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A Quantum Optimization Model for Dynamic Resource Allocation in Cloud Computing

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[1]**Abstract: -** Quantum Computing and Cloud Computing technologies have potential capability to change the dynamic of future computing. Similarly, both Complexities, time and Space are the basic constraints which can determine the efficient cloud service performance.

Quantum optimization for the cloud resources in dynamic environment provides a way to deal with the present classical cloud computation model's challenges. By combining the fields of quantum computing and cloud computing, will result in evolutionary technology. Virtual resource allocation is a major challenge facing cloud computing with dynamic characteristics, a single aspect for the evaluation of resource allocation strategy cannot satisfy the real world demands in this case. Quantum Optimization resource allocation mechanism on the cloud computing environment based two-way factors, improving user satisfaction and best use of resource utilization of cloud computing systems.

A dynamic resource allocation mechanism for cloud services, based on negotiation by keeping the focus on preferences and pricing factor is therefore proposed.

1. INTRODUCTION

Now a day, in distributed environment solving different type of problems having complex computation becomes increasingly complex, and dynamic behavior are making the requirements higher and higher, so traditional theories and methods face serious challenges.

1.1. Cloud Services

During Computer era, speed, storage and transmission capacity has turned into a reliable administrative service for extensive server farms, end to end customers and all organizations. In the point of view of administrations, Cloud registering can be recognized as

a Provision of any sort of programming administration
b Need base arrangement of the administration
c Service administration for PC assets

1.2. Characteristics of Cloud Computing

Main characteristics of the cloud computing are following:

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1.2.1. ***On-demand self-service:***

Provision of demanded cloud resources are made possible by cloud service providers and is referred as the On-demand self-service. Online services allow users to access these cloud services easily. The prime component of on-request self-administration is offerings required framework up to a client level without aggravating the host cloud operations. Several computing resources are offered by On-demand self-service like data storage, arrange transfer speed as independent process without aggravating Cloud specialist co-ops and server time. Adaptability of on-demand self-service is using servers whenever required. [1].

1.2.2. Resource pooling:

Cloud vendors offer a multi-inhabitant framework that joins various resources of computing to serve different purchasers and pooled assets to meet the consumer demands. The buyer has no data or learning about the cloud assets received. Capacity, registering, memory, organizing data transfer capacity and virtual machines are basic cases in resource pooling. Virtual assets are relegated progressively on client request by adjusting the load sharing process.

1.2.3. Rapid elasticity:

Distributed computing Services can be shared and discharged naturally. The abilities can be effectively changed flexibly to satisfy the customer requests and needs whenever they want. Resources of distributed computing are promptly accessible and they also enhance the throughput in times of developing need in programmed way as per the client current load.

1.2.4. Measured service:

Measured administrations permitting an observing plan for cloud asset utilization. The Measured information is therefore utilized for resources enhancement and their optimization, pay-per-utilize charging, Quality of Service, enabling transparency of purchasers.

1.2.5. Broad network access:

Broad network access is one of the most effective characteristics of cloud computing. Users have the facility to use different services of cloud computing on several devices and required formats. Easy communication is also possible in cloud computing through various tablets, work-stations, laptops and smartphones.

1.2.6. Dynamic Resource Allocation:

The resources allocated for cloud environment will dynamically change based on current environment. These services may be web server, ftp server, virtual machines. A game may be constructed with a solution for resource allocation strategy. Resource allocation tasks are mainly computing tasks and involve the timing factor. When a new request for resource task comes, conflict and negotiation will occur thus leading to dynamical resource allocation.

"It is more efficient to realize resource discovery, resource matching, task scheduling and execution. However, it is important and complicated to allocate the resource to all the tasks in cloud computing. Cloud computing service should make a resource assignment for every computing resource that is capable for applicant along with the task scheduling. Hence, the scheduling essence in cloud computing is the capability resource allocation in computing.

2. IMPORTANCE OF RESOURCE ALLOCATION.

Resource Allocation is a mechanism for providing available resources when demanded in cloud applications over the internet. In cloud environment resource allocation, the results will be the effect of poor allocations done that are not managed properly. Efficient resource planning will as a whole enable the service providers to manage the resources and solve several related problems. [2]

Various resource allocation strategies are available for collaborating the cloud provider activities for allocating and utilizing resources with the limitation to meet the needs of the cloud application of the cloud environment. Keeping in view the amount of resources needed by each application for fulfilling a user job the task can b completed. The order and time of allocation of resources are also an input for an optimization of resource. The following criteria should be avoided for optimization of resources in cloud environment:

a) Resource contention (same resources deadlock), when more than one cloud applications try to use the similar resource at one time.

b) Shortage of resources (limited VM) occur when there are limited resources.

c) Resource fragmentation (plenty of resources available). Enough resources availability but unable to allocate the required resources to the current application.

d) When a certain application gets surplus resources than the demanded one it leads to the over-provisioning of the resources.

e) When the application is assigned with fewer numbers of resources than required under-provisioning of resources occurs.

3. LITERATURE REVIEW

As cloud computing is gaining popularity day by day, it is hard to maintain privacy in datasets while providing adequate retrieval and searching procedures. Steven Zittrower introduces a novel approach in the field of encrypted searching that allows encrypted phrase searches and proximity ranked multi-keyword searches to encrypted datasets on untrusted cloud. [3]

Cloud computing is sharable resources and internet-based computing. Quality of Service (QoS) rankings in cloud services gives valued information for selecting particular cloud service from a set of available services. For QoS ranking, it usually required high computational cost and time consuming. Yaqboob and Singh presented a novel framework for ranking of cloud services in their paper "Better Ranking of Qos Feedback System in Cloud Computing ". They proposed QoS ranking to forecast the QoS rankings directly using two personalized prediction approaches. One is calculating similarity values with other training values and similar score can be identified.

Secondly, cloud services provider is to consider user feedback about cloud services and give them ranking. [4]

Encryption also known as encoding protects content or data by making it impossible for someone unauthorized to understand or identify this data as different or distinct. Critical transmission after conversion into encrypted form using cryptography is something not new rather it's being done for a very long time say since ca 400 BCE when armies used cryptography to avoid inconvenient discovery of their communication. For the next millennia it was believed that encrypted information cannot be identified until decrypted into their original understandable language. This was an acceptable approach until recent when it became impracticable to conveniently decrypt a large number of encrypted documents to decode some specific encrypted keywords rather than decrypted an entire document.

To solve this problem searchable encryption was introduced but until now it failed to meet expectations in regards to various needs to perform accurate searchable encryptions. Most techniques in searchable encryption make use of mathematical structures such as Bloom filters or trap-doors but this approach did not work as well because they facilitate only Boolean searches and do not support most wanted phrase searching. This approach did not focus on sub word matching, exact matching, regular expressions, natural language searches, frequency ranking, and proximity-based queries; this limitation on these forms of searching makes it hard for this method to be accepted as a common practice because these all search formats are now considered by search engines and modern users expect to have them. [3]

4. Optimization Problem:

Optimization problem for the cloud in resource allocation will aim to optimize the use of different resources like Job completion time, topology of the cloud, minimum execution time, Resource availability, Request satisfaction are considered. [5]

The task allocator is using knowledge base of all the VM types that the user can request and the host machine can configure. This information is used in the computation of the optimization matrix. All types of negotiation can be done on priority and pricing factors as shown in fig.

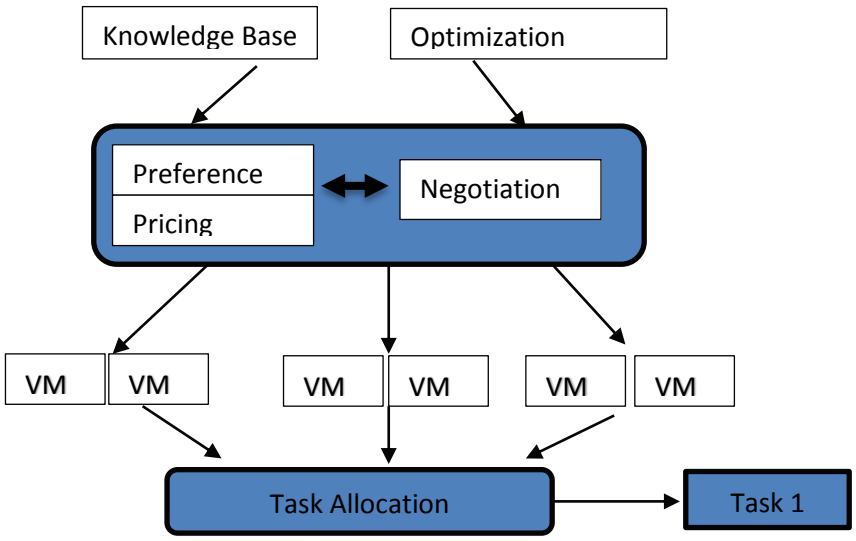

Figure 1 Task Optimization

Preference lists are used by the host machines to check for the task allocation accuracy and reliability by means of VM with respect to the task assigned.

5. CLOUD SERVICE LOGICAL ARCHITECTURE

In cloud computing most of the services are independent of each other that are used for resource provision. The different component in cloud service can work with loose-coupling integrated using conditional services. Complex cloud-based services include several components as shown in figure 2. Collaboration among different services during allocation of resources must be considered in this regard.

Quantum Cognition is a research field which uses mathematical aspects of the quantum theory to perfect the design of cognitive phenomenon. It includes human thought process, memory, conceptual reasoning, judgment and perception, and decision making. It is clearly distinguished from quantum mind which is based on microphysical quantum mechanical hypothesis rather than a macro-physical operating system of the human brain.

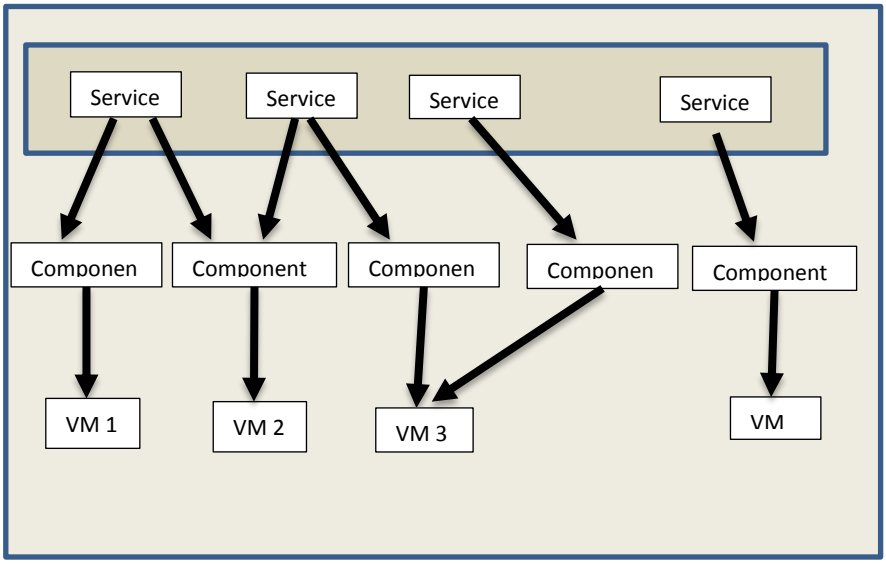

Figure 2 Cloud Service Logical Architecture

Quantum cognition is structured on the generalized quantum paradigm and that information processing contextual dependence of information and probabilistic reasoning can be scientifically explained using the framework from quantum information and the quantum probability theory

6. **Virtual Machine Migration after Resource Allocation**.

After the resource allocation is determined, how to maximize each virtual machine's utility is the next focus. In this part, we will mainly work on the virtual machine migration problem where many virtual machines will compete for the limited resources. [6]

7. Proposed Methodology

User task is submitted to quantum optimization model for resource allocation, how resources will be allocated to the submitted task. These tasks will be categorizing on the basis of execution time. Execution time will be measured on the basis of existing task mapping in the system. "The optimum resource allocation is exponential in huge systems like big clusters, data centers or Grids. Since resource demand and supply can be dynamic and uncertain, various strategies for resource allocation are proposed."

User submitted task is the inputs to the system. These inputs are measured against the resources like hardware to the system. Task is also measured on the basis of certain parameters like type of service, cost and security. In cloud system trust can be recognize by meeting all parameters of SLA (service level agreement) and providing successful transaction between interacting parties. SLA parameters are response time, through put and quality of service.

Resource manager then forward these tasks to the quantum task optimizer. Task optimizer will characterize the task on the basis of long short or medium jobs in order to execute them If more than one jobs are available in any category is available like long median of short. these will be in queue in order to execute or proceed for further processing. Finally, quantum job optimizer will distribute these jobs of task to the cloud environment

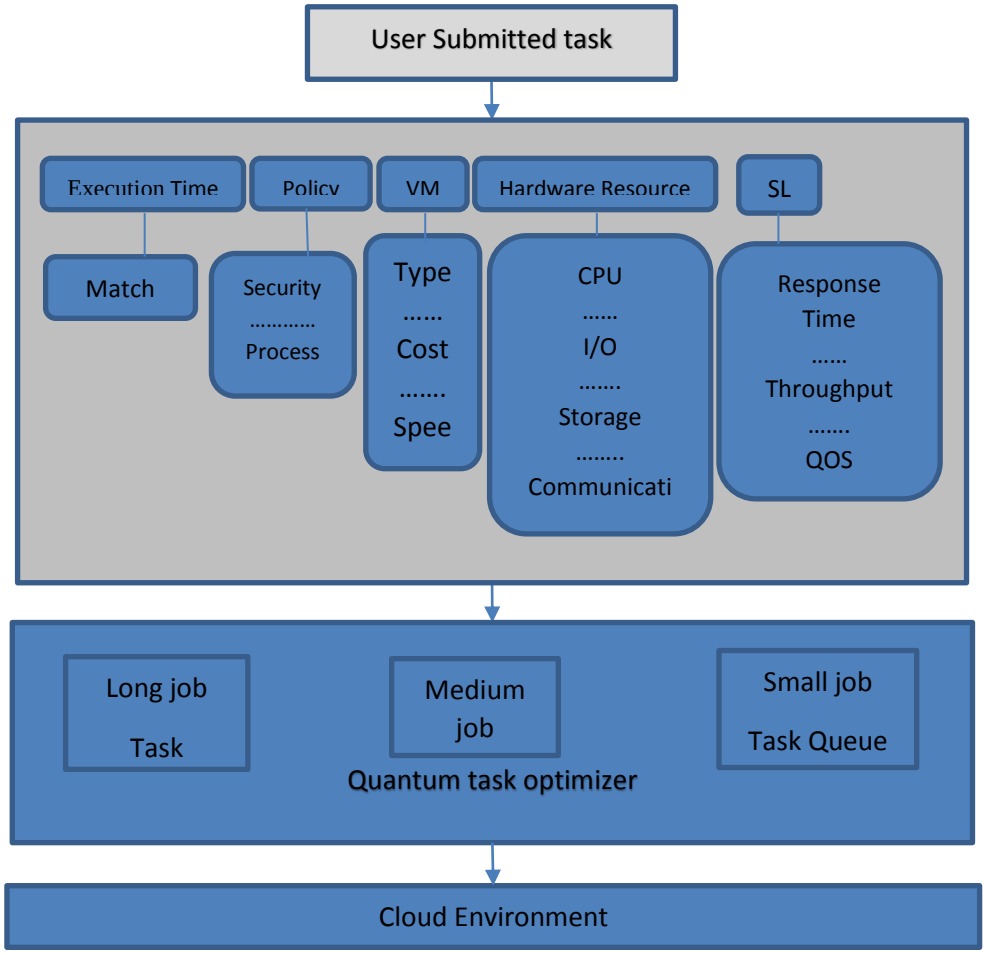

Figure 3 Quantum Task Optimization Proposed Model

8. CONCLUSION

Resource allocation mechanism using quantum optimization, may perform better with respect to lower task allocation time, lower resource wastage, and higher user request satisfaction.

The Significance and demand of resource allocation scheme in cloud computing. Resource allocation on the cloud aims at avoiding underutilization of resources.

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