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A Study and Modeling for Improving the Grid Service Consistency Using JAMM

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ABSTRACT: The promise of Grid computing organizations being able to acquire all the power they require for only as long as it is necessary is incredibly compelling. Although grid computing has experienced significant success in bringing productivity gains and cost savings to engineering, it has not yet proven its mettle for highly transaction oriented applications. When a program needs to access a remote resource, various types of failures are interleaved in the grid computing background, such as jamming failures, time-out failures, matchmaking failures, program failures, and resource failures. This paper presents a grid service consistency model using hive that is used to expand the range of problems that can be solved with grid and host the transaction-oriented applications upon which businesses depend. In the proposed model, client request are handled by ontology, a database to check whether the resources available in the particular server or not, and also using JAMM (java agents for monitoring and management) for retrieving, monitoring data concurrently for multiple clients. Jamm employed LDAP for aggregation, scalability and the replication of service data for fault tolerance. After finding the resource available, hive handles the request and moves the request to remote execution of Condor-G Scheduler. The Condor-G Scheduler executes the request and allocates the resource to the client. Thus the system consistency is afforded.

KEYWORDS*:* Ontology, Condor G Scheduler, RMS, Hive Computing, Reliability

I. INTRODUCTION

Grid computing is a new technology for large scale systems with resource sharing, wide area communication, multi-institutional collaboration etc. The real and specific problem that underlies is coordinated resource sharing and this sharing is controlled by Resource Management System (RMS) (Yuan Shun Dai, 2007). A grid service is designed to complete a set of programs under grid circumstances with the help of distributed remote resources (A.Kumar, 2000).
It offers exciting solutions for parallel and distributed computing and can provide reliable, collaborative, and secure access to remote computational resources, as well as distributed data and scientific instruments (I.Foster, 2002). The concept of grid describes a framework in which heterogeneous and distributed computational, networking, memory and storage resources can be linked to serve the needs of particular user applications (I.A. Khan, 2012).
Grid computing has matured as it has moved from the realm of experimentation to mainstream technology. Today, there is much more to successful grid computing infrastructure than merely deploying fast or inexpensive servers (Rahul Kumar, 2012).

In grid computing when it comes to transaction processing, the problem businesses face today is the need to choose between reliability and affordability. Existing transaction processing solutions such as fault tolerant systems are reliable but they depend on complex and expensive hardware. In contrast, commodity computers are affordable but are not reliable enough to do important work. As a result businesses are forced to spend more than they can afford. Hive computing aim is to make system reliability affordable (Chris O Lenry, 2003). Thus hive computing rectifies the problem of grid computing with the help of ontology and condor g scheduler.
Jamm (java agents for monitoring and management) employed LDAP for aggregation, scalability and the replication of service data for fault tolerance.
Ontology is a formal representation of knowledge by set of concepts within a domain and relationship between those concepts. OWL (Web Ontology Language) is used to represent ontology. It helps in constructing advanced queries, search and interoperability. It is easy to evolve and maintain.

Condor-G is a window to the grid. The software of a Condor pool is divided into two parts. The first part does job management and is called as job submission site. It keeps track of a user's jobs. The other part of the Condor software does resource management called as job execution site. It keeps track of which machines are available to run jobs, how the available machines should be utilized given all the users who want to run jobs on them, and when a machine is no longer available. Works with grid resources, allowing users to effectively submit jobs, manage jobs, and have jobs execute on widely distributed machines. Write about organization of paper

II. MOTIVATION OF RESEARCH

The motivation of my research is to verify that hive with condor g scheduler and ontology increases the reliability for heavy weight processes.

- Check Hive with Condor G Scheduler.
- How much is Hive Efficient?
- Have hive with ontology implemented?

III. LITERATURE SURVEY

1. Klaus Krauter and Maheshwaran (1997) proposed a grid architecture that is motivated by the large-scale routing principles in the Internet to provide an extensible, high-performance, scalable, and protected grid. Central to the proposed architecture is middleware called the grid operating system (GridOS). This paper describes the components of the GridOS. The Grid OS incorporates numerous novel ideas (i) a flexible naming scheme called “Gridspaces", (ii) a service mobility protocol, and (iii) a highly decentralized grid scheduling mechanism called the router-allocator.
2. Rajesh Raman and M.Livny (1998) says that Matchmaking framework is a flexible and general approach to resource management in distributed environment with decentralized ownership of resources. It includes a semi structured data model that combines schema, data, and query in a simple specification language, and a clean separation of the matching and claiming phases of resource allocation. It was designed to solve the problem of condor which derives much of its efficiency and robustness from the matchmaking architecture.
3. Junwei Cao and S.Saini (2002) explains that a hierarchy of homogeneous agents is used to provide a scalable and adaptable abstraction of the grid system architecture. Each agent is competent to assist with other agents and thereby provide service advertisement and discovery for the scheduling of applications that need to utilize grid resource. It makes use of ACTs for recording the service information with other agents. Yet only homogeneous agents provide scalability.
4. David Abrasom (2002) explains that Nimrod-G is a resource management system for scheduling computation on resources distributed across the world with varying quality of service. It manages all operations associated with remote execution including resource discovery, trading and scheduling based on economic principles and a user-defined QoS requirement. Yet it does not support scheduling with advance resource reservation.
5. Mario Cannataro and P.Trunfio (2004) describes the framework of knowledge grid for implementing distributed knowledge discovery. It is composed of two hierarchic levels namely core k grid layer and the high level k grid layer. Both refers to services directly implemented on top of generic grid services and is used to design, compose, and execute distributed knowledge discovery computations over the grid. It helps in searching grid resources.
6. Kai Hwang (2006) says that risk-resilient scheduling algorithms are used to assure secure grid job execution under different risky conditions. It can upgrade grid performance significantly at only a moderate increase in extra resources. It matches trust requirements by user jobs with a judicious security index at grid sites, which extends security-aware grid job scheduling in the direction of delay tolerance and job replications. A Kiviat graph is proposed for demonstrating the quality of Grid computing services. Among six one of the algorithm called Space Time Genetic Algorithm (STGA) is used for risk-resilient scheduling of many jobs simultaneously over a large number of Grid sites.
7. Kishore S Trivedi (2007) says that a virtual tree structured model is used for analyzing grid service performance considering data dependence and failure correction. The service time experienced by the users is usually random and affected by many factors. Different resources usually have respective task processing speeds and the data dependence imposes constraints on the sequence of the subtasks execution, which has been observed to have significant influence

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on the service time. This model analyzes and estimates the probability distributions of grid service performance by considering the reliability factors of grid resources, programs, and links. Followed by, a new algorithm is derived from the Bayesian theorem and Graph theory for predicting the random service time distribution and other performance or reliability-related measures.

8. R.Prodan and T.Fahringer (2008) proposed a new systematic approach to help the scientists and developers to understand the occurrences of performance losses during the execution of scientific workflows in dynamic Grid environments. An ideal model is introduced for the lowest execution time that can be achieved by a workflow. Workflow activities are typically legacy codes that can be remotely accessed and instantiated using a Grid Resource Allocation Manager. It is assumed that the work performed by the workflow computational activities is a useful execution time. This method is illustrated through postmortem and online performance analysis of two real-world workflow applications executed in the Austrian Grid environment.

9. Lizhe Wang (2010) explains that in order to run grid applications efficiently virtual machine resource information must be provided. The resource information is integrated into grid information service. Virtualized distributed grid infrastructures have been adopted to help a user to build an advanced computing environment. To ease the management of virtualized distributed grid systems, it is important to develop an information service to deliver the resource information and system status. It includes information collector, information translator and provider and GIS. Employing virtual machines as computing environments can address the problems like customized runtime environment, Qos of resource provision and performance isolation. Virtual machine based grid system contains distributed compute sites interconnected by networks.

10. Lei Liu (2012) proposed an optical burst switching (OBS)/wavelength switched optical network (WSON) infrastructure to support the consumer Grid services. It overcomes the limitations of resource discovery and management, network infrastructures which helps in self organized resource discovery and management. The experiments prove that TCP is the suitable protocol for grid. For the successful execution of grid job resources must meet the job requirements in a transparent manner. In order to overcome the issues like server updating, fault tolerant recovery a P2P based scheme is introduced which manages the resources in a distributed way for job requests execution. SRDM scheme is developed based on the P2P-based scheme by taking into account the blocking probability and end-to-end latency. Thus it provides high resource utilization, fault tolerant and high speed data transmission.

11. Yi Zhu (2012) explains that a greedy approximation algorithm is used to construct collective communication through a spanning tree that achieves an approximation ration. The idea behind the algorithm is to choose an SRLG and remove it from the edges. It considers differentiated reliability when making routing decisions. Thus the reliable communication is NP-hard for minimizing the total number of SRLGs among the trees. But reliability is not achieved in multicast trees.

12.Jasma Balasangameshwaran and Nedunchezhian Raju (2013) says that a PD_MinRC algorithm considers fault tolerance with minimum replication cost, dynamic load balancing and grid scheduling with moderate communication cost. Network congestion is prevented as message exchanges between the resources are simple and small sized. It provides good performance results and better resource utilization even during resource failures. It is a flexible approach in dealing with the changes that happen in the grid. Yet issues related to security have not been considered.

IV. CONCLUSION OF LITERATURE SURVEY

Hive answers all the above three questions. Hive can be effectively used with Condor G Scheduler. Though hive consists of number of workers it does not perform any scheduling. The workers cannot predict when to complete the processes. Condor G Scheduler performs scheduling mechanism but it does not consist of workers. Hence Hive is used with CGS. Scheduler is used for job execution and it increases the job execution speed based on priority requests. Ontology is used to search data (resources) efficiently.

V. GRID SERVICE RELIABILITY MODEL MODEL CONSTRUCTION

User sends the request which is translated into WSDL and is stored in common queue. Ontology checks the availability of resources and if resources are not available request is discarded. Otherwise it discovers the resource path and submits the request to Hive. Hive consists of number of workers. Tasks are assigned to individual workers. Each worker

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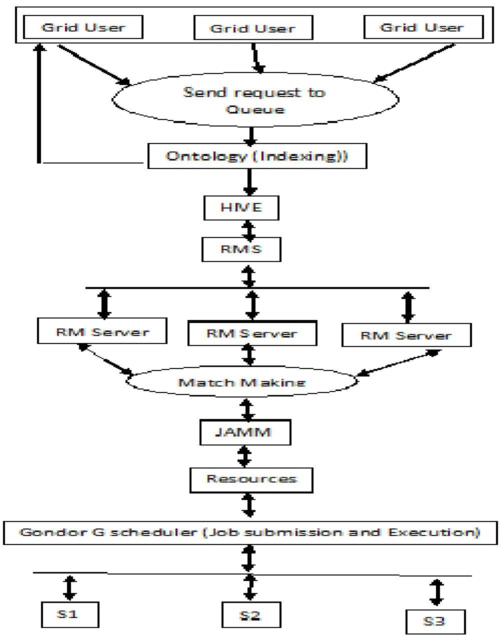
examines the task, determines which service it should carry out, loads the resources for to perform the service using RMS. Resource Management System manages a pool of shared resources and performs matchmaking.

The process of matchmaking is as follows.

1. Entities (User and Server) express their requirements and services through class ads and send them to matchmaker.
2. Matchmaker then invokes matchmaking algorithm by which matches are identified.
3. Once matched matchmaker sends notification to both entities and sense them matching ads.
4. User then contacts server directly using a claiming protocol to establish working relationship with server.

Identifying a match and invoking the matchmaking protocol does not immediately grant service to users. It is just a mutual introduction to the advertising entities. Hence required resources are matched and RMS allocates the resources to the request.

GRID SERVICE RELIABILITY DIAGRAM



Finally request is submitted to Condor G Scheduler which performs job submission and execution. It monitors and manages execution on those resources. Scheduler creates new GM to submit and manage those jobs. GM process handles all jobs of single user and terminates once it completes. Each GM job submission creates one globus job manager. Globus job manager connects to GM using GASS to transfer jobs executable and input files. Job manager then submits job to execution sites. Site job scheduler splits job to different servers and request processed. Processed request is sent back to CGS with the help of Condor G Collector. Thus the response generated is forwarded back to RMS which again forwards the response to the Grid users.

V. CASE STUDY

Once the target resources is known, the scheduling process is used to select the resources that best suits the constraints imposed by the user such as CPU usage and RAM availability. The result of resource selection is to identify a resource list ($R_{selected}$) in which all resources can meet the minimum requirements for a submitted job or a job list. The relationship between resources available ($R_{available}$) and resources selected ($R_{selected}$) is:

$$R_{selected} \subseteq R_{available}.$$

The resource selection process is used to choose resource(s) from the resource list ($R_{selected}$) for a given job. Since all resources in the list $R_{selected}$ could meet the minimum requirements imposed by the job, an algorithm is needed to choose the best resource(s) to execute the job. Although random selection is a choice, it is not an ideal resource selection policy. The resource selection algorithm should take into account the current state of resources and choose the best one based on a quantitative evaluation. A resource selection algorithm that only takes CPU and RAM into account could be designed as follows:

$$Evaluation_{Resource} = \frac{Evaluation\ of\ CPU + Evaluation\ of\ RAM}{Weight\ of\ CPU + Weight\ of\ RAM}$$

$$Evaluation\ of\ CPU = Weight\ of\ CPU(1 - CPU_{load})\frac{CPU\ Speed}{CPU\ Min}$$

$$Evaluation\ of\ RAM = Weight\ of\ RAM(1 - RAM_{load})\frac{RAM\ Size}{RAM\ Min}$$

Where, Weight of CPU – the weight allocated to CPU speed; CPU load – the current CPU load; CPU speed – real CPU speed; CPU min – minimum CPU speed; Weight of RAM – the weight allocated to RAM; RAM usage – the current RAM usage; RAM size – original RAM size; and RAM min – minimum RAM size.

VI. CONCLUSION

This paper studies the grid consistency and improves it using hive. In our model, grid user sends request to ontology for discovering resource path. Once discovered the path it is further moved on to hive framework. Hive using RMS performs matchmaking and provides intimation for granting services to the users. JAMM (java agents for monitoring and management) for retrieving, monitoring data concurrently for multiple clients. CGS performs job scheduling and finally allocates resources and services to users. Thus the new grid service consistency model using hive increases the grid system consistency. It will provide businesses and other organizations with tremendous levels of flexibility and drive down the cost of consistency. By plugging one or more Hives into a grid, businesses and research institutions will be able to gain access to a resource that provides them the transactional capabilities they require to perform their work in the most reliable manner.

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