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Negotiation Mechanism in Cloud Space Based on Price and Time

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Abstract: ***Cloud Computing is the most adopted technology of today if one wishes to access data at anytime and from anywhere. Cloud is defined as a collection of virtualized and interconnected computers which are provisioned dynamically and are represented as one to many uniform computing resources depending upon SLA (Service Level Agreements) which are established with the help of negotiations between cloud service consumers and providers. Most of the great organizations of present world have moved into cloud for application benefits. Cloud services are widely classified into three types: Software as a Service (SaaS), Infrastructure as a Service (IaaS) and Platform as a Service (PaaS). In order to overcome few issues with cloud services, multi-issue mechanisms are needed for negotiating price and time slots. This paper presents PTNs (Price and Time Slot Negotiation) between cloud agent and tradeoff between time-slot and price utilities which characterizes various preferences for multiple time-slots. "Burst Mode", a tradeoff algorithm is being designed for enhancing negotiation speed as well as aggregated use of time slot and price in multi-issue negotiation mechanisms.***

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

1. Introduction

It showcases a muti-issue mechanism for price and time-slot negotiation between the Cloud agents and proper tradeoff to occur between utilities of price and time slots. Another major novelty of this project is formulation of a novel utility function for time-slots which includes preferences for various time-slots. This major idea is implemented using agent-based Cloud bed (Fig: 3). Cloud computing service life cycle involves SLA Negotiation as an important feature (Fig: 1). Cloud computing architecture provides various levels of services (Fig: 2).

Cloud computing ensures services using consumer's data, computation and software over computer network. The Cloud consumers can make use of all the services with the help of internet. In general, the cloud enables consumers to either buy or use computing resources like application, storage, computation power, bandwidth, memory, database etc. Cloud resource pool is very huge which enables the users to to scale applications in cloud to great extent. Cloud has made it possible to access your data from anytime and at anytime on demand. Cloud is termed as a collection of distributed parallel and web-access enabled network which has to be dynamically virtualized and composed pending upon consumer needs [20]. The Cloud participants are service consumers and service providers- they are self-motivated, autonomous and must be capable of interacting and co-ordinating among them for making an efficient and effective access of cloud resources. The distributed and inherent mechanisms of cloud along with self-motivated cloud participants emphasize the need of agent-based cloud solutions. An agent simply means a computer system which is capable of working autonomously- decides everything by itself and knows how to react for various situations for satisfying design principles. For successful interaction, cloud agents must have the capability to coordinate, cooperate and negotiate with one another. For finding cloud services, there are no special search engines. In an agent based approach, the search engine consults the cloud ontology to reason about cloud service relations and obtains the appropriate service. The cloud consumer must register for desired services in cloud. Even though various time slots are identified by reservation manager, it fails to identify a utility function based on agent preferences to different time slot. The trade-off algorithm is designed to improve both utility of price and time slots as well as the negotiation speed. By the end of negotiation, both the consumer and the provider agree upon an agreement. In SOA, this agreement is termed as Service Level Agreement (SLA). The main objective of this work is designing an agent based test bed which can implement discovery of cloud service and PTN mechanisms for cloud space reservations.

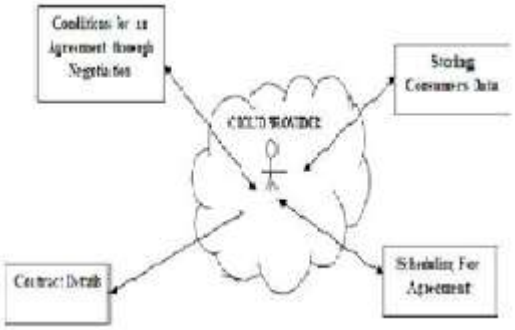


Figure 1: Architecture of Cloud

This work includes designing issues in agent based cloud test bed and service reservations, the related areas of this work includes discovery of cloud service, negotiation and reservation of cloud services. Cloud reservations with the help of PTN mechanisms are implemented using agent test bed. The negotiation mechanisms in cloud facilitate Price and Time slot Negotiations (PTNs) and tradeoff mechanisms facilitates price and time utilities. Another novelty includes formulating a utility function which gives preferences for multiple time slots. The negotiation machine is completely automated and it will identify mutually feasible terms and will demonstrate the way how negotiation engine controls QoS (Quality of Service levels they need. Bilateral protocols are used for SLA negotiations (Fig: 3) with the help of

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Alternate Offer mechanisms and it is capable of responding to offers through modification of some terms and generates counter offers. In previous negotiation mechanisms, a cloud agent can make only a single negotiation at a time; this work proposes multi-issue negotiation mechanisms based on price of services, time slots including when the service is used and to date. In previous works there is no negotiation support for price and time slot based reservations. Both price and time have inverse relationship among them and thus they need to be negotiated at the same time.

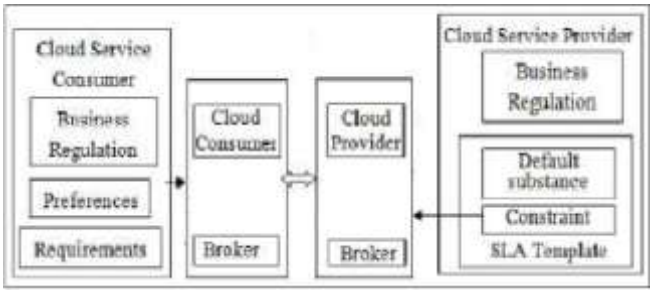


Figure 2: SLA Negotiation Mechanism

2. Overview of Related Resources

Negotiations on Service Level Agreements are the agreement among service consumers and providers. Mostly in cloud computing, the resources are borrowed with utility computing [2]. In negotiation mechanisms, provider and consumer negotiates over price and time slots. The consumers have advantages like price flexibility, efficient resource consumption, cost reduction and flexibility to start and execute their applications on various time slots. To access the cloud resources, the providers and consumers make deals in cloud environment. The agreement will be made between service provider and consumer if it meets at least some minimum requirements based on SLA. The price negotiated should not exceed maximum amount mentioned in the agreement. The negotiation includes finding an adaptable time [3] involving the appropriate order in which tasks are executed so that execution cost and time are reduced. This kind of negotiation mechanisms ensures consumers to run the applications at specified time slots without any interval. The PTN also provides both the consumers and providers to quote their preferences. The providers might charge higher rate for services at peak time and lower price for services at non-peak time. At the same time if the consumers are choosing their desirable time slots, they need to pay more. In this work, accuracy of contents and price and time slot techniques are important as the contents are never recreated and this electronic data is converted to final version. For proper price and time-slot negotiations, the consumers and providers must follow certain rules: 1) specify preferences based on time-slot and price 2) Search for mutual beneficial time-slot and price.

The service providers and consumers must follow the conditions below for proper PTNs mechanisms:

2.1 Objectives of Negotiation

The negotiation objectives are not just time-slot and price but there are many further essential features like reliability, quality and creation of relationships. Multiple objectives include refresh time, cost, availability and processing time.

2.2 QoS Parameters

The Quality of service parameters are for filling service requests for sorting negotiations for cloud resource, describing cloud offers, matching compliant services, building best available solutions, defining Service Level Agreements and monitoring service levels.

2.3 SLA Negotiation Mechanisms

The Service Level Agreement negotiations among various cloud service providers are delegate to every broker which provides: searching for cloud services according to user needs; Figuring out trust of providers; making decisions on whom to negotiate based on the user requirements; negotiating of lowest price for similar purpose by various providers; negotiating various SLAs among [6] various service providers in order to overcome the necessity of a single complaint proposal by service provider.

2.4 Multilateral Protocol

The Cloud PTN procedures to specify negotiation concerts among service providers and consumers are specified like follows: [7] the negotiations take place in sequence; both provider and consumer negotiate by alternating proposals and different provider-consumer pairs can make concurrent negotiations. When any negotiator creates a scheme, it also proposes agreements from the space of all feasible deals. If any agreement cannot be reached, the negotiation takes to subsequent rounds. Negotiations between provider and the consumer terminates: while an agreement has reached or due to inconsistency while negotiation deadline has been reached. In this work, negotiation can be made only on price and time slots. Concessions are provided for frequent visitors. The service providers will allocate storage based on negotiation of time and price and also on the amount of performed task by consumers.

2.5 Time and Price Negotiation

The agent based test bed in cloud acts as market place where both provider and consumer can indulge in negotiations using cloud registry. The cloud registry is nothing but a repository of information. The provider agent acts as advertiser for services and the consumer agent identifies services from cloud environment. Discovery of service occurs in cloud test bed while message passing. Simulations are restricted periodically by simulation controller. Status recorder in cloud displays information regarding cloud markets as well as negotiation. Two algorithms namely concession making and trade-off algorithm are implemented for PTNs. Cloud service reservations are done in memory arrays. The single and multi-issue negotiation mechanisms are considered here [4].

3. System Analysis

The Cloud Service Reservation and Discovery architectural diagram (Fig: 3) gives an interface for cloud reservation,

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cloud search, registration and negotiations between consumer agent and provider agent. It also includes a registry that has the list of all available infrastructural services and results of negotiations. The price and time negotiation mechanism in cloud includes the following:

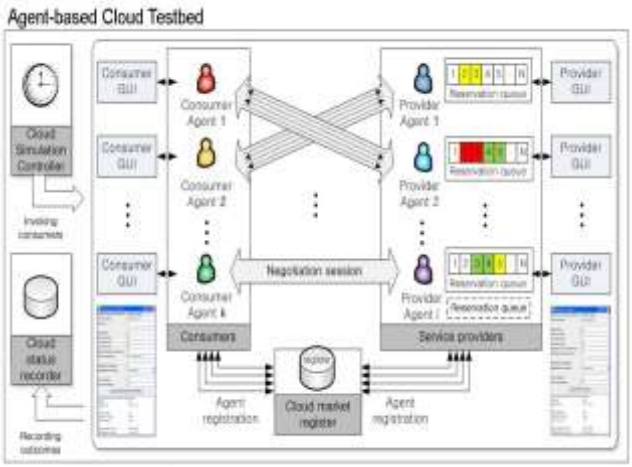


Figure 3: Agent based Cloud test bed

A) Cloud Interface

In order to enable flexibility to cloud users, interfaces are helpful and they can be accessed through browsers. The Graphical User Interface at top are classified as Administrate interfaces. The other kind is operational interface. The administrative interface concentrates on consistent data which are a part of an organization's activities and this needs correct data authentication. The administrative interfaces help administrators among different transaction states like Data deletion, Data insertion, Data search and Data update.

B) User registration

This enables the users to join cloud services and it has user friendly options. The users must log into this registration page to join the services. A unique username along with password is assigned to each user. Only after getting this username and password, the users can use cloud services. Once they register, they can access entertainment contents for free. The cloud is elastuic and environment friendly. It is capable of handling sudden, unantipated and extraordinary loads. Data integrity in cloud ensures that persistent data is correct, of great quality, accessible and consistent.

C) Allocation of resources

Resource allocation is an essential part of virtualization environment. Based on information received from several domains, the allocations of resources are performed. This depends on time and bandwidth. In weighted resource allocation, all domains have similar weight to enhance performance and scheduling. Resource allocation includes various factors such as reliability of resource, bandwidth, cost of resources and execution time. Resource allocation considers the factors such as resource cost, resource reliability, execution time and bandwidth. Various kinds of allocation algorithms are used for cloud resource allocation.

D) Negotiation sessions

Cloud computing is rigorous as it never relies on just one source. Cloud appears to be virtual as the applications are running on virtual servers attached to physical hosts. Only virtualization makes it possible to run any number of servers on similar hardware component. Using cloud, software programs are stored in servers and they are accessed through internet. Even while the computer crashes, the software is made available for users. The major difference between virtualization and cloud computing is in virtualization, one computer pretends to be like many computing environment where as many computers pretend to be a single computing environment in cloud computing. Correct selection of negotiation protocols would determine scope of the information flow that in turn would influence changes in agreement. Cloud computing is a similar abstraction to client server systems. You need not buy a server; instead it is made available by vendors for running data in data center. Negotiation in cloud is slightly different from auction as it focuses on creating value of objects. An agent act as bridge across various networks and also creates an infrastructure.

E) Agent based Cloud test bed

This acts like a market for cloud services. Both the provider and consumer agents take part in cloud service negotiation through cloud registry. Cloud registry is a repository of information. The cloud service provider acts like advertiser and the consumers are capable of discovering desired services from the cloud environment. The service discovery mechanism is carried out by passing messages. The simulation controller will control simulation periodically. Status recorder in cloud displays information about negotiation and cloud market at each negotiation round. Concession making and trade-off algorithms are designed for PTN mechanism. Reservations for cloud are made in memory arrays. Both single and multi issue negotiation mechanisms are considered in this work. The negotiation would fail when any agent's deadline is expired before arriving on a service agreement.

F) Future Works

In the future work, we would advocate creating federal cloud environment which would facilitate just-in-time, scalable and reliable running of application services. Consistently, QoS targets will be achieved under variating workloads. The problems of unpredicting geographical locations of users are encountered in future work. Three mechanisms would be considered for negotiation namely: Task, Time and Price. The providers concurrently perform negotiation of customers' in order to make individual price, time and task. Both the consumers and providers agree upon best negotiations. When both of them are satisfied, they sign mutual agreement and consumers are supposed to follow provider's terms and conditions. The two main things that enhance task negotiation in cloud environment are:

1) Job allocation processes of Consumer
2) Producer allocates resource and stores them in database based on task preferences of consumers

G) Negotiation state machines

The broker tracks the negotiation process using state machine. The state transition is usually performed by broker strategy and also by responses from service providers. The various states for task negotiation are Initiation, Submission of proposal, Counter, Acceptance of proposal, Confirmation and Rejection of proposal. Brokers plan and choose one

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among lists of resource providers using certain factors such as price of resource, time slots and task [15]. In order to initiate the negotiation session, one must submit the proposal. If this proposal is accepted, then proof of acceptance message would be sent to the provider. If any counter proposal is made, it is then evaluated to find out if the counter reservations are still in deadline. If it is true, the broker accepts the proposal.

F) Algorithm

The algorithm that is proposed is based on task based negotiations. Metanegotiation is stated as a way of metanegotiation document where the parties participating might convey; the pre-conditions should be satisfied for any negotiation but in metanegotiation, parties participating anywhere are capable of specifying negotiation principles. The participants bring certain terms and conditions in this approach.

4. Expected Outcomes

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



Figure 4: PTN Home page

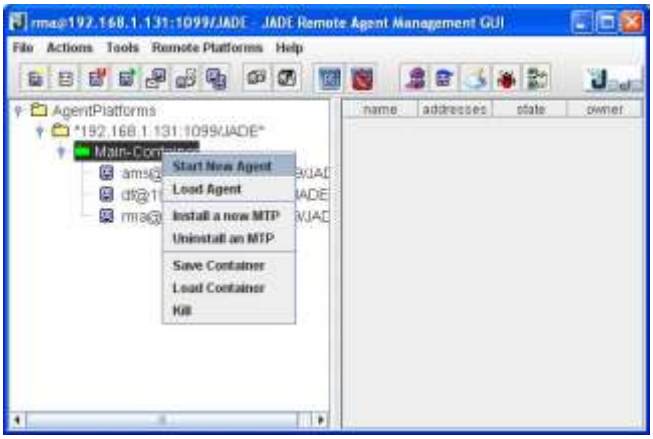


Figure 5: Establishment of communication among client and mediator



Figure 6: Connection establishment among other mediators simultaneously

5. Conclusion

Cloud computing is yet at its infancy and there are both good and bad feedbacks about cloud implementation in large enterprises. But it is for sure that the future of IT companies lies in Cloud Computing. This work brings insight into negotiation mechanisms based on two parameters- price and time. It tries the best to reduce the number of rounds needed to reach an agreement between the producer and the consumer. The waiting time of jobs rely upon counter offers and number of available resources. This paper work also represents design as well as implementation of negotiation mechanisms in order to achieve dynamic resource allocations. In negotiation models, various consumers and providers are given rights to negotiate with each other simultaneously. An agent tends to get de-commited from any agreement by paying the penalty. The negotiation strategy for providers and consumers consider essential factors as per literature survey. This work also considers economic policies while managing resources. This paper takes a step forward and demonstrates the use of utility functions for making cloud service negotiations.

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