Divisible Load Theory Analytical Hierarchy Process In Cloud Computing

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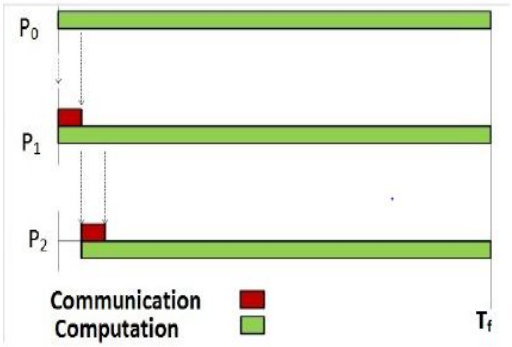
Abstract- *Cloud computing is rising as a new model of large scale distributed computing. In these systems a large amount of data is used which is distributed between many systems. The main challenge is dividing the data. One of the method proposed for managing data distribution is called Divisible Load Theory (DLT). For many years divisible load theory has evolve as an area of research which is getting popular day by day. According to the divisible load theory the computations and communications may be divided into some independent parts arbitrarily and separate parts can be processed individually by a processor.*

Divisible load theory is a methodology involving the linear and continuous modelling of partitionable computation . It adequately represents an important class of problems with applications in parallel and distributed system schedulling, various types of data processing, scientific and engineering computation, and sensor networks.

Keywords– Cloud computing; Divisible Load Theory; Priority; multi criteria; AHP Divisible Load Scheduling

I. INTRODUCTION

In general, DLT assumes that the computation and communication can be divided into some parts of arbitrary size and these parts can be independently processed in parallel by processors as bellow figure. DLT assumes that initially amount of load is held by the originator P0. The originator does not do any computation. It only distributes α1, α2, α3, ... , αm fractions of load on worker processors P1,P2,...,Pm. The condition for optimal solution is that all the processor stop processing at the same time. This fraction of load must be allocated based on criteria and priorities.



INTRODUCTION ABOUT ANALYTICAL HIERARCHY PROCESS

Thomas Saaty developed a multi-criteria decision making method that is called Analytical Heretical Process that consider Criteria's. AHP consists of three levels including objective level, attribute level and alternative level. AHP permits model with complex problem in a hierarchical structure, showing relationships between goal, attributes and alternatives [7]. AHP is made up of several componentlike hierarchical structure, pairwise comparisons, judgements and consistency considerations [7]. AHP provides solution by dividing the problem into the sub problems for easy evaluation, mostly in the form of hierarchy. AHP method consists of following steps [8].

- First the problem is splitted into hierarchy of goal, objective and alternatives.
- In the pairwise comparisons of alternatives Data are collected from decision maker's relatives to hierarchic structure,.
- Pairwise comparisons of various criteria is generated from the step 2and comparison matrix is made.
- From the comparison matrix we find the eigenvalue and its corresponding eigenvector that gives the relative importance of various criteria being compared.
- Consistency of matrix of order n is calculated. The comparisons may be re-examined, if the consistency rate

fails to reach required level. The ratio of Consistency Index (CI) to Random Index (RI)is defined as Consistency Rate (CR). Where CI= (γmax –n) / (n-1)

- Local ratings with respect to each objective is obtained by multiplying the ratings of each alternatives by weights of objective to get.

II. APPROACHES OF DIVISIBLE LOAD SCHEDULING

2.1 Optimal work load allocation model for scheduling divisible data grid applications

[5] In this paper a new model called the IDLT (Iterative Divisible Load Theory) is introduced. This model provides the optimal work load allocation in effective manner and is also being used for scheduling divisible data grid applications. The results claim that the proposed IDLT model was able to give almost optimal solution for single source scheduling. Hence can efficiently balance the processing load [5].

2.2 Cost-Based multi-Qos job scheduling using divisible load theory in cloud computing [9]

In this paper the DLT is used for efficient scheduling jobs by minimizing the overall processing time in computing cloud environments. In analysis it considers homogenous processors and derive effective solution for the load fraction that is assigned to all processors. The scheduling of job is done in such a way so that cloud provider can gain maximum benefit and provide Qos to users and studies with rigorous simulation studies [9].

2.3 A Priority based job scheduling algorithm in cloud computing [11]

In this paper a priority based job scheduling algorithm called PJSC is used. This algorithm uses the theory of AHP, Analytical hierarchy Process. PJSC algorithm works on the basis of multi criteria decision making model. The PJSC algorithm provides a discussion about some issues such as complexity, consistency and finishing time. Evaluation result of this algorithm has reasonable complexity also it decrease finishing time (Makespan) [11].

2.4 A New Load Balancing Scheduling Model in Data Grid Application [10]

In this paper a new model namely Adaptive Task Data Present (ATDP) model is used which reduces the makespan. They try to balance the load by considering the whole system, in other words the node speed fraction was calculated together with communication time. Here both communication and computation time are considered [10].

III. A2DLT: DIVISIBLE LOAD BALANCING MODEL FOR SCHEDULING COMMUNICATION-INTENSIVE GRID APPLICATIONS[12]

In this paper a new model named as A2DLT is used which considers both the communication time as well as computation time. A2DLT models are better than TDP because in TDP model input transfer time is not considered. But this model also faces a challenge which is that it transfers data to the working node from site without considering bandwidth and processing capability of the working node [.12] Here one of the comparisons table is given which compares all the approaches.

Comparison Table

Approaches	Advantages	Disadvantages	Parameter
Optimal work load allocation model for scheduling divisible data grid applications [5]	Iterative DLT model is designed for optimal work load allocation	Model is capable for producing an optimal solution for single source scheduling	Makespan
Cost-Based multi-Qos job scheduling using divisible load theory in cloud computing [9]	DLT based optimization model is designed for getting better overall performance	Machine failure, communicatio- n overheads and dynamic workloads are not considered	Load Balancing, Qos, Makespan, Cost
A Priority based job scheduling algorithm in cloud computing [11]	Priority is considered for scheduling designed based on multi criteria decision making model	Makespan consistency and complexity of the proposed method can be considered for improvement	Makespan
A New Load Balancing Scheduling Model in Data Grid Application [10]	Adaptive Task Data Present (ATDP) model which reduces the makespan.	Does not consider other parameters	Makespan
A^{2}DLT: Divisible Load Balancing Model for Scheduling Communication- Intensive Grid Applications [12]	Reduce the makespan	System can't handle the large number of data file	Makespan

IV. CONCLUSION

In this paper, we analyse the divisible load scheduling methods for dividing the load and allocate the load to the virtual machine so that we can achieve more resource utilization. A brief of the algorithm is introduced and discussed in this paper. The issues of the algorithm are addressed so that more efficient scheduling technique can be developed in future which can fulfill the various parameters and increase the performance of the system.

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