Improved Efficient Dynamic Resource Optimization for Cloud Computing

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Abstract: Computing resources are delivered as virtual machines in cloud computing. Such a scenario, scheduling algorithms play an important role where the aim is to schedule the tasks effectively so as to reduce the response and execution time and improve resource utilization. This was achieved in many scheduling algorithm such as EDFRLS and EDRAP algorithms. But still to improve the more Cloud performance an IEDRO algorithm is used. The proposed IEDRO algorithm gives more resource optimization and improve the speed of cloud at the time of data loading and data accessing. The experimental results show that proposed algorithms exhibit better performance under heavy loads.

Keywords: Cloud computing, Scheduling, Resource optimization, Virtual machine.

1. INTRODUCTION

The latest emerging trends in information technology is Cloud computing. Today the IT organizations transfer their information technology to cloud into something with greater business usage. The IT challenges listed below have made organizations think about the Cloud Computing model to provide better service to their customers[1]

The load balancing is a key objective of managing network traffic. It is a technique to distribute workload across multiple physical or virtual machines and parallel network links, to prevent overutilization or underutilization of the resources and to optimize performance. It is provided by a dedicated software or hardware. Load balancing is a process of reassigning the total load to the individual datacenter of the collective VM to make resource utilization effective and to improve the response time of the job. The load balancing algorithm can check the conditions in which some of the nodes are over loaded while some others are under loaded.[2]

The Cloud computing is a collection of interconnected and virtualized computing resources that are managed by one or more unified computing resources. Failures of the virtual machines and disaster cause data loss. As a result, the Cloud environment requires some capability for an adaptive data replication management. The reliability is an important component of trust. It is also called as the success rate. The Reliability is a component to perform the stated functions under stated conditions for a specified period of time

II. LITERATURE REVIEW

Cloud resource pool is a logical abstraction of aggregated physical resources that are managed centrally. Each physical machine and cluster has a parent resource pool that groups the resources of that physical machine or cluster. Administrators may create child resource pools from the parent resource pool. Each child resource pool owns some of the parent's resources[3][4]

A parent resource pool can contain child resource pools, virtual machine discusses both. For each resource pool and virtual machine, reservation, limit, and share can be specified. Reservation, limit, and share are used to control the resources consumed by a child resource pool or virtual machines. To optimize these resources, scheduling and reliability are needed to improve the efficiency in a Cloud computing environment

The load balancing and Reliability has been the emerging research issues recently in Cloud computing. Fast and efficient Cloud computing will be expected from the future generation technology. The efficient Cloud is not possible with the existing structure of present Cloud computing. However, there has been increasing need the Cloud computing emerges many research in Cloud. Many load balancing algorithms and reliability algorithms are available in the Cloud[5][6]

The load balancing is one of the major research challenges in Cloud computing. The Cloud

computing required to distribute the dynamic workload across multiple virtual machines.. The load balancing gives optimal utilization of resources and enhancing the performance of the Data center. A few existing scheduling algorithms can maintain load balancing and provide better strategies through efficient job scheduling and resource allocation techniques

The load balancing is one of the essential factors to enhance the working performance of the Cloud service provider. To improve the resource an optimized load balancing algorithm is needed to utilize resources efficiently[7]

The task scheduling is an essential problem with Cloud computing and the task can't fully meet its demands. The flexible, dynamic task scheduling scheme allocates virtual resources to execute compute tasks and execution process by using improved the completion time and improve the utilization of Cloud resources to achieve load balance. Reliability is an important parameter for validating performance in Cloud computing. Redundancy and resource allocation is an alternative approach to improvement in the Cloud. On the other hand, contemplating reliability irrespective of Quality of Service (QoS) requirements. Management of data reliability has become a challenge [8][9]

The reliability can identified at the time of failure in the VM on Cloud computing. The reliability gives an efficient result in the performance of the Cloud computing. Cloud service providers strive for reliability[10]. Resiliency is the ability of a Cloud-based service to withstand certain types of failure and yet remain functional from the customers' perspective. A service could be characterized as reliable simply because no part of the service has ever failed, and yet the service might not be considered resilient because it has not been tested[11]

The reliability, efficiency and effectiveness in resource utilization are the QoS parameters in Cloud computing systems. The purpose of this parameter is to improve the efficiency of the Cloud. The efficiency is taken as reduce response time, decrease latency and optimize the CPU resource utilization[12][13] Replication provides improved availability, decreased bandwidth of the network and improved scalability such as high data storage. To speed up access, file can be replicated so a user can access a nearby replica [14][15]

2. PROPOSED METHODOLOGY

A Cloud computing is used many data center with many VM based on the physical resources of the Cloud computing. The virtual machines are represented as a VM. Each VM has properties used for processing the VM. The proposed algorithm uses VM properties with parameters.

The IEDRO algorithm allocate the load in efficient VM based on the time consuming and resource level in VM. These two parameters gives more efficient result. Initially the fastest response time VM is identified based on the time limit and assign the priority value. After assign the priority value the resource level percentage is calculated and allocate the first load to first priority VM and so on. This gives fasted load and efficient result than the existing two algorithms.

3.1 Parameters Used in IEDRO

- t_{limit} denotes the limit of the time 1 to 1.5
- M^{max} maximum free memory space
- max_{COUNT} denotes the reliable VM count
- T^U denotes the upper limit of the time 1.5
- T^L denotes the lower limit of time 1.
- SP_i denoted the CPU speed
- M_i Denotes the Memory size
- RLP Denote resource level percentage.

The proposed algorithm IEDRO derive from two existing algorithms and produce the efficient result. The IEDRO take all the efficient proposed parameters in the existing EFRLS and EDRAP algorithms. The proposed algorithm IEDRO use five parameters, resource optimization, speed, delay, identify failure VM and efficiency.

3.2 Resource Optimization: The first parameter is the resource optimization. In this algorithm, it is assumed that the resource are utilized in an efficient manner. The RLP parameter optimizes the resource and load the data in a better way.

$$\text{Latency Rate} = \frac{\sum_{i=0}^{n}(\mathrm{CT_t} - \mathrm{AT_t}) - \mathrm{ET_t}}{n}$$

$$\text{Mean Execution Rate} = \frac{\sum_{i=0}^{n}(\mathrm{FT_i} - \mathrm{ST_i})}{\sum_{i=0}^{n}\mathrm{JS_i}}$$

$$RRL = \sum \frac{\frac{P}{Max_P} + \frac{e^{\log_2 cl} + e^{\log_2 L}}{2e^{\log_2 (L*cl)}} + \mathrm{E}}{n}$$

3.3 Resource Reliability (RR): Reliability of any resource is measured on a reliable scale, thus helping in allocating efficient resources to Virtual Machine speed. The speed is considered between middleware and the VM. The threshold value is assigned as the lower bound of 1 and the lower bound of 1.5. The load is allocated to the fast response VM within the time limit and the remaining VM is taken as secondly.

3.4 Delay: The delay is minimized in the proposed IEDRO algorithm. The delay was taken at the time of data load in the VM. The fast response VM gives less delay.

3.5 Identify Failure VM: The failure VM identification was used at the time data loading. The client sends data to middleware. The middleware sends request to all VM in the datacenter. With the time limit 1 to 1.5. The VM which contains an efficient CPU utilization gives fast response to the middleware. The middleware identifies the failure VM. The VM is assembled based on the response time. The client data is first loaded to fastest response VM within the time limit and so on.

3.6 Efficiency: The efficiency is achieved by a better way than the EDFRLS and RDRAP. The efficiency is calculated by above four parameters. The time limit is measured based on the CPU utilization of the VM. The time limit taken in the proposed methodology is between 1 to 1.5

$$M_{min} \sum_{VM=1}^{n} \rightarrow \int_{1}^{1.5} t_{limit} \leq 1.5$$

The VM responds to middleware based on the theme. The equation (1) gives the result of VM respond within the time

$$\sum_{i=1}^{1.5} \max\left(t^{U}(t)\right) = M^{L}(t_{limit}) \leq t_{limit} \quad \text{_____(1)}$$

The equation (2) gives the result of VM respond exceed the time

$$\sum_{i=1}^{1.5} \max\left(t^{U}(t)\right) = M^{L}(t_{limit}) \geq t_{limit} \quad \text{_____(2)}$$

The equation (3) gives the result of two or more VM respond same time

$$\sum_{i=1}^{1.5} \max\left(t^{U}(t)\right) = M^{L}(t_{limit}) \sum_{i=1}^{n} t_{limit} = VM1 = VM2 = VMn \quad \text{_____(3)}$$

The equation(4) shows the resource level percentage for the VM in the Cloud data enter.

$$RLP = \sum \frac{\frac{P}{Max\,P} + \frac{e^{\log 2\, cl} + e^{\log 2\, L}}{2e^{\log 2 (L*cl)}} + E}{n} \text{----------(4)}$$

The resource utilization is efficiently used in proposed load balancing parameters resource level percentage. The proposed methodology has the combination of the both EDFRLS and EDRAP algorithms.

3. STEPS IN IEDRO

Step 1: The load balancer gets the data from CSP. The load balancer is a middleware intermediate to CSP and data center.

Step 2: The middleware initially sends request to data center to identify the failure and reliable VM. Within the time limit 1 to 1.5. In data center there are multiple VM's are available. The data center receives the request form middleware and transfer the request total VM in the particular data center. All the VM responds the middleware depending upon the status. After collecting all the VM status. Based on the status like failure VM, VM responds within the time, VM respond exceed the time and more VM responds same time limit.

Step 3: The middleware list the VM based on the response time except failure VM. The Middleware allocates the load based on the VM respond time. The middleware allocates the load first the VM respond within the time limit.

Step 3: The VM properties such as total memory, used and free memory utilization, Latency rate and Execution rate are calculated

Step 4: Resource level is calculated using this property and convert into a percentage. This process is done by each VM separately.

Step 5: By applying the Fuzzy rules the resource level is identified Low, Medium and High.

Step 6: The resource is loaded parallel with the percentage identified by the resource level percentage calculation. This

resource level percentage is an efficient parameter this proposed methodology to increase efficiency of the Cloud computing.

4. EXPERIMENTAL ANALYSIS

The experimental and result deals the proposed IEDRO algorithm. The result shows better results than the EDFRLS and EDRAP. The analysis of IEDRO is shown in below.

TABLE 5.1: VM STATUS IN MIDDLEWARE

VM	VM Status	Decision mechanism	Time limit
VM1	True	True	1.142
VM2	True	True	1.477
VM3	True	False	1.695
VM4	False	False	1.916
VM5	False	True	1.213
VM6	True	True	1.119
VM7	True	False	1.743
VM8	True	True	1.456
VM9	True	True	1.235
VM10	True	True	1.428

TABLE5.2 IDENTIFICATION OF RELIABLE VM

VM	VM Status	Reconciliation Computation	Reliability in ms	Priority of VM to allocate Load
VM1	True	True	1.142	2
VM2	True	True	1.277	4
VM3	True	False	1.695	7
VM6	True	True	1.132	1
VM7	True	False	1.695	8
VM8	True	True	1.456	6
VM9	True	True	1.235	3
VM10	True	True	1.428	5

The Table 5.2 shows the reliable VM list based on the performance. The table is derived from the equation (1), (2), (3) and (4). The failure VM is not taken from this list. The load is allocated based on the priority of the VM which satisfies the conditions. The proposed IEDRO gives the efficient result for load balancing algorithm than the EDFRLS. For the better understanding the efficiency of the propose algorithm has been compared with the EDFRLS and EDRAP the new derived algorithm IEDRO gives better result than other two proposed algorithms. The IERO gives an increase in speed and the decrease in delay than the EDFRLS and EDRAP

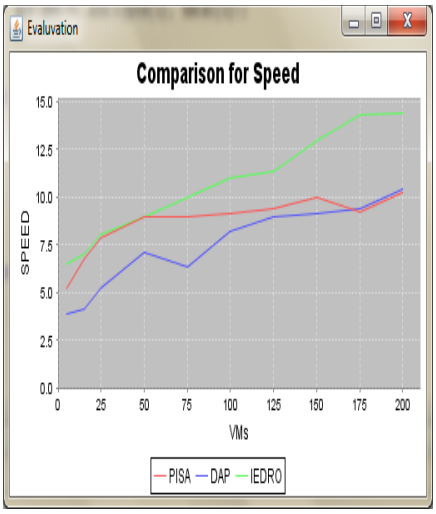

FIGURE 5.2: COMPARISON OF SPEED

The Figure 6.2 shows the comparison of the speed with existing PISA and DAP with proposed algorithm IEDRO. The result shows that the IEDRO gives more speed than other two existing algorithms.

The speed is calculated based on the execution and response time of the VM. The VM speed improvement gives more efficient with the result of Cloud computing.

The dynamic approach is the major challenges in Cloud computing. The existing algorithms gives less performance in Cloud computing. However the issue in Cloud is load balancing at the time of busy time. The existing algorithm gives less solution. The proposed methodology gives more efficient result than the existing algorithm. therefore an attempt is made to increase the speed and decrease the delay in Cloud VM using three different proposed algorithm EDFRLS, EDRAP and IEDRO. Among all the proposed algorithms' IEDRO has the efficient to improve the performance of the Cloud computing environment. All the proposed algorithms are experimented through CloudSim

tool. The requirements, flow chart , architecture and performance analysis of the proposed algorithms have been discussed in this chapter. It is concluded that the IEDRO provided better result than EDFRLS and EDRAP. Therefore the proposed method IEDRO is the efficient method for improving the Cloud performance and more suitable for the load balancing in the Cloud computing environment.

5. CONCLUSION

In this paper the efficient algorithm is introduce to improve the performance of the cloud. The proposed approach of "Improved Efficient Dynamic Resource Optimization" gives the better result and it can be well suited for Cloud computing load balancing. It can be experimented for real world application scenario. In future, the performance can be made with different parameters and it aims to find solutions to improve the throughput of the VM at very high rate with the combination of round robin basis of scheduling.

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