Application of a novel time-slot utility mechanism for pricing cloud resource to optimize preferences for different time slots

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Abstract: **Cloud is a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource based on service-level agreements established through negotiation between service providers and consumers. Nowadays most of the organization move towards cloud and they can store their data in the cloud and get benefits from their applications. Cloud can offer services in three in such as Software as a service, Platform as a service and Infrastructure as a service. It helps to rectify the future problems in cloud. It presents a multi-issue negotiation mechanism to facilitate PTNs between Cloud agents, tradeoff between price and time-slot utilities and formulating a novel time-slot utility function that characterizes preferences for different time slots. In this proposed work a novel time-slot utility function that characterizes different preferences for different time slots has been devised, the PTN mechanism is designed for both price and time-slot negotiations. A novel tradeoff algorithm, known as the "burst mode" proposal, has been designed to enhance both the negotiation speed and the aggregated utility of price and time slot in a multi-issue negotiation.**

Key words: time-slot utility function, PTN mechanism, multi-issue negotiation, reservations for Cloud services, Cloud negotiation, Resource allocation , Negotiation agent.

I. INTRODUCTION

It presents a multi-issue negotiation mechanism to facilitate PTNs between Cloud agents and tradeoff between price and time-slot utilities. Another novelty of this project is formulating a novel time-slot utility function that characterizes preferences for different time slots. These ideas are implemented in an agent-based Cloud testbed. (Fig:3) Cloud computing is an architecture for providing computing resources as a service(Fig:2). Cloud computing entrusts services with a consumer's data, software and computation over a network. The consumer of the cloud can obtain the services through the network. In other words, users are using or buying computing services from others In general, cloud provides application, computation power, storage, bandwidth, database etc. As the resource pool is very large, users can scale the application in the cloud to any level. The cloud makes it possible for you to access your information from anywhere on demand basis. Cloud computing is a collection of parallel distributed, and web–accessible that should be dynamically composed and virtualized based on consumer requirements [20]. Cloud participants, namely, service providers and consumers, are self–interested, autonomous parties that should interact and coordinate among themselves to make an effective and efficient use of cloud resources. The distributed nature and inherent dynamism of cloud systems as well as the self– interested autonomy of cloud participants emphasized the need for agent–based solutions. An agent is a computer system that is capable of autonomous actions, that is, deciding for itself and figuring out what needs to be done to satisfy its design objectives. To successfully interact, agents require the ability to cooperate, coordinate, and negotiate with each other. There are no specialized search engines for the consumers who want to find the cloud services. In an agent-based cloud service discovery approach, a search engine that consults cloud ontology for reasoning about the relations of cloud services and retrieves the relevant service information. The cloud consumer thus reserves the required service.

Even though the reservation manager can identify a common time slot that is acceptable to both consumer and provider agents, it did not provide a utility function for characterizing agents' preferences for different time slots. A tradeoff algorithm has been designed to enhance both the negotiation speed and the aggregated utility of price and time slot in a multi-issue negotiation. At the end of the negotiation process, provider and consumer commit to an agreement. This agreement in the SOA is referred to as a SLA.The objective of this work is to design an agent-based cloud system that implements cloud service discovery and PTN mechanism for cloud service reservation. Since this work explores the issue

of designing an agent based system for the cloud service discovery and service reservation, areas related to this work include the cloud service discovery, Cloud service reservation and negotiation. Cloud service reservation using PTN mechanism is implemented in an agent-based cloud.
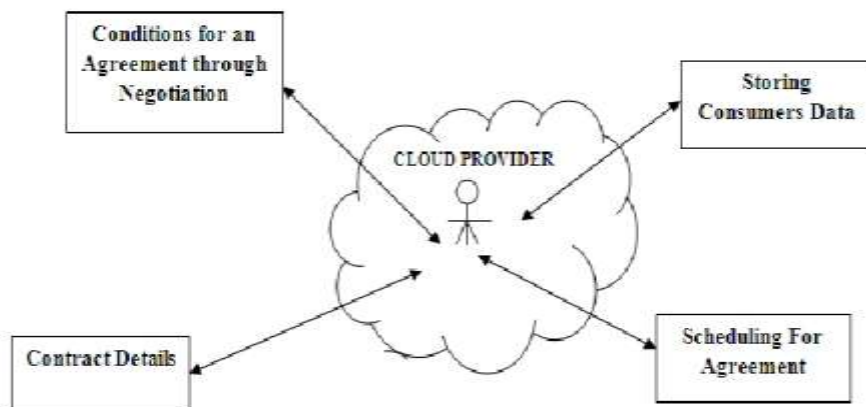

Fig.1: Cloud Architecture

The negotiation mechanism facilitates PTNs between cloud agents and tradeoff which deals between price and time-slot utilities. Another novelty of this work is formulating a novel time-slot utility function that characterizes preferences for different time slots. An automated negotiation engine that identifies mutually acceptable terms and also demonstrates how the negotiation engine enables users to control the quality of service levels they require. A bilateral protocol for SLA negotiation(Fig:3) using the Alternate Offers mechanism is able to respond to an offer by modifying some of its terms to generate a counter offers. In existing negotiation mechanisms in which a negotiation agent can only make one proposal at a time, Whereas it is essential for both a consumer and a provider to reach an agreement on the price of a service and when to use the service, to date, there is little or no negotiation support for both price and time-slot negotiations for Cloud service reservations. Whereas previous works have dealt with advance reservations considering bandwidth or time constraints and considered *SLA* negotiation, to date, there is no service reservation system that considers both price and time-slot negotiations. Since there is an inverse relationship between price and time-slot utilities, price and time slot have to be negotiated simultaneously.
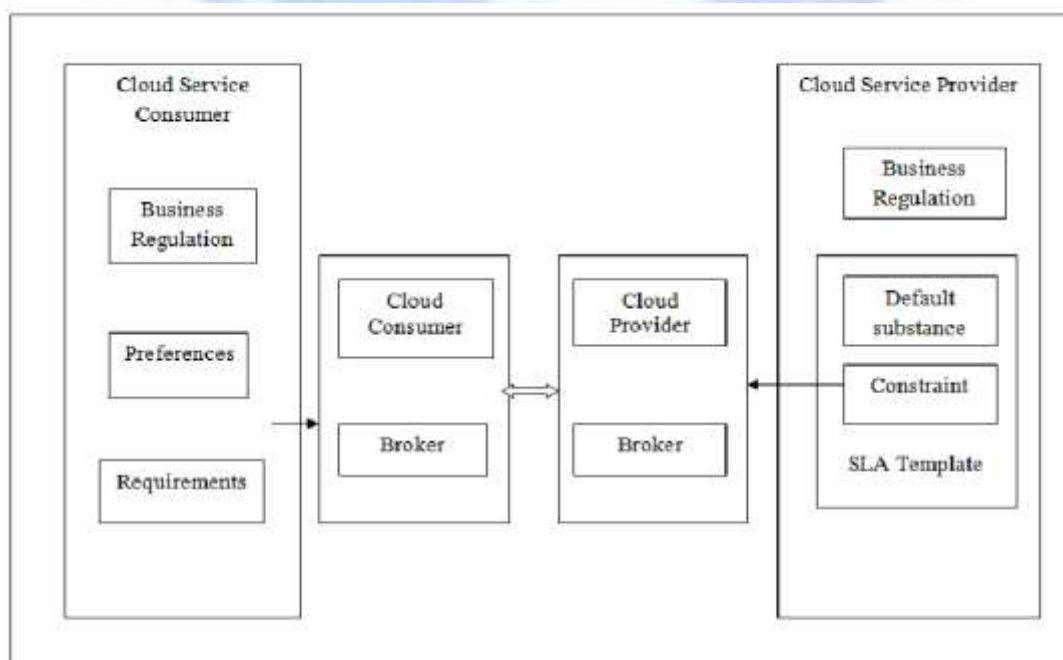

Fig 2: SLA   Negotiation Process

II. RELATED RESEARCHES: A REVIEW

Negotiation based on Service Level Agreement (SLA) is an agreement among providers and consumers. All resources are borrowed using cloud computing along with utility computing but in cloud computing [2] the company has fewer facts regarding resource of the services. In negotiation mechanism, the consumer and the provider can negotiate over both contract price and commitment negotiation method for flexible price of Cloud resources, providers can gain from more efficient consumption of their resources, and consumers can gain from cost reduction in several situations and having [4] more flexibility in scheduling the start and execution times for running their applications.

For accessing cloud resources, the consumer and the provider making deals within the cloud computing environment. Identifying an agreement among the consumer and the provider to address the loss, the agreement specifying at least a [4] minimum service requirements. Exchanging the resources at a service level at least equal to the minimum service level and for a price does not exceed the maximum price specified in the agreement and identify the comprising agreement database for an agreement through negotiation by the provider. Toward scheduling a task to an adaptable resources for a negotiation in accord [3] with adaptable time, which involves finding out an appropriate order which all the tasks can be executed such that execution time and execution cost can be minimized.

A negotiation mechanism provides a means for consumers to begin contracts with providers to assurance that consumers can run their applications at the reserved time slots without interval. Besides, the negotiation method should also permit both providers and consumers to specify their preferences. For example, providers may charge a higher price for as long as services at peak time and a lower price at nonpeak time, and consumers may want to pay a higher (correspondingly, lower) price to use a service at more (correspondingly, less) desirable time slots. In this work, a price and time slot technique so as to enables both providers and customers to do the following:

1) specify their preference on behalf of price and time slot and

2) search for mutually suitable prices and time slots.

 The provider and the consumer attaining a resource in cloud through:

a) Negotiation Objectives

The negotiation objective is not just price but as well further essentials such as quality, reliability of supply, or the creation of long-term relationships. To considering multiple objectives include cost, refresh time, process time and availability.

b) QoS Parameters

QoS parameters are to: fill the services request in sort to negotiate the Cloud resource; describe the Cloud offer; match the compliant services and build the best available solution; define the SLA; monitor the service levels.

c). SLA Negotiation

These SLA negotiation among multiple Cloud providers will be delegate to a broker in a market based context that provide**:** For searching for obtainable Cloud services, compliant with user needs; Finding trustiness of providers; Deciding among whom to negotiate, according to user requirements; Negotiating the finest price for the same propose by different providers; negotiating of several SLAs, among [6] different providers, to overcome the need of one compliant propose by a single provider.

d) Multilateral Negotiation Protocol

The Cloud negotiation procedure for specify the negotiation concert among consumer and provider is specified as follows: [7] Negotiation takings in a sequence of rounds;   Consumer and provider negotiate by making proposals in alternate rounds and multiple consumer-provider pairs can negotiate deals concurrently. When a negotiator makes a scheme, it proposes an agreement from its space of feasible deals and If no agreement is reached, negotiation takings to the subsequently round. Negotiation among the consumer and the provider they terminate: while an agreement is reached, or with an inconsistency when one of the negotiation deadline is reached. In existing system, the negotiation is done only

based on price and time. There is a concession for the frequent consumers. The providers allocate storage according to the negotiation of price and time and the amount of task performed by the consumer.

e)   Price And Time Slot Negotiation

An agent based cloud test bed performs as a market for cloud. Both the consumer and provider agent take part in cloud negotiation throughout the cloud market registry. The registry is an information repository. Provider agent purpose as service advertiser and consumer agent discovers the services from environment. Service discovery afford in test bed during the message passing. Periodic simulation restricted by the simulation controller. Cloud status recorder shows the information regarding the cloud market and negotiation as of all negotiation round. Two algorithm named tradeoff algorithm and concession making algorithm be implemented for PTN. Cloud reservation is task in memory array. Here particular issue and multi issue negotiation is considered [4]. Consider further negotiation issues for quality of services (QoS).

Introduce coordinators which allocate the application across different data centers which enabling SLA's for improving application's performance, consistency and scalability. Provisioning of virtual machine suggest protection. PTN method follows the negotiation protocol is agent construct negotiation in alternate rounds. It will recognize when both the consumer agent and provider agent reached in a contract for price and time. The negotiation fails when one of agent's deadlines expires by reach the agreement. Algorithm used in proposed system is the tradeoff algorithm and the concession making algorithm for price and time slot negotiation. The tradeoff algorithm involving for generating a negotiation based on the time of the service and the price of the service which is performing by the consumer for cloud resources. The concession making algorithm is based on the available frequent consumers performing the cloud resource according to the negotiation conditions of producer.

III.   PROPOSED SYSTEM ANALYSIS

The architecture diagram for Cloud Service Discovery and Reservation (Fig 3) provides an interface for cloud search, cloud service reservation, user registration and negotiation session between provider agents and consumer agents and includes a registry of available infrastructure services and negotiation results. The PTN mechanism consists of the following.
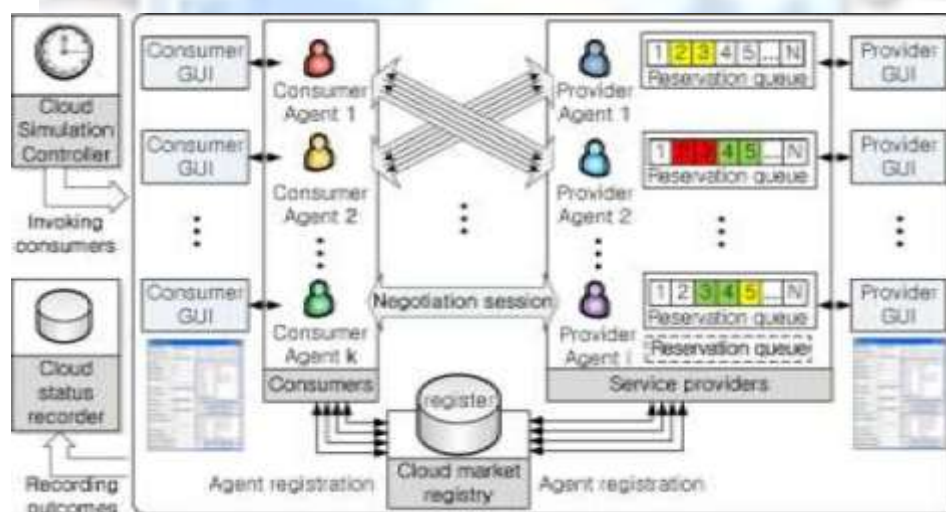

Figure 3: Agent-Based Cloud Testbed

A)   Interface for cloud search:

To provide flexibility to the users, the interfaces have been developed that are accessible through a browser. The GUI'S at the top level have been categorized as Administrative user interface The operational or generic user interface The 'administrative user interface' concentrates on the consistent information that is practically, part of the organizational activities and which needs proper authentication for the data collection. These interfaces help the administrators with all the transactional states like Data insertion, Data deletion and Date updating along with the extensive data search capabilities.

The 'operational or generic user interface' helps the end users of the system in transactions through the existing data and required services. The operational user interface also helps the ordinary users in managing their own information in a customized manner as per the included flexibilities.

B) **User registration**

This part is helpful for user to join with our services and it is user friendly. User can login to this page for join in our service. User can get unique username and password. Once they get the registration id and password they can use the resources provided by our service. If they join in our service they freely use the entertainment content. If the registration id and password matches then only user can use our resources. Only authorized user can use our resources. Unauthorized user cannot able to use our resources. If they are successfully login they can further access the resources provided by our service.

C) Clod service reservation

Cloud is environmental friendly and promotes telecommuting techniques. Cloud provides a platform where three elements such as Infrastructure as a service (IaaS), Platform as a Service (PaaS) and Software as a service (SaaS) to provide the requirements of the customer in most efficient manner. In cloud shared resources, software, and information are provided to computers as a metered service. IaaS providers give a virtual server to start, stop, and access and configure an online storage. This allow a company to pay only as much capacity as needed. PaaS providers host a set of software and product development tools as online infrastructure, to allow the developers the ability to create applications on platform. SaaS provides no investment in servers or software licensing. Desktop as a Service (DaaS) is an emerging service which deals with providing a whole desktop experience over the internet. It is also referred as desktop virtualization [13].

Elasticity means that platform can handle sudden, unanticipated and extraordinary loads. Scalability is a planned level of capacity with ability to scale in a quick and easy manner when need more or less resources. Data integrity is a property that ensures that the data is of high quality, correct, consistent and accessible. Reliability is the ability to perform and maintain its function in routine as well as unexpected circumstances.

Resource allocation is very important for virtualization platform. Resource allocation can be done based on the information from different domains. It depends on bandwidth and time. In the method of weighted allocation, all the domains are of same weight. It provides a better scheduling and performance. Resource allocation considers the factors such as resource cost, resource reliability, execution time and bandwidth. Different type allocation algorithms are used in cloud for allocating resources.

D) Negotiation session

Cloud computing is powerful, since it does not rely on any one source. Cloud may look like virtualization because it appears that the application is running on a virtual server detached from any connection to a single physical host. Virtualization is part of a physical infrastructure and technique which allow running more than one server on same hardware component. With cloud computing, the software programs are stored on servers placed elsewhere and it is accessed via the internet. Even if the computer crashes, then software is available for users. In virtualization technique, one physical computer is pretending to be many computing environments, whereas in cloud computing, many different computers pretending to be the one computing environment.

The selection of negotiation protocol determines the scope of information flow which in turn influences the changes upon the agreement. The fundamental phases of business transaction are product offers and discovery, negotiation process, payment activities, and the delivery of the product to customers. A negotiation coordinator is responsible for coordinating the actions taken by its various negotiation phases. An important feature of negotiation model is simultaneous negotiation of many buyer-seller pairs [7]. Accessing several resources by multiple resource providers is a challenging task for consumers. Grid calls for a shared environment on a computer system from multiple administrative domains. Both grid and cloud provide scalability. Cost of deploying is also high. Cloud computing is an abstraction of traditional server hosting applications. Instead of buying server, the server is taken for lease from a vendor to run and manage the system in data center. Negotiation mechanism differs from auction. Negotiation focus on cooperating to create the value of objects while auction determining the object's unknown value [8]. Negotiation agents play very important role in the mechanism [4]. Agent acts as a bridge between different networks and creates an infrastructure. Business infrastructure coordinates the dealers. Resource management is central to the operations. Conflicting request from multiple cloud participants are hard to

manage. In order to achieve high system utilization, the negotiation is conducted [5].Negotiation among cloud resource providers and cloud applications are unavoidable due to the following reasons:1)To maximize the selling of providers and minimize the price payment by consumers .2)To balance the market of cloud services [2].3)To obtain a contract for provisioning of resources.

An agent based cloud test bed act as a market for cloud. Both the consumer and provider agent participate in cloud negotiation through the cloud market registry. The registry is an information repository. Provider agent function as service advertiser and consumer agent discovers the services from environment. Service discovery provide in test bed through the message passing. Periodic simulation controlled by the simulation controller. Cloud status recorder shows the information about the cloud market and negotiation from all negotiation round. Two algorithm named tradeoff and concession-making algorithm are implemented for PTN. Cloud reservation is doing in memory array. Here single issue and multi issue negotiation is considered [14].

Consider other negotiation issues for quality of services. Introduce a coordinator which distribute the applications across different data centers which enabling SLA's for improving application's performance, reliability and scalability. Provisioning of virtual machine provide security. PTN mechanism follows the negotiation protocol is agent make negotiation in alternate rounds. It will accept when both the consumer agent and provider agent reached in an agreement for price and time. The negotiation fails when one of agent's deadlines expires before reach the agreement.

In future work we advocate creation of federated Cloud computing environment that facilitates just-in-time, reliable and scalable provisioning of application services, and consistently achieving QoS targets under variable workload. It is used to counter the problem such as the inability to predict geographic distribution of users consuming their services. In the proposed system, the consumer makes an agreement with the provider through negotiation for accessing cloud storage. There are 3 parameters for making this negotiation: price, time and task. The provider concurrently performs a multiple proposal to make individual time, price slot and task negotiation for each consumer.

A negotiation is the process of performing the things through deals among two parties to reach their goals as per their needs. Both the consumer and the provider agents achieve the best performance in terms of negotiation. The consumer and the provider gain a mutually satisfying agreement on negotiation of price, time and the task. On one occasion the negotiation has concluded and if mutually the both consumer and the provider are agree to the terms, and then they have to sign an agreement and the consumer should follow the producer terms and conditions for cloud resources through negotiation. Two things are going to enhance for a task negotiation in cloud: They are;

1) Consumer job allocation process

2) Producer allocating resources and storing their task according to their conditions for consumer and as per the consumer request through database.

At last, after a suitable service provider and a negotiation procedure is preferred by a consumer by using his/her private selection strategy, the negotiations between them will start according to the conditions specified in the provider's document.

E) **Negotiation state machine**

The broker keeps way of the negotiation process through a state machine. The transition among the states is lead by the broker's strategy and the responses from the provider[16]. The different states for a task negotiation are Initiation for negotiation, Submit proposal ,Counter, Accept proposal, Confirm proposal and Reject proposal are shown in Fig;9. Broker make a plan and chooses one out of a list of resource providers based on factors such as resource price, time and the task of the consumer [15]. To initiate a negotiation session and submit the proposal and if the proposal is accepted directly, then a proof message is returned to the provider. If a counter proposal is established, then it is evaluated to make out whether the counter reservation is still in the deadline. If so, then it is accepted by the broker. If not, then the aggression factor is improved to decrease the number of nodes essential. This made on the assumption that needs for smaller number of nodes have better chances to be accepted or found more acceptable counter time slots. This carry on until the aggression aspect is increased upto 1 which the most range available to broker. If the counter proposal from the resource provider does not assure the deadline requirements, the proposal   is rejected and the session stopped.
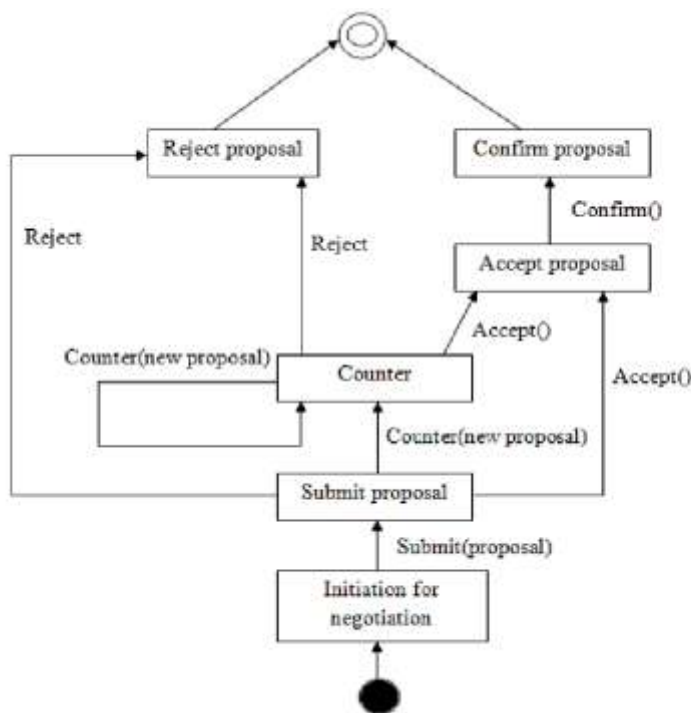
Fig.4   Negotiation State Machine

F). Algorithm

The proposed algorithm is mainly based on the *Task Based Meta Negotiation*. Metanegotiation is defined in way of a meta-negotiation document where participating parties may convey: the pre-requisites to be fulfilled for a negotiation. In Metanegotiation, anywhere participating parties can specify negotiation necessities and based on a private selection approach select those services which assure successful negotiation. In this approach, the participating parties bring out only the set of rules and conditions whereas keeping negotiation strategies hidden from potential associates. Meta-negotiation approach agrees to two parties to attain an agreement on what negotiation protocols and documents to utilize by initiating the negotiation process.

IV. EXPECTED OUTPUT SCREENS

The expected outcomes of the task negotiation with price and time slot negotiation using Meta Task Negotiation are

Fig 5: Index page

Fig: 6 About Page

Fig 7: Contact Page

Fig 8: Registration Page

Fig 9: Registration for User Page

Fig 10: Login Page

Fig 11: Login for Admin

V. CONCLUSION

Cloud computing is still struggling in its infancy, with positive and negative comments made on its possible implementation for a large-sized enterprise. In future cloud computing makes a big revolution in IT organization.This study tackles the negotiation process and tries to minimize the number of steps needed for agreement to minimize the waiting time for impatient jobs. The job waiting time depends on the number of counteroffers and the confirmation steps if we assume there are enough resources. This paper presents the design and implementation of a negotiation mechanism for dynamic resource allocation problem. In the negation model, multiple buyers and sellers are allowed to negotiate with other concurrently and an agent is allowed to decommit from an agreement at the cost of paying a penalty. This paper also presents negotiation strategies for both buyers and sellers considering important factors widely studied in the literature. This paper demonstrated how the figure of an EERM can benefit Providers by providing resource data to the Brokers and by considering economic policies in resource management. The other contribution of this paper is the intention of being a step forward in the modeling and evaluation of utility functions for negotiations in Cloud Computing Markets.

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