Lattice QCD on Clusters

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Fermilab

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- Challenge is to achieve the level of precision needed by new experiments.
- Requires more powerful computers and better algorithms.

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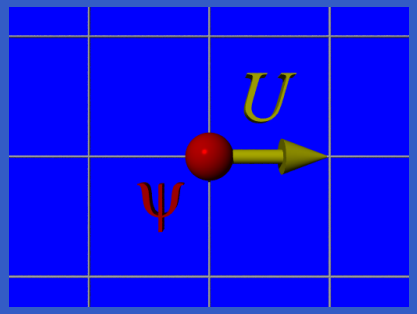

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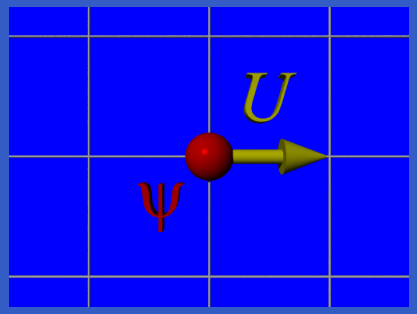

- Each processor communicates only boundary sites with neighboring processors.

Parallel Supercomputers

Computations traditionally performed on commercial or specially built supercomputers.

ACPMAPS

Scale from 8Gflop/s to $>$800Gflop/s? . . .

Lattice QCD National Infrastructure

Long-range plan to meet US computing needs proposed to the DOE (SciDAC) and NSF

- Three ~ 10TFlop/s facilities by FY2005
- Cluster investigations by Fermilab and Jefferson Lab
- 300 cluster nodes/yr over three years for FNAL and JLAB
- Design/deploy custom computer based on highly integrated systems on a chip at Brookhaven/Columbia.

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Rapid algorithm protoyping and test result turnaround times within a few days has been key to advances in LQCD.

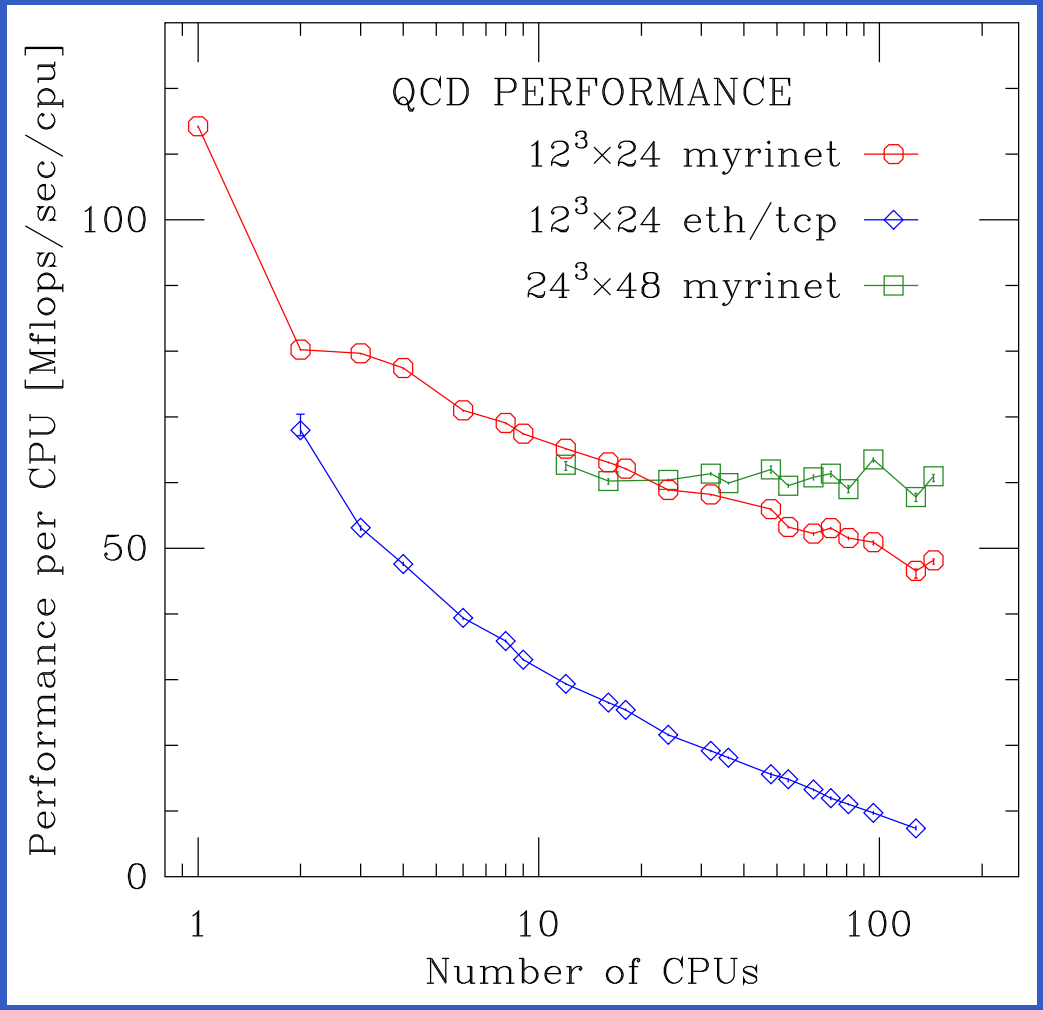
Eighty Node PIII Cluster

Installed Sepember-October 2000.

Features of Eighty Node Cluster

- L440GX+ motherboard, 100MHz FSB, dual 700MHz PIII, 256MB SDRAM and 18GB disk
- BIOS and EMP redirect to COM serial ports, monitor via Cyclades
- Remote boot via PXE capable ethernet BIOS
- 100mbps ethernet
- Myrinet-2000 NICS and 80-port switch
- Linux 2.2; PBS(maui); MPI mpich/vmi (NCSA)

MPI Over Myrinet and Ethernet



FY2001 Program

Fermilab has received $\sim \$0.6$M to fund cluster investigations in the current year.

- Hire one systems/applications software specialist
- RFP's mid-June to July. . .
- Add 130 to 180 compute nodes (dual P4, Athlon, Alpha, PPC, G4. . .)
- Expand high-performance networking (Myrinet, SCI, GigE. . .)