

# Parallel Computing in Grid Environment

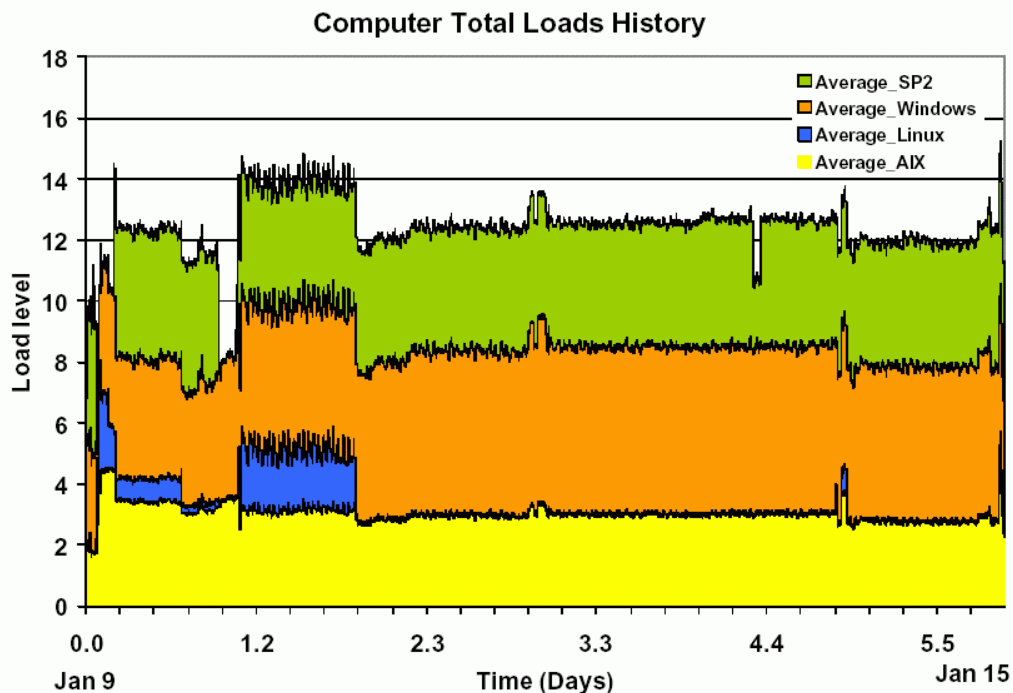
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The trend in establishing powerful parallel computer environments has been shifting towards more integration of resources from different institutions and enterprises. Increased bandwidth of communication, availability of efficient distributed computing software tools for dynamic resource allocations, high confidence level of security of the system, and overall cost reduction in high computational capacity needs are the main motivations for the resource integration. This has led to the development of the Grid technologies [1] and environment which have been widely accepted for scientific and technical computing. The Grid environment allows using and sharing of computers geographically distributed and operated by distinct organizations having different policies in a coordinated manner, while avoiding centralized control.

In this study, the computational results will be presented to demonstrate the performance of the Grid environment that has been created between different university campuses and institutions. Tools developed in house for parallelization of codes and management of dynamic loads will be used as part of the Grid environment, [2, 3]. The main objective of the tools are to support running jobs in different operating systems, such as Linux and Unix flavors, provide dynamic allocation of loads, allows distributed load scheduling, fault tolerance in case of failures of any component, and enhanced security by using Globus [1]. Some results of the computer load measurements in a Grid environment formed between different campuses are presented in the following picture.



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### References

1. I. Foster, C. Kesselman, and S. Tuecke, "The Anatomy of the Grid: Enabling Scalable Virtual Organizations," *Int. J. High-Performance Computing Applications*, vol. 15, no 3, 2001, pp. 200-222. <http://www.globus.org>
2. Chien, Y. P., Ecer, A., Akay, H. U., and Carpenter, F., "Dynamic Load Balancing on Network of Workstations for Solving Computational Fluid Dynamics Problems," *Computer Methods in Applied Mechanics and Engineering*, Vol. 119, 1994, pp. 17-33.
3. Chien, Y.P., Chen, J.D., Ecer, A., Akay, H.U., and Zhou, J., "DLB 2.0 – A Distributed Environment Tool for Supporting Balanced Execution of Multiple Parallel Jobs on Networked Computers", *Parallel Computational Fluid Dynamics*, Elsevier Science BV. 2002, pp: 95-102