



# THUNDERHEAD:

## Hardware/Software: Current & Future Vision



**JOSEPHINE PALENCIA**

**NASA Goddard Space Flight Center**

**2004 Thunderhead Workshop**

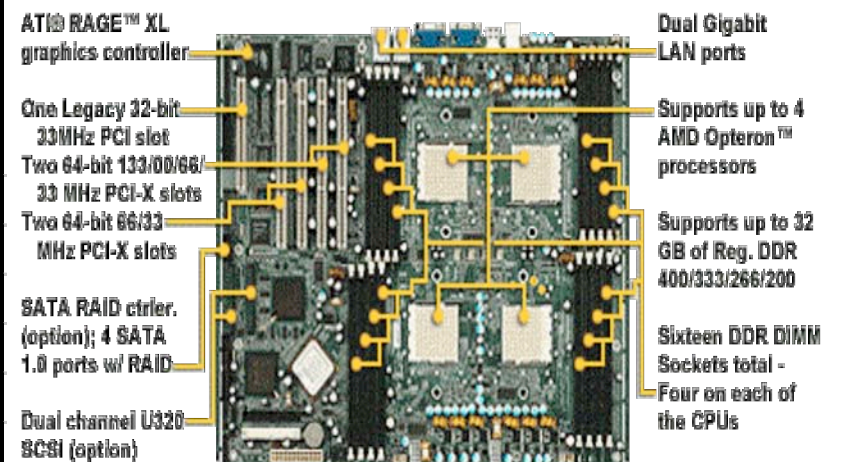
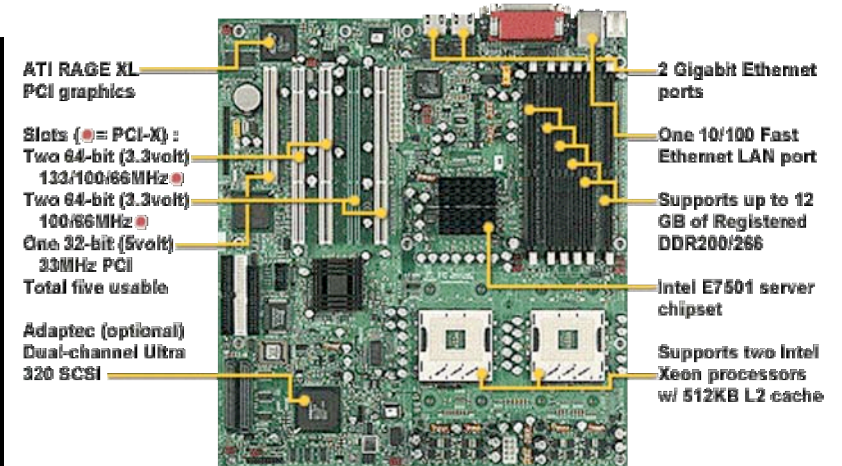
**November 22, 2004**



# HARDWARE



<b>Aggregate Specification</b>	
Number of nodes	268
Total processors	536
Total memory (Gb)	536
Total disk space (Tbyte))	21.44
Network interconnect 1	Myrinet 2000
Network interconnect 2	Gigabit Ethernet
Network interconnect 3	Fast Ethernet
Theor peak performance (Tflops)	2.5728
Linpack benchmark (Tflops)	1.2
<b>Node Specification</b>	
Motherboard	Tyan Thunder 2720
Number of processors	2X Intel 4 Xeon 2.4Ghz
Memory (Gb)	1024
Local disk (Gb)	80
Network interconnect 1	Myrinet 2000
Network interconnect 3	Fast Ethernet
Network interconnect 2	Gigabit Ethernet
Peak performance (Gflops)	9.6



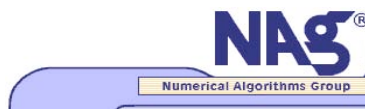


# SOFTWARE

- ◆ **OS:** Linux Fedora core
- ◆ **Network:** GM for Myrinet
- ◆ **Compilers (5):** NAG, Lahey, Intel, PGI, GNU (MPIIO + switcher)
- ◆ **Parallel:** Mpich-gm
- ◆ **Applications:** Paramesh, Flash, Java3d, JAT
- ◆ **Scheduler:** LTM + util
- ◆ **Parallel FS:** PVFS1, PVFS2 (rhome)
- ◆ **Cluster tools:** LACE, [Lookie](#)(cpu, memory, cache, load, jobs)



The Portland Group  
Compiler Technology





# ARCHITECTURE: Current/Future Vision Grid, heterogeneous, autonomic, adaptive

## THUNDERHEAD

10/100/1000 10gE Myrinet 2000



536 proc Xeon 2.64Ghz  
1.2Tflop, 14Tb PVFS  
Fedora, LTM GT3  
Grid Compute

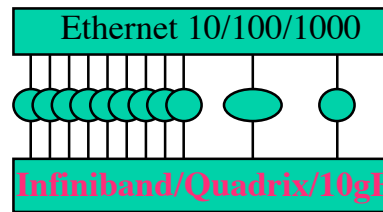
## ORKA

10/100 Myrinet 1280



32 proc PIII 700Mhz  
FreeBSD, OpenPBS, GT3  
Grid small compute

## JABBA



22Tb Apple Xserve 1.2Ghz G4  
MacOS X, Lustre, GT3  
Grid storage

## MEDUSA

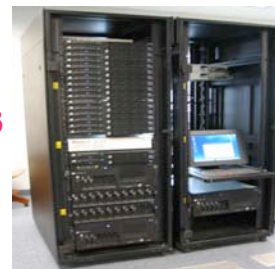
10/100/1000 Myrinet 1280



128 proc Athlon 1.4Ghz  
Fedora, PVFS, LTM  
Opteron/IB?, GT3  
Grid  
Compute/Graphics

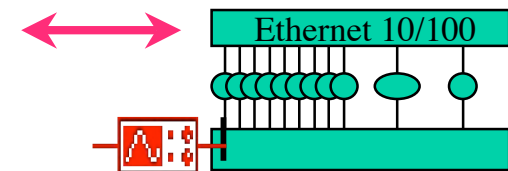
## BABY BLUE

10/100 Myrinet 1280



32 proc PIII 650Mhz  
SUSE, Lustre, SGEE, GT3  
Grid Portal/ Master

## TINK (mini)



Instrument

16-proc miniITX 1Ghz  
FreeBSD, GT3  
Grid minitx



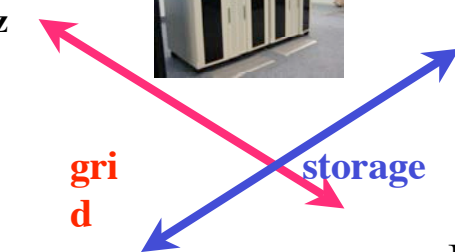
DOZER

14Tb PVFS  
Fedora, GT3  
Grid storage



grid

storage



ENTER here →



# ARCHITECTURE: Current & Future Vision

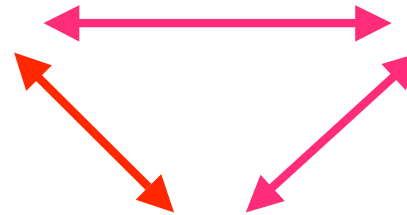
## Grid, heterogeneous, autonomic, adaptive

### THUNDERHEAD

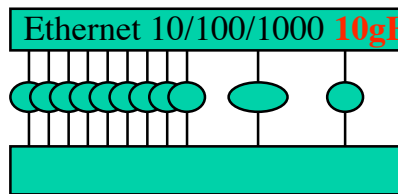
10/100/1000 Myrinet 2000 10gE



536 Xeon 2.64Ghz  
1.2Tflop, 14Tb PVFS  
Fedora, LTM GT3  
Grid Compute



SVS



GT3  
Grid visualization

### LIS

10/100/1000



208 Athlon  
1.5Ghz RH7.3,  
GT3  
Grid Compute

**AUTONOMIC:** self-monitoring, self-configuration, self-optimization, self-healing, self-protection

**ADAPTIVE HARDWARE:** metamorphosing chips changing network low power bias



# GRID PORTAL Sampler

## HOTPAGE

Login About Feedback

Home
Allocations
Resources & User Guides
Software
Consulting
Training
Successes
HotPage

**Compute Systems**

[DataStar \(datastar\)](#)

[Power4/368 \(copper\)](#)

[Compaq Cluster \(lemieux\)](#)

**Archival Systems**

[HPSS \(s-hpss\)](#)

[FAR \(far\)](#)

### PACI Compute and Archival Systems

Compute Systems									
Site	Center	Type	Name	Status	Load	Running	Queued	Queues	
<a href="#">UCSD</a>	<a href="#">SDSC</a>	<a href="#">IBM P655+/P690 HPC</a>	<a href="#">datastar</a>	<span style="color: green;">↑</span>	82%	16	73		
<a href="#">UIUC</a>	<a href="#">NCSA</a>	<a href="#">IBM Power4</a>	<a href="#">copper</a>	<span style="color: green;">↑</span>	92%	68	94		
<a href="#">CMU</a>	<a href="#">PSC</a>	<a href="#">Compaq Cluster</a>	<a href="#">lemieux</a>	<span style="color: red;">↓</span>	0%	0	0		

Archival Systems				
Site	Center	Type	Name	Status
<a href="#">UCSD</a>	<a href="#">SDSC</a>	<a href="#">HPSS</a>	<a href="#">s-hpss</a>	<span style="color: green;">↑</span>
<a href="#">CMU</a>	<a href="#">PSC</a>	<a href="#">DMF</a>	<a href="#">far</a>	<span style="color: green;">↑</span>

**HotPage Login**

To access HotPage web services you must have an account. If you do not have an account please [click here](#).

Username:

Passphrase:

Myproxy:

Updated:

Nov 17, at 20:05:02

**SDSC**

IBM 1760 HPSS S

**NCSA**

PWR4 368

**PSC**

LEMIEUX FAR 3000

**STATUS BAR LOCATION:** [Show](#) [In frame](#) [Pop-up](#) [Hide](#) **SORT BY:** [Organization](#) [Site](#) [Architecture](#) [Model](#)