THREE DIMENSIONAL MATCHMAKING MODELS
FOR RESOURCE ALLOCATION IN GRID ENVIRONMENT

a thesis submitted by
J. JAPHYNTH (08ZM002)

In partial fulfillment for the award of the degree of
DOCTOR OF PHILOSOPHY

Under the supervision of
DR. R. ELIJAH BLESSING M.E., Ph. D

SCHOOL OF COMPUTER SCIENCE AND TECHNOLOGY
KARUNYA UNIVERSITY
(Karunya Institute of Technology and Sciences)
(Declared as Deemed-to-be-under sec-3 of the UGC act, 1956)
Karunya Nagar, Coimbatore – 641 114. INDIA
SEPTEMBER 2013
DECLARATION

I, Japhynth J. hereby declare that the thesis entitled, “THREE DIMENSIONAL MATCHMAKING MODELS FOR RESOURCE ALLOCATION IN GRID ENVIRONMENT” submitted to Karunya University, in partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy in Computer Science and Engineering is a record of original and independent research work done by me during 2008-2013 under the supervision and guidance of Dr. R. Elijah Blessing, Director, School of Computer Science and Technology, Karunya University. The work contained in this thesis has not been previously submitted to meet the requirements for a degree or diploma at this or any other higher education institution.

J. Japhynth

Signature of the candidate
BONAFIDE CERTIFICATE

Certified that this Thesis titled “THREE DIMENSIONAL MATCHMAKING MODELS FOR RESOURCE ALLOCATION IN GRID ENVIRONMENT” is the bonafide work of J. JAPHYNTH (08ZM002) who carried out the research under my supervision. Certified further that to the best of my knowledge the work reported herein does not form part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other scholar.

Dr. R. Elijah Blessing
SUPERVISOR
Director
School of Computer Science and Technology
Karunya University
ABSTRACT

Grid is a collection of resources owned by multiple organizations. Grid has the ability to integrate multiple, distributed, heterogeneous, and independently managed data resources. In the Grid environment, selecting appropriate resource for a job is a complex undertaking as resources are distributed and heterogeneous in nature. Matching the users’ requirements with the resource capabilities plays a vital role in the resource selection process. The traditional matchmaking process considers the static parameters of resources alone which results in inappropriate resource selection. This increases the number of failed jobs in the grid environment. The matchmaking process must consider the dynamically changing parameters of resources both in terms of resource demand and resource availability. The matchmaking process must also consider the past behavior of the resources to select the best available resource for a job. Therefore a novel Three Dimensional Matchmaking Model (TDMM) is proposed, which considers the three dimensional viz. static, dynamic and behavioral parameters of the resources for resource selection.

The user submits the user requirements i.e. the expected static, dynamic and behavioral parameter values of resources as user requirements along with the executable data. The user requirements are stored in the job table of the TDMM. The resource
capabilities (i.e static, dynamic and behavioral parameter values) are stored in the resource repository table of the resource analyst. The matchmaking is done by the three dimensional matchmaking engine of TDMM which considers the three dimensional parameters of both the job and the resources and calculate the rank_list (a list of 5 crest matched resources) of resources. The dynamic parameter values of the resources are updated at every $\Delta t$ time in the resource repository table by the service provider. The behavioral parameters of the resources are calculated by the knowledge unit of the TDMM based upon the previous behavior of the resources and updated in the resource repository table at every $\Delta t$ time. As the user’s requirements and the resource capabilities are matched in three dimensions, appropriate resource is selected for a job. This in turn minimizes the number of failed jobs and increases the number of successful jobs.

The TDMM identifies the job as ‘mature’$(m_j)$ or ‘new’$(n_j)$. Mature job is the job that has been previously processed successfully by the TDMM and submitted again within the $\Delta t$ time for want of resources. New job is the job that has been submitted for the first time into the TDMM. The already calculated rank_list are considered for resource allocation when the submitted job is ‘mature’$(m_j)$. This reduces the rank_list calculation time which in turn reduces the average response time of jobs. A new rank_list is prepared by three dimensional matchmaking engine when the submitted job is ‘new’$(n_j)$. 
The TDMM is modified into DQTDMM which maintains separate queues for ‘mature’ \(m_j\) and ‘new’ \(n_j\) job in the resource analyst of TDMM. Having two separate queues for jobs further reduces the average response time and increases the average number of successful jobs. The performance of DQTDMM is compared with the TDMM. It has been observed that DQTDMM outperforms TDMM. Thus the DQTDMM enhances the overall performance of the grid.
ACKNOWLEDGEMENT

First and foremost I offer my gratitude to my loving Jesus Christ the Heavenly Father for being my source of strength. I thank Him for His mercy, grace and guidance. Without Him this dissertation would not have been possible. I praise you and I thank you my Creator and Savior. To God be the glory. I would like to thank the Karunya University for providing me with the source to do my research. I thank late Dr. D. G. S. Dhinakaran, Founder, Karunya University, Dr. Paul Dhinakaran, Chancellor, Karunya University for their fervent prayers and support. I would like to express my deepest gratitude to my guide, Dr. R. Elijah Blessing for his excellent guidance, caring, patience in correcting the thesis and providing me with an excellent atmosphere for doing research. To you Sir, I give you lots of thanks and respect. I would like to thank my committee members for their valuable assistance in the completion of this research. I would like to thank my loving husband Dr. J. R Isaac Balasingh. He was always there cheering me up and stood by me through the good times and bad. I would like to thank my son, Master I. Jubil Timothy for enabling me to do the research without any troubles. I would like to thank my parents Mr. J. Jacob Gnanadoss, Mrs. V. Melba Mary, my father in law Mr. RajaPandian and mother in law Mrs. Stella Violet and all my family members. Finally my sincere thanks go to my friends for sharing their valuable time and for their moral support.

JJAPHYNTH