Exploitation of modern CPU architectures and its impact on the computing model of HEP experiments

Goals of the Workshop

- Review of current industrial technologies
  - Hardware
  - Software
- Trend for the future
  - Short term
  - Next decade
- Review of current activities in HEP

Presentations

- Reviews (hardware, software, activities)
  - Vincenzo: Multi-Core
  - Leone: GPUs
- Specific topics
  - Alfio: "final" physics analysis
  - Gerri: I/O (root) and analysis of large datasets
  - Karen: physics analysis on GPUs

Goals of the Workshop

Exploitation of modern CPU means parallelization

- New Evaluate impact on
  - SuperB computing model
  - Software Architecture
- Identify the most affected areas
- Propose a short term R&D program

Issues for discussion R&D

- Optimization of scalar code
  - It will not go faster because of technology
  - We need to go back to trading accuracy for speed
- Vectorization (in core parallelism)
  - Compiler level auto-vectorization is not enough
  - We may need to rethink algorithms to exploit it

Challenge here is to achieve a significant speed-up while keeping the code flexible and readable/ maintainable by a large group of people

Issues for discussion R&D

- High grain parallelism (inside algorithms)
  - Many paradigms around (OMP, TBB, Cilk++, Cl, std::thread,…)
  - We need to evaluate the various approaches and see which best fit our environment
  - Try with existing algorithms (pattern recognition and tracking for instance)

Issues for discussion R&D

- Framework level parallelism
  - Beyond the well established event by event parallelism
    - Algorithm pipelines, parallel I/0
  - Needs to establish the actual gain of different scheduling strategies
    - Leverage Babar's software and data to build "emulators"
- Keep an eye on emerging technology
  - GPGPU: established for specialized use-case, can be used for general computing?
  - Experiment with (HL)T algorithms