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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
pertubative 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(12^4) at beta=6.0 is finished.
The results are very encouraging.
We started a new run on a 14^4 lattice whith the same physical
volume. Although the statistics is yet unsufficient, 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 12^4 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 14^4 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.

Authors: Dr TAGLIENTI, Bruno (INFN Sezione di Roma1); Dr ANDRONICO, Giuseppe (INFN SEZIONE DI CATANIA); Dr GIUSTI, Leonardo (CERN); Dr DEL DEBBIO, Luigi (CERN); Prof. PETRARCA, Silvano (Universita La Sapienza)

Presenter: Dr ANDRONICO, Giuseppe (INFN SEZIONE DI CATANIA)

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