NTNU, Trondheim, Norway

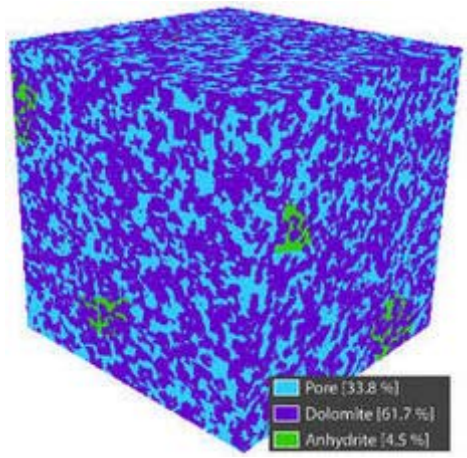
NTNU
Norwegian University of
Science and Technology

- **NTNU (Trondheim, Norway)**
- **Lasse Natvig**
  - Professor in computer architecture
  - Department of computer and information science (IDI), NTNU
- **Possible collaboration areas within prog.mod.& OS cluster**
  - 1) General purpose hardware acceleration in HPC Clusters, with Numerical Rocks
  - 2) Parallelization of Linear Programming (LP) on Novel Multicore Hardware, with Miriam AS
  - 3) Efficient and portable parallel programming (EU 7FP, call 4 ...)
- **Related activity**
  - Cooperating with Dr. Anne Elster's HPC group at NTNU
  - Simulation based design space exploration of multicore memory systems (Participating in the multi-cluster)

1) Numerical Rocks, HPC and CUDA?

- **Context**: Objective: compute representative petrophysical and transport properties of reservoir rocks directly from 3D images of the rock microstructure. (oil&gas industry)
- Development of highly optimized massively parallel algorithms running on HPC clusters using state-of-the-art acceleration boards from the HPC and gaming industry.
- Candidate platforms: GPUs, physics processing units (PPUs), Cell BE and homogeneous multicore processors
- Status: PhD-student B. M. Mathisen
  - PhD courses, initial experiments with **CUDA and an 8-core workstation, Tesla**
  - Participates at ICS, Greece, 7-12 June.
  - Co-supervisor is Dr. Anne Elster
- Collaboration:
  - similar projects?
  - 3 – 6 months stay in a relevant research group

numericalrocks



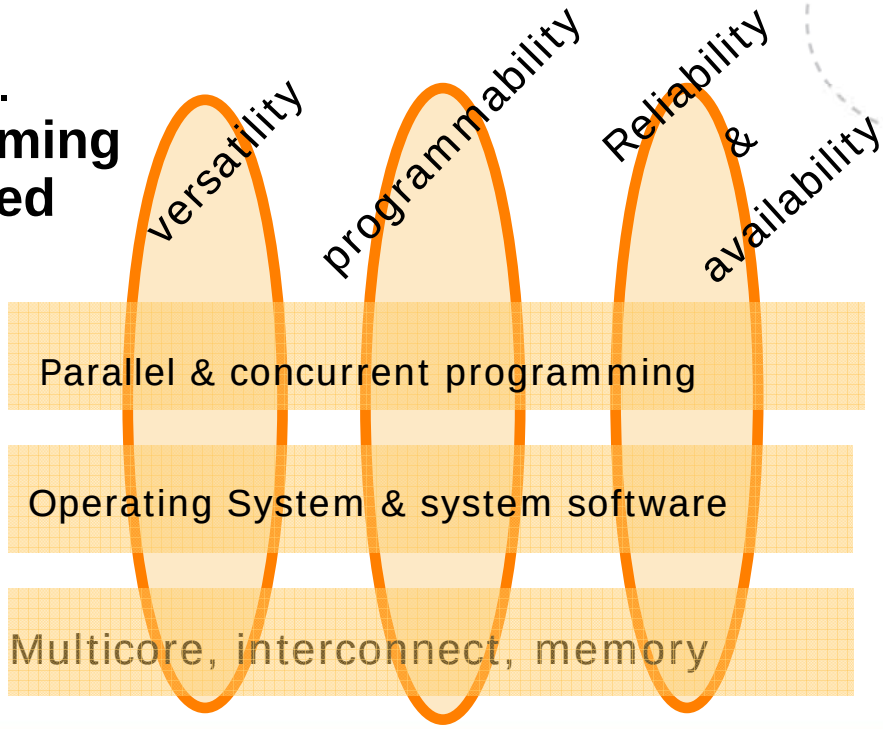
2) LP parallelization on Cell

- **Context**: Miriam Gas Simulation and Forecasting Centre in Halden, Norway, develops a gas network simulation system. To be able to better support the European gas market increased computational performance is required.
- Miriam AS in cooperation with NTNU has very recently got an **"industry-PhD" fellowship** focused at parallelisation of Linear Programming (LP) on Novel Multicore Hardware.
- **Platform**: A cluster of **Cell Broadband Engine**
- **Main challenge**: Adopt a layered parallelisation approach to make the software more robust to future changes in the underlying compute platform, i.e. to combine high computational efficiency with software portability.
- **Status**: Need applications NOW, deadline 13 June 2008.
- Collaboration: yes

3) Efficient and portable parallel programming (EU 7FP, call 4 ...)

- Partner in a STREP proposal spring 2007 for **EU 7FP challenge 3.4 ---** programmability of multi-core systems.
  - No. 13 of 24 ? (Above all thresholds, low budget)
  - Coordinator: Univ of. Vienna

- We want to take part in STREP proposals etc. as a research partner. Possible role: "**linking the programming level to the HW to achieve improved performance". Holistic view** on multi-core application performance.



Background & contact info

- Background for research in multicore proramming
  - PhD: ”Evaluating Parallel Algorithms: Theoretical and Practical Aspects ” (1991)
  - Simulation of the P-RAM model, Synchronous MIMD programming, Simulation of Valiant’s BSP model, general interest in HW/SW interface, parallelism, and simulation based research in multicore memory systems (since 2004)

- **Contact:**
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