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RESOURCE BROKERING SCHEME IN WIRELESS GRIDS CONSIDERING OUT OF VICINITY RELIABLE RESOURCES WITH IMPROVED DEVICE RELIABILITY EVALUATION

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ABSTRACT

The wireless grids, due to the rapid growth in wireless devices it have been evolved in communication services and also in Information Access. The customers prefer reliable resources at minimum cost and providers prefer maximum benefit for their resources. The non-cooperative bargaining game is used between the negotiation agent and the provider where both agents bargain to return a solution. With the improved device reliability evaluation the resources are allocated for high reliability device and jobs are done with limited amount of time. Continuous negotiation process is applied with discount strategies like conservative, linear or aggressive bargaining based on the negotiation status of the agent. The parameters like device reliability, resource utilization rate are evaluated.

Keywords—Non Cooperative bargaining, Device reliability.

INTRODUCTION

Grid computing came into existence as a manner of sharing heavy computational loads among multiple computers to be able to compute highly complex mathematical problems. However, it developed rapidly into a way of sharing virtually any resource that is available on any machine on the grid. Wired grids are now used to share not only computing power, but also hard disk space, data, and applications. The grid topology is highly flexible and easily scalable, allowing users to join and leave the grid without the hassle of time and resource hungry identification procedures, having to adjust their devices or install additional software on them. The goal of grid computing is described as "to provide flexible, secure and coordinated resource sharing among dynamic collections of individuals, institutions and resources"

It is intended to be a dynamic network without geographical, political, or cultural boundaries that offers real-time access to heterogeneous resources and still offer the same characteristics of the traditional distributed networks that are in use everywhere in our houses and offices.

Wireless computational grids are evolving due to rapid growth in wireless devices to provide anytime anywhere computing and communication services. Wireless devices are considered as important resources for job execution in a wireless grid. However, they are unreliable due to unstable wireless connections, frequent mobility, and device resource constraints such as limited processing capacity, limited battery life, low communication bandwidth etc. Consumers and providers in a wireless grid have potential conflicting interests: consumers prefer reliable resources at minimum cost for job execution whereas providers prefer efficient utilization of resources with a maximum profit. Hence it is necessary to design a resource brokering mechanism that assures job execution and satisfies needs of consumers and providers.

This paper proposes a software agent based resource brokering scheme that employs a resource brokering agency consisting of software agents which discover and recommend reliable devices, negotiate resource cost using a cooperative bargaining game and schedule jobs. Device reliability is modeled by using

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parameters like processing rate, memory, and bandwidth and battery power. Discount function is employed in bargain game based on job deadline, previous offers of an opponent, and dynamics in the grid market. Adaptive negotiation process is applied by exercising different discount strategies (aggressive or conservative or linear) based on the negotiation status of a player. The scheme is simulated to evaluate performance parameters like resource utilization rate, expected profit, job completion time and job execution rate. It will observe that the proposed scheme performs better than the existing resource brokering scheme.

RELATED WORKS

“Grid Service Reliability Modeling and Optimal Task Scheduling Considering Fault Recovery, Hong-Zhong Huang”[1] LNFR offers an opportunity to resume execution from failure and saves the migration expense. Because of fault recovery modules located at grid resources, resource providers can set customizable constraints on fault recovery, which makes it easy to achieve distributed management of fault tolerance. “Mobile Grid SEAS: Simple Energy-Aware Scheduler, Juan Manuel Rodriguez”[2] To deal with complexity like battery estimation time or job completion time Simple Energy Aware Scheduler is used. The algorithm consists in two parts: measuring mobile devices capabilities and assigning a resource to a job. “Non-cooperative load balancing in distributed systems, Daniel Grosu, Anthony T. Chronopoulos”[3] For our load balancing game there existing a unique Nash equilibrium because the expected response time functions are continuous, convex and increasing. Nash equilibrium can be defined as a strategy profile for which every user’s load balancing strategy is a best reply to the other user’s strategies. This best reply for a user will provide a minimum expected response time for that user’s jobs given the other users’ strategies. “PANDA: Specifying Policies for Automated Negotiations of Service Contracts, Henner Gimpel”[4] The PANDA approach automates decision-making and proposes to specify a negotiation policy, expressing a party’s private negotiation strategy, by combining rules and utility functions. In addition, the decision-making problem can be decomposed into different aspects that can be executed by different interacting decision-makers. “Comparison of Price-based Static and Dynamic Job Allocation Schemes for Grid Computing Systems, Satish Penmatsa”[5] The DOPTIM scheme tries to provide a system-optimal solution so that the expected average price or cost for the execution of all the jobs in the grid system is minimized. The DCCOOP tries to provide a job-optimal solution so that all the

jobs in the system of approximately the same size will be charged approximately the same expected price independent of the computers allocated for their execution. A “New Resource Allocation Model for Grid Networks based on Bargaining in a Competitive Market, Somayyeh Haghtalabi”[6] Bargaining model is one of multiparty type, meaning there are a few buyers and a few sellers. In this model every customer declares his needs together with preferences and the sellers search for the best and most appropriate proposed price for the requested service. At first, the customer’s agent declares the needed service to the resource broker. Customers’ agents specify the amount of data, the ability to process the required work and deadline before bargaining starts in the negotiation process.” Monitoring and Status Representation of Devices in Wireless Grids, Mahantesh N. Birje”[7] Relative difference is an enhancement over variable bit v representation method. It needs some bits to represent the difference in status values of successive observations of same resource. Here, first value needs $\lceil \log_2 V \rceil$ bits, second value needs less than it since it represents the difference value (*Change*) with respect to first, third value represents the difference with respect to second and so on. ”Resource Monitoring Algorithms Evaluation for Cloud Environment, Mustafa M. Al-Sayed”[8] If the pull interval is large, this causes the loss of important updates during this large interval. Hence, if the pull model has a high efficiency property, its consistency would be low. So, a less transmission costs and a better efficiency would be obtained when the pull interval is proper. “Economic models for resource management and scheduling in Grid computing, Raj Kumar Buyya”[9] Advertises special offers in order to attract (new) consumers to establish market share or motivate users to consider using cheaper slots. In this case, brokers need not negotiate directly with GSPs for price but use posted prices as they are generally cheaper compared to regular prices. “BOINC: A System for Public-Resource Computing and Storage, David P. Anderson”[10] participate in multiple BOINC projects, and can specify how their resources are allocated among these projects. “A pricing strategy for job allocation in mobile grids using a non-cooperative bargaining theory framework, Preetam Ghosh”[11] Addressing such issues as network efficiency, fairness, utility maximization, and pricing. In particular, we characterize a two-player, non-cooperative, alternating-offer bargaining game between the Wireless Access Point Server and the mobile devices to determine a fair pricing strategy which is then used to effectively allocate jobs to the mobile devices with a goal to maximize the revenue for

the grid users. “Dynamic Resource Management in Energy Constrained Heterogeneous Computing Systems Using Voltage Scaling, Jong-Kook Kim”[12] To maximize the performance of the system, it is essential to assign resources to tasks (match) and order the execution of tasks on each resource (schedule) in a manner that exploits the heterogeneity of the resources and tasks while considering the energy constraints of the devices. “Market Based Resource Allocation with Incomplete Information”[13] by augmenting the resource allocation mechanism with a deal optimization mechanism, trading agents can be programmed to optimize resource allocation results by updating beliefs and resubmitting bids. It enhances the performance of resource allocation and trading. “Yet another Improvement in RSFT Algorithm in Mobile Grid, L. Anita Elizabeth, V.M. Sivagami”[14] Fault tolerance is an important property in Grid computing as the dependability of individual Grid resources may not be able to be guaranteed. The Replica Supporting Fault-Tolerance (RSFT) algorithm is formulated to support QoS-aware replica placement, balancing the load of replicas and to reduce the communication cost in mobile grid environment using bottom-up dynamic programming approach. “Negotiating Socially Optimal Allocations of Resources, Ulle Endriss”[15] In this paper, we study an abstract negotiation framework where agents can agree on multilateral deals to exchange bundles of indivisible resources. We then analyses how these deals affect social welfare for different instances of the basic framework and different interpretations of the concept of social welfare itself.

PROPOSED SYSTEM

A Software Agent based resource brokering scheme that employs a resource brokering agency consisting of software agents which discover and recommend reliable devices, negotiate resource cost using on cooperative bargaining game and schedule jobs. Device reliability is modelled by using parameters like processing rate, memory, and bandwidth and battery power. Discount function is employed in bargain game based on job deadline, previous offers of an opponent, and dynamics in the grid market. Adaptive negotiation process is applied by exercising different discount strategies (aggressive or conservative or linear) based on the negotiation status of a player. The scheme is simulated to evaluate performance parameters like resource utilization rate, expected profit, job completion time and job execution rate. It will observe that the proposed scheme performs better than the existing resource brokering scheme.

PROBLEM DEFINITION

There are many relevant works in grid resource management domain but in wireless grid there is no consideration of vicinity of reliable resources. So an improved device reliability evaluation is used for considering out of vicinity resources.

METHODOLOGY

DEVICE REGISTRATION MODULE

In this module the device id, power in watts, memory, bandwidth and process rate are to be registered and the device which is going to be under certain base station controller are also to be registered. The new option is used to create a new registration of the device and by giving submit the device has been registered.

JOB DESCRIPTION MODULE

The Job Registration involves the job id, memory required to finish the job, job size, the result size and the power and process rate are used for registering the job by the user agent.

RESOURCE BROKER MODULE

The Resource broker is used to select the job that want to be done and he divides the job into number of sub jobs and he will make sure the deadline for that job. The Reliability of the device will be found out according to number of sub jobs that are divided. This will be viewed in a data grid view.

NEGOTIATION AGENT MODULE

By the use of Bandwidth, Memory, Power availability of the device the reliability have been found out. The Reserve price of Negotiation Agent will be given and the negotiation game will be begun.

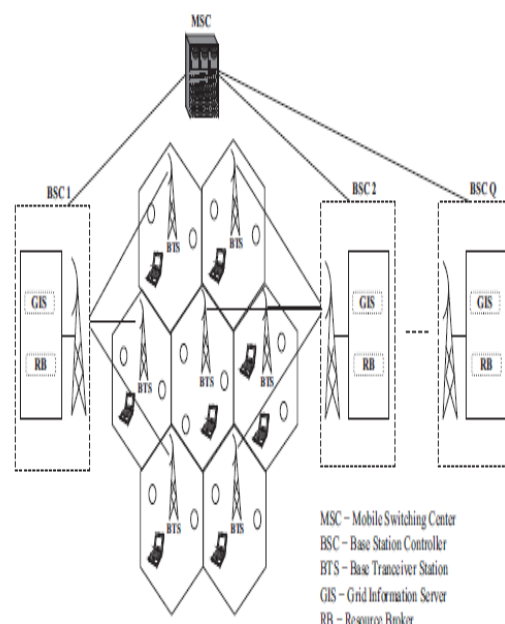
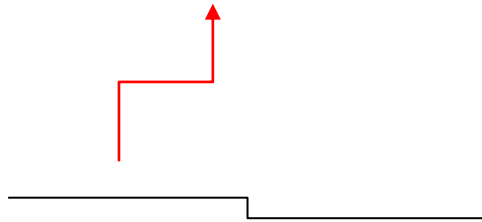


Fig 1. Architecture of the proposed approach

THE PROPOSED ALGORITHM



STEP1: nmax=10;

STEP2: op_{na}= 50% rp_{na};

STEP3: op_{pa}= 150% rp_{pa};

STEP4:for each pa of the set rel-set do nneg=1

STEP5: PA INITIATES BARGAINING GAME BY OFFERING OPPA.

STEP6: WHILE (PRICE ACCEPTED == FALSE && NNEG < NMAXNEG)

STEP7: IF (OPPA < OPNA)

STEP8: PRICEACCEPTED = TRUE AND PLACE PA IN REL-SET'

ELSE

STEP9: IF MARKET IS FAVOURABLE THEN CONSERVATIVE BARGAINING

ELSE

STEP10: IF MARKET IS UNFAVOURABLE THEN LINEAR BARGAINING

ELSE AGGRESSIVE BARGAINING

CPC = OPC + MATH. POW((T / T), B) * (RPC - OPC) * (1 / NP) * FSR

STEP11: NNEG = NNEG+1;

DEVICE MOBILITY

There are many mobility models that are used to define the position of mobile devices. Here the Rush

hour Traffic Model is used for defining the position of devices within the vicinity.

The Destination Allocation Algorithm is an algorithm when people were most frequently close to each other the destination selection will be exponentially based one.

There are five stages in DA algorithm.

1. Finding all destinations within maximum range of resource allocation.
2. For each source, sort all the reachable destinations in ascending order.
3. Find the sum of inverse exponential distances of sources of reachable distances.
4. Each source allocates percentage of its total nodes to its reachable distances.
5. The allocation process will leave remaining nodes.

$$P_{i,j} = \frac{e^{-d_{i,j}}}{\sum_{k=1}^{inrange} e^{-d_{i,k}}} \times 100$$

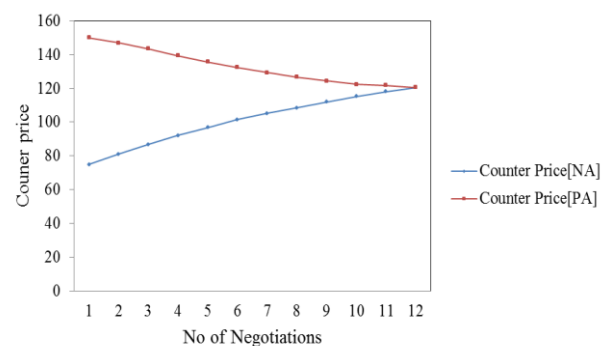
$P_{i,j}$ - Percentage of nodes moving from location i to j

$d_{i,j}$ - Distance between location i and j.

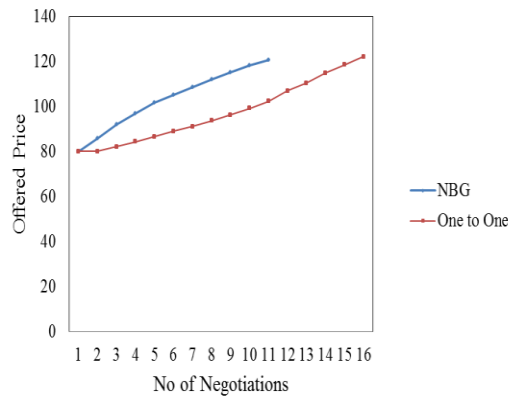
RESULT ANALYSIS

The proposed way of using non cooperative bargaining concept is expected to improve the negotiation time and the device reliability.

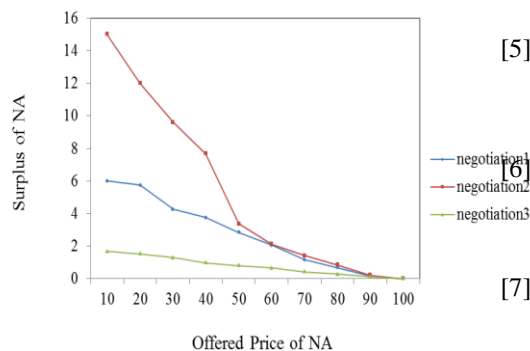
In the bargaining game the counter price given by negotiation agent for every negotiation and the counter price given by provider agent for every negotiation has been analysed.



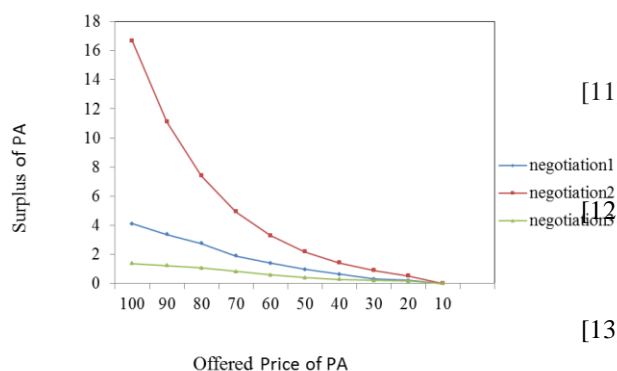
The offered price given for every negotiation in the non-cooperative bargaining has been compared with one to one bargaining model. The Non Cooperative bargaining game will have minimum number of negotiations compared to other bargaining.



The Surplus of Negotiation agent for three consecutive negotiations has been determined. The surplus amount will continuously decrease until it accepted.



The Surplus of Provider agent for three consecutive negotiations has been determined. The surplus amount will continuously decrease until it accepted.



CONCLUSIONS

To guarantee the execution of jobs in an unreliable wireless grid Environment, an agent based resource brokering scheme is used. The reliability of the device and resource utilization rate has been calculated for better performance. During bargaining

process, players offer discounts to converge the negotiation process as early as possible while maximizing their own utilities.

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