Technique to Reduce SLA Violation in Cloud Computing using Efficient Resource Allocation

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

Abstract: Cloud computing is no more a new paradigm and it has gained tremendous adaptation due to its characteristics such as rapid elasticity, availability, pay per use, on-demand self-servicing, resource pooling, metered services etc. The pay per use feature requires Quality of Service (QoS) management to observe and evaluate the services delivered to the Cloud users. To achieve QoS, it needs to follow Service Level Agreement (SLA) which is essentially a contract between the Cloud service provider and Cloud user. Due to the dynamic nature of Cloud and heterogeneity in the architecture of its components, through proper resource allocation, a self-managed technique is essential which aims to reduce SLA violations (SLAV) and results into decrease in user's satisfaction level. In this dissertation, we intend to propose a technique which reduces SLAV through proficient allocation of Cloud's virtualized resources. The experimental results demonstrate the performance of the proposed technique which results into reduction in SLAV.

Keywords: Cloud Computing, Service level agreement (SLA), Resource Allocation

I. INTRODUCTION

The cloud computing is run-through of using remote servers that are hosted on the internet for storage purpose, manage and process data instead of a company's local server. From the specified infrastructure, the IT resources and services are provided with demand basis at a low price in a shared, multitenant and elastic environment, are known as transformational model for the enterprise. In recent trends, enterprises are expecting the cloud computing for helping them to provide a high performance than the existing as well as new, innovative services with a demand basis across network, computing and storage resources at lower price. When the services come to business, the "cloud" is completely different.

The following definition of cloud computing has been developed by the U.S. National Institute of Standards and Technology (NIST):"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction"[6]

The "cloud" provides Software as a Service (SaaS), when a company subscribes for an application, access the service over the internet. A company can develop its own custom applications and its platform for the usage of all consumer, delivered by cloud is Platform as a Service (PaaS). Service providers Amazon, Google providers Amazon, Google and Rackspace provide a backbone that can be rented out by other companies (for example, Netfix provides the services to other companies, but it accesses the services from Amazon). [7] A Service Level Agreement (SLA) is a contract document or a formal negotiated agreement based upon the purpose and objectives that exists between the Cloud Service Providers and the cloud users. It includes the brief terms and conditions upon which the services being provided by the service providers. SLAs gives a transparent view to the cloud users for understanding about the cloud environment, which includes the advantages and disadvantages of the cloud, cloud services, cloud deployment and security issues ,responsibilities, guarantees and warranties of the services. SLA used for measuring, monitoring and reporting the performance of the cloud, based on the user's involvement or the capability to consume the resources. [8]

It is essential to monitor and control the services offered to users by Cloud service provider. Quality of Services (QoS) can be measured by various means. Service Level Agreement (SLA) is one of them. However, ensuring dynamic QoS requirement while reducing SLA violation is a challenging task.

The paper has been organized as under. After this introduction session, we study various techniques pertaining to Service Level Agreement in section-2 viz. related work. We identify few research directions in the domain of reduce SLA Violation through Efficient Resource Allocation in section-3. In section-4, we propose our work which we wish to carry out to achieve Reduce SLA Violation. In section-5 we conclude our research followed by future work and list of references.

II. RELATED WORK

Sukhpal Singh et al [2016] [1] identify the issue of providing exclusive computing resources while maintaining dynamic QoS need and eliminating SLA violation. Authors propose SLA-aware autonomic resource management technique known as STAR while claimed to be reducing SLAV rate. Through real cloud experimental evaluation. Authors claim the proposed mechanism to be efficient in different facts such as execution time, cost, latency, reliability and availability.

Lionel Eyraud-Dubois et al [2013] [2] identify the issue of active resource allocation of virtual machines onto physical machines in cloud computing environment. Authors present an algorithm which is confirming a universal utilization of the resources. Which claimed the algorithm maintains an effective resource allocation through random variations of the CPU intake VMs over time. While keeping a good quality of service by ensuring that SLA Violations are corrected rapidly. It also claimed that at any point in time the universal CPU utilization of the platform is at least 66%.

Linlin Wu et al [2014] [3] is finding the issue of reduce cost and to improve customer satisfaction level (CSL) for define a QoS to establish a SLA. Authors present customer driven SLA-based resource provisioning algorithm to minimize cost by minimizing resource advantage cost and CSL by minimizing SLA violation. Authors claim that customer's and SaaS provider's viewpoints to maximize various KPI criteria, including the total cost number of introduced VMs percentage of SLA violation and service quality improvement. Through simulation authors claimed, the algorithm improved service and the BFResuResource improved most in regard to the service quality.

Jen-Hsiang Chen et al [2015] [4] is finding the issue of VMs in lower utilization host or over utilization host will be migrated to the suitable hosts in an attempt to reduce delays in task processing and avoid SLA Violation. Authors present a technique to evaluate resource allocation and identify which of these VMs can match a suitable host based on economic of the cost and SLA violation penalty. Which claimed a technique improves the process of the service plan for improving a better level of service quality.

H. Morshedlou et al [2013] [5] is finding the issue is decrease user's satisfaction level. That's depend on user's features such character and treat users, based on their SLA parameters. So, two users with different features but similar SLAs have equal importance for the service provider. Authors propose new proactive resource allocation approach for decreasing impact of SLA Violation on user's satisfaction level. While claimed the estimated features can help the service provider to decide about which users should be served and which one can be discarded this can raise user satisfaction level as much as possible and leads to more reliability of users and higher revenue for service provider.

III. PROPOSED WORK

Our Proposed Work:

3.1 Proposed Flowchart
3.2 Proposed Algorithm
3.3 Simulation Scenario
3.4 Proposed Mechanism

3.1 Proposed Flowchart

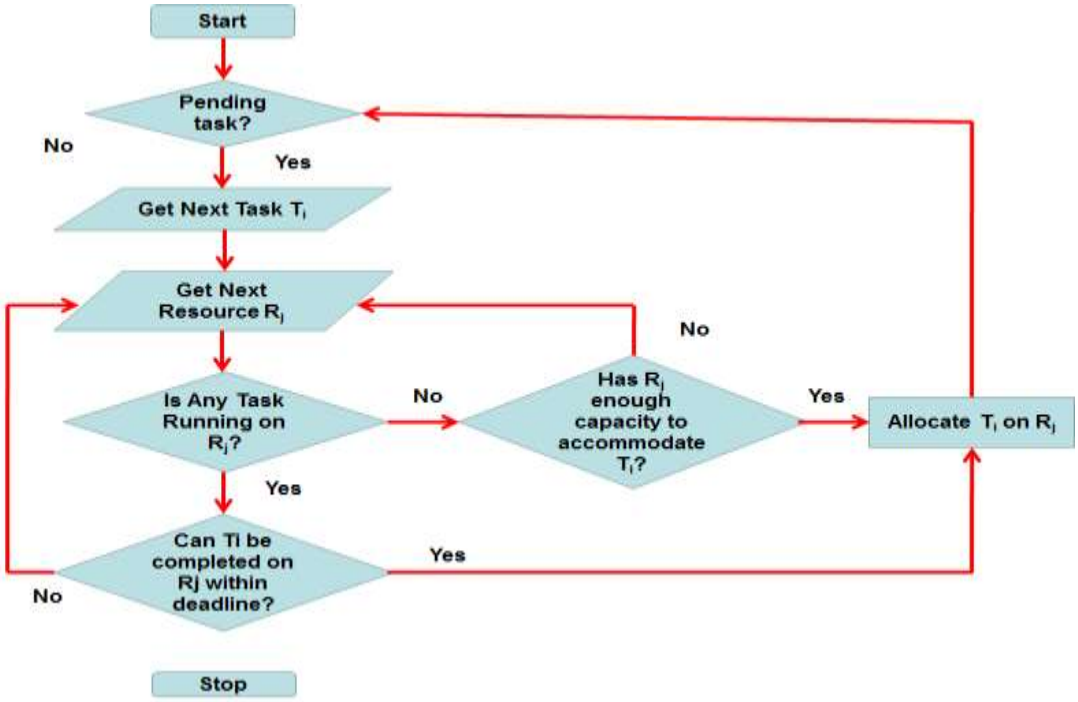

Figure 1.Proposed Flowchart

3.2 Proposed Algorithm

Algorithm: Resource Allocation
Input: Task list T, Resource list R
Output: Mapping of tasks on resources

1. Get next task Ti from the task list T
2. Get next resource Rj from the resource list R
3. If already a task is running on Rj then go to step 6
4. If Rj has not enough capacity to execute Ti then go to step 2
5. Allocate Ti on Rj and go to step 1
6. If Ti can be completed on Rj within deadline then go to step 5

Go to step 2

3.3 Simulation Scenario

Task Specifications:

Table 1: Task Specification

Tasks	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
MIPS	500	1000	1500	800	500	1000	1200	700	600	1300
Arrival / Submission Time (with respect to T)	0	3	5	7	10	15	20	22	25	28
Execution Time (with respect to T)	5	4	6	4	3	5	8	7	6	4
Task Deadline	5	8	8	4	8	7	10	10	6	5

Resource Specifications:

Table 2: Resource Specification

Resource	R1	R2	R3	R4	R5	R6
MIPS	2000	1500	500	800	500	1200

3.4 Proposed Mechanism

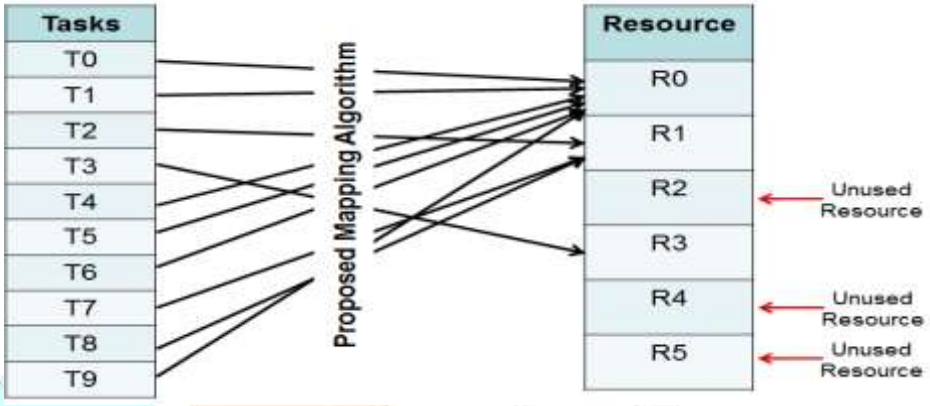

Figure 2. Proposed Mechanism

IV. EXPERIMENTS AND RESULT ANALYSIS

In Existing Mapping Algorithm, one task is unmapped and one resource is unused. Where in Proposed Mapping Algorithm, all tasks are allocated and three resources are unused.so using proposed Mapping Algorithm we reduce the SLA Violation by Efficient Resource Allocation.

4.1 Number of Task Allotted

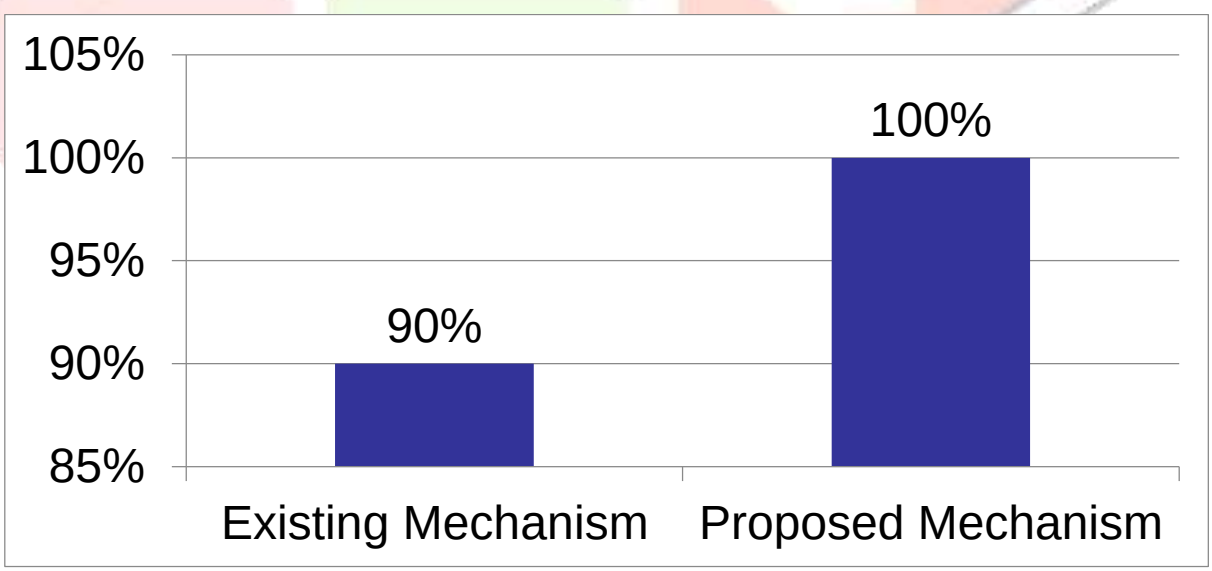

Figure 3. Number of Task Allotted

In Fig.3 shows that in Existing Mechanism 90% tasks are allotted and in Proposed Mechanism 100% tasks are allotted.

4.2 Number of Task Un-Allotted

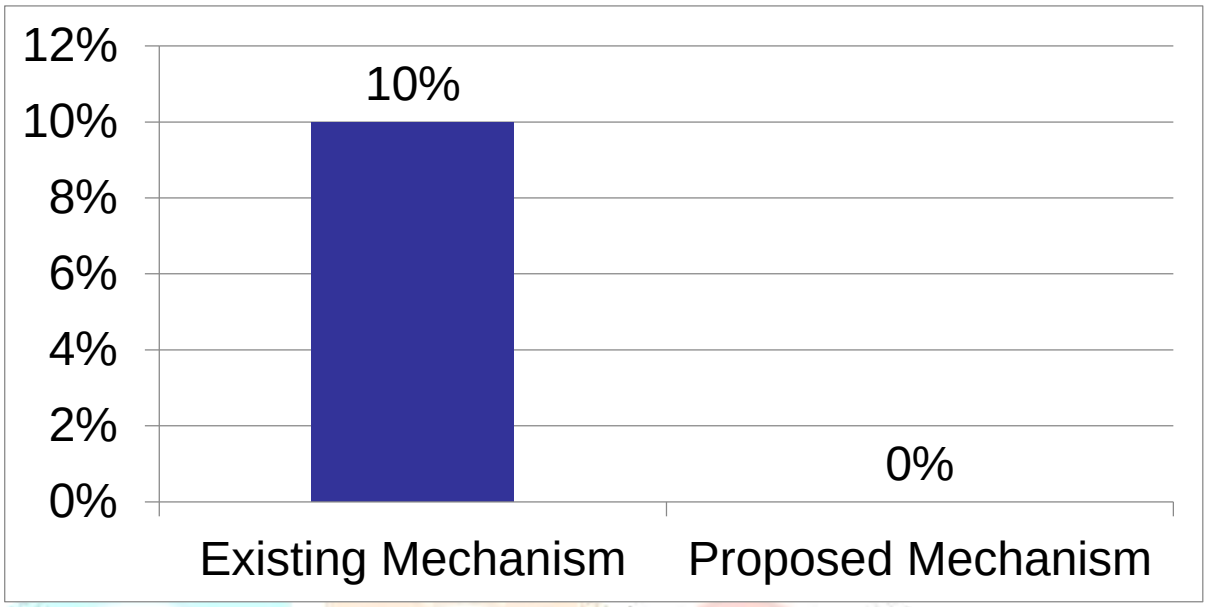

Figure 4. Number of Task Un-Allotted

In Fig.4 shows that in Existing Mechanism Un-Allotted tasks are 10% and in Proposed Mechanism un-allotted tasks are 0%.

4.3 Number of Resources Utilized

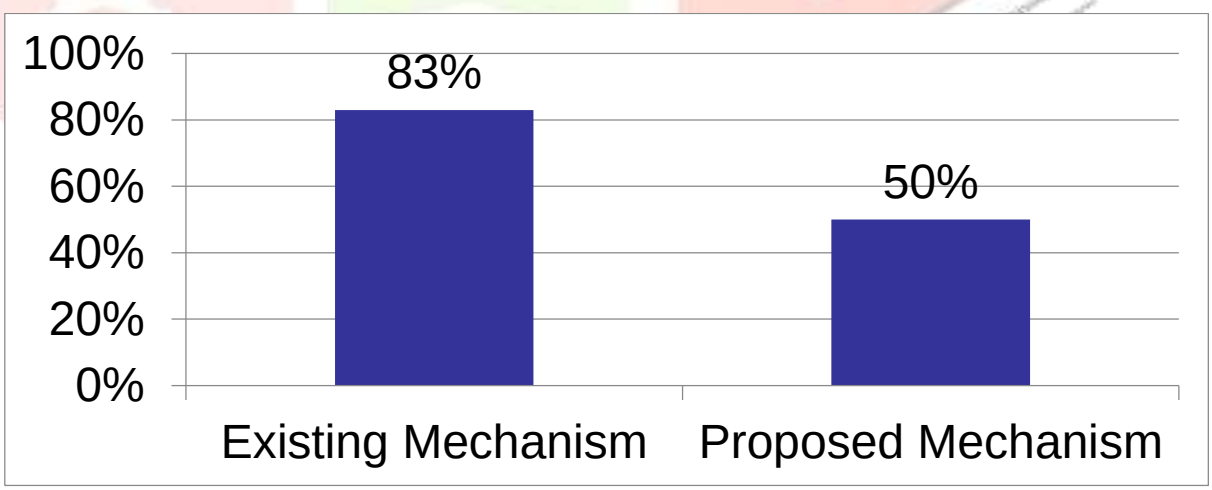

Figure 5. Number of Resources Utilized

In Fig.5 shows that in Existing Mechanism 83% resources are utilized and in Proposed Mechanism save 50% resources are utilized.

4.4 Number of Resources Kept Offline to Save Energy

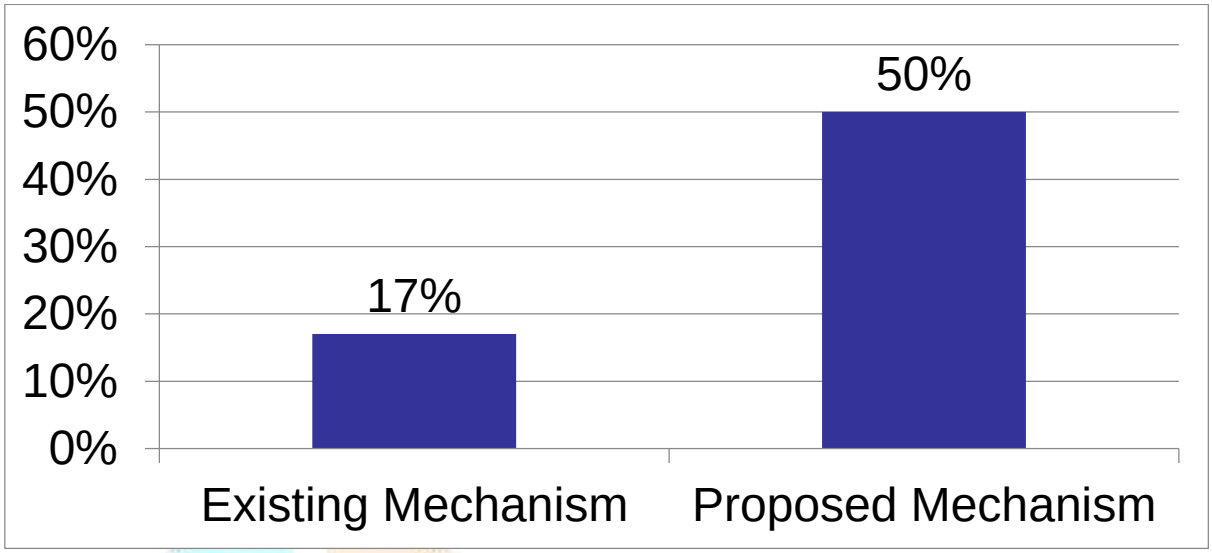

Figure 6. Number of Resources Kept Offline to Save Energy

In Fig.6 shows that the Existing Mechanism saves 17% Energy and Proposed Mechanism saves 50% energy.

CONCLUSION

In this paper, we have identified SLA Violation is main problems in the cloud computing. We Aim to achieve reduce SLA Violation using Efficient Resource Allocation. We proposed Resource Mapping Algorithm. In Resource Mapping Algorithm, minimum resources used and complete all task. Using this method reduce the SLA Violation.

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