International Journal in Management and Social Science
Volume 09 Issue 11, November 2021 ISSN: 2321-1784 Impact Factor: 7.088
Journal Homepage: http://ijmr.net.in, Email: irjmss@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal

EXAMINING DIFFERENT OPTIMIZATION TECHNIQUES USED IN CLOUD COMPUTING ENVIRONMENT

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ABSTRACT

There is a much research avenue available for solving this problem as it is in the real-world. Here, in this paper we provide details about various optimization techniques for resource provisioning. Cloud computing is the provision of IT resources (IaaS) on-demand using a pay as you go model over the internet. It is a broad and deep platform that helps customers builds sophisticated, scalable applications. To get the full benefits, research on a wide range of topics is needed. While resource over-provisioning can cost users more than necessary, resource under provisioning hurts the application performance. The cost effectiveness of cloud computing highly depends on how well the customer can optimize the cost of renting resources (VMs) from cloud providers. The issue of resource provisioning optimization from cloud-consumer potential is a complicated optimization issue, which includes much uncertainty parameters. There is a much research avenue available for solving this problem as it is in the real-world. Here, in this paper we provide details about various optimization techniques for resource provisioning. A Cloud is a network of a shared pool of configurable and computing resources providing efficient, on-demand pay-as-per-use access

Keywords: - Cloud Computing, Environment, Techniques, Software, Consumers

I. INTRODUCTION

Cloud Computing is a broad and deep platform that helps customers build sophisticated scalable applications. Cloud provisioning is the allocation of a cloud provider's resources to a customer. When a cloud provider accepts a request from a customer, it must create the appropriate number of virtual machines (VMs) and allocate resources to support them. In this context, the term provisioning simply means "to provide".

The Provisioning has been done in several different ways.

a) Advance Provisioning: The customer requests the provider for services and the provider prepares the appropriate resources in advance. The customer is charged a flat fee or is billed on a monthly basis.

b) Dynamic Provisioning: The provider allocates more resources when they are needed and removes them when they are not needed. The customer is billed on a pay-per-use basis.

Provisioning enables the most efficient use of resources to provide the required level of service to customers in a limited amount of time. The issue here is that the user is either over- or under-provisioned. In formal terms, the provisioning issue is characterized by uncertainty parameters during the selection of resources with limitations in order to maximize an objective function. The objective is to devise a strategy that minimizes both over and under provisioning. Whether it's the distribution of water or power, this issue has been studied for decades.

Cloud computing is a model of on-demand computing where users pay only for the resources they really utilize. The cloud is a network-based, decentralized platform where users may access their software from any computer. The client services are delivered using the virtualization paradigm.

Cloud consumers, Cloud Service Providers, and Cloud resource providers are the three main types of cloud users. When a user submits a request to the Cloud Scheduler using a Portal, the Scheduler then uses Application Provisioning and Virtualization technologies to obtain the necessary Cloud resources to fulfill the request.

Cloud Computing is categorized based on

1) The services offered as: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS).

2) The Cloud location as: Public, Private, Hybrid Cloud.

When determining how to schedule jobs in the cloud, several factors such as execution time, cost, scalability, make span, dependability, availability, throughput, resource usage, and so on are taken into account.Here is how the remainder of the paper is structured: The numerous optimization measures are discussed in Section II. The different optimization restrictions are discussed in Section III. In Section IV, we see examples of the various optimization strategies presented by various writers. The literature review is compared and contrasted in Section V.

II. CLOUDING COMPUTING

A new computer paradigm called "cloud computing" is on the horizon. This fourth-season 2007 buzzword—the long-held ambition of computing as a utility—has the potential to revolutionize a sizable portion of the IT sector, increasing the appeal of software as a service and influencing the development and procurement of IT hardware. Creators of cutting-edge Internet services no longer have to worry about the time and money it takes to build and run their infrastructure.

A. The Concept of Cloud Computing

Clouds have been defined in a variety of ways by academics and professionals in the field of computing. In this paper, we use the definition of cloud computing proposed in "A Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers."

Clouds seem like a hybrid of clusters and Grids at first sight. This, however, is not the situation. Clouds are obvious next-generation data centers where individual nodes are "virtualized" using hypervisor technologies like VMs and then "provisioned" on demand as a personalized resource collection to meet a specific service-level agreement (SLA) that is established through "negotiation" and made available as a compostable service through "Web 2.0" technologies.

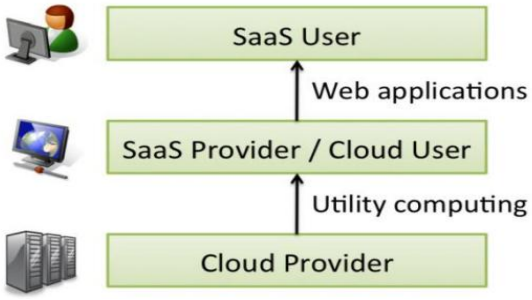

Figure 1. Users and Providers of Cloud Computing.

From a hardware point of view, three aspects are new in Cloud Computing.

a)Users of Cloud Computing don't have to worry about future provisioning thanks to the cloud's appearance of endless computing resources.

b)The lack of an initial investment on the part of Cloud customers makes it possible for businesses to start out small and scale up as their demands grow.

c)The capacity to pay for and release computing resources on an as-needed basis (such as processors by the hour and storage by the day), encouraging resource conservation by releasing unused machines and storage.

B. Cloud Computing Style

Although opinions on cloud computing vary, a consensus has been formed on its fundamental structure. This is how its format looks:

a) SAAS (Software as a service)

By using a web browser, millions of people may access the same set of applications using cloud computing. Users may see a reduction in server and software costs as a result of this. Since the supplier will only have to worry about one software, they will save money on upkeep. To far, Salesforce.com has proven to be the most well-known provider of such a service. Both HRM and ERP (Enterprise Resource Planning) make extensive use of SAAS. Similar services may also be found at Google Apps and Zoho Office.

b) Utility Computing

Storage and virtual service providers like Amazon.com, Sun Microsystems, and IBM have emerged in recent years. By pooling together resources like memory, IO hardware, storage, and processing power in a virtual data center, cloud computing enables the IT sector to serve the whole Internet.

c) Network service

SAAS is closely related to online service. By offering an API (Application Programming Interface), service providers may aid programmers in creating internet-based apps in place of a single machine operation.

d) PAAS(Platform as a service)

This kind of cloud computing offers a SaaS platform as a service for creating applications. Using the middleman's resources, you may create your own software and distribute it to end consumers through the web and server farms.

C. The Characters of Cloud Computing

a) Ultra large-scale

The cloud is really big in size. Google has more than a million servers in the cloud. Amazon, IBM, Microsoft, and Yahoo all have hundreds of thousands of servers, and that's just the tip of the iceberg. In a large company, there might be hundreds of servers. Cloud computing gives users access to more resources.

b) Virtualization

Thanks to cloud storage, information may be accessed from anywhere at any time. The essential parts are not delivered by a physical item, but rather by a remote server in the cloud. You can accomplish anything if you have a computer, smartphone, and access to the internet. Users may get to it and share it easily and safely from any location. Essentially, users may do the work of multiple computers at once.

c) High reliability

The high uptime of cloud services is guaranteed by the use of fault-tolerant multi-transcript data storage, isomorphic exchangeable processing nodes, and similar technologies. The security of cloud computing is superior to that of on-premises systems.

d) Versatility

The cloud has no one specific use in mind. It has the potential to develop several cloud-based apps, and a single cloud infrastructure may accommodate a wide range of concurrently operating programs.

III. OPTIMIZATION TECHNIQUES

Optimization, in the fields of computer science and operations research, is picking the optimal solution out of a number of possible ones based on specified criteria. There are two main players in the cloud computing industry: cloud service providers and cloud users. As a rental service, cloud service providers make their resources available to cloud users, who then make provisioning requests. When they join the cloud, they each do so for their different reasons. Users care about how quickly and smoothly their apps run, while service providers care more about making the most of their limited resources. There are two broad categories into which these Optimization Methods fall: static and dynamic. Following are some of the optimization criteria followed while provisioning resources in cloud environment as shown in Figure 2

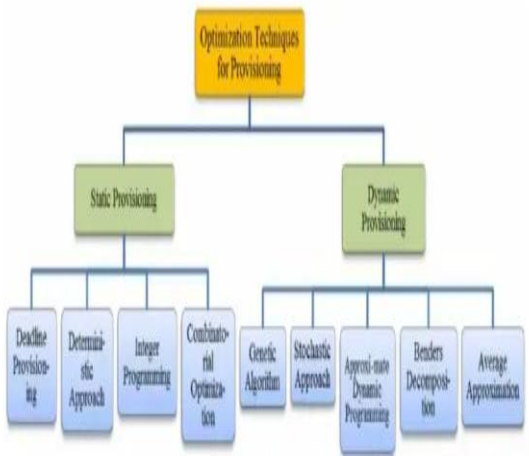

Figure 2 Optimization techniques

COMPARISON OF THE VARIOUS OPTIMIZATION TECHNIQUES

S. No	Technique	Parameters Considered	Performance
1	Artificial Immune System	Execution time	Efficient resource utilization.
2	Hierarchical Job Scheduling Algorithm(HJSA)	Transfer Cost, Transmission and Execution cost	Applied in hierarchical environment – Efficient throughput and cost.
3	Hierarchical Load Balancing based on generalized neural network(HLBSGNN)	Communication Overhead	Better Migration of tasks. Reduced tree height.
4	Greedy Optimization	Task Completion time, memory space	Optimized Cost
5	Enhanced Load Balancing Mutation Algorithm.	Particle Swarm optimization, round trip time	Optimized Cost.
6	Stochastic Hill Climbing	Probability factors	Applied in Centralized environment - Improved response time.
7	Dynamic Optimization	Energy load	Reduced Execution time
8	Modified Bacterial Foraging Optimization(MBFO)	CPU utilization, RAM Size , Bandwidth	Minimized execution time, cost. Efficient throughput.

IV. CONCLUSION

This study examines the many optimization methods by looking at how they perform under different conditions. The goal is to suggest a tweak that would speed up cloud-based responses.

Cloud computing is an emerging field that has attracted a lot of attention in recent years. Both businesses and universities have access to a plethora of cloud computing services nowadays. This problem of learning and using these platforms is significant. In this article, we not only defined and characterized cloud computing, but we also summarized the most important approaches used by Google's cloud platform, and we included several illustrative examples of cloud computing suppliers to help drive home our points.

Although different cloud computing platforms have different advantages, it is important to note that regardless of the kind of platform, there are many problems that have yet to be resolved. Constantly high availability, techniques for handling cluster failure in the cloud, guarantees of consistency and synchronization across cloud platform clusters, interoperability and standardization, and cloud platform security are just a few. The focus of cloud computing research will be on the aforementioned topics.

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