs. In the future work could be to Implementing the scheme on heterogeneous cluster.

Adhikary et al [5] identify the issue is Technique based centralized job placement approaches reduce the reliability of operation due to a single point failure. The existing works do not consider energy consumption cost for communication device and network appliance. Author proposed a mechanism for cluster formation based on network vicinity among the data servers. Author claim to be achieve the developed two distributed and localized intra-cluster and inter cluster VM scheduling algorithms based on energy calculation, resource requirement and availability.

Knauth et al [6] identify the using simulation to measure the difference in energy consumption caused exclusively by virtual machine schedulers. Besides demonstrating the inefficiency of wide spread default scheduler. Authors propose their own optimized scheduler (OptSched). Author Claim to be achieving the evaluate reductions in server uptime for energy saving using the simulation testbed for Authors' own developed OMNet++.

Li et al [7] identify the issue is database and computing power, requires more virtual machine and consumes lots of electricity resource. The increasing scale of datacenter the energy consumption problem. And to address the issue of energy consumption optimization. Authors propose an energy aware scheduling algorithm (EAS) for scheduling a workflow application based on the proposed heuristic policy. Author claim to be achieving better result show the proposed algorithm can reduce energy consumption significantly. In future work the monetary consumption into our scheduling model.

III. PROPOSED WORK

Our Proposed has been mainly categorized among two phases:

3.1 Task allocation without dependency
3.2 Task allocation with dependency

3.1 Task allocation without dependency

For part A, We propose a technique task allocation without dependency

Table 1: Task allocation without dependency

Tasks	Workload	VM0	VM1	VM2	VM3	VM4	VM5	
	(MI)	2000	1200	500	800	1500	1000	Deadline
T0	1000	0.50	0.83	2.00	1.25	0.67	1.00	1.04
T1	500	0.25	0.42	1.00	0.63	0.33	0.50	0.52
T2	2000	1.00	1.67	4.00	2.50	1.33	2.00	2.08
T3	700	0.35	0.58	1.40	0.88	0.47	0.70	0.73
T4	300	0.15	0.25	0.60	0.38	0.20	0.30	0.31
T5	1200	0.60	1.00	2.40	1.50	0.80	1.20	1.25
T6	800	0.40	0.67	1.60	1.00	0.53	0.80	0.83
T7	600	0.30	0.50	1.20	0.75	0.40	0.60	0.63
T8	1300	0.65	1.08	2.60	1.63	0.87	1.30	1.35
T9	700	0.35	0.58	1.40	0.88	0.47	0.70	0.73
		22	11	6	7	17	11	

	Million Instructions
	MIPS
	Execution time (microseconds)
	Power Consumption (W)
	Power Utility

Task Placement:

Table 2: Task Placement without dependency

	VM0	VM1	VM2	VM3	VM4	VM5
T0	1					
T1		1				
T2					1	
T3	1					
T4	1					
T5						1
T6					1	
T7			1#			
T8				1#		
T9						

Illegal Task

Category 1: Out of 10 tasks, T0 to T6 could be mapped on one of the resources, maintaining deadline constraint and with power utility consideration.
Category 2: T7 and T8 could be mapped on the resources, without maintaining deadline constraint, with power utility consideration. (Illegal tasks)
Category 3: T9 could not be placed on any resources.

3.2 Task allocation without dependency

For part B, We propose a technique task allocation with dependency

Table 3: Task allocation with dependency

Tasks	Workload (MI)	VM0 2000	VM1 1200	VM2 500	VM3 800	VM4 1500	VM5 1000	Deadline
T0	1000	0.50	0.83	2.00	1.25	0.67	1.00	1.04
T1	500	0.25	0.42	1.00	0.63	0.33	0.50	0.52
T2	2000	1.00	1.67	4.00	2.50	1.33	2.00	2.08
T3	700	0.35	0.58	1.40	0.88	0.47	0.70	0.73
T4	300	0.15	0.25	0.60	0.38	0.20	0.30	0.31
T5	1200	0.60	1.00	2.40	1.50	0.80	1.20	1.25
T6	800	0.40	0.67	1.60	1.00	0.53	0.80	0.83
T7	600	0.30	0.50	1.20	0.75	0.40	0.60	0.63
T8	1300	0.65	1.08	2.60	1.63	0.87	1.30	1.35
T9	700	0.35	0.58	1.40	0.88	0.47	0.70	0.73
		22	11	6	7	17	11	

Task Dependency Matrix:

Table 4: Task Dependency Matrix

	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9

T0										
T1										
T2										
T3										
T4			1							
T5										
T6						1				
T7										
T8										
T9									1	

Task Placement with dependency:

Table 5: Task Placement with Dependency

	VM0	**VM1**	**VM2**	**VM3**	**VM4**	**VM5**
T0	1					
T1		1				
T2	1					
T3					1	
T4	***1****					
T5						1
T6						***1****
T7			1			
T8					1	
T9					***1****	

* Dependent Task

Category 1: Out of 10 tasks, Except T7, all tasks could be mapped on one of the resources, maintaining deadline constraint and with power utility consideration.
Category 2: T7 could be mapped on the resources, without maintaining deadline constraint, with power utility consideration. (Illegal tasks)
Category 3: All the task could be placed on any/all resources. One resource (VM3) could be kept unused.

IV. EXPERIMENTS AND RESULT ANALYSIS

Existing system in the two tasks are illegal task and last two tasks could not be placed on any resources. Our propose task allocation without dependency in the two task are illegal task and last one task could not be placed on any resources. Task allocation with dependency in the one task illegal task and all the task could be placed on any/all resources. Task allocation with dependency in the less resource utilization so reduce energy consumption.

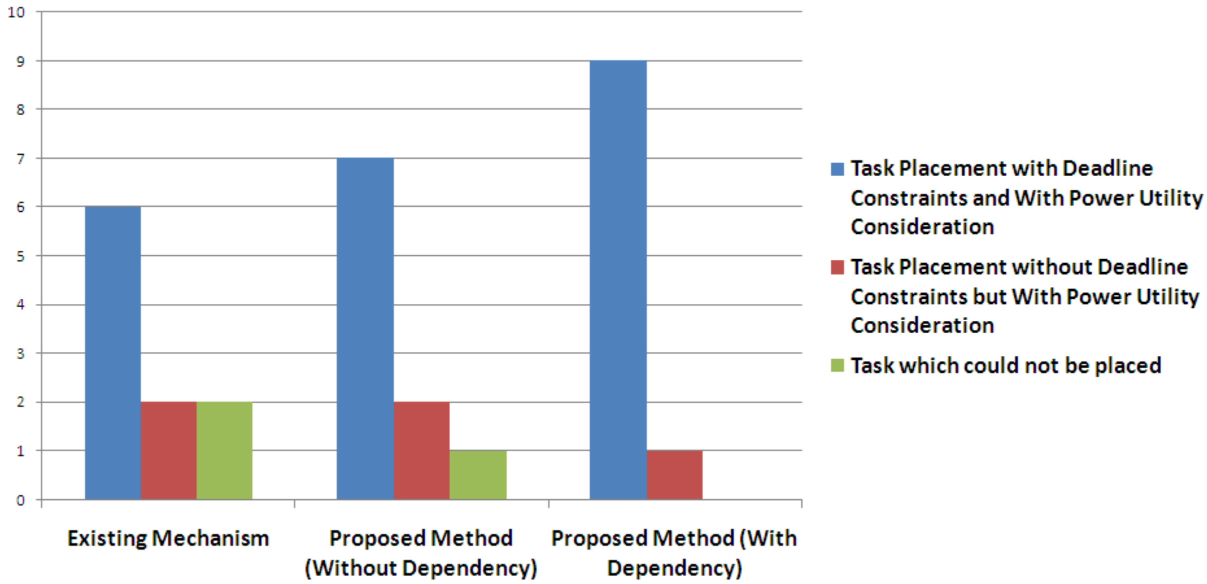

Figure 1. Comparison of three methods

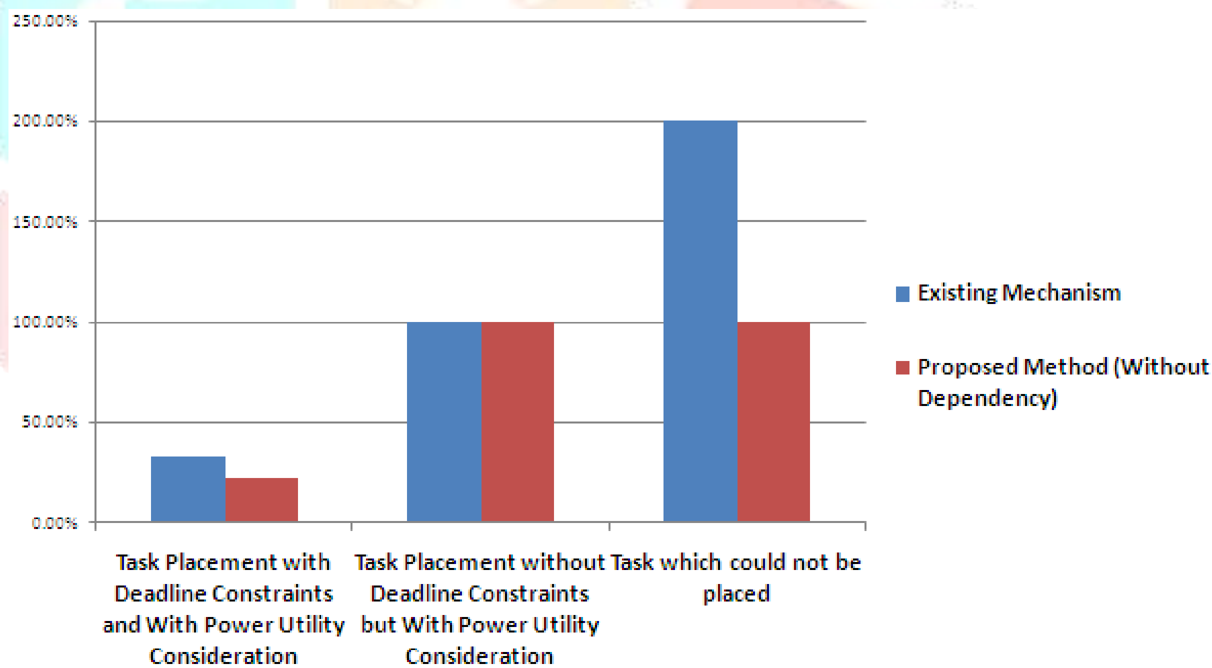

Figure 2. Improvement due to Proposed Method (with dependency)

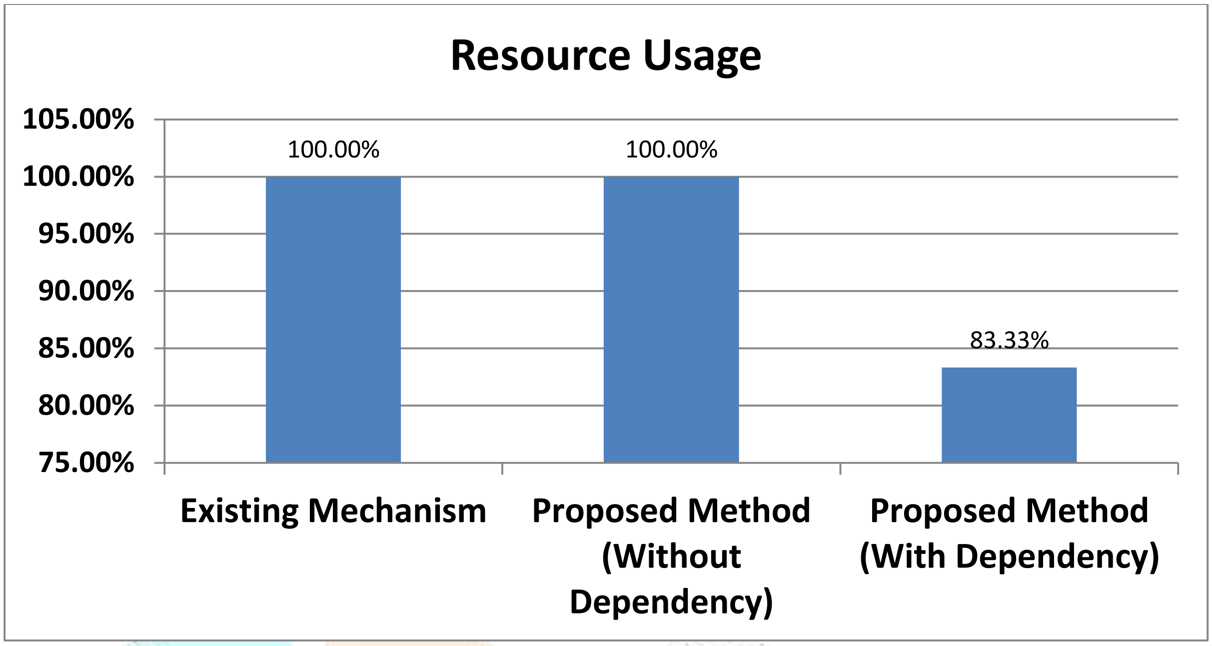

Figure 3. Resource usage

CONCLUSION

In this paper, we have identified Power Consumption main problems in the cloud computing environment. We Aim to achieve reduce energy consumption for using VM scheduling. We proposed two methods: Task allocation without dependency and task allocation with dependency. Task allocation without dependency in the one task could not be placed on any resources. Task allocation with dependency in the all the task could be placed on any/all resources. Task allocation with dependency method in the less resource utilization so reduce energy consumption.

REFERENCES

[1] P. Mell and T. Grance, "The NIST Definition of Cloud Computing, "National Institute of Standards and Technology, Information Technology Laboratory 800-145, September 2011.
[2] I˜nigo Goiri, Ferran Juli`a, Ram´on Nou, Josep Ll, Jordi Guitart And Jordi Torres, "Energy-aware scheduling in virtualized datacenters" in IEEE International Conference on Cluster Computing, 2010.
[3] Ibrahim Takouna, Wesam Dawoud, and Christoph Meinel "Energy Efficient Scheduling of HPC-jobs on Virtualized Clusters Using Host and VM Dynamic Configuration" in 2nd International Workshop on Green Computing Middleware, 2011.
[4] Sukhpal Singh and Inderveer Chana, "QoS-aware resource scheduling framework in cloud computing" in Springer 2014.
[5] Tamal Adhikary, Amit Kumar Das, Md. Abdur Razzaque, And A. M. Jehad Sarkar, "Energy-efficient scheduling algorithms for data center resources in cloud computing" in 978-0-7695-5088-6/13 $26.00 © 2013 IEEE.
[6] Thomas Knauth, Christof Fetzer, "Energy-aware Scheduling for Infrastructure Clouds" in 978-1-4673-4510-1/12/$31.00 ©2012 IEEE.
[7] Li Liu And Zhe Qiu "A Survey On Virtual Machine Scheduling in Cloud Computing" IEEE International Conference on Computer And Communications 2016.