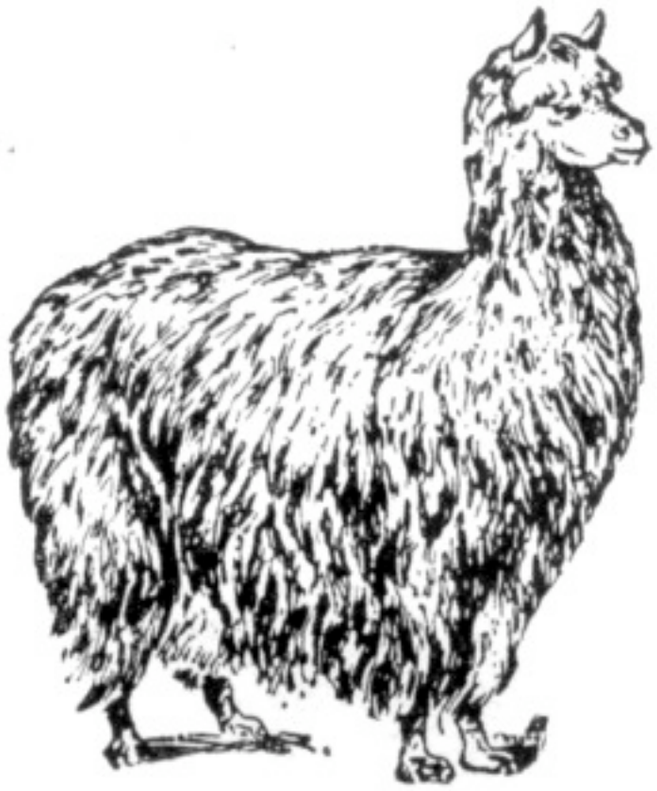

Alpaca

Erik Schnetter

Baton Rouge, February 2008

LSU

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Alpaca

- Cactus Tools for Application Level Profiling And Correctness Analysis
  (E. Schnetter, G. Allen, T. Goodale, M. Tyagi)
- NSF SDCI, $590k, 3yr (2007-2010)
- 1 postdoc, 1 student
- Connected to Blue Waters
  (Eclipse interface for Cactus)

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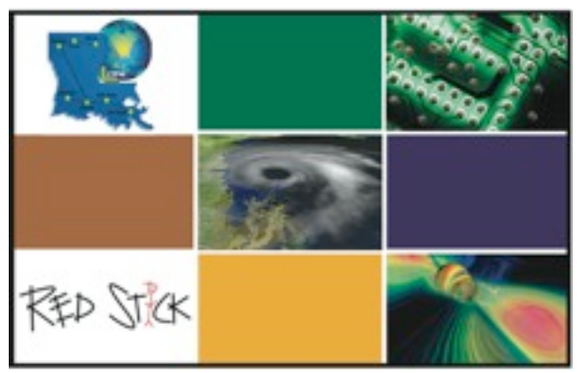
Research

1. High level debugging tools for HPC applications
   (debugging the physics, not the code)
2. High level profiling tools for HPC applications
   (profiling the application as a whole)
3. Hardware fault tolerance
4. User interface for the above
   (for physicists, not programmers)



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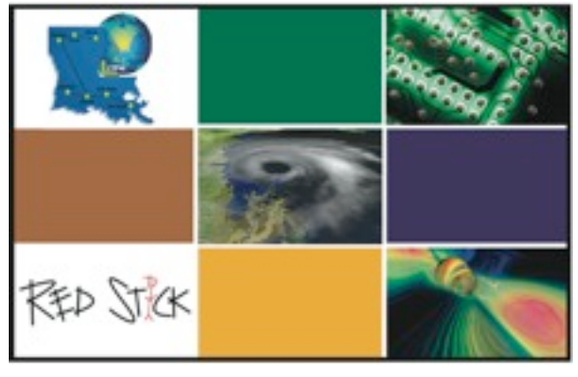
Ail

(the drops that made my barrel overflow)

- Physicist at AEI debugged problem by making movies of simulations
- Inter-thorn dependencies with AMR are horribly complicated (data flow, call tree)
- printf is a fine debugger
- rdtsc is a fine profiler



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Main Idea

- A software framework has detailed knowledge about the state of the application
- Debugger, profiler should interact with the framework, instead of only inspecting the application from the outside
- Need to involve end user in this, since debugging and profiling are holistic tasks

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Plans: Debugging

- Use VisIt (LLNL) as (remote) visualisation tool
- VisIt's "libsim" supports user interaction with running simulations
- Expand existing web server debugging UI
- Add fine-grained schedule control
- Fancy ideas: modify variables, modify code, go back in time, ...

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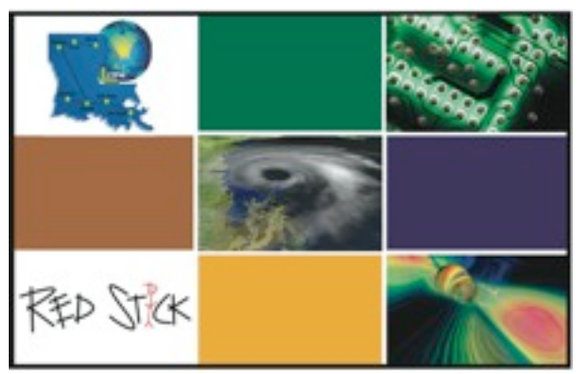
Plans: Profiling

- Existing tools: Cactus timers, FFTW clocks, TAU; health indicators: M/h, Flop/s, gpu/s
- Problem: output format, display to user (too much data)
- Incorporate framework's knowledge on domain topology
- Problem: teach users about AMR algorithms, about prejudices, about looking outside the circle of light



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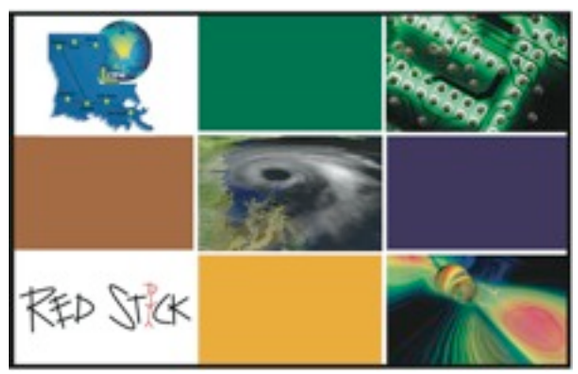
Plans: User Interface

- Plan A: Extend current web server
- Plan B: Build UI using VisIt's libsim (QT)
- Plan C: Use Eclipse (PTP, TPTP)
- Note: HPC platforms are fungible
- Note: People have laptops these days
- Need seamless transition between production - debugging - profiling



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Almost-Achievements

- Updates to web server
- Fine grained schedule control
- Remote, online visualisation with VisIt
- Lightweight timers (FFTW)
- New model for checking schedule correctness
- Incorporate meta-data from automatically generated code

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Next Steps

- Implement remote UI, remote visualisation (basis for other work)
- Fine grained step size control for debugging (to attract early users)
- Define efficient output format for high-resolution low-level timers (necessary for XiRel)