

3.1.

3.1.1

(A3)



3.

3.1

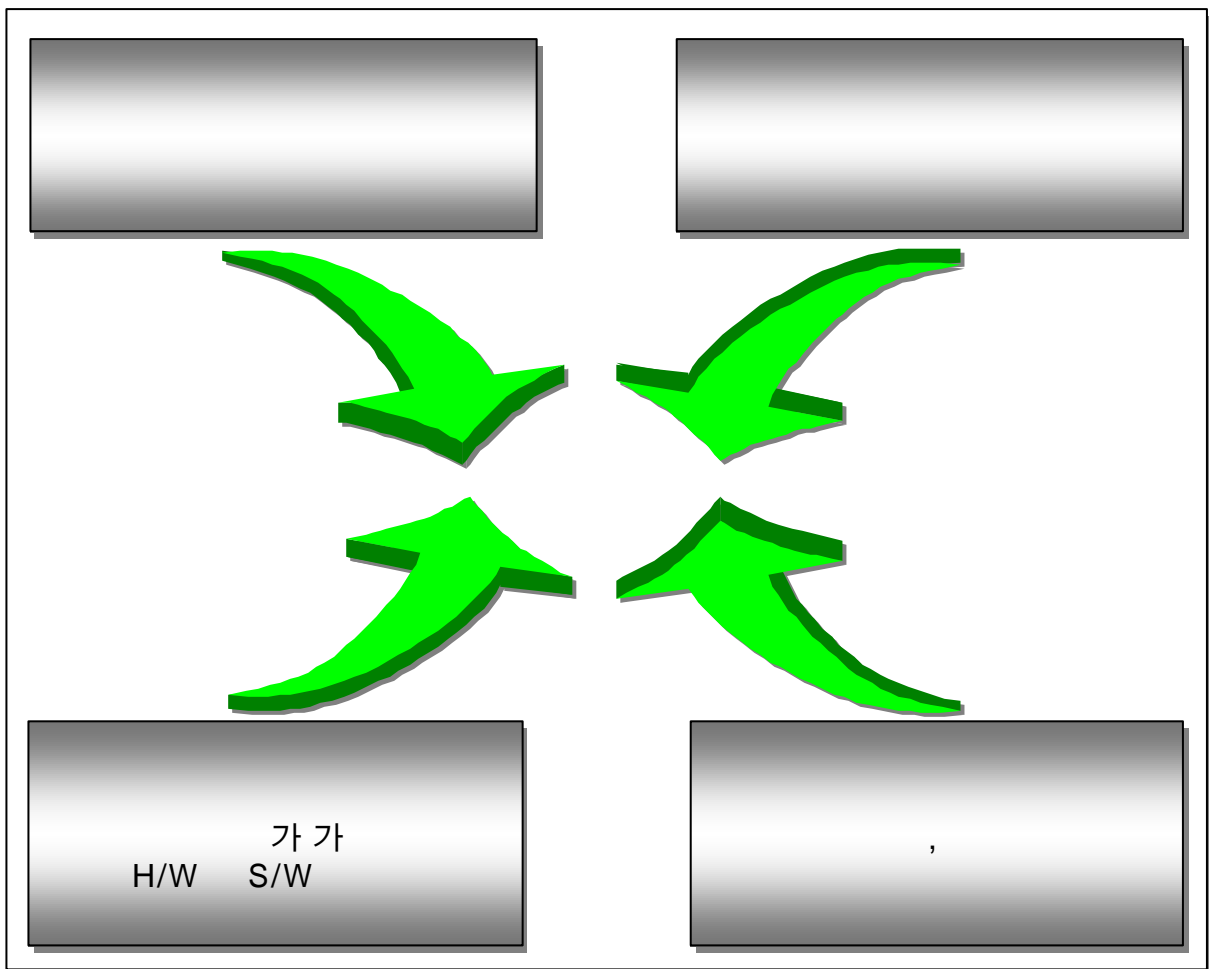
1.2

(A3)

## 3.2

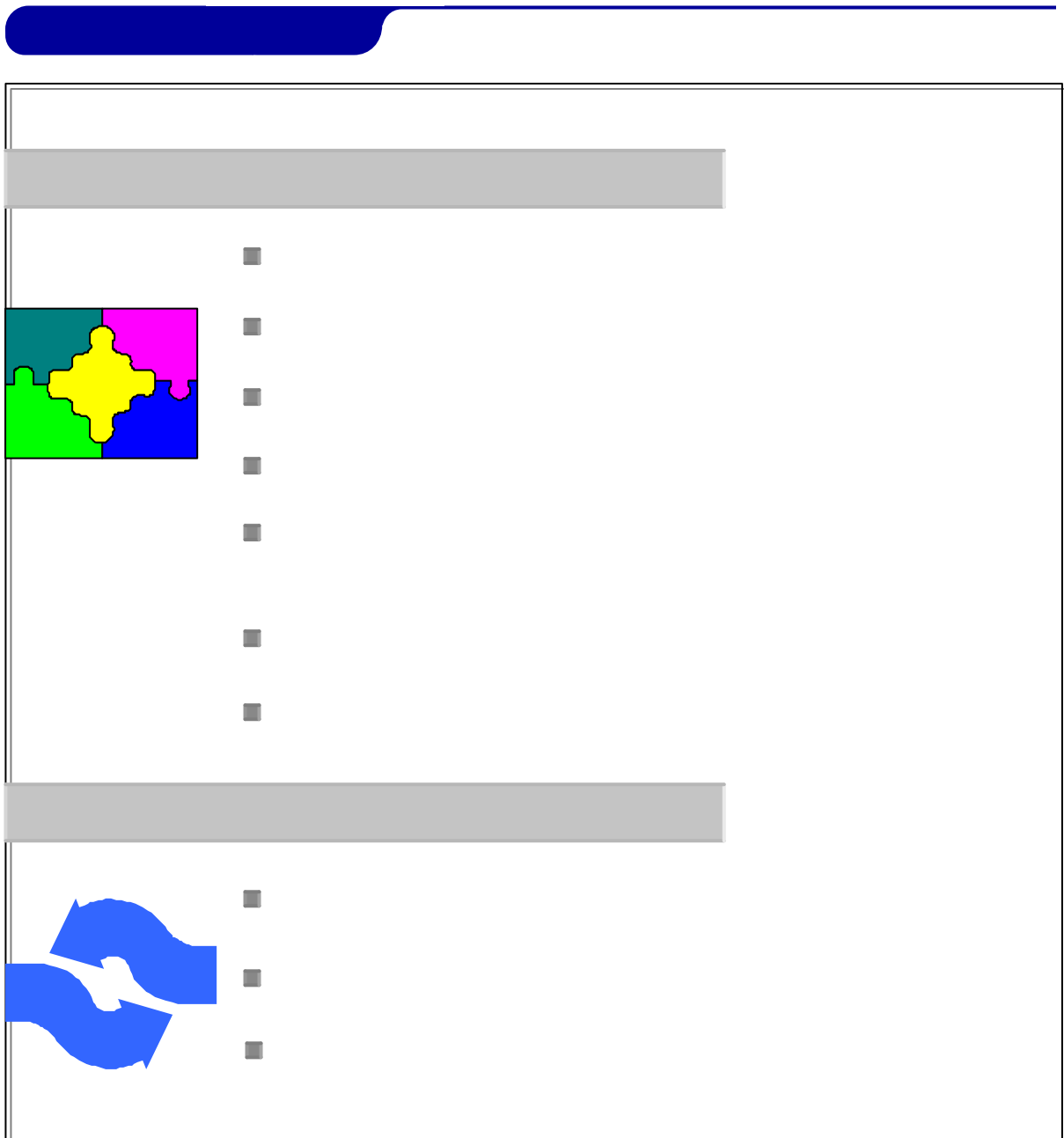
### 3.2.1

#### 3.2.1.1



### 3.2.1.2

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### 3.2.1.3

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(CPU Flops, Mem Bandwidth, DISC & Network I/O)

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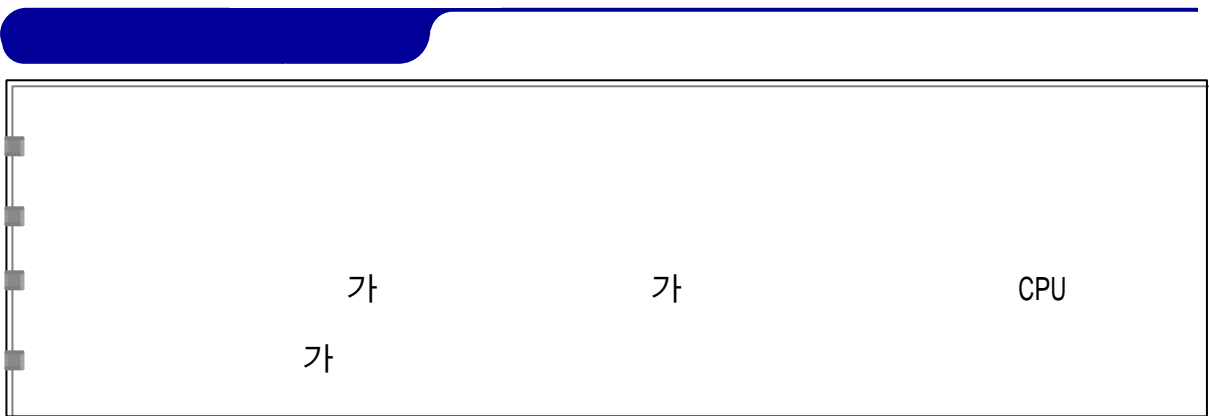
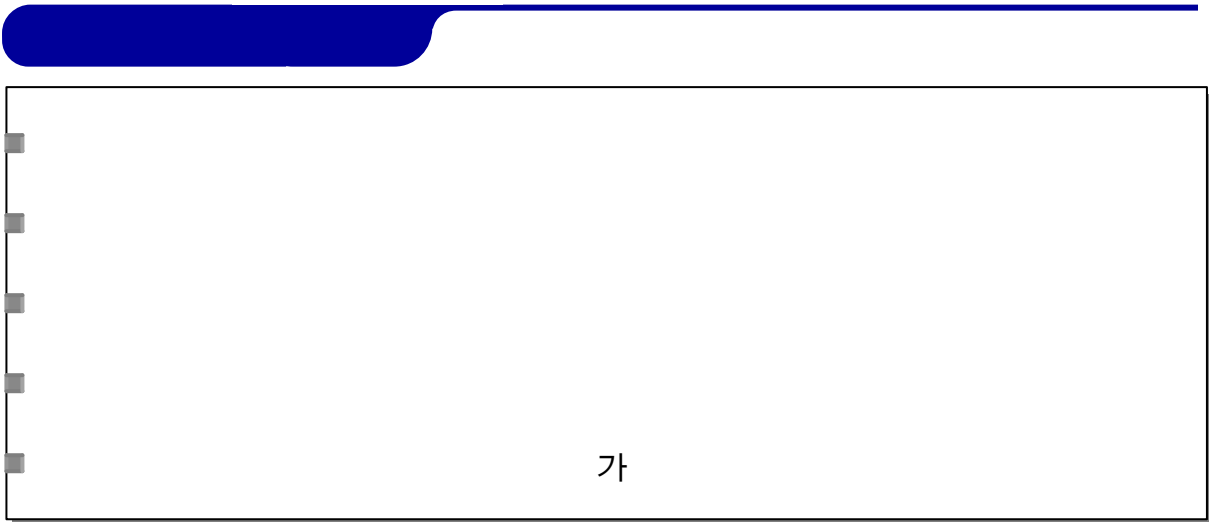
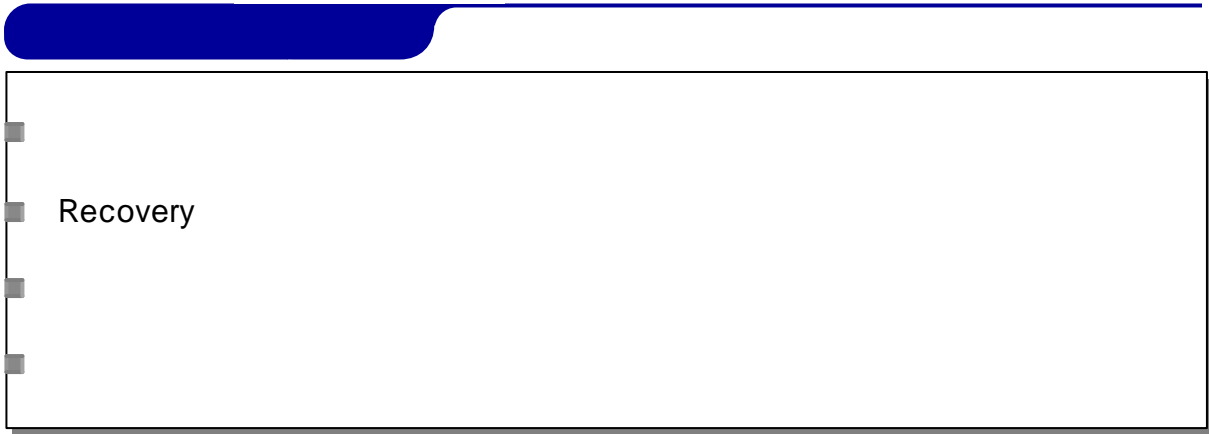
가

가

가

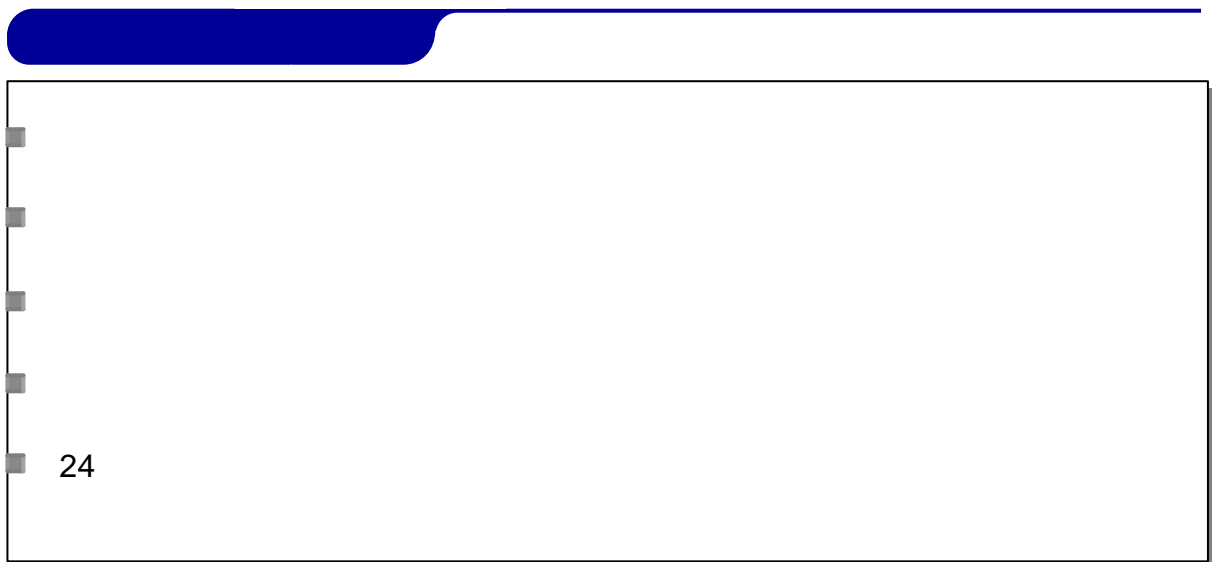
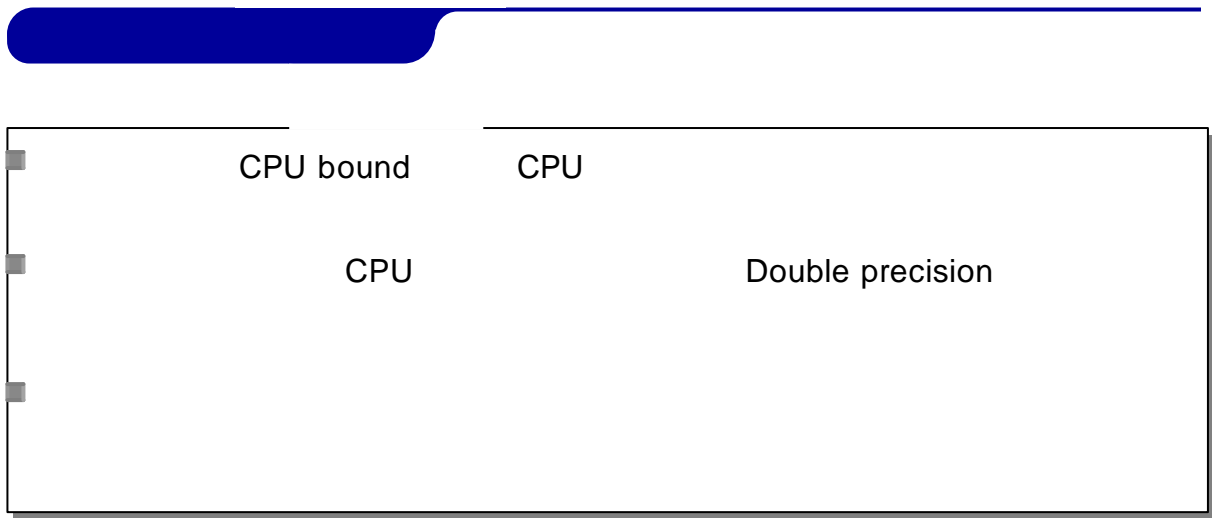
### 3.2.1.3

( )



### 3.2.1.4

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### 3.2.1.4 ( )

가 CPU upgrading 가

Array

Rack-Mountable 가

bootable interface

power-on/off/reset 가 , remote console

SAN

,

,



3.2.2

(A3 )









### 3.2.3

#### 3.2.3.1

Archon II -C

	128	Rack 가
	7	가 가
	135	

CPU	Intel Pentium 4 1.7GHz	<div> <div>256KB L2 cache</div> <div>400MHz FSB</div> <div>SSE SSE2</div> <div>single precision ,</div> <div>double precision</div> <div>가</div> </div>
RAM	1Gbyte PC800 RDRAM	<div> <div>3.2GB/sec . (</div> <div>4.2 GB/sec )</div> </div>
M/B	Intel i850MD	<div> <div>CPU 가 가</div> <div>ECC 2GByte</div> <div>가</div> <div>2 PCI 가</div> </div>
DISK	40Gbyte IDE ATA - 100	<div> <div>38Mbyte/sec 가</div> <div>가 ,</div> <div>I/O</div> </div>

### 3.2.3.1 ( )

( )

	Serial Console	Remote console
	Hot Swap bay	Hot Swap interface
	Rack mount kit	Rack mount
	Floppy disc	bootable interface
	MasterSwitch	가 .

#### LINPACK LU Decomposition

Intel P4 1.7G

1.8 GFlops

Athlon 1.2G

1.0GFlops

\* 가

Intel P4 1.7G

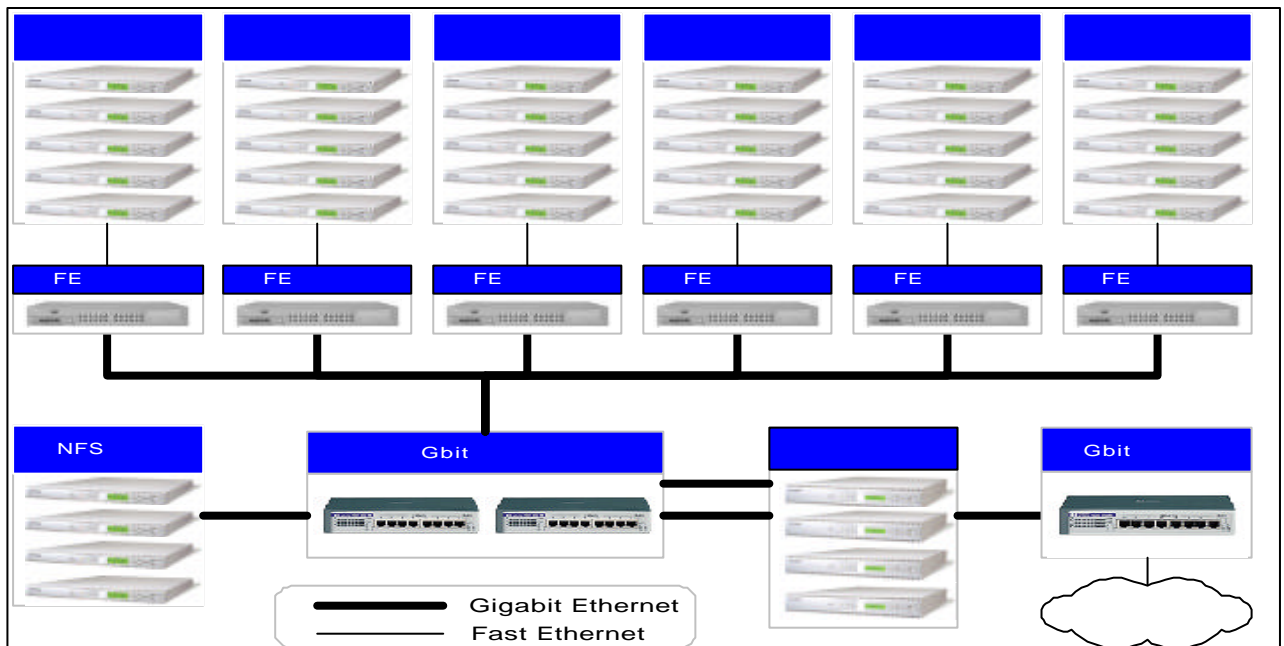
30

Athlon 1.2G

44

\* 가

### 3.2.3.2



NIC	On board Fast Ethernet x 135	
Switch	Nortel 420-24T 24 port Fast Ethernet X 6 ( gigabit module )	<p>144 port</p> <p>12.8Gbps</p> <p>510</p> <p>가</p> <p>.</p> <p>VLAN, Multilink Trunking</p> <p>SNMP, WEB 가 .</p>



### 3.2.3.2 ( )

NIC	Myrinet 2000-Fibre/PCI	I/O : 64bit, 66MHz Processor : 200 MHz RISC MEMORY : 2MB
Enclosure	Myrinet 2000 switch enclosure	9U, Rack mountable 128 port Full
Switch line card	8 port card Monitoring card	Enclosure .

NIC	Gbit Ethernet x 8	Gbit Swtich . ( Up / Down 1 ) NFS FE Switch NFS 1Gbit
Switch	Alcatel Omnistack8008 8 port Gbit Ethernet x 2	Full Fabric

NIC	Gbit Ethernet x 4	Swtich .
Switch	Alcatel Omnistack8008 8 port Gbit Ethernet	Full Fabric Switch

### 3.2.3.3

128

LDAP

4

가

Archon II -C

### 3.2.3.4 NFS

128 , 4 NFS .

NFS  
EnCluster™ Fail Take-over가 가 ,

NAS 가 NFS 가 가 .

NFS SAMBA ,

#### NFS

CPU	Intel Pentium 3 1GHz x 2	Dual CPU 가
RAM	1GByte	4Gbyte 가
M/B	Intel ServerWork III	64bit 66MHz PCI .
DISK	40Gbyte IDE	ATA - 100
NIC	Fast Ethernet x 2 ( on board ) Gbit ethernet card x 1	
CASE	Rack Mountable 1U case	3 disk 가 .
	Floppy/CDROM	

### 3.2.3.5

Capellix 3000 SAN switch , NFS

Raidtec FibreArray H112

16

1.14TByte

#### SAN switch

INTERFACE	Optical Fibre Channel	100Mbyte/sec
PORT	8	28Gbps 가 .
	SANtolls MANAGER 3.0	Local Console 가 . SNMP Telnet
	Clustering	Clustering High Availability

INTERFACE	Fibre Channel Arbitrated Loop	
CACHE	128MB	
Controller	RAID Level 0, 1, 0+1, 5	120 DISK 가 . ( 7 Tbyte )
DISK	16 x 10000 RPM 73GB ( 1.14Tbyte )	Hot swap 가
		GUI
	FC Access Volume Management add-on module	GFS 가 .

### 3.3.

#### 3.3.1

GUI

S/W

가

GUI

3.3.2

(A3 )

3.3.2

(A3 )

### 3.3.3

#### 3.3.3.1

Login host	( 2.4 )	EXT2
	( 2.4 )	EXT2
NFS	( 2.4 )	GFS



, NFS

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가 3

가

가

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EXT2

EXT2



가 .

binary compatible execution code data code .





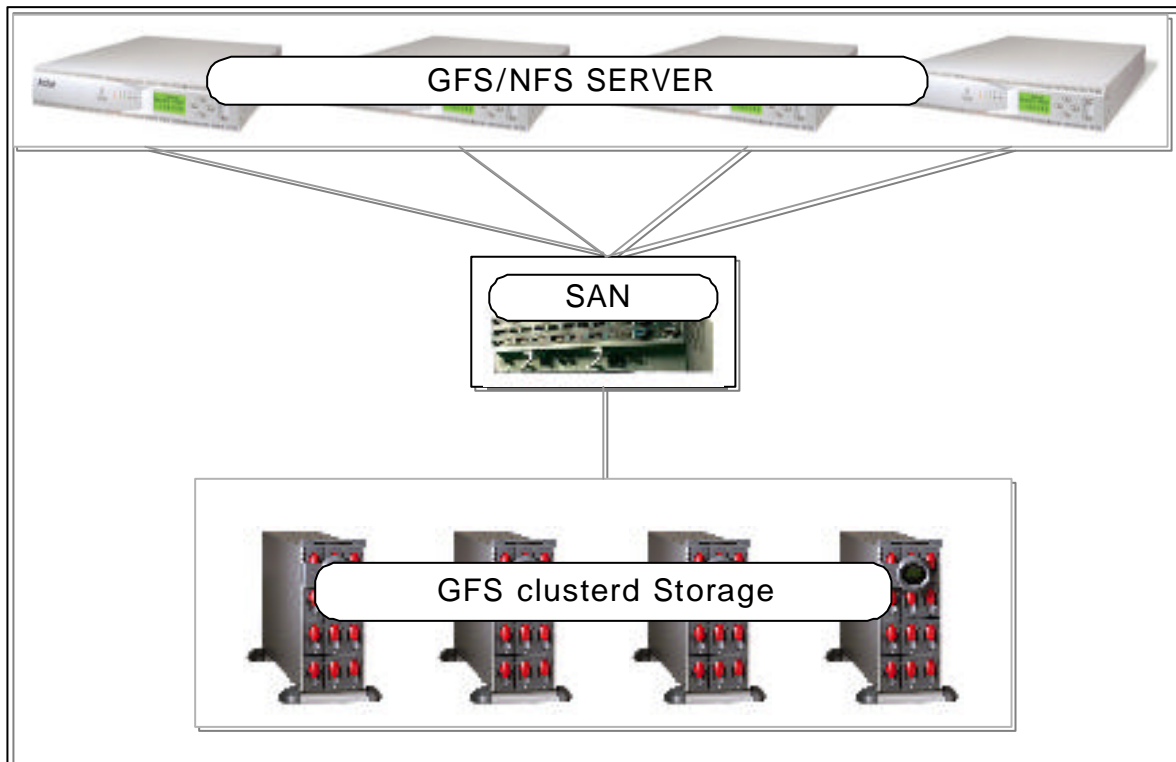
## 3.3.3.1

( )

## GFS

: GFS ( Global Filesystem )  
: sistina ( <http://www.sistina.com> )

Read/Write GFS .  
VFS( Virtual Filesystem ) Filesystem .  
NFS 가 .  
Fail 가 가 .  
active-active failover NFS 가 가 .  
30 가 .



### 3.3.3.2

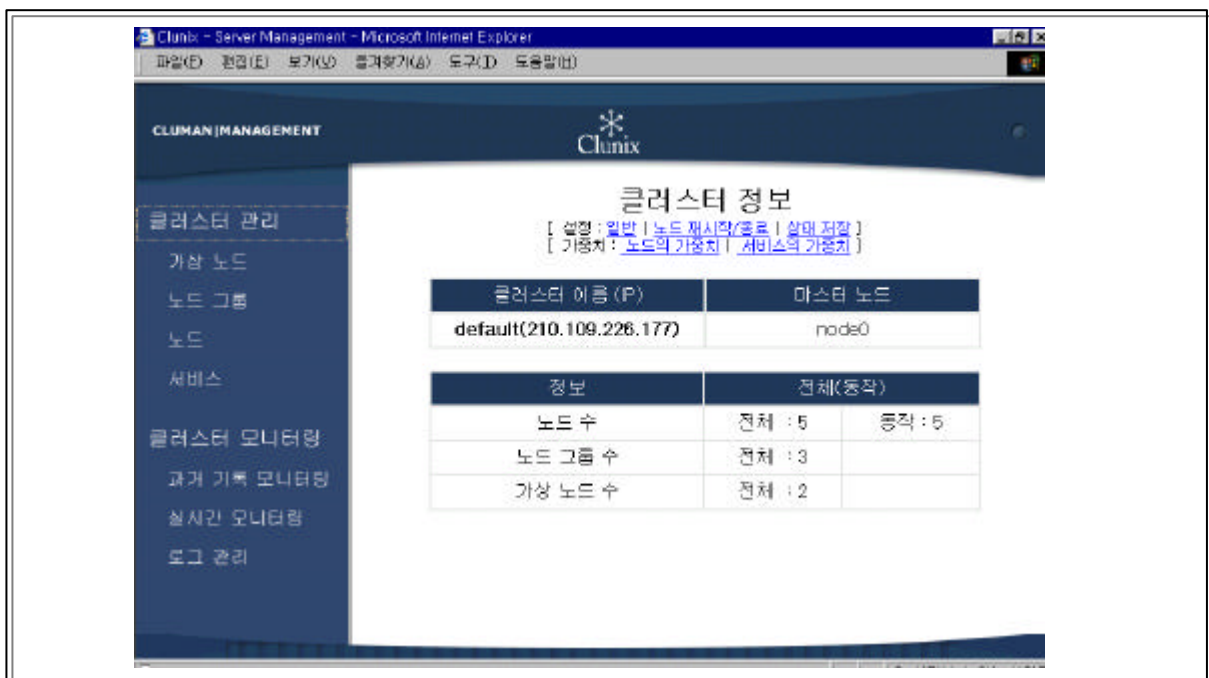
: EnCluster ( ) ( )  
: ( <http://www.clunix.com> )

Encluster

. Encluster

Encluster

NFS

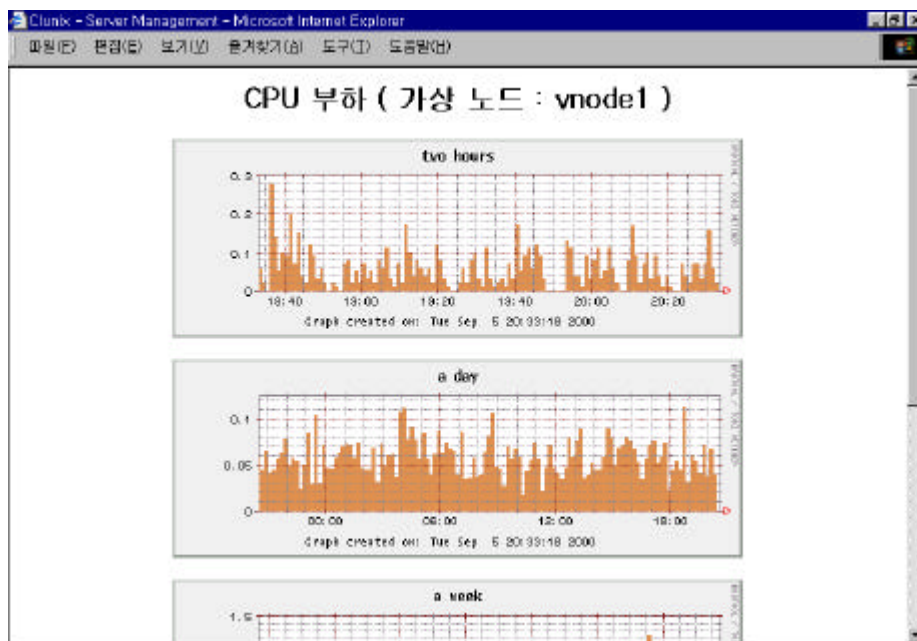


클러스터 이름 (P)	마스터 노드
default(210.109.226.177)	node0

정보	전체(종착)	
노드 수	전체 : 5	중복 : 5
노드 그룹 수	전체 : 3	
가상 노드 수	전체 : 2	

### 3.3.3.2

( )



### 3.3.3.2

( )

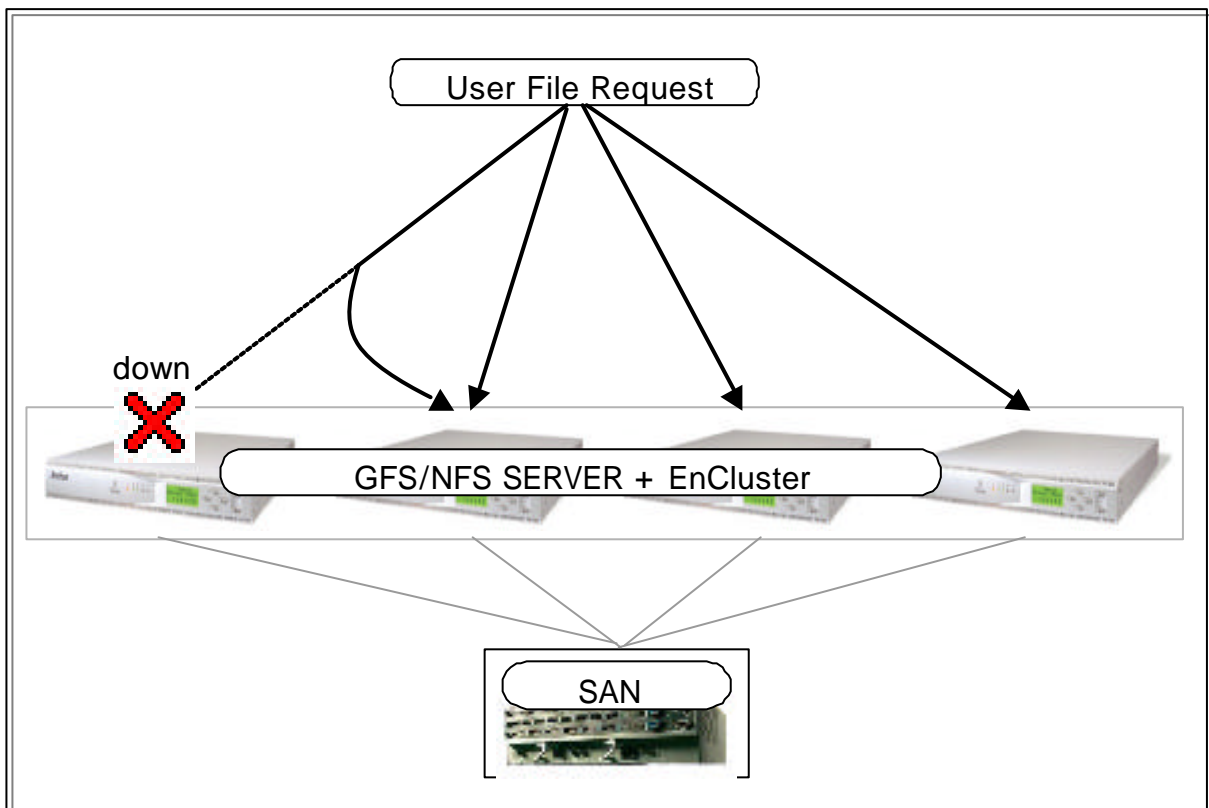


■	
■	
■	가
■	(power on/off/reset)
■	
■	
■	
■	
■	- CPU , , , I/O
■	- CPU , Mainboard , Fan ,
■	
■	
■	가
■	가 가
■	가

## 3.3.3.2

( )

## NFS Fai lover



### 3.3.3.3

		( )
Compiler	Fortran 77/90, HPF, C/C++	Portland Group (PGI)
	Fortran 77, C/C++	GNU
	Fortran 77/90/95, C/C++	Intel
Debugger	pgdbg (with GUI)	Portland Group (PGI)
	mpigdb (in mpich, )	GNU
Profiler	pgprof (with GUI)	Portland Group (PGI)
	upshot, jumpshot ( in mpich)	GNU
	XPVM ( GUI Monitor in PVM )	GNU
Library	GM, MPICH-GM, MPI-PVM	Myricom



# Myricom



### 3.3.3.3 ( )

#### 가. PGI

: PGI CDK Cluster Development Kit ( )  
: The Portland Group ( <http://www.pgroup.com> )

Pentium  
가 PGI CDK  
Cluster Development Kit .  
Fortran, C, C++ , HPF, OpenMP, MPI ,  
GUI debugger GUI profiler .

■ 256 CPU license

■ : 5 users

■ : 1

### 3.3.3.3 ( )

#### 가. PGI ( )

■ Fortran 77, Fortran 90, C , C++ ( OpenMP )

■ HPF, OpenMP, MPI, PVM

■ GUI(Graphical User Interface) debugger profiler

■ FFFw , PETSc, ScaLAPACK, NAG Fortran, C

■ : PGI SPECFP\_base 95 g77/egcs  
30% .



### 3.3.3.3 ( )

. Myrinet

: GM, MPICH-GM, MPI-PVM  
: Myricom, Inc. ( <http://www.myri.com> )



GM Myrinet Message - passing  
Myrinet  
. GM driver, Myrinet -interface control , network  
mapping , GM API, .  
MPICH-GM TCP/IP bandwidth latency  
GM . Myrinet FM, AM  
MPI , , MPICH-GM .  
MPI-PVM PVM .

### 3.3.3.4

: dua, dush  
: ( <http://www.clunix.com> )



, 가

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dua, dush

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#### ■ dua

. dua

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(

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.

#### ■ dush

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### 3.3.3.5 Queueing

: OpenPBS 2.3 ( )  
: Veridian Systems. ( <http://www.openpbs.com> )

: Maui Scheduler ( )  
: Supercluster Development Group. ( <http://supercluster.org/> )

OpenPBS 2.3

. PBS(Portable Batch System)

가

Maui Scheduler

. PBS

Maui Scheduler

. PBS

### 3.3.3.5 Queueing ( )

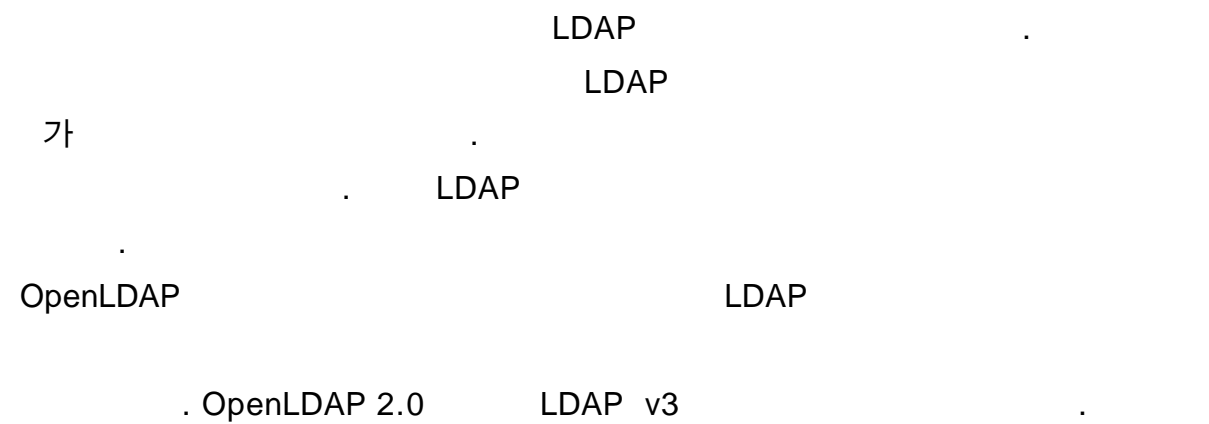
- .
- POSIX , API .
- , 가 .
- 가 , 가 가 .
- PBS GUI(graphical user interface) .
- MPI, PVM, HPF .
- (log)  
Accounting .
- Maui Scheduler .

## 3.3.3.6

가.

: OpenLDAP 2.0 ( )  
: OpenLDAP Foundation. ( <http://www.openldap.org/> )

: PAM LDAP Module ( )  
: PADL SOFTWARE (<http://www.padl.com>)



### 3.3.3.6

( )

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Encluster

4

가

가 가 ,

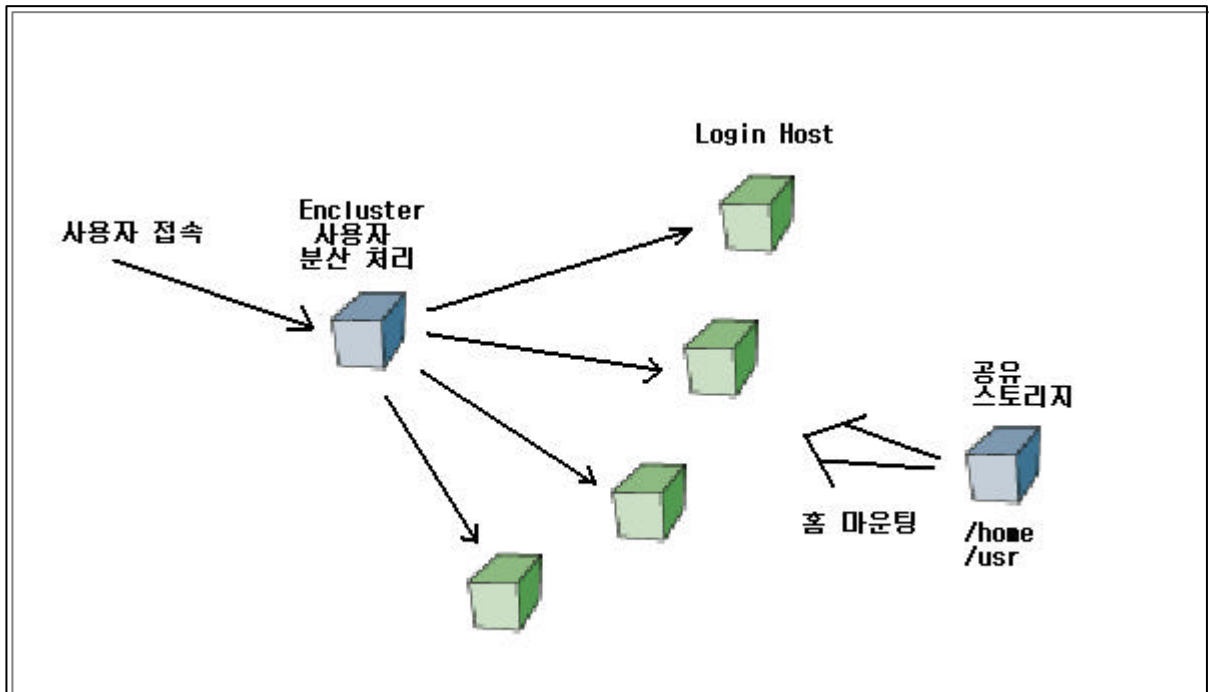
가 가

가 failure

가

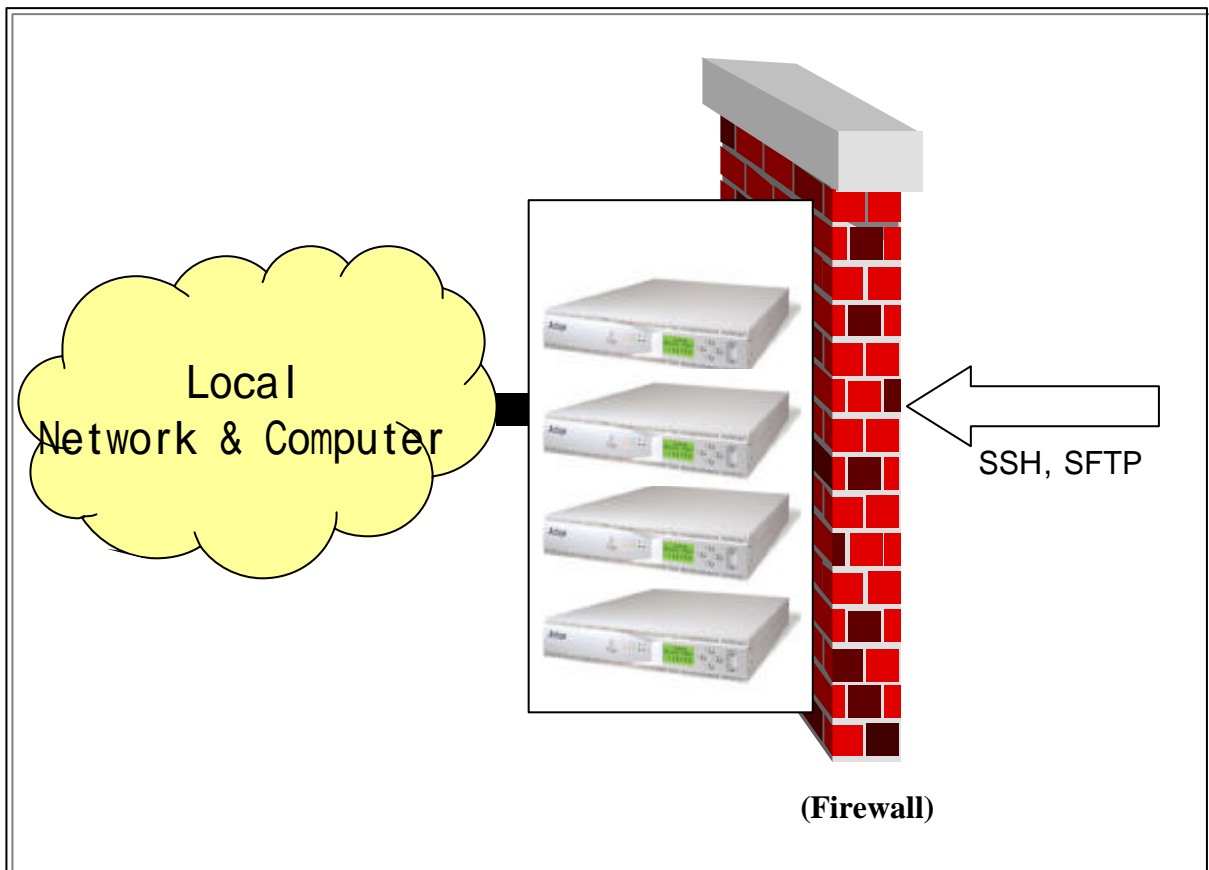
NFS

가



### 3.3.3.7

IP 가 ,  
telnet SSH(Secure Shell, )  
ftp  
sftp(Secure ftp)  
 ,



## 3.3.3.8

## 가. Myrinet Switch

: M3 Switch Software  
: Myricom, Inc. ( <http://www.myri.com> )

Myrinet-2000 Switch Monitoring Line Card M3 Switch  
Software Myrinet Switch  
Monitoring Line Card Ethernet , SNMP  
. Myrinet Switch , ,  
.

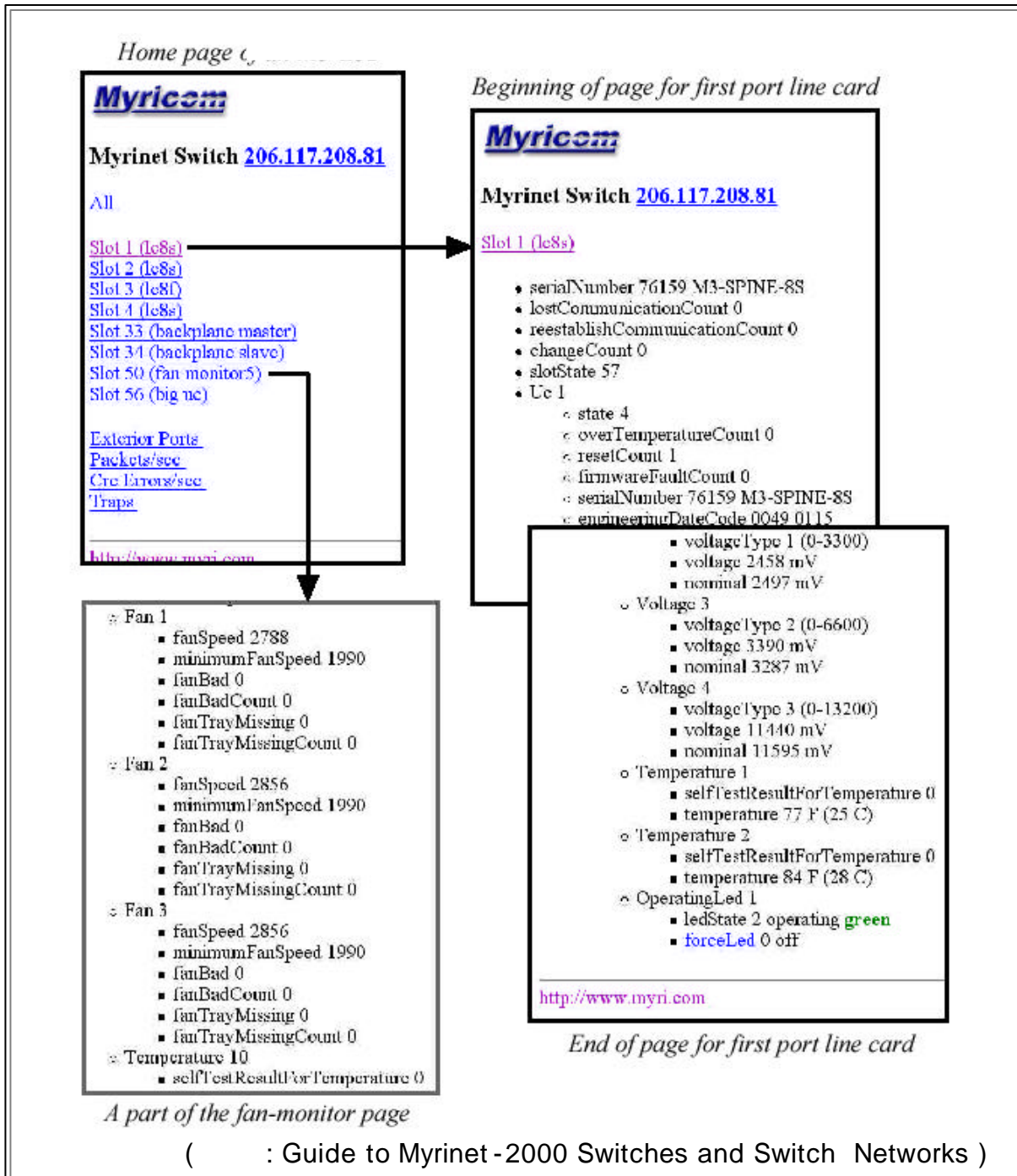


### 3.3.3.8

( )

### 가. Myrinet Switch

( )



### 3.3.3.8

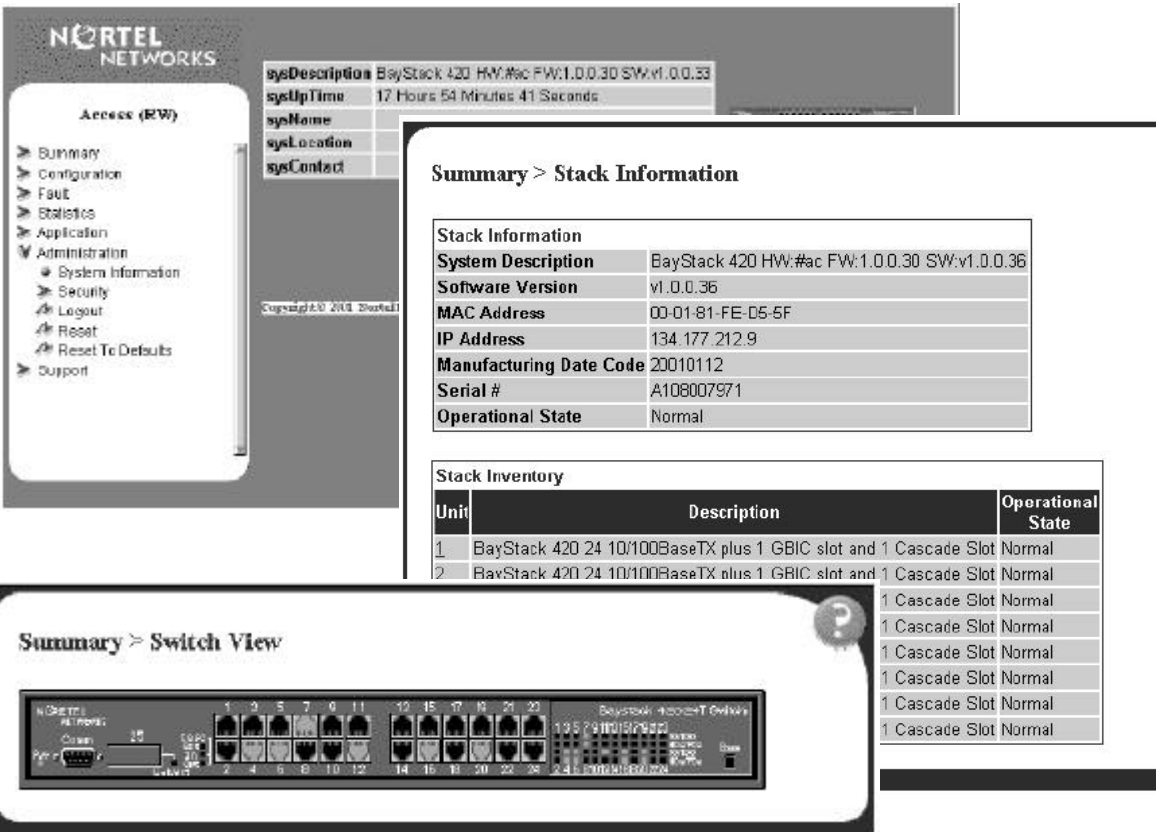
( )

#### . Fast Ethernet Switch

: Web-Based Management for BayStack 420 Switch  
: Nortel Networks ( <http://www.nortelnetworks.com> )

#### Fast Ethernet Switch

. RMON, SNMP 가 .




**Summary > Stack Information**

<b>Stack Information</b>	
<b>System Description</b>	BayStack 420 HW:#ac FW:1.0.0.30 SW:v1.0.0.36
<b>Software Version</b>	v1.0.0.36
<b>MAC Address</b>	00-01-81-FE-D5-5F
<b>IP Address</b>	134.177.212.9
<b>Manufacturing Date Code</b>	20010112
<b>Serial #</b>	A108007971
<b>Operational State</b>	Normal

**Stack Inventory**

Unit	Description	Operational State
1	BayStack 420 24 10/100BaseTX plus 1 GBIC slot and 1 Cascade Slot	Normal
2	BayStack 420 24 10/100BaseTX plus 1 GBIC slot and 1 Cascade Slot	Normal
	1 Cascade Slot	Normal
	1 Cascade Slot	Normal
	1 Cascade Slot	Normal
	1 Cascade Slot	Normal
	1 Cascade Slot	Normal
	1 Cascade Slot	Normal

**Summary > Switch View**



( : Using Web-Based Management for BayStack 420 10/100/1000 Switch )

### 3.3.3.9

11가

BLAS	<a href="http://www.netlib.org/blas/">http://www.netlib.org/blas/</a>
LAPACK	<a href="http://www.netlib.org/lapack/">http://www.netlib.org/lapack/</a>
ATLAS	<a href="http://www.netlib.org/atlas/">http://www.netlib.org/atlas/</a>
ScaLAPACK	<a href="http://www.netlib.org/scalapack/">http://www.netlib.org/scalapack/</a>
BLACS	<a href="http://www.netlib.org/blacs/">http://www.netlib.org/blacs/</a>
PBLAS	<a href="http://www.netlib.org/scalapack/pblas_qref.html">http://www.netlib.org/scalapack/pblas_qref.html</a>
FFTW	<a href="http://www.fftw.org">http://www.fftw.org</a>
PETSc	<a href="http://www-fp.mcs.anl.gov/petsc">http://www-fp.mcs.anl.gov/petsc</a>
SPRNG	<a href="http://sprng.cs.fsu.edu">http://sprng.cs.fsu.edu</a>
(P)ARPACK	<a href="http://www.caam.rice.edu/~kristyn/parpack_home.html">http://www.caam.rice.edu/~kristyn/parpack_home.html</a>
SuperLU	<a href="http://www.nersc.gov/~xiaoye/SuperLU/">http://www.nersc.gov/~xiaoye/SuperLU/</a>

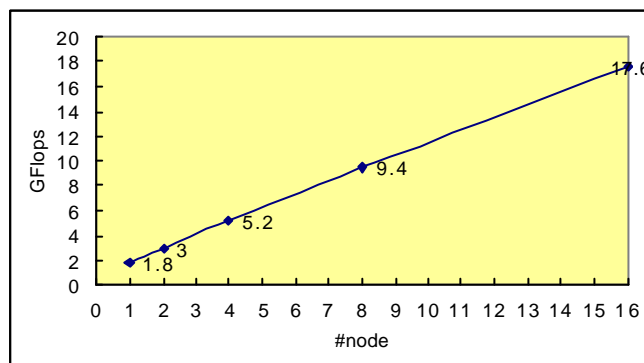
### 3.3.4

#### 3.3.4.1 ( A3 )

### 3.3.4.2

:  
 : LINPACK  
 : SCALAPACK 16 Fast Ethernet

16 + Fast Ethernet : 17.6GFlops



128 : 128 110 Gflops

:

<http://www-user.tu-chemnitz.de/~pester/CLIC-Einweihung/>

<http://www.alpha11.com/>

<http://www-scf.usc.edu/~yeyang/657fin1.html>

<http://andy.usc.edu/trojan/hardware.html>

<http://prg.cpe.ku.ac.th/resource/athlon.html>

<http://www.lunarc.lu.se/Beowulf/html/>

<http://www.nsc.liu.se/alice/>

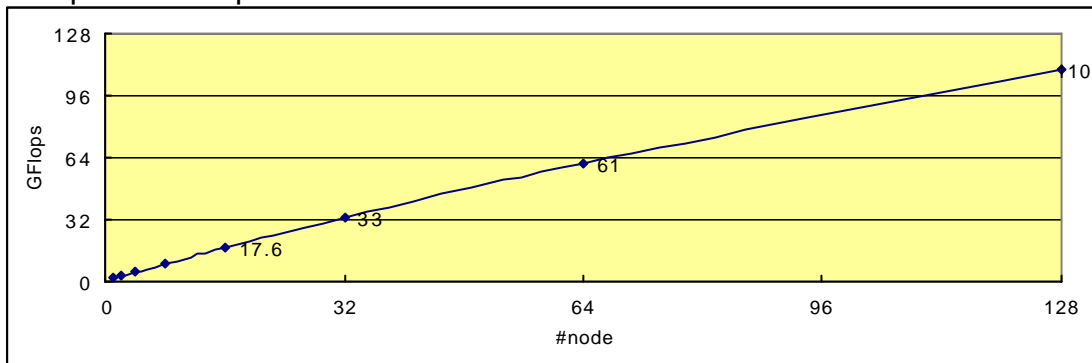
<http://www.nsc.liu.se/ingvar/>

<http://www.nsc.liu.se/grendel/>

### 3.3.4.2 ( )

( )

, 가 가 .

\* <http://www.alpha11.com/>


Turn-around Time

	Total	user	system
	33	28.3	4.7
	238	51	23

### 3.3.4.2 ( )

: LU  
 decomposition 가  
 : LINPACK  
 : 16  
 :

	(Gflops)	(Gflops)
4 node + 8 node	14.6	5.0
4 node + 8 node + 16 node	32.2	11.4

### 3.3.4.2 ( )

#### FASTA

: Sequencing

: Sequencing

pv3compfa

FASTA

return time

: 16

Fast Ethernet

pv3compfa

:

# node		
8	182	200
16	129	130

