Computing developments in Albania and it's applications

N. Frasheri, B. Cico

Little History

- First computers in 1971
  - Dominance of scientific and engineering problems
  - First experiences with Monte-Carlo
- Introduction of personal computers
  - Institute of Nuclear Physics
  -
- First metropolitan network in 1985
  - Problematics dominated by politics
- All ended in early nineties

Difficult Recovery

- Rebuilding from the scratch

    Local networks

    TCP/IP

    First tests with Internet access

- Involvement in SEE-GRID in 2004

    Local grid interconnected in a regional Grid

    Tentatives for applications

SEE-GRID and After

- Three regional grid projects

  http://www.see-grid-sci.eu/

  Our applications
  - Started with energetics
  - Remote sensing (matrix calculus)
  - Geophysical modeling (matrix calculus)

- High Performance Computing regional project

  Exploitation of HPC resources in Region

  Our experience:
  - SGE system of NFII=HH in Pecs, Hungary
  - HPC cluster of IICTP-BAS in Sofia, Bulgaria

More on HPC-SEE [1]

- http://www.hp-see.eu/
- Continuation of 10 years of joint activities
- Regional FP7 infrastructure support action
- Partners:

  Gr, Bg, Ro, Tr, Hu, Rs,

  Al, Ba, Mk, Me, Md, Am, Ge, Az

- Objectives:

  Applications, promotion of HPC, training & dissemination

More on HPC-SEE $_2$

- Applications

  Computational physics (AL: HMLQCD & GIM)

  Computational chemistry

  Life sciences

- Platforms

  10 HPC systems in Bg, Ro, Hu, Rs

  Programming in MPI and OpenMP

  Joint management and monitoring services

  Geant connectivity for Caucasus

HPC Applications - Beginning

- HML-QCD

  …

- GIM

  Inversion of geophysical gravity anomalies

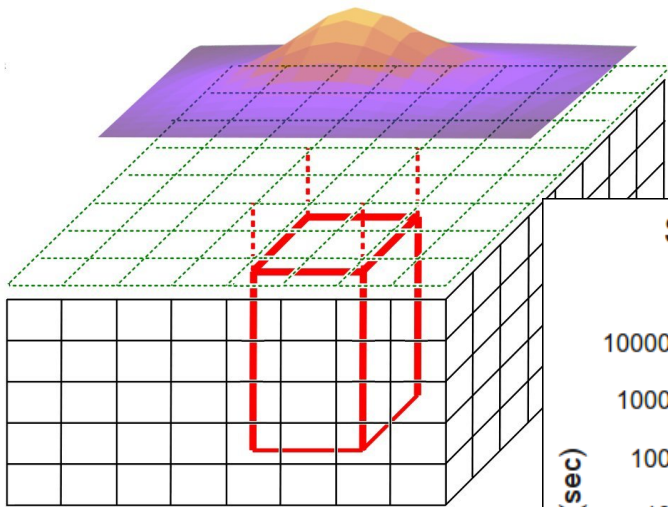 Calculation of a 3D array from initial 2D array data

  Iterative problem scalability of the order of $O(N^8)$

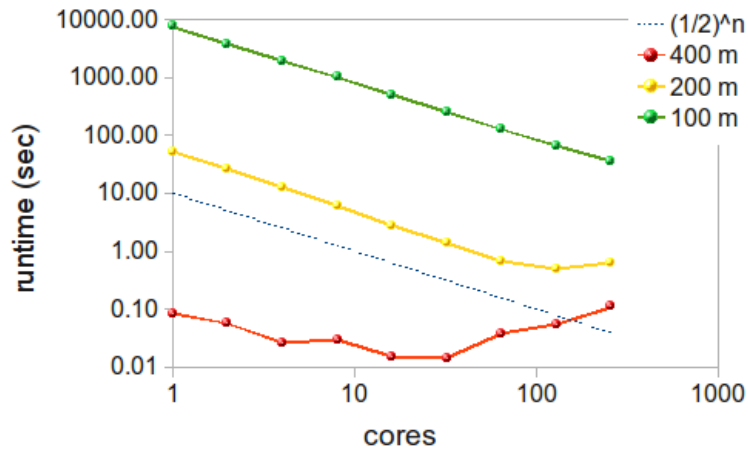 Engineering cases may require years of runtime

- Technology: OpenMP and MPI
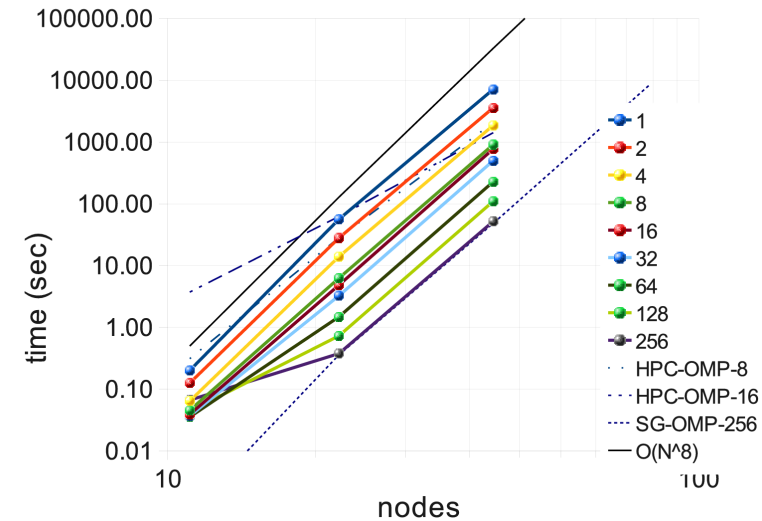
Gravity Inversion Example

- Ill-posed problem 2D=>3D and its scalability

Monte-Carlo Experiments

- Interesting case requested from Industry

  Immediate objective - statistical physics for transitions from paramagnetic phase to ferromagnetic phase (Ising model)

  Long term objective – using similar methods for prediction of markets shares (economics)

- Use of multi-core Graphical Processing Units
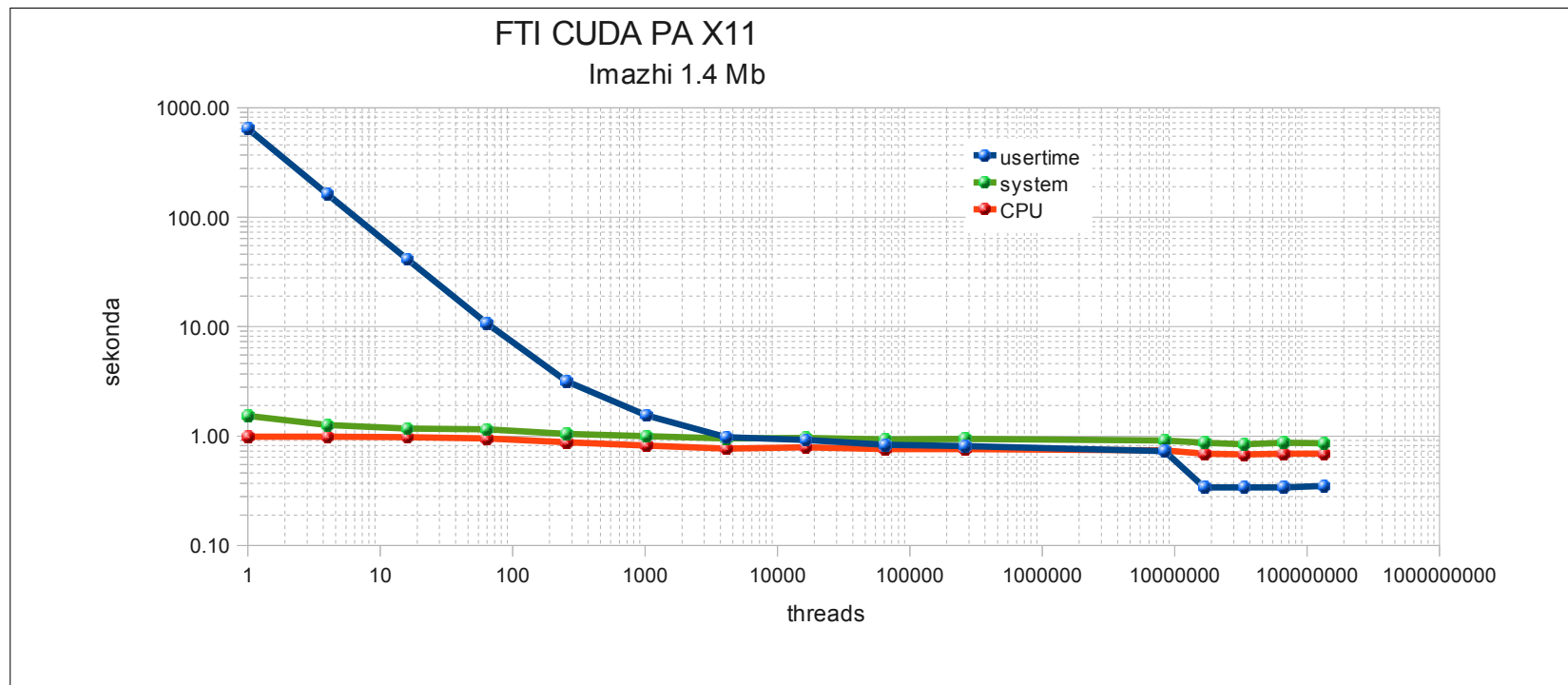
  Available in desktops / laptops

Ising Example - Magentism

- From one core CPU to four cores CPU to GPU
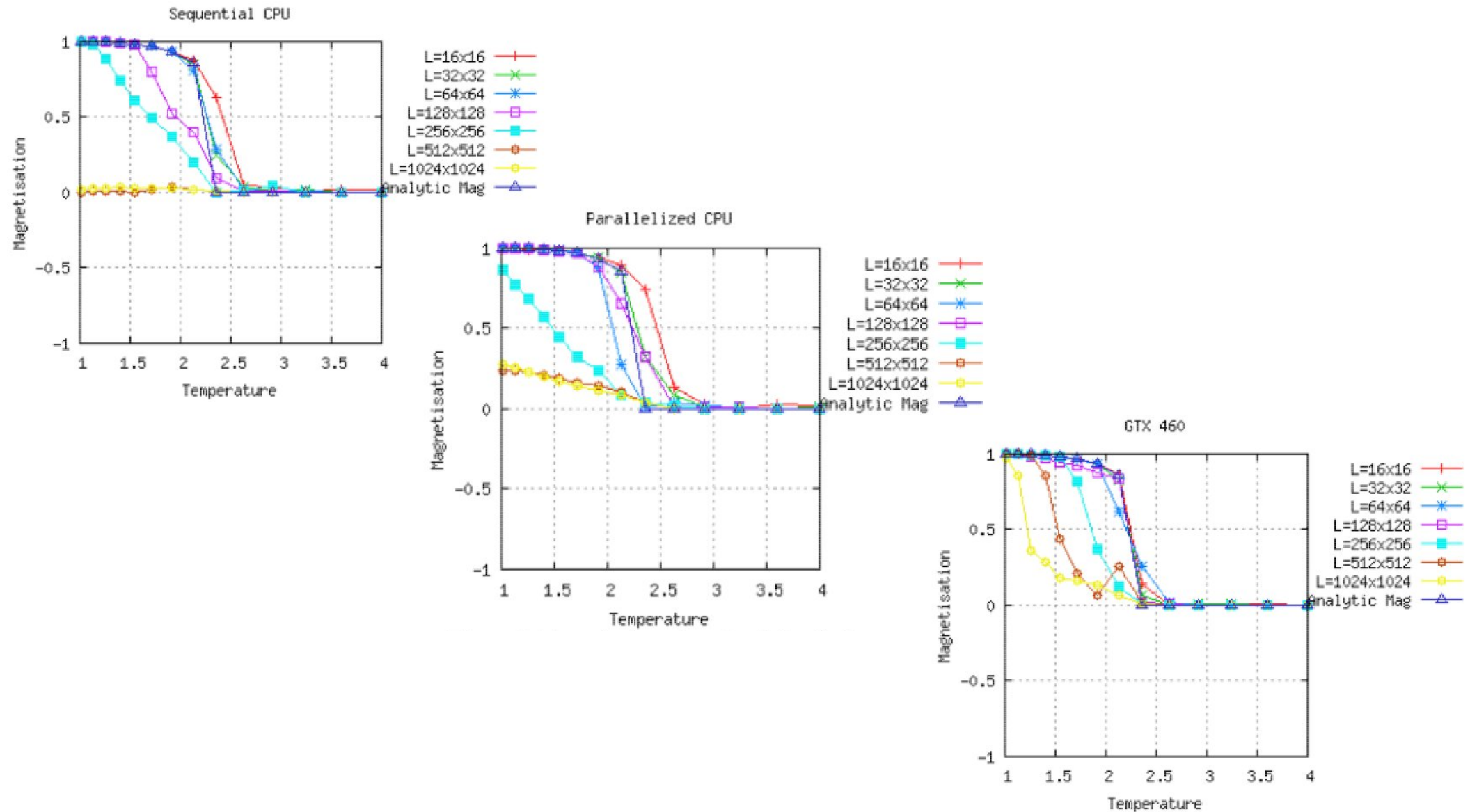
More Experiments on GPU

- Trend analysis for suites of 2D arrays
- NVIDIA 400 Quadro (48 cores) in FTI

  Available (contact nfrasheri@fti.edu.al)

FTI CUDA PA X11
Imazhi 1.4 Mb

New Platforms

- New HCP system of 250 cores in process of installation in UPT to serve for the research community

- Need for mastering of deployment and exploitation of grid clusters available

- Need for applications

Need for Applications ?

- "Sequenciality" is gone

    Actual systems are multicore

- We must start to think in "parallel"

    Multicore systems for new and old problems

    Parallelization of algorithms is tricky game

    Need for training

    Need for portals

Training Issues

- Elements of parallel processing in curricula

    Faculty of Natural Sciences

    Faculty of Information Technology

    Faculty of Economy

- Focus on traditional communities

    Computer sciences

    Physics and mathematics

    What about others ???

Collaboration Issues

- There are already few teams "playing" with HPC

- There are teams as "potential players" ...

- How we can promote collaboration between old teams and new teams ???

- Support fro national programmes is small

- Support from EC Framework Programmes is effective if local research community is active

- Probably we need to re-focus research areas ?

Thank You

- Q & A