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Grid computation for Lattice QCD

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This is the first use of the GRID structure to an expensive QCD lattice calculation performed under the VO theophys. It concerns the study on the lattice of the SU(3) Yang-Mills topological charge distribution, which is one of the most important non perturbative features of the theory. The first moment of the distribution is the topological susceptibility, which enters in the famous Witten Veneziano formula (See Luigi Del Debbio, Leonardo Giusti, Claudio Pica Phys.Rev.Lett.94:032003,2005 and references therein). The codes adopted in this project, are optimized to run with high efficiency on a single pc using the SSE2 feature of Intel and AMD processors to implement the performances.

(L. Giusti, C. Hoelbling, M. Luscher, H.

Wittig, Comput.Phys.Commun.153:31-51,2003)

Different codes based on parallel structure are already being developed and tested. They need a band interconnection among nodes greater than 250 MBytes/s and we hope they can be sent to the GRID in the future. The first physical results of the project are planned to be presented at Lattice2006 international symposium at the end of July in Tucson by the collaboration (L. Del Debbio (Edinburgh), L. Giusti (Cern), S. Petrarca (univ. of Roma 1), B. Taglienti (INFN, Sez. of Roma1).

The production on a "small" SU(3) lattice(12⁴) at beta=6.0 is finished.

The results are very encouraging.

We started a new run on a 14⁴ lattice whith the same physical volume. Although the statistics is yet insufficient, the signal is confirmed.

The total CPU time used from the beginning of the work (20-10-2005) up to now (26-01-2006) under the VO theophys turns out to be 70000 hours.

Total number of job submitted is about 6500.

Failures (approximately):

500 due to non-sse2 CPU.

1000 job aborted due to unknown reasons.

A typical 12⁴ job requires 220 MB of ram; all the production has been divided in

small chunks requiring approximately 12 hours of CPU. (Longer jobs are prone to be aborted

by the GRID system). Every job reads and writes 5.7MB from/to a storage element.

The resouces needed by the typical 14⁴ job are nearly a factor of 2 for CPU, ram and storage.

We organized the production in 120 simultaneous jobs, and each job runs on a

single processor.

The job time length is chosen as a compromise between the job time limit actually imposed by the GRID system and the bookkeeping activity needed to acquire the result and start a new job.

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