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Resource Allocation in Cloud Computing

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Abstract: ***Cloud computing is known as a provider of dynamic services using very large scalable and virtualized resources over the Internet. Many industries have started offering Cloud services on a "pay-as- you-go" basis. The developments have led to the concept of market exchange that provides the trading between cloud provider and consumer. A light weight and platform is proposed as independent framework called "Market Environment", which allow the consumers and providers to trade computing resources according to their requirements. In this paper, we drive our design and discuss how trading can be done with the help of auctions. Finally we evaluate the performance in terms of scalability.***

Keywords: Cloud computing, Resource allocation**.**

1. Introduction

Cloud computing, often referred to as simply "the cloud," is the delivery of on-demand computing resources—everything from applications to data centers—over the Internet on a pay-for-use basis.

1.1 Cloud Computing Services

a) **Software as a service (SaaS)** - is a Cloud-based applications run on distant computers "in the cloud" that are owned and operated by others and that connect to users' computers via the Internet and, usually, a web browser.
b) **Platform as a service(PaaS)** - Platform as a service provides a cloud-based environment with everything required to support the complete lifecycle of building and delivering web-based (cloud) applications—without the cost and complexity of buying and managing the underlying hardware, software, provisioning and hosting.
c) **Infrastructure as a service (IaaS)** - is where users acquire computing resources such as processing power, memory and storage from an IaaS provider and use the resources to deploy and run their applications. [1]

1.2 Resource allocation

In cloud computing, Resource Allocation (RA) is the process of assigning available resources to the needed cloud applications over the internet. RA starves services if the allocation is not managed precisely. Resource provisioning solves that problem by allowing the service providers to manage the resources for each individual module.

1.2.1 Resource allocation Strategies (RAS)

It is all about integrating cloud provider activities for utilizing and allocating scarce resources within the limit of cloud environment so as to meet the needs of the cloud application. It requires the type and amount of resources needed by each application in order to complete a user job. The order and time of allocation of resources are also an input for an optimal RAS. [2]

The input parameters to RAS and the way of resource allocation vary based on the services, infrastructure and the nature of applications which demand resources**.** The schematic diagram in **Figure 1.1** depicts the classification of RAS proposed in cloud paradigm. The following section discusses the RAS employed in cloud.

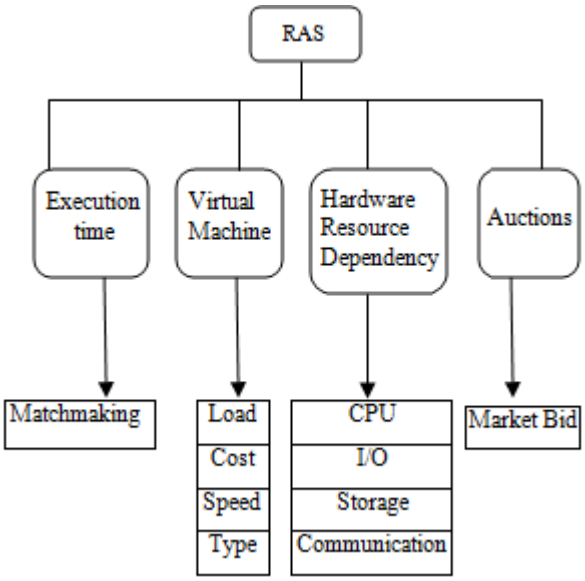

Figure 1.1 Resource allocation strategies in cloud computing. [2]

In this paper, we are working with Auctions; we propose the design of a Market Exchange (ME) framework which specifically addresses the needs of computing consumers and providers. It supports diverse ME services including:

a. Registration and selling.
b. Advertisement of free resources.
c. Coexistence of multiple market models or negotiation protocols such as auctions.
d. Resource brokers and Resource Management Systems (RMS) to discover resources/services and their attributes (e.g., access price and usage constraints) that meet user Quality of Service (QoS) requirements.

1.3 Market exchange architecture and design

The primary aim is to provide a market place where the consumer's resource requests and the provider's compute resources queued up, and matched using different market models. Trading scenario of market exchange is shown with the help of diagram.

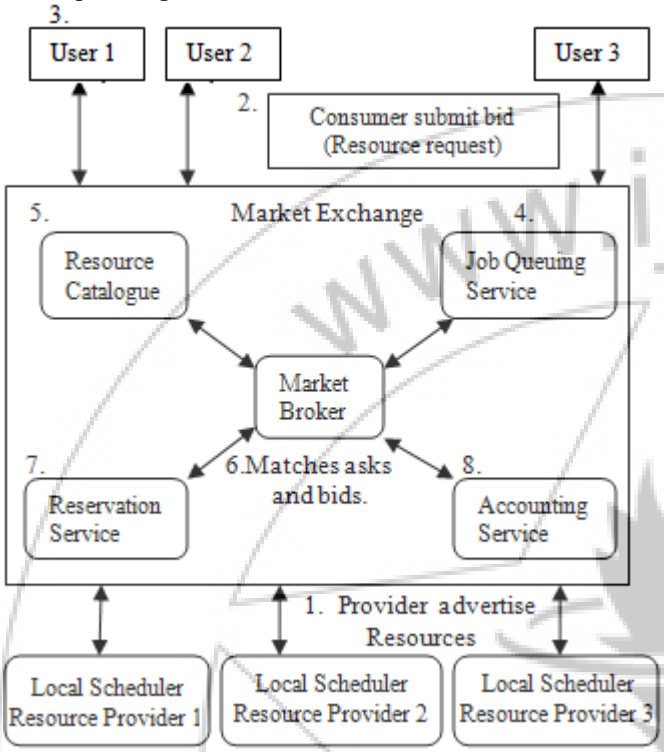

Figure 1.2 Trading scenario of Market Exchange (ME)

Figure 1.2 shows a typical scenario of trading conducted within ME.

- The providers advertise their resources with their price (asks).
- Consumers submit their bids to show their interest in the advertised resources. All the bids and asks are stored in the database which will be accessed at the end of the auction for calculating the winning bids.
- The Meta-Broker, which is the main agent of market, coordinates the matching of asks and bids, and trading between auction participants. At the end of the auction, the Meta-Broker decides the winners and sends the reservation requests to the Reservation Service. Then the Reservation Service informs the resource providers and consumers about the auction result. The information about reservations is stored using the Accounting service.[3]

1.3.1Architectural components (services)

1) **Registration Service:** The users need to register before they can access the exchange's services. The users' details are maintained in the database and are used for authentication and authorization.
2) **Resource Services**: Reservation Service allows the consumers to find services of their requirements and reserve them. Advertisement Service allows resource providers to advertise their cloud resources (number of CPUs and time at which they will be available).
3) **Job Queuing Service:** Bids are queued
4) **Reservation Service:** It informs the resource providers about the match, reserves the advertised (matched) service, and gets the reservation ID that is used by consumer to submit his application.
5) **Accounting Service:** Stores the trading information of each user. It also stores the information about the failed and successful transactions.

2. Literature Review

1. N.Krishnaveni,et al [4] in " Survey on Dynamic Resource Allocation Strategy in Cloud Computing Environment" presents that Cloud computing becomes quite popular among cloud users by offering a variety of resources. Cloud provides on demand services because it offers dynamic versatile resource allocation and guaranteed services in pay as-you-use manner to public. The author presents the several effective resource allocation techniques and its performance. The author in this paper provides detailed description of the dynamic resource allocation technique in cloud for cloud users and comparative study provides the clear detail about the different techniques. The author in this paper describes theoretically, the study of number of dynamic resource allocation techniques in cloud environment. The author provides the detail description of the techniques is summarized and also summarizes the advantages and benefits with parameters of the various techniques in cloud computing environment.

2. D.Cenk Erdil [5] in "Simulating peer-to-peer Cloud Resource Scheduling" states that resource scheduling is difficult in large-scale clouds and grids due to the size, dynamism, and volatility of resources. Researchers have proposed a wide variety of approaches and polices for mapping offered load onto resources. However, current production grids are largely underutilized, and do not exhibit the load to effectively characterize the environment. A simulation environment is thus useful to study different approaches, especially those that are expected, but that are not currently characteristic of existing clouds and grids. It describes a simulator that includes a core model and mechanisms for the grid resource scheduling problem, and a matching solver model to determine upper-bounds for performance. It also presents an overview of how the simulator is used to study performance of the grid resource scheduling approaches for different resource and load characteristics in large-scale and dynamic environments.

3. Pinal Salot's [6] in "Survey of Various Scheduling Algorithm in Cloud Computing Environment" states that Cloud computing is known as a provider of locomotive services using very large scalable and virtualized resources over the Internet. Due to innovation of cloud computing field, there are many standard task scheduling algorithm used in cloud environment. Mainly in cloud, there is a high communication cost that prevents well known task schedulers to be applied in large scale distributed environment. In now days, investigators attempt to build job scheduling algorithms that are appropriate and applicable in cloud computing environment Job scheduling is most important task in cloud computing environment because user

have to pay for resources used based upon time. Hence effective usage of resources must be important and for that scheduling plays a vital role to get maximum benefit from the resources. In this paper there are various scheduling algorithms and issues related to them in cloud computing. The author concludes that Scheduling is one of the most important tasks in cloud computing environment. Here various scheduling algorithm and tabulated various parameter are analyzed. It is noticed that disk space management is critical issue in virtual environment. Existing scheduling algorithm gives excessive throughput and cost effective but they do not consider reliability and availability. So here is a need of algorithm that improves availability and reliability in cloud computing environment.

4. Rajkumar Buyya et al. [7] in" Mandi: a market exchange for trading utility and cloud computing services" states that the recent development in Cloud computing has modified the realization of delivering computing as Superior .Many industries have started offering Cloud services on a "pay-as-you-go" basis. These advancements have led to the evolution of the market frame in the form of a Market Exchange (ME) that facilitates the trading between consumers and Cloud providers. Such market scenario assist the trading process by aggregating IT services from a different sources, and allows consumers to easily choose them. In this, the author propose a light weight and platform independent framework called "Market Environment", which allow trading of computing resources between consumer and provider as per their requirements. The originality of Market Environment is to provide its users the flexibility in terms of exploration protocol, but also allows the together coexistence of multiple trading explorations. In this, first present the requirements that motivated the design and discuss how these facilitate the trading of compute resources using multiple market models. Finally, he considers the performance of the first prototype of Market Environment in terms of its scalability. And conclude the various technical and market requirements and challenges in designing such an exchange. He described the architecture and the implementation of market and evaluated it with two experiments: measuring the effect of design choices on the performance of market and measuring the overhead time incurred in the interaction between the consumer and the provider through market. The experiments show that market can scale well and can handle many concurrent trading models and resource requests. Thus it was concluded that the overhead generated for matching a large number of resource requests in concurrent auctions is minimal. In order to address this issue, a more efficient database server and a solid replication infrastructure has to be put in place.

3. Material and Methodology

1. Existing system: The Existing system is inspired by the concepts of the "Open Market" where any user can join, sell and buy their compute services. Cloud market conducted a double auction to match bids of multiple resource requests to the providers' ask. First, the providers advertise their resources with their price (asks). Consumers submit their bids to show their interest in leasing the advertised resources. All the bids and asks are stored in the database which will be accessed at the end of the auction for calculating the winning bids. The Meta-Broker, which is the main agent of market, coordinates the matching of asks and bids, and trading between auction participants. At the end of the auction, the Meta-Broker decides the winners and sends the reservation requests to the Reservation Service of market. Then the Reservation Service informs the resource providers and consumers about the auction result. The information about reservations is stored within market using the Accounting service. [7]

2. Proposed system: The proposed system is an implementation of cloud market which shows that number of users is requesting for the resource, and cloud provider will provide the resource accordingly, in this prices for different resources are considered to be fixed but the best part of this system is if two users are requesting for the same resource with same price for the same time, the cloud provider will provide the resource to the one who is the loyal or trust worthy user. This can be calculated based upon the number of visits of user to the cloud market. In this we are considering the budget constraint i.e. if the user do not have appropriate budget then he is not allowed to request for a resource.

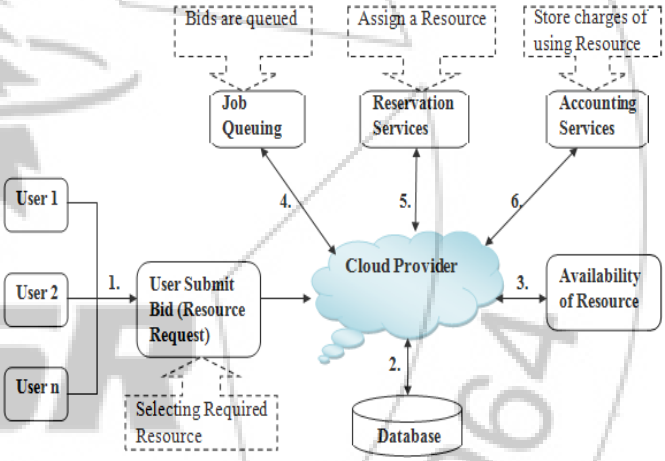

Figure 3.1 System Model for Resource allocation in cloud computing

User: Users are the consumers who submit a resource request to get a resource of their use. Consumers have to bid for a resource to show their interest in it.

- **Cloud Provider**: cloud provider is a central authority who accepts the requests of the users and checks the trading between auction participants. Cloud Provide the services to consumers after interacting with database.
- **Database**: Database is a back end of whole criteria; the detailed information like time, cost and budget of consumer is stored in it. Database allows the cloud provider whether to accept or reject the proposal of resource being used.
- **Reservation Services**: Users must register themselves before requesting for a resource. They are not allowed to access any of the resource before login. After registering they are assigned with the required resource.
- **Job Queuing**: Cloud provider maintains the no. of jobs by interacting with database; jobs are queued up according to

bidding cost. The cloud provider will provide the resource to the one who is having the highest bid.

- **Accounting Services**: Accounting services maintains the information about the charges that a user has to pay for using a particular resource with respect to time.

3.1 Sequence Diagram

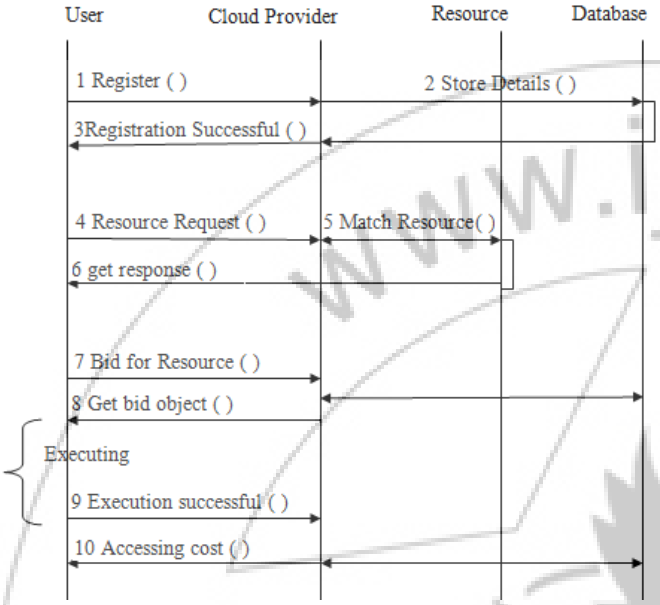

Figure 3.2 shows the sequence diagram for system model

4. Results and Discussions

In order to evaluate the performance of cloud market and provide a proof of concept of its architecture, we implemented a prototype and tested as a service provider. In this section, we describe the prototype implementation and discuss its performance results.

Market exchange has been implemented in Java in order to be portable over different platforms such as the Windows operating systems. From the implementation point of view, cloud market is composed of a collection of services that interact by means of a persistence layer represented by the SQL database. The system is accessible from external components through a web service that has been deployed by using Glassfish server. The web service interface makes the interaction with market as platform independent.

In this implementation, prices are considered to be fixed. It is more reliable since users can know more quickly whether he will get resources or not. To show the results, we use three metrics:

a) Time taken by cloud provider to assign the resource.
b) Cost incurred per consumer.

a) Time taken by cloud provider to assign the resource: when a user sends a resource request, cloud provider first checks whether the resource is available or not. Then it checks the bidding cost that a user submits for required resource and assigns the resource to the one having the highest bid.

Table 4.1 shows the time taken by cloud server to assign a resource for execution

Client ID	Time Taken
1	7
2	7
3	6
4	8
5	10

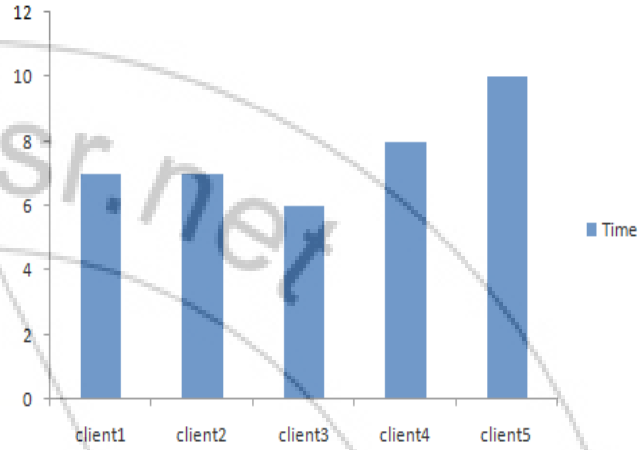

Figure 4.1 Performance of cloud Market for 5 clearance requests

The graph shows the time between request and assigning the service to the client.

b) Cost Incurred per consumer: As we know cloud provides the services "pay-as-you-go" basis. So consumers are charged with amount that they have to pay for using the resource.

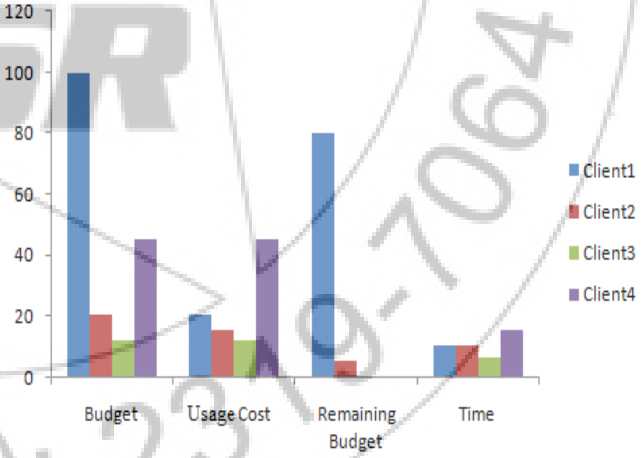

Figure 4.2 shows the graphical representation of user's detail

Cloud computing systems are popular that rent computing resources on-demand, bill on a pay-as-you-go basis, and multiplex many users on the same physical infrastructure. These cloud computing environments provide an illusion of infinite computing resources to cloud users so that they can increase or decrease their resource consumption rate according to the demands. Basically cost is according to the bulk of time that client had selected, if client wants more

amount of time for single execution then obviously he has to pay more.

Figure 4.3 shows charges for executed services.

Table 4.2 shows time v/s cost graph

User	Time	Cost
Client1	7	7.7
Client2	6	12
Client3	7	14
Client4	3	6
Client5	10	20

5. Conclusion and Future directions

5.1 Conclusion

In this paper, we are considering the concept of budget constraint; cloud provider will provide the services based upon budget that the users use to get a resource. If user has appropriate budget then he will get the resource otherwise not. Budget is considered as a deadline and time keeps on changing according to the requirement of user. Moreover cost is considered to be fixed for a particular resource while time varies to execute a resource.

5.2 Future Scope

For future we will work on time constraint as well as by combining both time and budget constraint. In time constraint, time is considered to be deadline that user has to execute the resource in fixed time only otherwise cloud provider will de-allocate the resource forcefully. Secondly, both time and budget are considered as deadline, user has to execute his task within a particular amount of time with given budget.

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