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Cost of Dynamic Migration of Content and Load Balancing Distribution Services into Hybrid Clouds

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ABSTRACT

Cloud computing is a technology which is most recently used for resources sharing for end users. Cloud providers provide services to end user like software, Application and Platform as services to complete their job. One of the objectives of cloud computing is load balancing. In this paper we used hybrid cloud for taking advantages of both cloud i.e. private cloud and public cloud. Content distribution services where cloud provider switch contents on different servers to improve load balancing. The contents are migrated or distributed dynamically on different servers. We used the Lyapunov optimization theory to minimize operational cost of the application with quality of services guarantees. In Lyapunov theory operational cost is reduces using threshold and rating parameter. If rating is above the threshold values then cost is increases same for if rating value is below then the cost is decreases. Threshold values is one kind of limit is define as constant. We proposed dynamic control algorithm is used to design for dynamic load balancing on servers and also provide higher security.

Keywords: Content-Distribution; Dynamic Resource Allocation; Load Balancing; Dynamic Migration; Lyapunov Optimization theory.

I. INTRODUCTION

Cloud computing is recently and widely used technology where cloud provider provides resources to user to complete their job. There are types of resources end user want to complete their need for the application they might be computational resources or networking resources. When resources are provide to end user from the cloud provider the resources are in order and in time. Resources are servers to end user in number of order and allocated time slice to each resource. Paper [7] used selective algorithm for dynamic resource allocation to end user to complete their need of application .selective algorithm is based on min max algorithm which is minimize overall task on machine. [11]user send a request to need a resources but in some cases the respected resource is not available to allocated in this condition request is in longer delay .Cloud provider is for utilizing and allocating resources within the limit of cloud environment. We used hybrid cloud is a combination of both public and private cloud. CDN is like private cloud and DCN is like a public cloud. One data center is a place is in each region which is geographically distributed.

Load balancing is one of the main objectives of the cloud computing to manage the spaces on the servers. We used dynamic control algorithm to manage load balancing. In this algorithm we used concept hot spot and cold spot. Hot spot technique if user uploads data on respected server and if server full then migrated content on different servers and leave the respected server. When user is requesting to download file or data the user request is migrated on different server and dispatch from the data center.

We used Lyapunov optimization theory [11] [12] to reduce operational cost. There is measure parameter are used to calculate updated cost is depend upon rating and time. Rating is parameter where numbers of user download a data or particular file with in time; cost is updated on this parameter. Threshold value is predefine if rating is above than threshold value then cost is increase with constant values. Same as if value is above threshold but long duration rating value is low, then cost

is decreases with constant value. Using lyapunov optimization theory with dynamic control algorithm onto hybrid cloud is satisfactory reducing load balancing problem.
Security is also one of measure issue in cloud computing in this paper we archiving load balancing as well as providing security.

Main objectives of this paper is as following

1. Cost is updated dynamically over time for cloud provider.
2. Achieving efficient Load balancing and providing high Security.

II. METHODS AND MATERIAL

1. Literature Survey

Siva Theja Maguluri, R. Srikant and Lei Ying [2] discuss, cloud computing is an omnipresent and provide resources to various applications. In cloud computing, when jobs are arriving to process and request for resources such as Memory, VM's, CPU, Bandwidth, Storage space. There a problem of resources allocation such as load balancing problem, job scheduling problems, and VM configuration. Stochastic model in cloud computing cluster is for load balancing and scheduling.

Tejinder Sharma and Vijay Kumar Banga [9] discuss, now a day's number of user accessing a resources but one challenge is resource scheduling. Load balancing is a technique to distribute workload on different computers to achieve resource utilization, data processing time is less, minimum average response time, and avoid overload. Author proposed enhances and efficient scheduling algorithm using Cloudsim that reducing load balancing. This algorithm is efficiently handling request to executing job and minimizing server overload.

Mayanka Katyal, Atul Mishra [7] discuss, in cloud environment rapidly increases the demand for cloud services. User wants to access services on the basis of their requirement. Resources are needed to serve more efficiently manner to user. Author discuss on Selective algorithm is for serves cloud resources dynamically to user on-demand. Selective algorithm is based on min-min and max-min algorithm there are two conventional task scheduling algorithm to serve a resources dynamically task are schedule on spaces shared or time shared and calculate provision heuristic using cloudsim. Result is in overall makespan of tasks on the given set of virtual machine which is minimizes in different scenarios.

Seematai S. Patil, koganti bhavani[3] discuss, cloud computing serve, the services to customer/ users based on their need to complete the job. They are presenting a system that uses virtualization technique to allocation of datacenters a resource dynamically based on the application demand. They proposed virtualization technology to provide a resource dynamically on the basis of necessity. Concept of skewneess used to minimize server overload. Utilization of virtual machine and maintain overload.

Ninad Shinde and J. Ratnaraja Kumar [11] discuss, user send request for different Cloud services for accessing their resource. Author discuss suppose at a same time user send a request for accessing different services. Commercial companies are take resources on rent cloud for storage with the help of pay as you go model with minimum operational cost. The Main challenges in cloud computing is to provide resources efficiently to end user. If respected resource is not available on the time then request is in longer delay. To reduce longer delay can use optimization resource allocation techniques.

Shaolei Ren, Yuxiong He and Fei Xu[10] discuss, cloud computing environment there is need to decreases the solar energy cost imperatively in large datacenter. In this Environment limited computational resources are need to fairly allocated among different organization. There is problem of job scheduling, where request are arriving from different organizations. Resources are needed to allocate to end user on demand. Author proposed the GreFar algorithm which is optimizing energy cost and farness among different organization. Algorithm is achieved energy cost, latency as well as fairness.

Haitao Li, Lili Zhong,, Jiangchuan Liu, Bo Li, Ke Xu[13] discuss, nows a day's demands are increase for Video on Demand service with the time in one day period. VoD providers are pay by byte for resources potentially leading to save a cost if the unit rate to rent a machine from a cloud provider is probably higher than the rate to

own one. Take a challenges to design and predictable benefits in migrating Video on Demand service on hybrid cloud-assisted deployment, where user send a requests are partly served by the self-owned servers and partly served by the cloud.

Prabhjot Kaur and Dr. Pankaj Deep Kaur[12] discuss, In cloud computing environment end user can access cloud service anytime and anywhere. Request is depend on requirement to complete their job. User only pays for only those resources they want to be use. Now day's demands are rapidly increases so the needs to creation of large scale datacenters. Prabhjot Kaur and Dr. Pankaj Deep Kaur proposed a method is to allocate resources efficiently based on load of virtual machine. The solution of the problem of VM resource scheduling in cloud environment load predictor is used. Load predictor is predicting the load on each node and allocates resources accordingly.

M. Pathan, J. Broberg, and R. Buyya[16] discuss, In content delivery cloud e.g. MetaCDN it provide content delivery service to end users. Using this utility for request redirection policy is increasing the performances of a content delivery. There also one prediction for content provider having the benefits from MetaCDN based on user prehension performances. They conducting test bed experiment is proof-of-concept for MetaCDN to demonstrate the performance as well as disclose the observation on the MetaCDN utility.

Xu Cheng, Jiangchuan Liu [14] discuss, Social networking applications are more powerful and popular but they also have one challenge is huge demand of bandwidth as well as storage. They are practiced, problem formulated as a constrained *k*-medoids clustering problem. Proposed wPAM algorithm, which is decreases the deviation of access each cluster, flexibly preserves the social relationship.

Arash Ghorbannia Delavar, Yalda Aryan [19] discuss, they are present synthetic method based generic algorithm for independent task scheduling. Task scheduling is one of the biggest tasks to schedule in proper way. They proposed SHIS algorithm for optimal initial population, dual step evaluation, and load balancing as well as it also reduces the probabilities of task failure on the basis of resources unavailability and also decreases starvation problem.

K K Shahabanath, T Sreekesh Namboodiri [5] discuss, dynamic scheduling algorithms are used for serve a virtualized resources. K K Shahabanath, T Sreekesh Namboodiri are comparing with different scheduling algorithms are e.g converging algorithm, skewness algorithm and synthetic heuristic algorithm. Resource converging algorithm has good performances but less efficient, synthetic heuristic algorithm is optimize task completion time but it is not useful in increases population. Skewness algorithm has good stability but the algorithm is computationally expensive.

K C Gouda, Radhika T V, Akshatha M [20] discuss, in cloud computing environment where multiple user requesting number of resources dynamically. An efficiently allocated resource to user is a challenging job. K C Gouda, Radhika T V, Akshatha M proposed resources is serving to end user with the minimum wastage and provides maximum profit. Resources allocation algorithm is based upon some parameters e.g. time, number of process requesting and cost. They used priority algorithm for better resources allocation and the performances also increases.

2. Architecture

Private cloud is more secure than public cloud. Normally private cloud is owned by enterprise or business for internally used, where public cloud is used by individuals or an organization based upon their requirements and necessities e.g. Drop box, GoDaddy. Private cloud kept the original copy of file or data and send replicate copy to end user. Hybrid cloud is allowing business to manage some resource internally within organization and some externally. Content distribution (is also called as content delivery or content distribution delivery) applications is service of copying the contents of files and send to end users. The components of Content Distribution application are

1) Back-end storage of the contents.
2) Front-end web service that serves users' requests for contents.

As we say at least one data center is place is in each region. The data centers are place in multiple geographically regions. Content replicas are established in different physical location of multiple clouds.

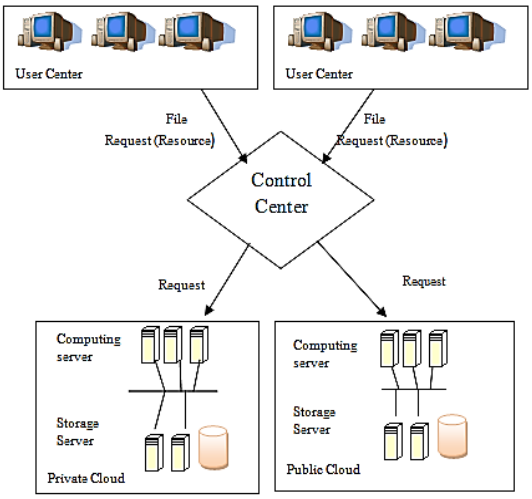


Figure 1: System Architecture

In Fig 1. In data center two inter connected servers are:

1) Computing Server-There multiple virtual machines are running and provisioning.
2) Storage Server- Storage server is used for data storage.

Data center can communicate with each other via Data Center Network (DCN). When user requesting for data then application provider migrate services where content can be replicated in storage server in cloud and dispatch the services from web services on VMs on computing servers.

3. System Modules

A. Hybrid Cloud

Hybrid cloud is a cloud computing environment which uses a mix of on-premises, private cloud & public cloud services. By allowing task (workloads) to move between private and public clouds as computing needs and costs change. Combine the best characteristics of public cloud and private cloud computing, virtualization and a dedicated hardware to build the most effective solution with the flexibility to scale according to demand. Hybrid gives greater flexibility and more data deployment options.

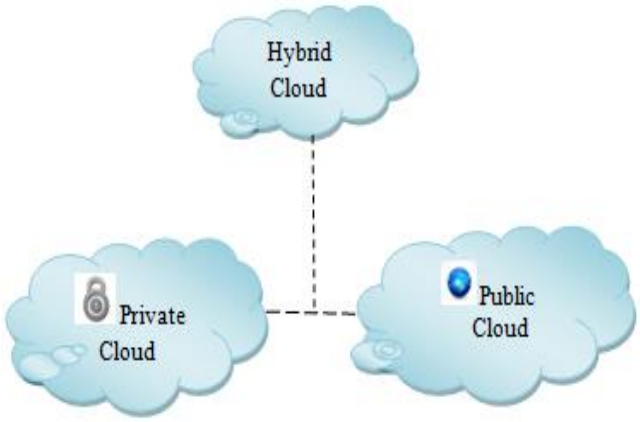


Figure 2: Hybrid Cloud

B. Dynamic Migration

Users upload data on respected server. Server has a capacity or space with giga byte or tera byte. In some case there is problem with space on server e.g. if user upload data 3 GB, total space on server A is 10 GB and server B is 10 GB, but server A has 99% full then migrate the content of data on server B. When contents are migrated from server A to server B is needed to check space availability on server B. If space is available on server B then migrates content from server A to server B this process called hot spot.

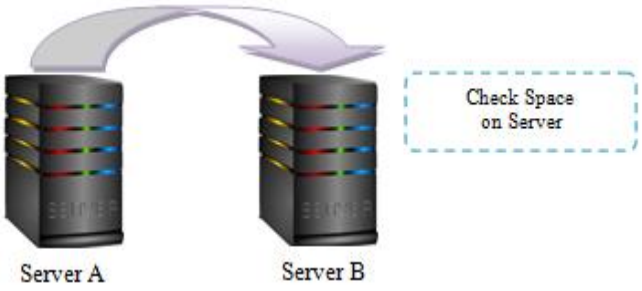


Figure 3: Hot spot

C. Service Migration

When user is upload a data (file) on server. If user want to search a file then user send request. If file is found on CDN (Content Distribution Network) cloud provider send file to user. If file is not found then send request to DCN (Data Center Network).Data center receive request and apply Authentication technique to verify a user authentication.

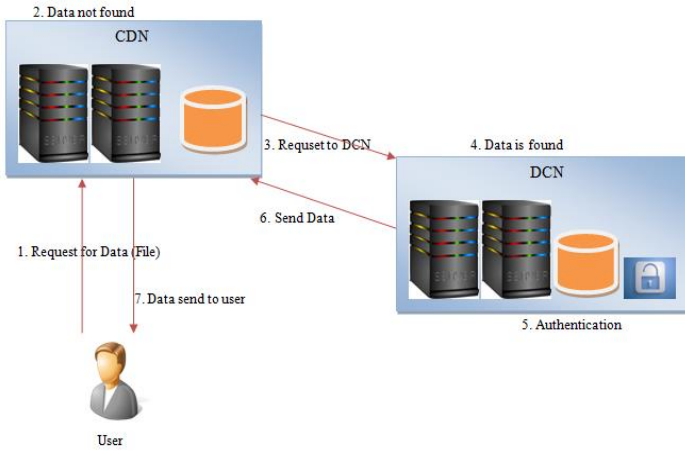


Figure 4. Service Migration

If user is authorized to access services then and only then send configuration key to use. User can receive only key access pages. User cannot access or use other pages.

D. Cost-Minimizing Service Migration

User submits a request with respective cost of that file (data). Cost updating is depending on time and rating. Rating value is varies with respect to number if user questing that file. Threshold value is constant; if rating value is higher than threshold value then cost is increases. If value is above threshold but long time rating is low, then cost is decreases with constant value. Cost updating is a process of increases or decrease cost depends on time and rating values.

4. Algorithm

A. Dynamic Control Algorithm

1. START
2. CREATE CLOUD → maintain cost
3. Contact Admin
4. Admin Check Condition
5. Allocate Respective Allocation as following step
6. Request,
   a. String server_name;
   b. int memory;
7. Accept request
8. ENCRYPT as per ciphertext policy
9. Check threshold Condition,
   S (Z) = {S1, S2, S3.....}
   Tvalue = {T1, T2, T3....}
   R (Z) = {R1, R2, R3....}
10. Find and manage load balancing
11. Rn(Z) = Respective Server → S n(Z)
12. Hot → Rn(Z)
13. Cold→ Rn(Z)
14. Rn(Z) → Set Threshold
15. Rn (Z) → allocated
16. User Login
17. Upload data respective server
18. Yes and Migrate
19. Store respective server
20. Manage all data respective cost time
21. END

B. Myopic Scheduling Algorithm

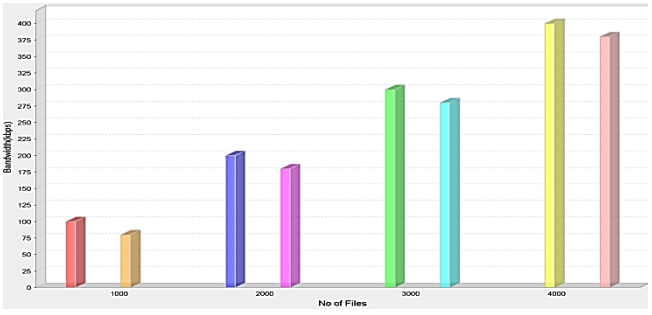
- Deadline (D_i)
- Earliest Start Time
- Laxity (D_i-e_i)

For example if the heuristics H(i) = D_i, then the schedule is carried out based on the tasks with earlier deadline.

III. RESULTS AND DISCUSSION

Experimental Result

The duration of a time slot is 10 seconds. The duration of a time slot is set based on the following practical considerations: On one hand, running the optimization solver too frequently is too costly, and since file migration is involved, it is unlikely to be done in a time scale smaller than a few seconds; on the other hand, the duration of a time slot should not be too long, as otherwise queuing delays experienced by requests tend to be too long. After some trials, we find 10-seconds is an appropriate value.



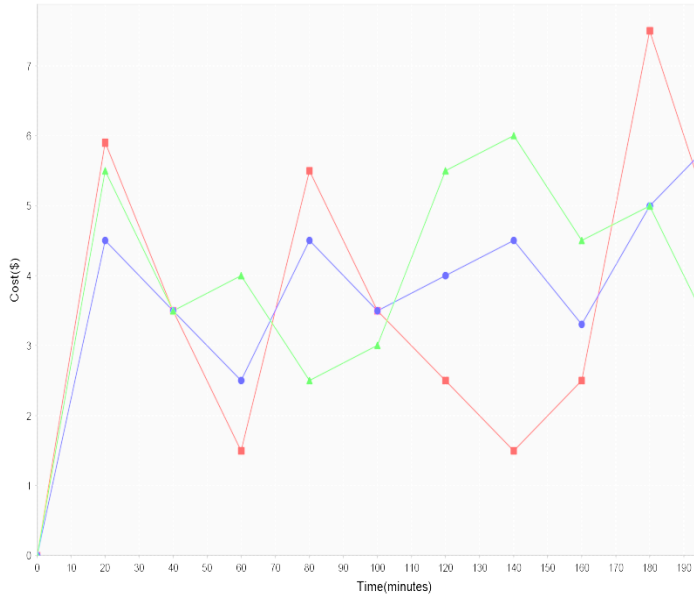


Figure 5: Experimental Result

Fig.5 shows (red colour is for myopic scheduling algorithm, blue colour for IPMW with min-weight Evictions and green for dynamic control algorithm) Suppose, Threshold value is x, time is y and rating value is x+1 in y time .Cost is increases. If rating value is x-1 in y time then cost is decreases.

IV. CONCLUSION

We conclude that from survey we studied various techniques and algorithms for utilization of resources in proper ways such as load balancing, job scheduling. Virtualization techniques is a powerful feature in cloud computing. A live migration is to increases performance and availability. In this paper, optimal migration of a content distribution service into a hybrid cloud consisting of a private cloud and public cloud services. We are using the Lyapunov optimization theory which is minimizes the operational cost of the application with Quality of service guarantees. Also achieving efficient load balancing and provide high security.

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