## Scientific Computing with Linux Open Source Software

Dr. Paul Michaels, PE BSU Geophysics Dr. Amit Jain Computer Science

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

#### **Beowulf Cluster Room**



- Master Node
- 64+ Slave Nodes (128
  2.4Ghz Xeons, 64GB
  RAM, 2.56TB disk)
- Giga-Bit Switches connect slave nodes to master node on LAN.
- 2 CPU's per Node, 1GB RAM, 40G Disk

#### **Cluster Room**



# Conrad Kennington's Cluster Monitor MS Computer Science

ClusMon - Beowulf Cluster Web System Monitor - Konqueror	? <b>- -</b> X
Location Edit <u>V</u> iew <u>G</u> o <u>B</u> ookmarks <u>T</u> ools <u>S</u> ettings <u>W</u> indow <u>H</u> elp	
10000000000000000000000000000000000000	and the second se
🛛 🗈 Location: 🕼 http://webwulf.boisestate.edu/clusmon/	
📗 🚰 webmail 🚰 Journals, 🚰 DOC, 🔀 Google 🚰 ASCE, 🚰 Software, 🚰 BSU, 🚰 Financial, 💿	Actiontec
CLUSMON Beowulf	PAST STATS NODE LIST
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
56 out of 60      0 out of 60      4 out of 60      0 out of 60        93% Unused      0% Low      7% Medium      0% High	0 out of 60 O% Down
	- 1.500.0 Condition
Low Average High	
축 Menory Usage 축] 11%	S CPU Average 3%
50%	
Network Traffic      5698719.5	Uptine 124 days, 07:12:31
this page was generated in about 0.0136 seconds with 4 database queries.	
Page loaded.	

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathomatic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

#### Scilab

INRIA (France, many contributors) http://www.scilab.org

- Interactive, Linear Algebra, Polynomials, Statistics, Sound, Help Facility, ...
- Toolboxes include: Signal Processing, Fractals, Wavelets, Color.
- Dynamic Systems: Sicos (animations)
- Graphics: Simple plots, 3-D plotting of surfaces, pixal image plots in color.
- Export Graphics to XFIG (CAD program, can prepare journal quality images).

### Scilab Plot Cubic Equation



- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathomatic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

#### Symbolic Processing

#### xmaxima

- http://maxima.sourceforege.net
- Like Maple (MIT Macsyma)



#### • mathomatic

- http://mathomatic.orgserve.de/math
- CAS Computer Algebra System



- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

#### XFIG

#### Supo Sutanthavibul, Brian Smith (LBL), Brian King, et al. http://www.xfig.org



• Manipulate graphical entities

CAD Program

- Original drawings, or draft on an exported figure from Scilab
- File Names: foobar.fig

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

### Finite Elements with FELT

by Jason Gobat and Darren Atkinson http://felt.sourceforge.net



- Static and Dynamic
- Choice of Elements
- Choice of Materials
- VELVET: CAD Input
- Stress, Strain, Displacement
- Choice of Output Formats

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

## PLPLOT

M. LeBrun, G. Furnish, A. Irwin, R. Laboissiere, J. Cardoso http:plplot.sourceforge.net



- Graphics Library for C, C++, Fortran, TCL, TK, JAVA, Octave, Python . . .
- Graphs, Surface Plots, Contour, Perspective, Color
- Well Documented (postscript, html)

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions

#### **Mathematical Libraries**

When you need a function or subroutine to compute from C or Fortran

- LAPACK: Linear Algebra, (C and Fortran, get the book from SIAM)
- BLAS: Basic Linear Algebra Subroutines
- GAMS: Guide to Available Mathematical Software Web Page
- NETLIB: Web Page for downloads
- NIST: Web Page with more links to sites like GAMS

- Cluster Update
- Interactive Computing with Scilab
- Symbolic Computing with maxima (based on MIT Macsyma )and mathematic (CAS)
- Figures with XFIG
- Interactive Computing with FELT
- Graphics Libraries
- Mathematical Libraries
- Questions