

# LittleFe

A Parallel Computing Education Appliance

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Parallel Programming/Distributed Computing Workshop  
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# Motivation

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- Not practical to teach computer science with a serial mind-set any longer
- Most cluster cycles go to research, not teaching
- When cluster cycles are available the use of job schedulers makes educational uses difficult at best
- Teachers should teach, not administer the clusters and software stacks needed for teaching
- Low cost, \$2,500 USD gives you 6 nodes/12 cores/1GB RAM per core and GPGPU resources
- Vehicles for students to experience real-world hardware and software construction and support



# History

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- First LittleFe prototype built in 2004, once the concept was proven we built 3 more for ourselves
- TeraGrid and the SC Education Program supported the construction of 10 v3 units in 2006
- Intel, EAPF and the SC Steering Committee supported the construction of 25 v4 units in 2011 through buildouts at OU, PUPR and SC11
- Numerous groups have developed riffs based on our designs, e.g. Joel Adams, ORNL, and Microsoft

# Design

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- Atom based dual core CPUs with NVIDIA GT218 GP-GPU chipsets, 2GB RAM (6 nodes)
- 160GB 7200 RPM 8MB cache SATA disk drive
- 8-port GB Ethernet switch
- PCI-E WiFi adapter
- PB-360P-12 switching transformer
- Custom frame
- Bootable Cluster CD (BCCD) software stack

# Use Cases

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- Classroom demonstrations and labs:
  - Parallel models - message passing, shared memory, GP-GPU, hybrid
  - Domain and functional decomposition
  - Speedup and efficiency
- Cluster design laboratory:
  - Power consumption and heat dissipation
  - Load balancing and component choice
- Outreach events, blinky lights attract people...
- Build and test locally and then upload and run on XSEDE or other large-scale resources

# Where are they now?



# Future Plans

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- Curriculum module development, e.g. MapReduce
- Funding to support buildouts during 2012
- Support for high school appropriate curriculum
- v5 redesign - smaller, lighter, faster, cheaper
- MicroFe - the developer's friend

# Thanks!

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- Scott Lathrop and TeraGrid/XSEDE
- Bob Panoff and the Shodor Foundation
- Wilf Pinfold, Paul Steinberg, Jennifer Teal and Intel Corporation
- Educational Alliance for a Parallel Future (EAPF)
- The ACM and the IEEE - Computer Society
- The SC Steering Committee
- Earlham College
- Many, many colleagues, students and former students