A WEB-BASED INTERFACE FOR A HIGH PERFORMANCE COMPUTING SYSTEM

MOHAMMED M I AWAD

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KOLEJ SASTERA DAN SAINS
(College of Arts and Sciences)
Universiti Utara Malaysia

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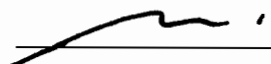*(candidate for the degree of)*   **MSc. (IT)**

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(Name of Main Supervisor): **ASSOC. PROF. DR. SUHAIDI HASSAN**

Tandatangan
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Nama Penyelia Kedua
(Name of 2nd Supervisor): **MR. MOHD. AMIR ABU SEMAN**

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ABSTRACT

High performance computing systems (HPCS) target to execute software whether this software is a simple or complicated one. Most of HPCS should have an interface to enable software owners to upload their files to be installed by the HPCS administrator. The interface should be extensible to work together in the future with the other remaining parts of the complete system. Also it has to be divided into phases in order to make development easier and also to make those components reusable. It is the best option to make the software a platform independent one. To achieve that, J2EE (Java 2 Enterprise Edition) should be chosen to implement this interface and also free licensed and open source software have to be chosen such as Tomcat Jakarta server, MySQL to be used in the development phases. All of the previous recommendations are applied in this research prototype. On top of that, the interface prototype has been tested on local environment and has achieved the expected results. This report passes through all phases to have a proper web interface to be used for a HPCS.

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LIST OF ABBREVIATIONS

J2EE	Java To Enterprise Edition
HTTP	Hypertext Transfer Protocol
JVM	Java Virtual Machine
VM	Virtual Machine
IDE	Integrated Development Environment
JSP	Java Server Pages
EJB	Enterprise Java Beans
HPCS	high performance computing system
UML	Unified Modelling Language
WAP	Wireless Application Protocol
ISP	Intenet Service Provider
PUEU	Perceived Usefulness and Ease of Use
SPSS	Statistical Package for the Social Sciences
WWW	World Wide Web

CHAPTER 1

INTRODUCTION

This chapter briefly explains the background of the study that mainly involves the importance of the web interface for a "high performance computing system" (HPCS) (G. Y. Yongwei Wu, 2003). The problem statement, objectives, significance of the project and scopes will also be introduced.

1.1 Background

Software techniques are not enough to improve scalability and performance issues (Victor P. Holmes, 2000). As a result, computation power will not be increased depending only on those techniques, because of that, a HPCS such as "cluster system" (G.J. Jense, 1997), "parallel processing system", or "Grid system" (Jordan, 2006) is needed to achieve that purpose and they are considered as hardware or physical techniques. As an example, Grid computing has been emerged as an important new field by its focus on large-scale computing and resource sharing (Grid, 2007). This technology provides integrated approaches to the coordinated use of resources at multiple sites for computation.

HPCS including supercomputers, clusters, Grid systems or other super computing instruments can be integrated into a virtual computing facility to provide supercomputing services for clients through a web interface (component) (Yongwei Wu, 2003). A web

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References

Arthur H. Watson, T. J. M. (1996). Structured Testing: A Testing Methodology Using the Cyclomatic Complexity Metric.

Bagchi, S. (2005). SIMULATION OF GRID COMPUTING INFRASTRUCTURE: CHALLENGES AND SOLUTIONS. *Proceedings of the 2005 Winter Simulation Conference.*

Ballou, D. P. a. P., H.L. (2004). Designing information systems to optimize the accuracy-timeliness tradeoff. *Information Systems Research, Vol. 6, No. 1, pp.51–72.*

Batini, C., Catarci, T. and Scannapiceco, M. (2004). A survey of data quality issues in cooperative information systems. *Tutorial Presented at the 23rd International Conference on Conceptual Modeling (ER2004), Shanghai, China.*

Beer, C. d., & Afrikaans, R. (2004). Applying Artificial Intelligence Principles to Portal Customization - A Theoretical Approach. *Paper presented at the 2nd International Conference on Autonomous Robots and Agents, New Zealand:277-282.*

Bennett, S., McRobb, S., & Farmer, R. (2005). Object-oriented Systems Analysis and Design Using UML. *McGraw Hill Higher Education.*

Bouzeghoub, M. a. P. (2004). A framework for analysis of data freshness. *Proceedings of the First ACM International Workshop on Information Quality in Information Systems (IQIS 2004), Paris, France.*

Brebner, P. (2002). Is your AppServer being Crippled by the JVM? . *in proceedings of: BorCon2002, 5th Annual Asia Pacific Borland Conference, Australia, Sydney.*

California, U. o. (2007). Grid Web Interface. Retrieved March 7, 2007, from http://www.ats.ucla.edu/News/spotlight.htm#Grid.

Cavaye, A. L. M. (1996). Case study research: a multi-faceted research approach for IS. *Information System Journal, Vol. 6, pp.227–242.*

Chervenak, I. F., C. Kesselman, C. Salisbury, S., & Tuecke. (2002). The Data Grid: Towards an Architecture for the Distributed Management and Analysis of Large Scientific Datasets. *Journal of Network and Computer.*

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Dahmann and K. L. Morse. (1998). High Level Architecture for Simulation: An Update. *Proceedings of the 2nd International Workshop on Distributed Interactive Simulation and Real-Time Applications, July 1998, Montreal, Canada, pp.*

Davis, D. a. C., R.M. (1988). Business Research for Decision Making. *2nd ed., Boston, PWS-Kent.*

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13(3), 319-340.*

Defense, U. S. D. o. (1998). High-Level Architecture Rules Version 1.3.

Eckel, B. (2000). Comparing C++ and Java [Electronic Version]. Retrieved 20/3/2008 from http://www.javacoffeebreak.com/articles/thinkinginjava/comparingc++andjava.html.

Engine, S. G. (2007). Sun Grid Engine 6.1 Features & Benefits. Retrieved Feb 8, 2007, from http://www.sun.com/software/Gridware/features.xml

G. Y. Yongwei Wu, J. M., Shuming Shi, Weimin Zheng. (2003). Grid Computing Pool and Its Framework. *Proceedings of the 2003 International Conference on Parallel Processing Workshops (ICPPW'03).*

G.J. Jense, N. H. L. K., and A.C.M. Dumay,. (1997). DIS and HLA: Connecting People, Simulations and Simulators in the Military, Space and Civil Domains. *48th International Astronautical Congress,.*

Gaza, I. U. o. (2008). Evaluation [Electronic Version]. Retrieved 1/4/2008 from http://www.iugaza.edu.ps/ar/Deanships/Graduated/Graduated.aspx?PageID=22.

Grid, S. (2007). Sun Grid System. Retrieved April 15, 2007, from http://www.sun.com/service/sunGrid

Group, A. A. (2004). Asset Information Management. *A CALM Prerequisite, White Paper, ARC Advisory Group, Dedham, USA.*

Hazra, T. K. (2002). Building enterprise portals: principles to practice. *Paper presented at the International Conference on Software Engineering 623 - 633.*

Huang, K., Lee, Y. W. and Wang, R.Y. (1999). Quality Information and Knowledge. *Prentice-Hall, Upper Saddle River, NJ.*

Interface, G. W. (2007). Grid Web Interface. Retrieved March 7, 2007, from http://www.ats.ucla.edu/News/spotlight.htm#Grid

Ives, B., Olson, M., and Baroudi, J.J. (1988). The measurement of user information satisfaction. *Communications of the ACM, Vol. 26, No. 10, pp.785–793.*

J. I. Beiriger, H. P. B., S. L. Humphreys, W. R., & Johnson, a. R. E. R. Constructing the ASCI Computational Grid. *Ninth IEEE International Symposium on High Performance Distributed Computing,.*

Jense, N. H. L. K., and A.C.M. Dumay,. (1997). DIS and HLA: Connecting People, Simulations and Simulators in the Military, Space and Civil Domains. *48th International Astronautical Congress,.*

Jordan, M. (2004). ACM International Workshop on Grid Computing. *SOFTWARE PRACTICE AND EXPERIENCE.*

Jordan, M. (2006). Scaling J2EE application servers with the multi tasking virtual machine. *SOFTWARE PRACTICE AND EXPERIENCE*

Kahn, B. K., Strong, D.M. and Wang, R.Y. (2004). Information quality benchmarks: product and services performance. *Communications of the ACM, Vol. 45, No. 4, pp.184–192.*

Kirakowski, J. (2004). Questionnaires in Usability Engineering, A List of Frequently Asked Questions [Electronic Version]. *Human Factors Research Group, Cork, Ireland* Retrieved Oct, 12, 2007 from http://www.ucc.ie/hfrg/resources/qfaq1.html.

Koronios, A., Lin, S. and Gao, J. (2005). A data quality model for asset management in engineering organisations. *Proceedings of the 10th International Conference on Information Quality (ICIQ 2005), 4–6 November, Cambridge, MA, USA, pp.27–51.*

Koronios, A. a. H., A. (2004). Managing engineering assets: a knowledge based asset management methodology through information quality. *E-Business and Organisations in the 21th Century, pp.443–45.*

Kuechler, V. (2004). Research in information system. Retrieved March 15, 2007, from http://www.isworld.org/Researchdesign/drisISworld.htm

Kuechler, V. (2007). Design Research in information system [Electronic Version]. Retrieved March 15, 2007 from http://www.isworld.org/Researchdesign/drisISworld.htm.

Laudon, K. C., & Laudon, J. P. (2000). Management Information Systems. *Prentice Hall PTR Upper Saddle River, NJ, USA.*

Levitin, A. V. a. R., T.C. (1998). 'Data as a resource: properties, implications and prescriptions. *Sloan Management Review, Vol. 40, No. 1, pp.89–101.*

Liang L.A.H, C. W., Lee B-S. and Turner S.J. (1999). Performance Analysis of Packet Bundling Techniques in DIS. *Proceeding of the 3rd International Workshop on Distributed Interactive Simulation and Real-Time Applications (DiS-RT '99), IEEE Press, USA, pp 75-82.*

Lin, S., Gao, J. and Koronios, A. (2006). Key data quality issues for enterprise asset management in engineering organisations. *International Journal of Electronic Business Management (IJEBM), Vol. 4, No. 1, pp.96–110.*

Liu, L. a. C., L. (2002). Evolutionary data quality- a theory-specific view. *Proceedings of the 7th Intl. Conf. on Information Quality, Massachusetts Institute of Technology, Cambridge, MA, pp.292–304.*

Management, A. (2004). Asset Management. Part 1. *Specification for the ptimised Management of Physical Infrastructure Asset.*

Microsystems, S. (2007). Sun Grid Engine 6.1 Features & Benefits. Retrieved Feb 8, 2007, from http://www.sun.com/software/Gridware/features.xml

Mitroff, I. I. a. L., H.A. (1993). The Unbounded Mind: Breaking the Chains of Traditional Business Thinking. *Oxford University Press, New York.*

Neely, P. a. P., T. (2002). Teaching Data Quality Concepts Through Case Studies. *Center for Technology in Government, Albany.*

Nielsen, J. (2000). New Riders Publish, Indianapolis, Indiana, USA.

Parsons, D. (2006). An architechtural pattern for designing component-based application frameworks. *SOFTWARE PRACTICE AND EXPERIENCE*

Samuel D. Kounev and Alejandro P. Buchmann. (2001). Implement-ing and Optimising Sun's ECperf Benchmark with WebLogic Server. *BEA Technology Conference, 14 November 2001,.*

Shaizan, H. L., F. (2003). Utilizing IGV Approach In Evaluating the Usability of Web Sites. *Journal of Information and Communication Technology,2(2), 25-40.*

Shaw, M. J. (2004). Building E-Business from Enterprise Systems. *Journal of Information Systems Frontiers 2(1):7-11.*

Shuping Ran, P. B., Ian Gorton,. (2001). The Rigorous Evaluation of Enterprise Java Bean Technology. *pp 93-100, 15th International conference on Information Networking, Japan, 31 January-2 February 2001.*

Smith, A. (2007). New to Grid computing. *IT NEWS*

Sullivan, D. (2004). Proven Portals: Best Practices for Planning, Designing, and Developing Enterprise Portals. *Addison-Wesley Professional.*

Vaishnavi, V., & Kuechler, B. (2004). Design Research in Information Systems [Electronic Version]. Retrieved july, 7,2007 from http://www.isworld.org/Researchdesign/drisISworld.htm.

Victor P. Holmes, S. D. K., David J. Miller, Constantine Pavlakos, Clark A. Poore, Ruthe L. Vandewart, Charles P. Crowley. (2000). An Architecture and Implementation to Support Large-scale Data Access in Scientific Simulation Environments. *The Society for Modeling and Simulation International (SCS), San Diego, CA,.*

Yongwei Wu, J. M., Shuming Shi, Weimin Zheng. (2003). Grid Computing Pool and Its Framework. *Proceedings of the 2003 International Conference on Parallel Processing Workshops (ICPPW'03).*