



HPC CLUSTER SYSTEM

Outline

- System Properties
- How to use
- Job submission demonstration
- Closing

Hardware

- Servers
 - 1 x HP ProLiant DL360 G5
 - System Management
 - 2 x HP ProLiant DL380 G5
 - Storage Management
 - 46 x HP ProLiant BL460c
 - Processing
- Storage
 - 4 x HP MSA60
- Console
 - HP TFT7600 Rackmount Keyboard and Monitor

Capacity

- CPU
 - $46 \times 2 = 92$
- Core
 - $46 \times 2 \times 4 = 368$
- Memory
 - $46 \times 16 = 736$ GB
- Local Disks
 - $46 \times 146 = 6.5$ TB (halved by RAID)
- Common Storage Area
 - $2 \times 3 = 6$ TB (halved by RAID)

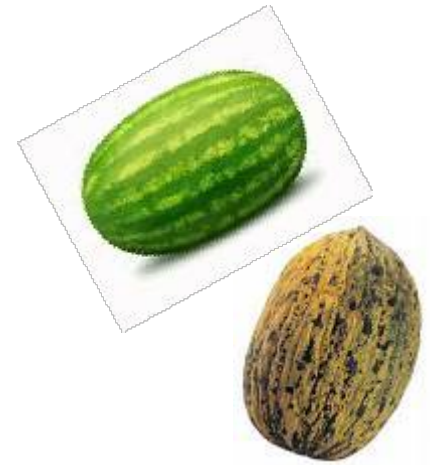
DL360

- Intel Xeon 5110 CPU
 - Dual-Core
 - 1.60 GHz
 - 4 MB L2 Cache
 - 1066 MHz FSB
- 2 GB Memory
- 2 x Hot-Plug SAS 10K 72 GB Local Disk with RAID



DL380

- 2 x Intel Xeon E 5430 CPU
 - Quad-Core
 - 2.66 GHz
 - 12 MB L2 Cache
 - 1333 MHz FSB
- 16 GB Memory
- 2 x Hot-Plug SAS 10K 146 GB Local Disk with RAID
- Each manages 2 x MS A60



MS A60



- 3 TB storage capacity
 - 12 x 250 GB
 - with RAID
- 7200 rpm S A T A disks

BL460c

- 2 x Intel Xeon E5430 CPU
 - Quad-Core
 - 2.66 GHz
 - 12 MB L2 Cache
 - 1333 MHz FSB
- 16 GB Memory
- 2 x Hot-Plug SAS 10K 146 GB Local Disk with RAID



16 Blades in c7000 Enclosure



TFT7600



Network Configuration

- 2 x 3Com 4200G 24-port Gigabit Ethernet Switch

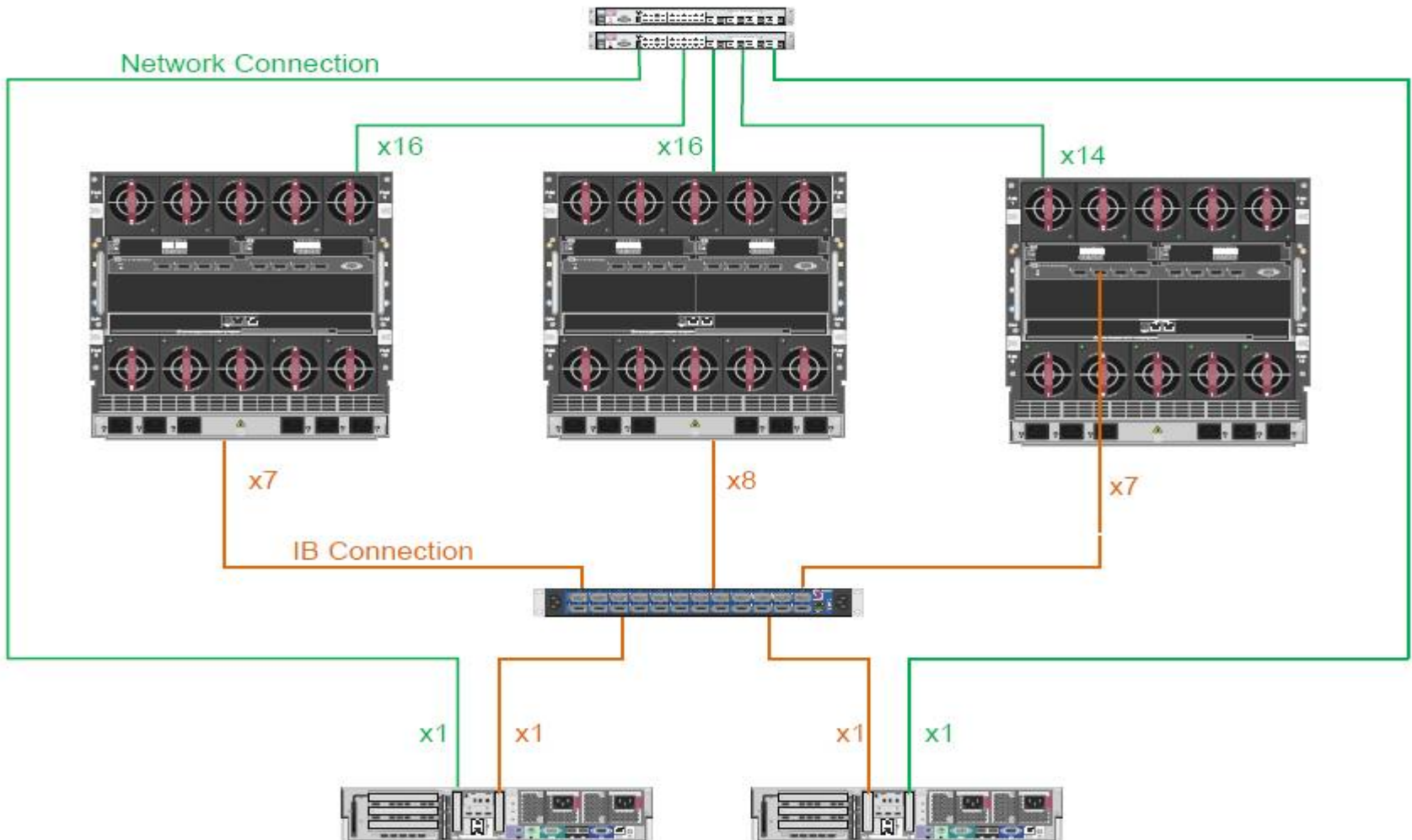


- + 1 Gigabit Ethernet Switch (temporary)

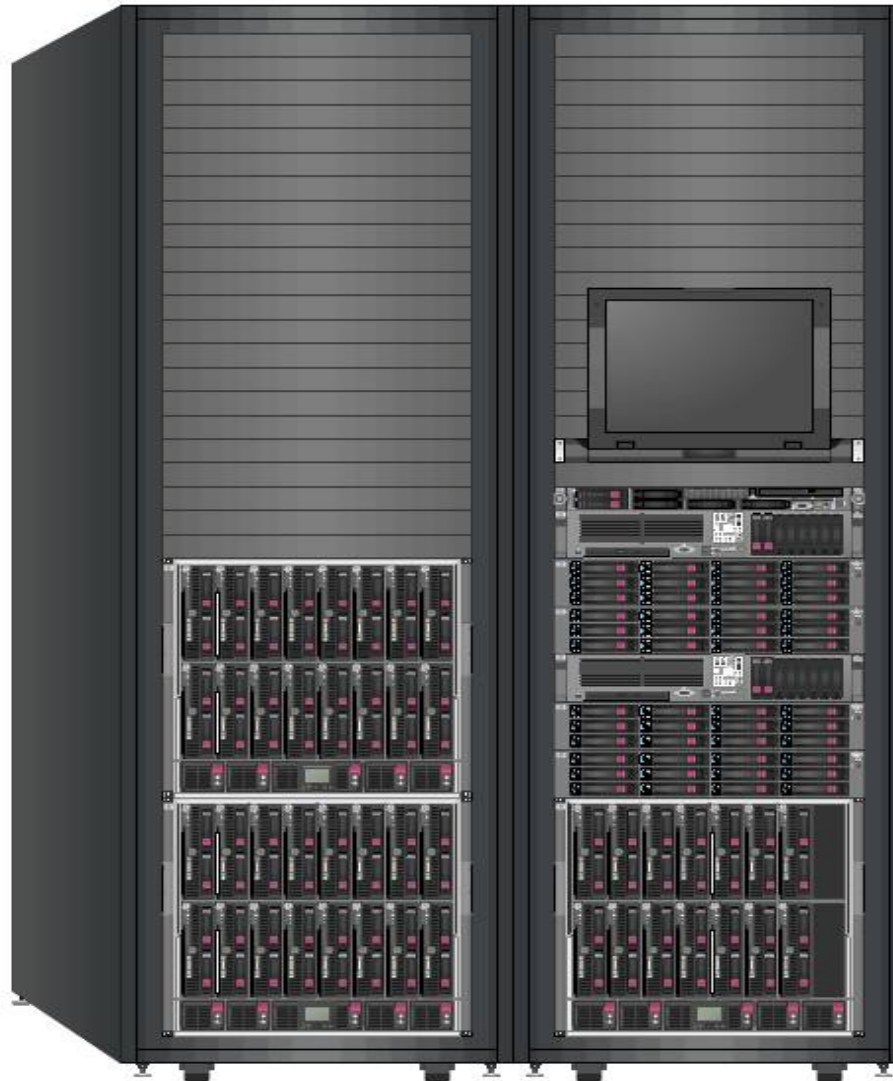
- 1 x Voltaire 9240D 24-port Infiniband Switch



Network Topology



Rack View







Software

- Scientific Linux 4.5 64-bit (OS)
- Lustre 1.6.4.2 (Parallel File System)
- Torque 2.1.9 (Resource Manager)
- Maui 3.2.6 (Job Scheduler)
- OFED 1.2.5 (Remote Direct Memory Access)
- LDAP (User authentication)

Compilers

- GNU compilers & debuggers (3.4.6)
 - gcc & g++ (C/C++)
 - g77 (Fortran 77)
 - gcj (Java)
 - gdb (Debugger)
- Intel non-commercial compilers & debuggers (10.1)
 - icc & icpc (C/C++)
 - ifort (Fortran)
 - idb (Debugger)

Libraries

- MPI
 - MVAPICH 0.9.9
 - MVAPICH2 0.9.8
 - OpenMPI 1.2.4
- Intel MKL 10.0 (Math Kernel Library)
- Intel IPP 5.3 (Integrated Performance Primitives)
- FFTW 3.1.2 (Fastest Fourier Transform in the West)

To be Installed

- MATLAB
 - Image Processing Toolbox
 - Neural Network Toolbox
 - Genetic Algorithm and Direct Search Toolbox
 - Statistics Toolbox
 - Optimization Toolbox
 - Distributed Computing Toolbox
 - Distributed Computing Engine for 64 worker

To be Installed

- Unified Parallel C
- R
-?

How to use

- Fill in the user registration form

<http://web.ceng.metu.edu.tr/~ketenci/UserForm.php>

- For any question

hpc-admin@ceng.metu.edu.tr

- Web page

<http://hpc.ceng.metu.edu.tr/>

– info, how-to, links, announcements, presentations, success stories, user discussion, ...

How to use

- Connect

`ssh -l username nar.ceng.metu.edu.tr`

- Prepare your application and pbsscript

- Submit your job

`qsub pbsscript`

- Check the status of your jobs

`qstat`