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Convinced Resume Point Strategy Based On Job Characteristics and Resource Availability

Maheswari.R¹, Jayanthi.S², Praveena.R³, Aswiga.R.V⁴

Abstract: *In vast many organizations are increasingly turning to the cloud because it providing ease of access to resources, cost-effective mechanism, enhanced Collaboration, limitless flexibility, security etc., of running resource-intensive applications. Cloud systems are very economical and useful for businesses of all sizes. It helps in optimal utilization of resources and hence in enhancing the performance of the system. Resource management is one of the main challenges in cloud computing which is required to allocate the jobs or requests from cloud users towards multiple resources available in cloud. In this paper we show how the résumé points is to be fixed for the jobs submitted to the resources in the cloud. These resume points which are fixed during the process executing in the resources, based on the job characteristics and resources availability. It also checks whether the resources working properly, if not it restarts the execution from its last proper working résumé point. A convinced résumé point strategy is proposed to improve the performance by reducing the cost and reducing the execution time by applying the knowledge of job characteristics and resource availability.*

Keywords: Jobs, Resources Availability, Résumé point, Job Characteristics.

I. INTRODUCTION

Cloud Computing has come into view as a new paradigm for managing, deploying and contribute services through a shared infrastructure. The term “Cloud” is the default symbol of the internet in diagrams and “Computing” which means Computation, Coordination logic, Storages etc. Cloud computing environment can provides one or more of the requirements as Pay-Per use basis. Cloud computing becomes visible in a way that provides on-demand resources to the users, so as to precede locally available computational power, delivering new computing resources whenever necessary. With the use of computing resources (hardware and software) that are delivered as a service over a network. It Provisioned and Released with minimal management effort; dynamically scalable infrastructure for Computation, application hosting, content storage and delivery The Basic Idea of cloud computing is that Reuse of IT facilities, ease of organize the services with very low expenses and constant operational expenses leading to variable pricing schemes and reduced opportunity costs. It leverages the economies for both services providers and users of the cloud.

Forrester defines cloud computing as:

“A pool of abstracted, highly scalable, and managed compute infrastructure capable of hosting end-customer applications and billed by consumption.”

CLOUD computing provides different computing resources are made accessible over the Internet to remote user as services. The projected benefits of cloud computing are very compelling both from a cloud consumer as well as a cloud services provider perspective.

The Services provided by the cloud are Software as a service(SaaS), Platform as a Service (PaaS), Infrastructure as a Service (IaaS) are the basic fundamental services. The other services like Data as a Service (DaaS), Network as a Service (NaaS), everything as a Service (XaaS) etc., are all provided by the cloud. The main services description is given below:

1. **Software as a Service (SaaS):** In this model, cloud user can be able to access the software application and storages. Only one instance is running in the cloud which is accessed by multiple end users. In customer side there is no need of any investment for software’s licenses or servers.

Example: Xactly, Salesforce.com, NetDocuments, Zoho, Google Apps., eVapt, etc.,

2. **Platform as a Service (Paas):** In this layer the software platform or software development environment is provided as a service for the cloud users. The cloud users can develop their own software using cloud platform without any cost and complexity of buying and managing the hardware’s and software’s.

Example: Infobright, Google BigTable, Amazon simpleDB, Force.com etc.,

3. **Infrastructure as a Service (Iaas):** This layer provides its Network, storage, capacity and computing resources as a service. The cloud user can give access to the virtualized components to build their own IT platforms.

Example: Amazon S3, Nirvanix, Terramark, Rightscale, App Nexus etc.,



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II. RELATED WORK

A “cloud” is dynamic. In this resources can be added or removed to fit the need. Rapid, request driven provisioning and it is lower total cost of operations. In cloud only “pay for what you use” mechanism is used. Cloud also consists of both redundant systems as well as redundant physical sites. It provides new API’s which gives independent access to the resources. There are some cloud offerings available, for example, in Microsoft Azure we are having Cloud API’s, Resource Management, Resource Abstraction and Claims Based Authentication. [1]. If the scheduler detects the resource that can be withdrawn, a message is sent to the resource pools which proceed with the process. They invent a mechanism that enables the execution of jobs inside a user-defined deadline [2]. The resource provisioner has to take care of the process for allocating the resources to the virtual machines which is to be utilized optimally. To utilize the resources within the cloud an optimum cost based on performance factor is proposed. This factor depends on overall cost, channel cost, reliability and popularity factor in [3]. The Green Cloud Computing is to achieve a balance between the resource consumption and quality of service. To achieve this and to maintain its flexibility of cloud, dynamic resource provisioning and resource allocation strategies to optimize the use of cloud resources without decreasing the availability. They proposed two strategies both aimed to optimize the energy of resource without reducing service availability. It achieves 87% of the consumption reduction by comparing standard clouds with the Green Clouds [4]. In IaaS dynamic cloud the running time and the resource utilization of cloud applications; an efficient checkpoint restart mechanism is the dominant issue. Here a solution that minimize the storage space and performance overhead of checkpoint restart. A method that controls virtual machine (VM) disk-image multi-snapshot ting and multi-deployment in the checkpoint-restart protocols running at guest level in get efficient capture and potentially roll back the complete state of application, which consists of file system modifications [5]. Based on a check pointing/restart mechanism they aim to optimize fault tolerance techniques. They consider three steps they are: first, deriving a formula to compute the optimal number of checkpoints for cloud jobs with varied distributions of failure events. Secondly, an adaptive algorithm designed to optimize the impact of check pointing various costs like check pointing/restart overhead and finally evaluate with real cluster environment [6].

III. PROPOSED WORK

In our proposed work, during the execution of a job submitted to the resources in IaaS layer, we checking that, the resource is working properly. So that we are using resume point to resume the processing job for some few seconds, to check whether the job is running without any error. Here we are using two states as: true and false. Let us consider the resume point takes p seconds to store the state of the job and q is the time taken to restart from its recent resume-point if the job found as failed. The cost is calculated for each state such as resuming the job and restarting the job. The cost is denoted by c . Also the resume point setup cost and recovery cost must be calculated.

Resume Point setup cost (RPC): It is that the suspended job for c_0 seconds to store the job state.

Recovery Cost (RC): The time required for a failed job to restart from recent active resume point.

Let us consider that the job has been successfully executed at the given time, and then the particular job’s resume points are to be deleted. It is not needed any more. In this case those resume points which takes some c seconds for every resume points it interrupts the job from its execution and that are to be noted. Once the particular job completed its execution then there is no needs of that resume points and the cost also. Also that the resume points cost must be minimized.

Time taken = $p * c$ where $T < (Jobs\ execution\ time + Cost)$

In other case, if the job is failed which is identified during the resume point, then that job should be restarted again from the last proper working resource resume points. We have to analyze that particular resource for its failure and recover the system from its failure. It may take some time q from its recover. Once recovered then the resource must be restart from its resume point where its last stage of proper working. The cost for resuming the job and restarting the job again is to be calculated. But it should not exceed the job’s execution cost.

Total Job’s execution cost $< (Cost\ for\ resuming\ the\ job + Cost\ for\ restarting\ the\ job)$

If suppose the cost exceeds the cost for resuming the job with cost for restarting the job then the particular job must be discarded. We have to restart the job from it’s from first stage of execution because it leads to less execution cost. But each time it is not possible if the job is larger.

The resources may have some reasons like system failure, power failure, software fault, etc., for its failure. Due to these reasons the particular resources may stop its execution at any time. So that, we prefer these resume points to know that the assigned jobs are executing properly. These issues rely on both job characteristics and



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resource availability. For example, if the job having shortest execution time then there is no need of resume point, it may be unnecessary. Like that, for the jobs having longest execution time resume point is advisable and the resume-point interval should be optimized.

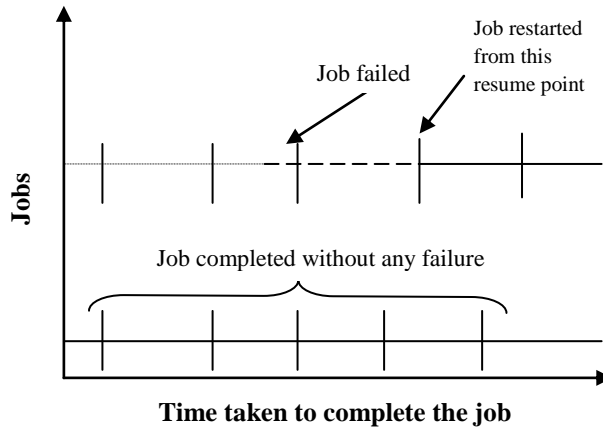
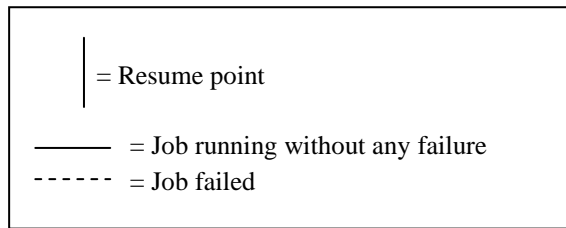


Fig. 1. Job vs. Time



IV. SYSTEM OVERVIEW

Convinced resume point mechanism (CRPM) is a framework based on resource availability and job characteristics. It explores that the resume point data are stored in sharing storage resources with high reliability. The system level resume point is not considered instead we are considering the application-level résumé point because it can be activated by running the application or the job scheduler. The Architecture is shown in fig. 2. It consists of main components like Cloud /user’s application interface, Scheduler, resource management and job management.

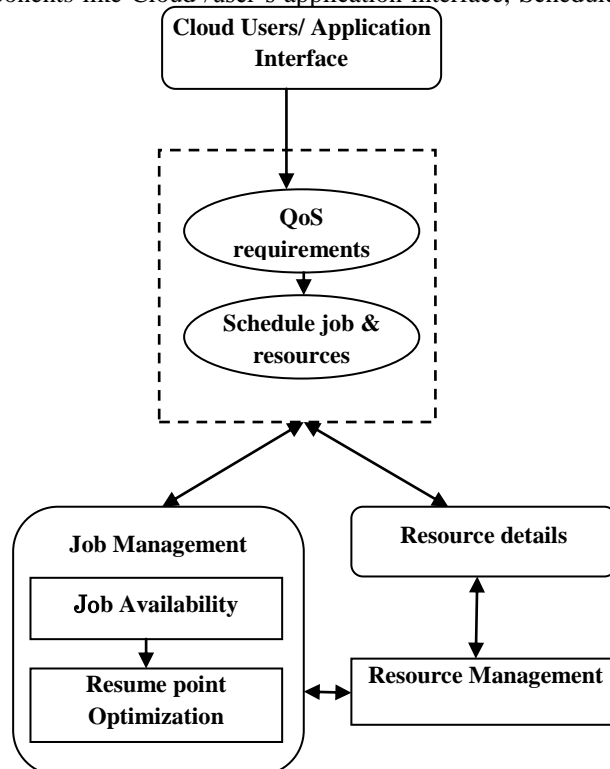


Fig.2. Architecture



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Cloud User's/Application interface:

The Cloud users/ application interface which includes the QoS (Quality of Service) requirement interface and cloud user checkpoint interface. With these interfaces, users can submit jobs with the required QoS and also specify the résumé point interval.

Scheduler

The Scheduler schedules the resources to the jobs according to the available information. It is in charge of collecting the information of various resources also.

Job Management

The job management which specifies the job's characteristics, its availability to the resources, job scheduling, job fault tolerance and job monitoring.

Resource Management

The resource management manages the details or information about the resources. Information's about resource availability, resource utilization, resource fault, resources capacity, working condition, computing power, data, network, storage etc. The resource management component includes service broker, data broker, and data center. We focus mainly on the checkpoint fault tolerance. As shown in Fig. 2, the job scheduling can be divided into two phases. First, user submits a job with the required QoS. The scheduler analyzes the QoS requirements and makes scheduling decision by consulting with resource details. By implementing the CRPM, it requires successful mechanisms for job completion time and resource availability prediction. We have developed prediction methods that achieve high accuracy as well as higher efficiency.

Convinced Resume Point Strategies (CRPS)

It developed two resume point strategies based on the job characteristics and resource availability they are: resume point job choosing policy and resume point interval optimization policy. Resume point job choosing policy aims at determining whether to resume point a job, checkpoint interval policy is to identify optimal resume point intervals for a job.

Resume point Job Deciding Approach

Resume point Largest Job

It aims to only resumepoint the jobs whose execution time exceeds certain duration and the reliability of success execution of jobs is less than the specified time. The basis is that for shortest job, even if system misses resumepoint, the job does not run too long to incur significant work loss while resource failure occurs. Here, whether a job is long or not depends on the execution time of job on resources rather than the completion time. During the waiting time of job on the scheduled resources, resume point is meaningless. Only the resume pointing during the Execution time (ET) is meaningful and can reduce the work loss. CRPS defines the longest job based on the execution time and success ratio of job on resources. For example, the job whose execution time exceeds an hour(it can be pre-specified) and whose execution success ratio is less than 90%(it can be pre-specified) can be referred as the longest job.

Algorithm 1: Resumepoint job deciding algorithm

Input: Scheduled jobs

Output: Resume points to the jobs

1. **for** each scheduled job **do**
2. **if** Jobs belonging to the largest job policy **then**
3. Allocate the Resume points to the jobs
4. Continue;
5. **endif**
6. **if** jobs belonging to the very shortest job policy **then**
7. No need for Resume points
8. Continue;
9. **endif**
10. Calculate the Completion time of the job as:
 Completion time = (Waiting time of the job for resource (WT)
 + Time for fetching the data required for execution (TF)



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+ processing time of the job in resource (PT))

11. Execution time = (TF + PT + TO)

Where TO be the time to output the processed data and results

12. **if** Execution Time $> T_{\text{threshold}}$ and Completion time $< S_{\text{threshold}}$ **then**

13. Allocate the Resume points to the jobs

14. **endif**

15. **endfor**

According to the *algorithm 1*, the inputs are the jobs which are scheduled according to the available resources. The output is that, allocating the resume points to the jobs which are of largest job. It is analyzed by the algorithm. If the job is largest then it is allocated the resume points to the jobs without need of any calculation. For the very shortest job there is no need for resume point. If not of both mentioned characteristics then proceed by calculating the job Completion time, Execution time. $T_{\text{threshold}}$ and $S_{\text{threshold}}$ denote the threshold of Execution time and reliability of job success execution, respectively.

V. EXPERIMENTAL ANALYSIS

We analyze the process of this algorithm, by allocating the jobs to the resources and find that the resumepoint mechanism is needed or not. If needed then find that the job is largest or smallest. If it is largest then the resume points at some user specified intervals is to find whether the jobs are executing properly (i.e., without any errors of resources). Also find that the particular resumepoint mechanism which reduces cost and the execution time which is shown in graphs given below. In fig.3a. Cost of the job executing and the number of the jobs allocated to the resources. Here the number of the jobs must be higher but the costs have to be reduced. It shows that, the time for the resume points fixed for the largest jobs leads to be less and also the cost is to be reduced. In fig. 3b. the execution time for the job and the number of jobs allocated to the resources is considered. It is clear that the jobs must be higher but the efficiency is to be higher and the Execution time should be minimized.

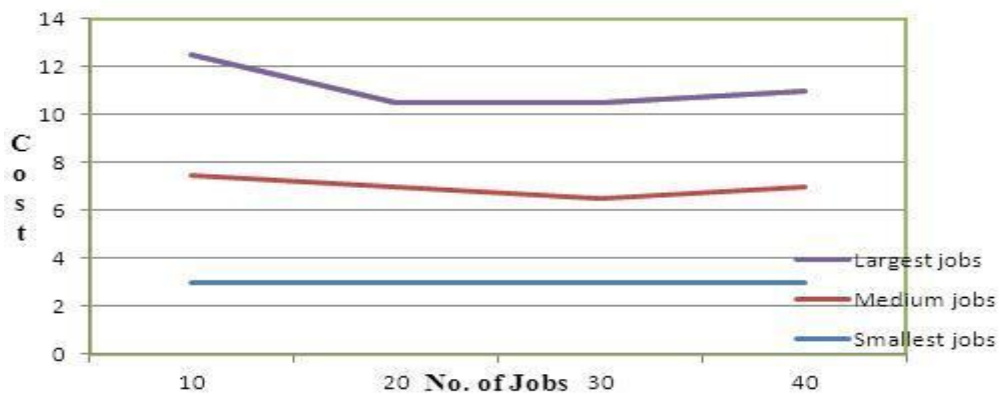


Fig. 3 a. Jobs vs. cost

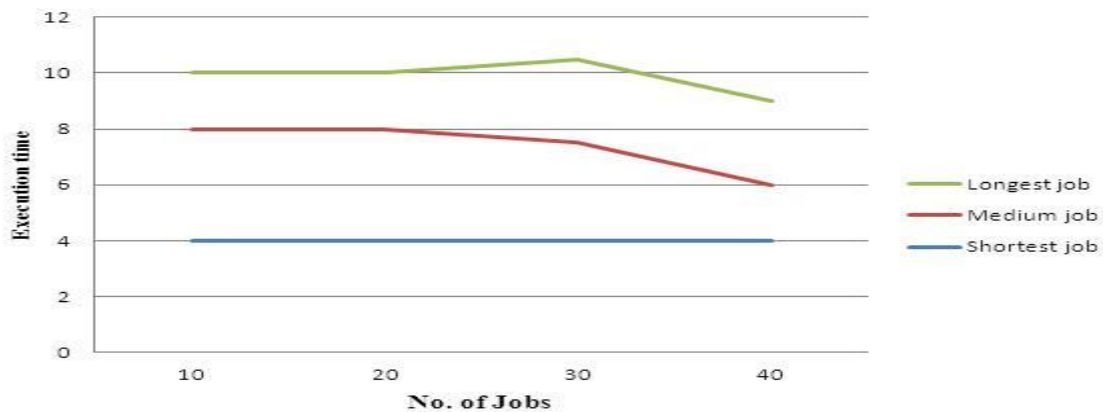


Fig.3b.) Jobs vs. Execution time



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VI. CONCLUSION

This paper which shows how the resume point is to be fixed for the jobs submitted to the resources in the cloud. These resume points which are fixed during the process executing in the resources, based on the job characteristics and resources availability. The resume points is fixed only for the jobs which is largest but not for the smallest job, because it will complete its execution within a small time. It also checks whether the resources working properly, if not it restarts the execution from its last proper working resumepoint. A convinced resumepoint strategy is proposed to improve the performance by reducing the cost and reducing the execution time by applying the knowledge of job characteristics and resource availability.

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AUTHORS BIOGRAPHY

Mrs. Maheswari Rangasamy¹ has received BE degree in Computer Science and Engineering from Anna University, Coimbatore. She is pursuing her M.E degree in Computer Science and Engineering from Anna University, Chennai. She is one of the university rank holder. She has secured centum in Java and Digital principals and system design. She has published 4 papers in national conferences. She has presented 3 papers in technical symposiums and attended 3 Seminars and 5 workshops. She is a member of MISTE. She has undergone in-plant training for 10 days in various organizations.

Ms. Jayanthi Shanmugasundaram² has received B.E degree in Computer Science and Engineering from Anna University, Chennai and pursuing her M.E degree in Computer Science and Engineering from Anna University, Chennai. She has published 1 paper in International conference and 3 papers in National conferences. She has attended 1 Seminar and 1 Workshop to boost her knowledge. She is a member of MISTE. She underwent in plant training for 3 days in some organizations to endure in her field.

Mrs. Praveena Ramasamy³ has received B.Tech degree in Information and Technology from Anna University, Chennai and she has teaching experience of 5 years. She is pursuing her M.E degree in Computer Science and Engineering from Anna University, Chennai. She has published 1 paper in International conference and 3 papers in National conferences. She has attended 1 Seminar to advance her knowledge. She is a member of MISTE. She underwent in plant training to continue in her field.

Ms. R. V. Aswiga⁴ has received B.E degree in Computer Science and Engineering from Anna University, Chennai and pursuing her M.E degree in Computer Science and Engineering from Anna University, Chennai. She has published 1 paper in International conference and 5 papers in National conferences. She has attended 3 Seminars and 3 Workshops and also published 7 papers in technical symposiums to enhance her knowledge. She is one of the university rank holder during the year 2008 to 2012. She has secured centum in Numerical methods. She is a member of IAENG, MISTE, and CSI. She underwent in plant training for 23 days in several organizations to withstand in her domain.