

**HiPEAC**  
**Applications Task Force**  
*Show Us Your Apps!*

Pahpos, Jan. 29, 2009

Yoav Etsion

# Collaborative Applications' Repository

- The research community needs to study the characteristics of parallel applications
- **Problem:** collecting and adapting applications is a tedious job...
- **Solution:** collaborative effort!
  - We each put the applications we compile and adapt into a shared repository
- **Kickstart:** each research group takes responsibility for one app.
- The goal of this meeting is to propose applications, and dispense the work
- Let us try and select applications wisely...

# Workload Convergence

## Example: *Recognition, Mining, and Synthesis*

Level 1: Applications				
Ad-hoc search	...	Derivative Pricing	Ray-Tracing	Computer Vision
Semantic Search	Portfolio Selection	...	Physical Simulation	...
Level 2: Mathematical Models				
Partitioning Based	...	Diffusion Models	Level Sets	Tracking &Reconstr.
Generative non-linear	Quadratic Optimization	...	Particle Systems	...
Level 3: Mathematical Techniques				
SVD	...	Interior-Point Method	Collision Detection	Path Planning
K-means	Stochastic Simulation	...	Filtering&Anti-Aliasing	...
Level 4.1: Numerical Algorithms				
Direct Solvers	Iterative Solvers	Monte Carlo Simulation	Convex Collision (V-Clip, GJK)	
Level 4.2: Numerical Primitives and Data Structures				
Sparse BLAS123		Dense BLAS123	Structured matrix operat.	
Sparsity struct. (CRS, graphs, elimination tree)		Basic geometry primitives (triangle, box, convex)	Partition structures (grids, kd-tree, BVH)	

Chen et al. "Convergence of Recognition, Mining, and Synthesis Workloads and Its Implications",

Proceedings of the IEEE , 96(5), May 2008

# Other Possible Candidate Applications

- **WRF** Serial / MPI / OpenMP
- **SETI@HOME** Serial / CUDA
- **PBPI** MPI
- **FOLDING@HOME** Serial / MPI / MPI-SMP / CUDA / CAL / PS3

(closed source)

- What about computational libraries?
  - **BLAS**
  - **LAPACK**

# Metrics



- The trivial ones: *IPC*, *cache miss-rate*, *interconnect bandwidth*, ...
- What metrics are of interest to the different research domains?
- Researchers will check measurement-enabled code back to repository
  - Reproducible results.
  - Meaningful comparisons of different algorithms/mechanisms.

# Application Repository Coverage

<i>Prog. Model Comp. Class</i>	Serial	MPI	OMP	Pthreads	Cell	VMX	SSE	CUDA	...
HPC	WRF	WRF	WRF						
Embed.									
Soft RT									
Hard RT									
...									

# Application Information

- **Short description of the application**
- **Human classification**      *Physics, Chemistry, Medical, Engineering, ...*
- **Algorithms / Math. Models**      *FFT, Linear Algebra, Bayesian methods, ...*
- **Programming Model**      *Serial, MPI, OpenMP, ...*
- **Computational Class**      *HPC, Embedded, ...*
- **Platform**      *x86, x86\_64, SparcV9, PowerPC, ARM, ...*
- **Compiler**
- **Libraries**

# Repository Directory Structure

```
App / kernel / src / platform / model / buildme
                                     /
                                     runme
                                     / scripts (general)
                                     / input
                                     / output
                                     / doc / partner / paper.pdf
                                     / runtime-report.txt
```

- *runme* script will also collect results
- Once we have enough metrics, we can structure the result files
- The basic kernel is the full run, but once we have extracted kernels...
- **WRF** example will be published in a few weeks

# Who to contact?

- Coordinator: **Yoav Etsion** [yoav.etsion@bsc.es](mailto:yoav.etsion@bsc.es)
1. If you already have an application you analyzed, please contribute
  2. Please contact me before you start working on an application:
    - Perhaps someone is already adapting the application?
    - Cooperating from the get-go enables faster integration
      - ...and makes my job easier...
  3. Let us know if you any ideas for improving this service