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ENHANCEMENT OF CLOUD WORKFLOW SCHEDULING IN RESOURCE RENTING

P.V. NAGANJANEYULU[1], G.NAGARJUNA[2]

[1] PG Student, Eswar College of Engineering, Narasaraopet

[2] Asst.Professor, Eswar College of Engineering, Narasaraopet

Abstract: Cloud computing is a new resource provisioning mechanism, which represents a convenient way for users to access different computing resources. Periodical workflow applications commonly exist in scientific and business analysis, among many other fields. One of the most challenging problems is to determine the right amount of resources for multiple periodical workflow applications. In this paper, the periodical workflow applications scheduling problem with total renting cost minimization is considered. The novelty of this work relies precisely on this objective function, which is more realistic in practice than the more commonly considered makespan minimization. An integer programming model is constructed for the problem under study. A Precedence Tree based Heuristic (PTH) is developed which considers three types of initial schedule construction methods. Based on the initial schedule, two improvement procedures are presented. The proposed methods are compared with existing algorithms for the related makespan based multiple workflow scheduling problem. Experimental and statistical results demonstrate the effectiveness and efficiency of the proposed algorithm

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1. INTRODUCTION

Cloud computing is a novel market-oriented distributed computing model enabling convenient access to a pool of sharable computing resources (e.g., networks, servers, storage) potentially distributed and in a seamless and straightforward way. In the Cloud, resources are owned by Cloud Service Providers (CSP) and are encapsulated as services. Basically, users do not need to own resources which effectively spares them from expensive purchases and no less expensive run and maintenance costs. By renting resources from service providers for their requirements, users need to pay whenever they make use of the cloud computing services. In other words, cloud computing makes it convenient for users to access resources from anywhere and anytime with significant enhanced convenience and greatly reduced costs.

The weather forecasting model (workflow application) is calculated every hour to analyze the weather information and weather forecasting users collect the weather information every hour.

Note that rented resources are paid by period and if a rented resource is not used for the whole period, that capacity is lost. Therefore, resource sharing that unused rented resources can be further used for other tasks.

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2. LITERATURE SURVEY

Literature survey is the most important step in software development process. Before developing the tool it is necessary to determine the time factor, economy n company strength. Once these things r satisfied, ten next steps are to determine which operating system and language can be used for developing the tool. Once the programmers start building the tool the programmers need lot of external support. This support can be obtained from senior programmers, from book or from websites. Before building the system the above consideration r taken into account for developing the proposed system.

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A self-adaptive learning particle swarm optimization for minimizing the cost of outsourcing deadline constrained tasks in hybrid IaaS clouds. The short-term resources provisioning for workflow applications with the ondemand option is usually considered in the existing literature.

There are no existing benchmarks for the considered problem. To fairly compare different procedures, instances are randomly generated according to the characteristic of the problem.

The best resulting combination procedure (PTH) is compared with the existing method. As the tested algorithms are for long-term resource renting, only the performance (cost) is taken into account. The CPU time of each algorithm is not considered. RPD (Relative Percentage Deviation) is adopted to evaluate the performance.

A Balanced Time Scheduling (BTS) algorithm to allocate homogeneous resources to a workflow within a user-specified finish time according to the reserved strategy. Allocating heterogeneous resources to workflow applications was not considered. In a following work the Partitioned Balanced Time Scheduling (PBTS) algorithm was presented for homogeneous resources in which resources were provided with the On-demand option.

Each task of workflows was executed only on one resource (processor). Resources were limited and cost minimization was not

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considered. Therefore, the problem of scheduling multiple periodical workflow application with different arrival times has not been considered yet in cloud where resources are regarded as unlimited and shareable.

Given a set of workflows with different resource requirements and deadline constraints, a Synchronization based Workflows Combination procedure (SWC) is proposed to combine multiple workflows into a big single workflow. Resources are unlimited and shareable between tasks of different workflows, tasks of different workflows can be considered as parallel tasks and be executed concurrently.

3. EXISTING SYSTEM

A self-adaptive learning particle swarm optimization for minimizing the cost of outsourcing deadline constrained tasks in hybrid IaaS clouds. The short-term resources provisioning for workflow applications with the ondemand option is usually considered in the existing literature.

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4. PROPOSED SYSTEM

A Balanced Time Scheduling (BTS) algorithm to allocate homogeneous resources to a workflow within a user-specified finish time according to the reserved strategy. Allocating heterogeneous resources to workflow applications was not considered. In a following work the Partitioned Balanced Time Scheduling (PBTS) algorithm was presented for homogeneous resources in which resources were provided with the On-demand option.

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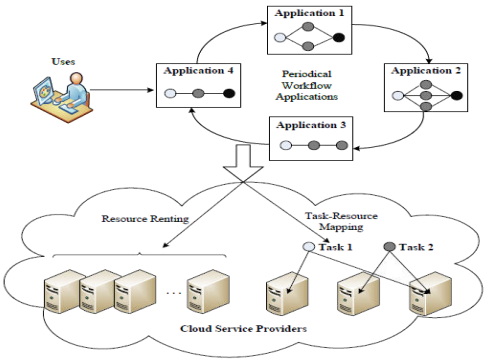
5. ARCHITECTURE



Relationships between users and cloud service providers.

6. IMPLEMENTATION

Implementation is the stage of the project when the theoretical design is turned out into a working system. Thus it can be considered to be the most critical stage in achieving a successful new system and in

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giving the user, confidence that the new system will work and be effective.

The implementation stage involves careful planning, investigation of the existing system and it's constraints on implementation, designing of methods to achieve changeover and evaluation of changeover methods.

Workflows Combination and Parameters Initialization (WCPI)

Given a set of workflows with different resource requirements and deadline constraints, a Synchronization based Workflows Combination procedure (SWC) is proposed to combine multiple workflows into a big single workflow. Resources are unlimited and shareable between tasks of different workflows, tasks of different workflows can be considered as parallel tasks and be executed concurrently.

The Precedence Tree based Heuristic (PTH) is proposed for the considered problem. PTH consists of three phases: Workflows Combination and Parameters Initialization (WCPI), initial schedule Construction Methods (CM) and Schedule Improvement Procedure (SIP). WCPI considers the features and constraints of different workflows and combines them into a big single workflow. Relative parameters will be initialized and used in CM and SIP. Different types of rules are proposed in CM to construct the initial schedule for the considered problem. SIP contains two main improvement procedures, which decrease the resource renting cost by mode and resource adjustments.

Initial Schedule Construction Methods (CM)

To construct a schedule for the considered problem, the main aspect is to determine the execution mode and start time for each task. A precedence tree based enumeration scheme is established in this section to find one possible solution. Based on the enumeration scheme, different types of rules are proposed to construct a schedule.

The precedence tree based enumeration procedure starts from the dummy start task v0. Two sets including the complete set CS and the eligible set ES are calculated at each level of the enumeration tree. The complete set CS contains all scheduled tasks. Activities vj with all the predecessors in the complete set CS are added to the eligible set ES.

Schedule Improvement Procedure(SIP)

Resources are always used in an unbalanced way in the initial schedule, i.e., a great number of resources are required in some periods while a small amount of resources are needed in other ones which may result in high resource renting costs. Therefore, the Schedule Improvement Procedure (SIP) is developed to balance the resource utilization. SIP consists of two processes: Moving and Mode based Peak Elimination procedure (MMPE) and Resource based Adjustment Procedure (RAP). The MMPE eliminates the peak demand of the resources by adjusting the schedule and mode of the initial solution. RAP reduces the renting cost by decreasing the amount of expensive resources and by increasing the amount of cheaper resources.

The MMPE tries to relocate each task vj between estj and lstj or to change its

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available execution mode in order to reduce the peak demand of the resource. In other words, tasks are moved from busy time slots to relatively idle time slots and eventually the total resource utilization is balanced.

7. CONCLUSION AND FUTURE WORK

In this paper the multiple periodical workflow scheduling problem with cost minimization is considered regarding the long-term resource rental relationship between the users and the CSP. The precedence tree based heuristic (PTH) is developed for the considered problem which contains a Synchronization based Workflows Combination procedure (SWC), three types of precedence tree based initial schedule Construction Methods (CM) and a mode and resource based Schedule Improvement Procedure (SIP). The proposed PTH is compared on randomly generated instances with algorithms for the similar makespan based multiple workflow scheduling problem. Experimental results demonstrate that the one-step heuristic with dynamic is the best initial schedule construction method no matter the number of workflows, tasks, modes or types of resource. The SIP has a greater influence on the performance of the PTH. The performance of MMPE increases with the rising in the number of execution modes while RAP increases with the rising in the types of resource. The combination of MMPE and RAP gives the best result when comparing to other adapted algorithms. The proposed PTH is also compared with the adapted algorithms on a simulated real public cloud. PTH saves a lot of cost for both Montage and LIGO applications while comparing with resource provisioning with only on-demand instances. Few works have been carried out on the multiple workflows scheduling problem. The proposed schedule construction and improvement procedures can be easily adapted to other workflow based scheduling problems. Future work might include more accurate models to predict the arrival of workflows. Problems with resources that are not sharable between workflows are also worth considering.

REFERENCES

[1] E. Deelman, D. Gannon, M. Shields, and I. Taylor, "Workflows and e-science: An overview of workflow system features and capabilities," Future Generation Computer Systems, vol. 25, no. 5, pp. 528–540, 2009.

[2] D. A. Brown, P. R. Brady, A. Dietz, J. Cao, B. Johnson, and J. McNabb, "A case study on the use of workflow technologies for scientific analysis: Gravitational wave data analysis," in Workflows for e-Science. Springer, 2007, pp. 39–59.

[3] AmazonEC2, "Amazon elastic compute cloud (Amazon EC2)," http://aws.amazon.com/ec2/pricing, 2014.

[4] M. Xu, L. Cui, H. Wang, and Y. Bi, "A multiple QoS constrained scheduling strategy of multiple workflows for cloud computing," in IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA 2009). IEEE, 2009, pp. 629–634.

[5] L. F. Bittencourt and E. R. Madeira, "Towards the scheduling of multiple workflows on computational grids," Journal of grid computing, vol. 8, no. 3, pp. 419–441, 2010.

[6] J. Yu and R. Buyya, "Scheduling scientific workflow applications with

International Journal For Recent Developments in Science & Technology
2581-4575
Crossref
A Peer Reviewed Research Journal

deadline and budget constraints using genetic algorithms," Scientific Programming, vol. 14, no. 3, pp. 217–230, 2006.

[7] E. Demeulemeester, W. S. Herroelen, and S. E. Elmaghraby, "Optimal procedures for the discrete time/cost trade-off problem in project networks," European Journal of Operational Research, vol. 88, no. 1, pp. 50–68, 1996.

[8] E. Demeulemeester, B. De Reyck, B. Foubert, W. S. Herroelen, and M. Vanhoucke, "New computational results on the discrete time/cost trade-off problem in project networks," Journal of the Operational Research Society, vol. 49, no. 11, pp. 1153–1163, 1998.

[9] O¨ . Hazır, M. Haouari, and E. Erel, "Discrete time/cost trade-off problem: A decomposition-based solution algorithm for the budget version," Computers & Operations Research, vol. 37, no. 4, pp. 649–655, 2010.

[10] H. Topcuoglu, S. Hariri, and M.-Y. Wu, "Performance-effective and low-complexity task scheduling for heterogeneous computing," IEEE Transactions on Parallel and Distributed Systems, vol. 13, no. 3, pp. 260–274, 2002.

[11] A. Radulescu and A. J. Van Gemund, "A low-cost approach towards mixed task and data parallel scheduling," in International Conference on Parallel Processing (ICPP2001). IEEE, 2001, pp. 69–76.

AUTHORS PROFILE

P.V.NAGANJANEYULU is a student pursuing M.Tech(CSE) in Eswar college Of Engineering, Narasaraopet, Guntur

G. NAGARJUNA M.Tech in Computer Science & Engineering. He is currently working as an Asst Professor in Eswar College of Engineering, Narasaraopet, Guntur, India. He is having about 10 years of teaching experience in different Engineering Colleges.