ECE 574 – Cluster Computing Lecture 13b

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Project Ideas

- Making a cluster is a popular idea. Fine if multiple people do it.
  - First, install OS on all machines (Linux is popular)
  - Second, connect over a network. Wired Ethernet is fine. Can be wireless, can even be remotely located although this gets tricky if behind a NAT.
  - Set up machines so that they know each other's names (/etc/hosts or similar). You can use IPs too.
  - Install MPI on all of the machines. MPICH or

OpenMPI both work in my experience.

- You need to have some way of having same executable on all machines in same location. Easiest way is some sort of network file system. NFS3 is relatively easy to set up. One machine acts as server, export in /etc/exports. Mount this on all other machines.
- Also need to set up some way to login without a password. Usually you do this by setting up SSH using keys.
- Finally, build your code, then `mpirun -np 4 -hosts nodea,nodeb,nodec,noded`

- ○ Fun issues: how do MPI and OpenMP interact? Heterogeneous systems?
- ○ What do you want to run on it? Sobel and Linpack are boring. Can you find something more interesting? Performance runs? Not limited to data crunching. LED displays and music can be played via MPI as well.
- Applications
  - ○ Some code of your own design?
  - ○ Fractals?
  - ○ Ray-tracing? Animation rendering?
  - ○ Calculate pi?

- Big data / Hadoop?
- To do this type of thing, not just run something. Need to show improvement vs single core and analyze some (list efficiency, type of scaling, etc)
- Other
  - GPGPU programming (not quite there yet)
  - SIMD/SSE programming
  - Embedded? DSP? The QPU and GPU on the Raspberry Pi?
  - Reliability/Power related?
  - Use a raspberry pi / memory scanner to try to detect

radiation bitflips?