

A Resource Discovery Approach for VN-Grid

N. P. H. Cu¹, H. H. Pham², and T. V. Pham³

Abstract: For solving large scientific problems, computational resources within a single Grid site, e.g. available CPUs, memory and data storage, are usually not enough. Co-ordination of available resources from multiple Grid sites becomes necessary. However, the resources are heterogeneous not only across Grid sites but also within a site. In addition, the availability of resources is varied from time to time, depending on the current workload. Therefore, discovering the right resources for solving a particular scientific problem across sites within VN-Grid is non-trivial.

In the proposed VN-Grid model, each participating institution in VN-Grid needs to have its own campus Grid, which centrally manages its own computational resources. The connection amongst the Grid sites simulates a P2P network, in which, each site is seen as a peer of the network. Therefore, the resource in VN-Grid needs to be discovered in a P2P manner. Common P2P resource discovery approaches can be classified into two groups: index-based and routing-based. In index-based approach, e.g. Napster, Chord and CAN, keywords are used as look-up keys to look in index tables for peers that hold the resources. This approach can quickly return result of a query. However, it can only support keyword-based queries and requires index tables to be updated frequently. In the VN-Grid environment as queries are often complex and the state of resources changes continuously overtime, this approach seems to have few advantages. On the other hand, the routing-based approach, e.g. flooding or random walk as typically in Gnutella network, needs more time to forward a search query around the network to look for a match, and may not guarantee a complete answer to the query. However, this approach seems to be suitable for VN-Grid environment as it can support various types of query and the results reflect almost the current state of the resources, with some delay due to query traversing.

This paper reports an investigation on a resource discovery technique for VN-Grid environment having the routing mechanism based on the behaviours of ant colonies. When moving, each ant drops a kind of chemical substance called pheromone to mark its trails. To decide which way to follow, the ants sense their environment for existing pheromone trails and follow them with a probability that is proportional to the strength of the trail. Usually, the higher density of pheromone the choosing path has, the shorter the way to the destination is. The proposed approach exploits this mechanism to find the optimal paths for routing search queries to minimize the network traffics and maximize the possibility of finding proper results. The efficiency of this method will be testified in a simulated environment.

^{1,2,3} Faculty of Computer Science and Engineering
Ho Chi Minh City University of Technology
268 Ly Thuong Kiet street, District 10, Ho Chi Minh City, Vietnam
phuongha@cse.hcmut.edu.vn, phhoa79@yahoo.com, t.v.pham@cse.hcmut.edu.vn