



Science

## **ALGORITHM FOR TASK CONSOLIDATION IN CLOUD COMPUTING: A COMPARATIVE SURVEY**

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### **Abstract**

Cloud Computing is an emerging field in the IT industry. Cloud computing provides computing services over the Internet. Cloud Computing demand increasing drastically, which has enforced cloud service provider to ensure proper resource utilization with less cost and less energy consumption. In recent time various consolidation problems found in cloud computing like the task, VM, and server consolidation. These consolidation problems become challenging for resource utilization in cloud computing. We found in the literature review that there is a high level of coupling in resource utilization, cost, and energy consumption. The main challenge for cloud service provider is to maximize the resource utilization, reduce the cost and minimize the energy consumption. The dynamic task consolidation of virtual machines can be a way to solve the problem. This paper presents the comparative study of various task consolidation algorithms.

**Keywords:** Cloud Computing; Task Consolidation; VM Consolidation; Resource Utilization; Energy Consumption.

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### **1. Introduction**

Cloud computing traditionally uses to provide infrastructure, platforms, software and data as a service. It offers three service model SaaS, PaaS and IaaS. Cloud Computing is a new trend for computing technology that uses the central remote servers and Internet to maintain data and application. Many virtual machines in the cloud will continue to run simultaneously, when a particular machine is overloaded, cloud computing dynamically transfers its load into several virtual machines. The process of transferring the virtual machine from a physical machine to the load is called migration. Cloud provides various services over the public and private network. Cloud Computing is both a combination of software and hardware-based computing resources delivered as a network service.

System architecture contains four layers:

- 1) User Interface: This layer contains cloudlets, where cloudlets are the application services that need to be executed at virtual machines.
- 2) VM Services: This layer is responsible for managing the virtual machines services, creating the virtual machine and cloudlets execution.
- 3) Cloud Services: Cloud provides various services over internet like task consolidation, load balancing, virtual machine management and resource utilization.
- 4) Cloud Resources: This layer consist of physical computing servers termed as host, which has pre-configured processing capability in terms of MIPS, network, memory and bandwidth.

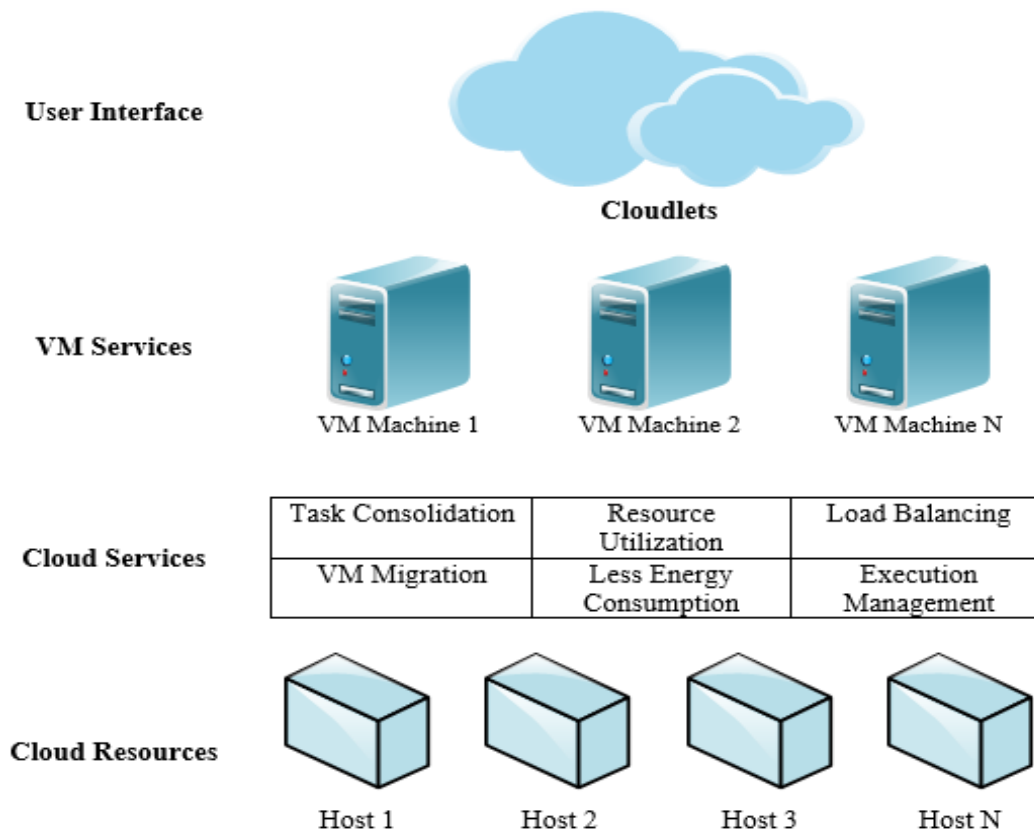


Figure 1: System Architecture

## 2. Related Work

### 2.1. Task Consolidation

Task consolidation is a technique to utilize resources properly in cloud computing. For task consolidation technique lots of work is going on. Some articles have done to maximize the resource utilization, some articles have done for minimizing the energy consumption and reducing the cost. In my research work, we are going to develop a technique that will take care of all problems of task consolidation in cloud computing. In a cloud infrastructure, active users can demand several services to the cloud infrastructure simultaneously. So cloud service providers should made

available all the resources with less execution time and less cost to satisfying the need. The energy consumption in the cloud is proportional to the resource utilization, so virtual machine scheduler should provide flexibility for better resource utilization.

Task Consolidation provides many benefits:

- 1) Maximize the Resources utilization
- 2) Consolidated administrative tasks
- 3) Maximizing cloud computing resource
- 4) Customization of IT services
- 5) Centralized Management
- 6) Quality of Service
- 7) Minimize Hardware Cost

## 2.2. Data Centers

A data center provides networked computers and storage power that use to organize, process, store and disseminate large amounts of data in businesses or other organizations. A business typically relies heavily upon the applications, services and data contained within a data center, making it a focal point and critical asset for everyday operations.

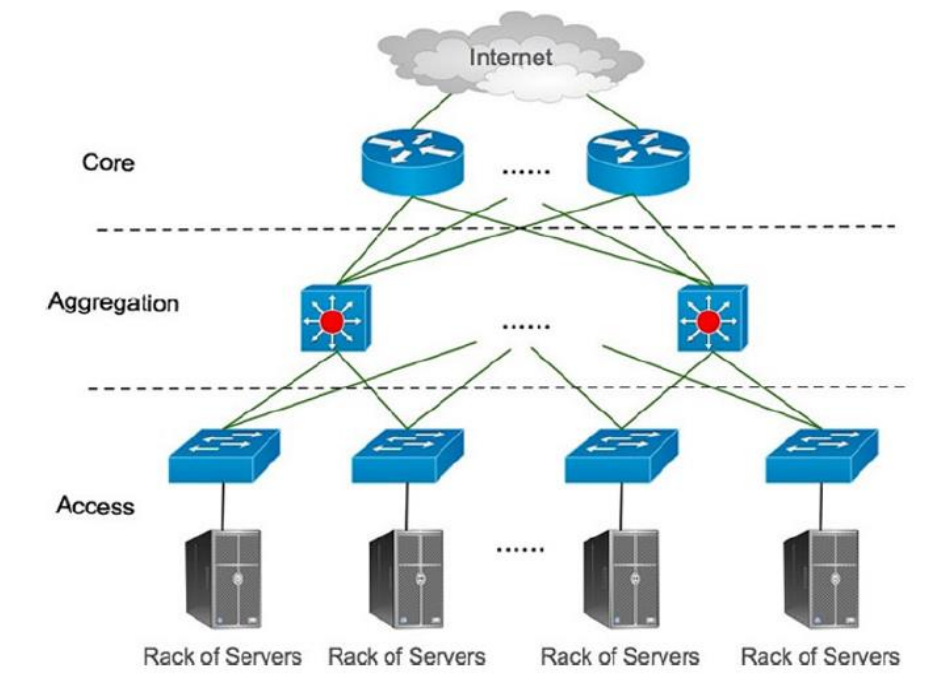


Figure 2: Data Centers

## 2.3. VM Migration

Virtualization is widely used and implemented with virtual machines, for the use of high resources and better quality of service. The process of moving a physical machine into another machine is called virtual machine migration. Cloud computing distributes computing tasks to many different machines.

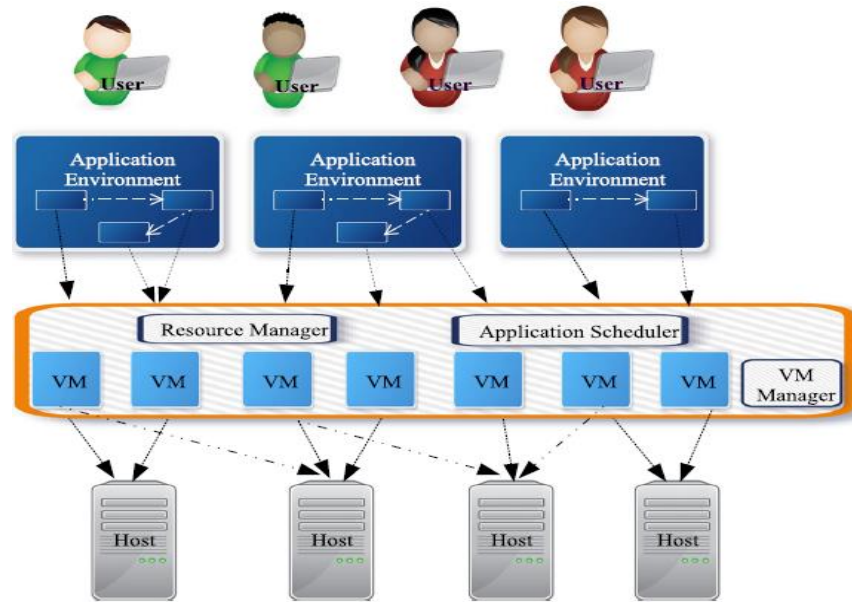


Figure 3: VM Migration

### 3. Literature Survey

The task consolidation is very important area for research to improve the utilization of resources with less execution time and less cost in cloud environment. We referred many existing work and drafted a comparative study.

The paper [1] (Kumar Dilip, 2016) describes about an active user demands for various services to cloud. They have provision to available all resources are available efficiently with minimum cost. Virtual machines are scheduled to map resources to every request. They used priority queue algorithm (Greedy approach) to map VMs and reduce the cost. After implementing priority queue to map VMs is more effective than sorting and default methods.

The paper [2] (Chandra P., 2016) describes about efficiency of cloud is depend on VM allocation policy. They used genetic algorithm for optimal allocation of VMs to improve the resource utilization and minimizing execution time. After implementing genetic algorithm execution time of cloudlets is minimized compared to FCFS policy.

The paper [3] (Tavana M., 2017) designed a mathematical model using Group Technology to handle consolidation problems like server, task and VM consolidation. The objective of this paper to control several operational cost in cloud computing. They proposed a DCO algorithm based on group technology for consolidation in cloud computing. They considered grouping strategy using Jaccard similarity coefficient, egg lying and immigration of the cuckoos. They got minimum cost using DCOA compared with first fit and round robin algorithm.

The paper [4] (Gourisaria, 2018) describes to maximize utilization of resources, efficient use of power, Quality of service and customization of IT services. They used MaxUtil and ECTC algorithm. Simulation results shows that 70% CPU utilization threshold is energy efficiency in task consolidation.

The paper [5] (Madhu B.R., 2016) describes task consolidation technique to map task into virtual machines to improve the CPU utilization and minimize the energy consumption. They developed task scheduler LRR-MMT technique for scheduling the task and minimizing the energy consumption. They got better results compared to existing round robin approach.

The paper [6] (Hsu C. H., 2014) describes energy aware task consolidation (ETC) technique that minimizes energy consumption. ETC achieve minimizing energy consumption restricting CPU below a specified peak threshold. The performance of ETC technique is compared to MaxUtil algorithm. Using ETC algorithm they reduced power consumption in cloud with 17% improvement over MaxUtil.

Title	Algorithm	Execution Time	Energy Consumption	Cost				Resource Utilization
				Computati on Cost	Energy Cost	Migration Cost	Penalty Cost	
Greedy Approaches for Deadline Based Task Consolidation in Cloud Computing	Priority Queue	No	No	Yes	No	No	No	No
Minimizing Execution Time of Cloudlets through Optimal Allocation of Virtual Machines Using Genetic Algorithm	Genetic Algorithm	Yes	No	No	No	No	No	No
A Discrete Cuckoo Optimization Algorithm for Consolidation in Cloud Computing	DCO Algorithm	No	No	No	Yes	Yes	Yes	No
Energy Saving Task Consolidation Technique in Cloud Centres with Resource Utilization Threshold	ECTC and MaxUtil algorithm	No	Yes	No	No	No	No	Yes
Minimizing Energy Consumption in Cloud Datacentres using Task Consolidation	Task Consolidation and Round Robin	No	Yes	No	No	No	No	No
Optimizing energy consumption with task consolidation in clouds	ETC and MaxUtil algorithm	No	Yes	No	No	No	No	No

Figure 4: Comparative Study

Figure 4 shows the comparative study of existing scheduling algorithm and techniques for task consolidation. We reviewed many research papers and scholarly articles and done comparative study based on several parameters like execution time, energy consumption, cost, and resource utilization.

#### 4. Conclusions and Future Work

There has been extensive research work going on to maximize the resource utilization using task consolidation in cloud computing. We referred many research papers and got many techniques, algorithms and methods to maximize the resource utilization like FCFS, priority queue, round robin, first fit, genetic algorithm, DCOA, MaxUtil and ETC algorithm.

In my future work I want to propose a better solution to maximize the resource utilization in task consolidation with less energy consumption and less cost.

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