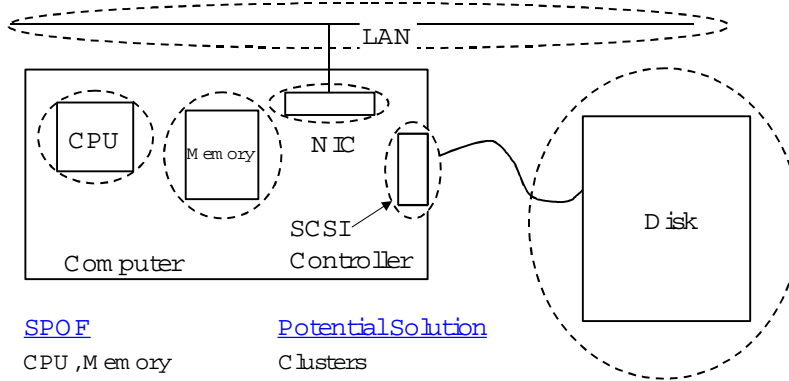


What is ServiceGuard?

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Single Points of Failure in a Computer



SPOF

CPU ,M em ory

D isks

I nterface Cards

L AN ,N ICs

P ower

Potential Solution

C lusters

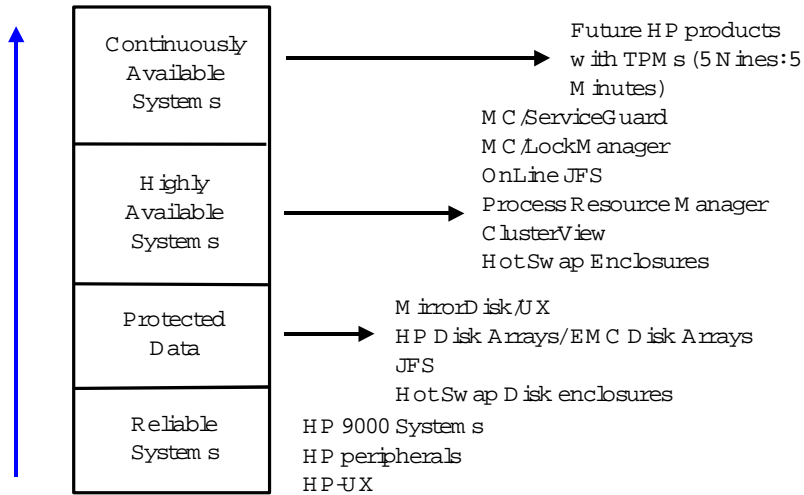
M irroring and RA ID

M irroring and PV Links

R edundant L AN s and L AN IC

U PS ,D iesel generator

High Availability Solutions



Steps to Install and Implement a High Availability Solution

1. Define High Availability Requirements
2. Perform Environmental Audit and Configuration Planning
3. Plan Installation
4. Plan Implementation
5. Install and Configure Systems
6. Install and Configure Applications
7. Develop Operational Procedures
8. Test High Availability Implementation
9. Complete System Acceptance.

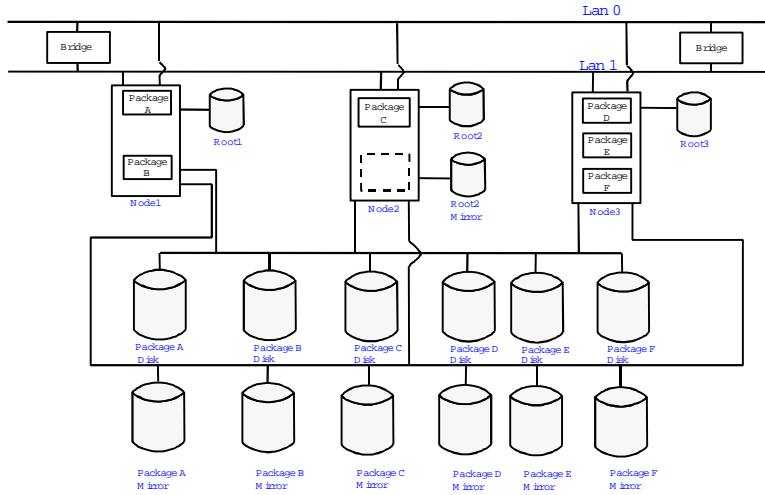
Features/Benefits of M C /ServiceGuard

- Completely transparent to applications
- Intelligent cluster reconfiguration after node failure
 - Data Integrity: No 'split-brain' syndrome
 - Dynamic formation of new, viable cluster
- Flexible load balancing
- Mixed Series 800 class nodes
- Facilitates online hardware and software updates
- Highly available Enterprise Cluster
 - Fast switchover of applications to alternate node (<60 seconds for basic system resources with JFS)
 - LAN failure protection (very fast local switchover to standby LAN adapter inside same node)
- Application Packages
 - Easy application management
 - Flexible recovery options
- No idle resources
 - All systems run mission-critical applications

M C /ServiceGuard History

- Initial release of M C /SG
 - 4 nodes
 - packages & relocatable IP
- New Features of 10.03 SG (HP-UX 10.01)
 - service restart option
 - **cmigrate** command (Switch over to M C /SG)
- New Features of 10.04 SG (HP-UX 10.10)
 - SAM GUI for M C /SG
 - 8 node support
 - RS-232C link for 2-node heartbeat
 - security enhancements (.zhosts)
- New features of 10.05 SG (hp-UX 10.10)
 - Support for ClusterView
- New features of 10.10 SG (hp-UX 10.20)
 - Online node and package configuration
 - Support for event monitoring services (EMS)
 - New M C /SG commands: **cmscancl**, **cmgetconf**, **cmdeleteconf**
- New Features of 11.00 SG (HP-UX 11.00)
 - 16 nodes
 - New Failover and Failback Policies
 - Support for V-Class
 - Support for HP-UX 11.00

How M C /Service Guard Works

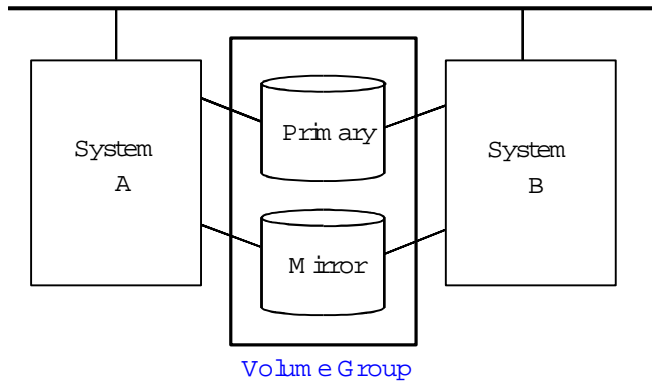


Volume Groups and Mirrors

Disk Drive Technology

- Standalone drives with LVM mirroring
- High Availability Disk Arrays
- Disk Arrays with AutoRAID
- HP SureStore XP256 Disk Arrays

M C /ServiceG uard C onfiguration U sing M irrored D isks

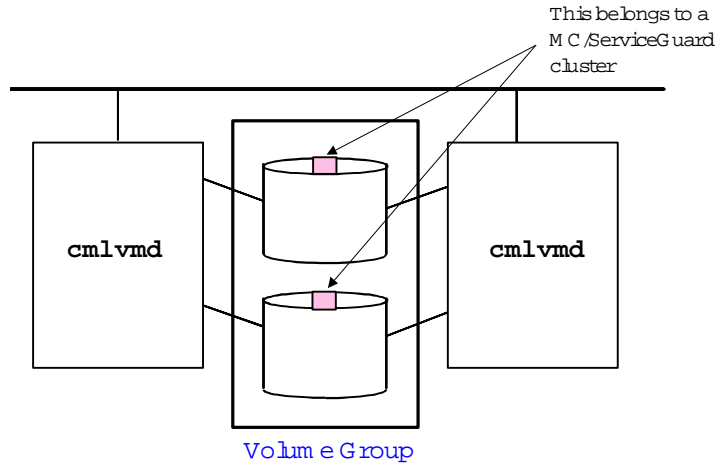


Recommended SCSI Addressing for 4-Node Cluster

System or Disk	Host Interface or Device SCSI Address
System A	7
System B	6
System C	5
System D	4
Disk 1	3
Disk 2	2
Disk 3	1
Disk 4	0
Disk 5	15
Disk 6	14
etc.	13-8

eg0301

M C /ServiceGuard Volume Groups



Marking Volume Groups as M C /ServiceGuard Volume Groups

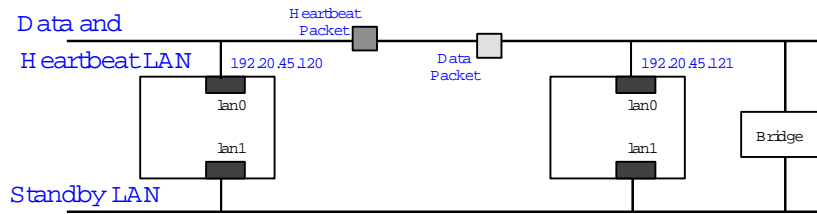
Marking Volume Group
for M C /ServiceGuard **vgchange -c y VGName**

Marking Volume Group
as non-M C /ServiceGuard **vgchange -c n VGName**

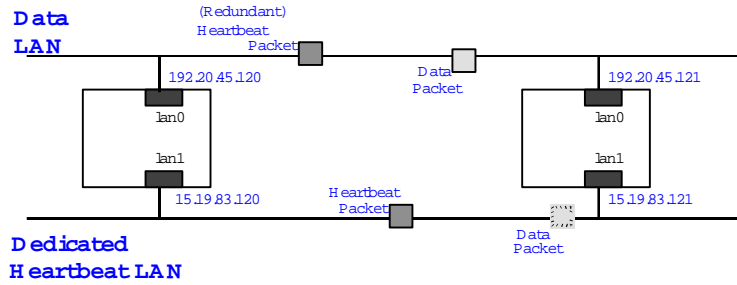
Standard Volume Group
Activation **vgchange -a y VGName**

Exclusive Volume Group
Activation **vgchange -a e VGName**

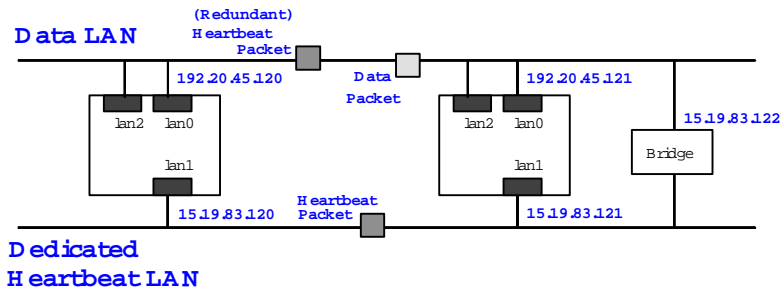
Standby LAN Cards



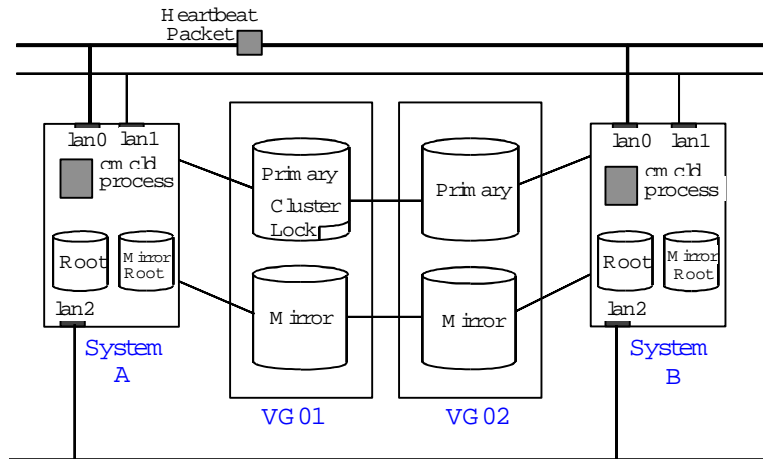
Dedicated Heartbeat LANs



Dedicated Heartbeat LAN and Standby LAN Cards



Sample Cluster



Cluster Formation Requirements

Cluster Lock Disk

- Required for 2 nodes
- Optional for 3 or 4 nodes
- Not supported for 5 or more nodes
- Should be on separate power sources from other systems in cluster

Node Attendance

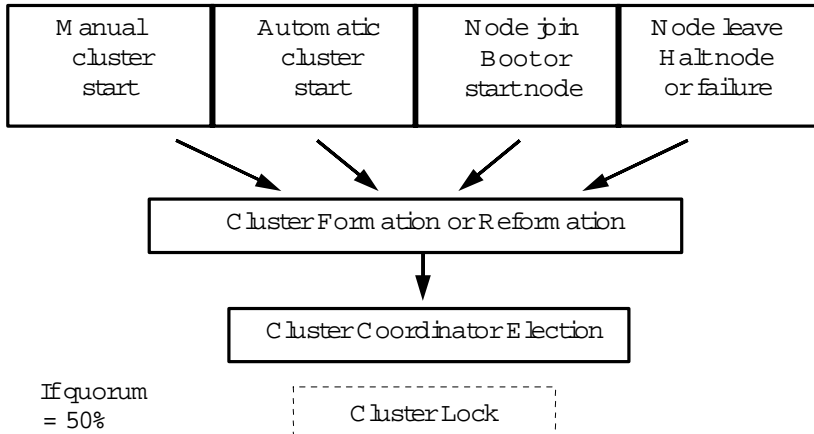
- 100% node attendance is required for initial cluster formation

Network Requirements

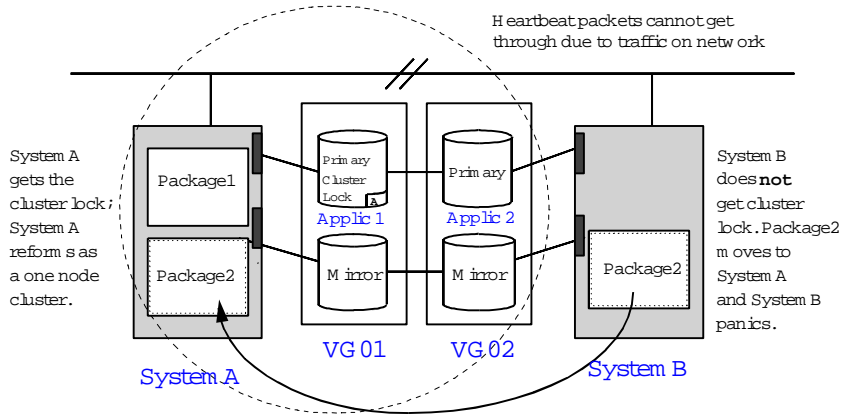
- All nodes in the cluster must be on same subnet
- LAN cards in the same system **MUST** be on separate subnets
- At least one HEARTBEAT_IP network is configured

When Is the Election Protocol Used?

This protocol is used during 4 events:



Cluster Reformation Example



Procedure for Configuring a Packageless Cluster

1. Set up trusted hosts within cluster systems:
`vi $HOME/.rhosts`
OR `/etc/cmcluster/cmclnodelist`
2. `cd /etc/cmcluster`
3. `cmquerycl -C cmclconf.ascii -n node1 -n node2`
4. `vi cmclconf.ascii`
Modify `CLUSTER_NAME` field
5. `cmcheckconf -C /etc/cmcluster/cmclconf.ascii`
6. `cmapplyconf -C /etc/cmcluster/cmclconf.ascii`
7. `cmruncl`

— Viewing the Cluster — **cmviewcl** Command

```
# cmviewcl -v
```

```
CLUSTER      STATUS
cluster1    up
NODE         STATUS      STATE
System A    up          running
```

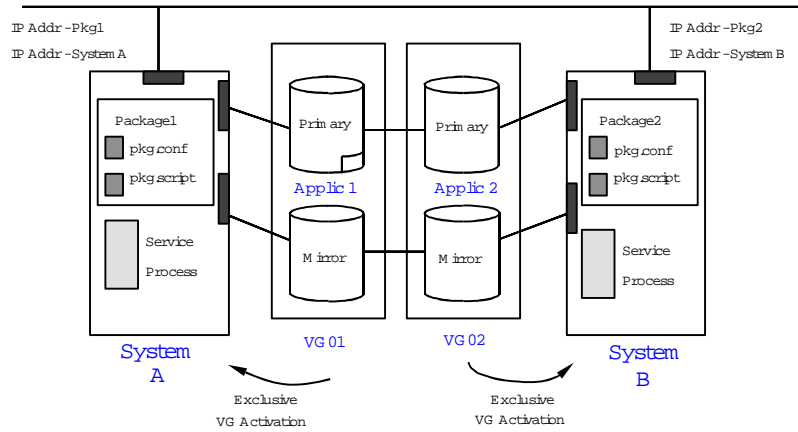
```
Network_Parameters:
```

```
INTERFACE  STATUS  PATH  NAME
PRIMARY    up      56/36.1  lan0
STANDBY    up      60/6     lan1
```

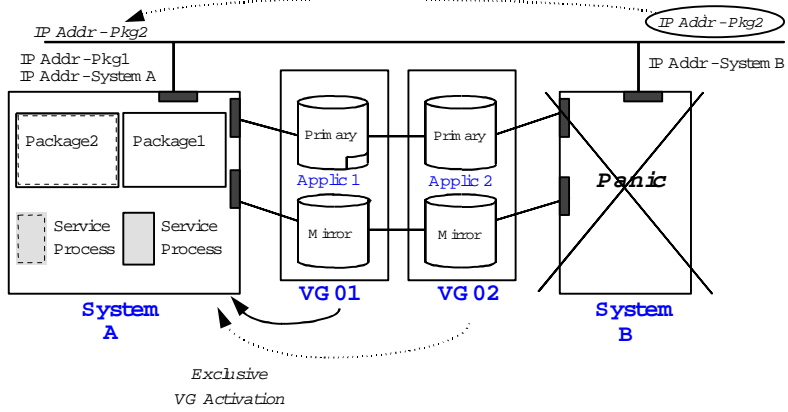
```
SerialHeartbeat:
```

```
DEVICE FILE NAME  CONNECTED TO :
/dev/tty0p3       /dev/tty0p3
```

Sample Package Configuration



Sample Configuration after Node Failure



Procedure for Configuring a Package

1. `mkdir /etc/cmcluster/package_name`
(Create directory for package specific files)
2. `cd /etc/cmcluster/package_name`
(Change to the directory)
3. `cmmakepkg -p pkg.conf` (Create package configuration template)
4. `vi pkg.conf` (Modify package parameters)
5. `cmmakepkg -s pkg.cntl` (Create package controlscript template)
6. `vi pkg.cntl` (Modify script variables)
7. `ftp pkg.cntl` to other systems in the cluster
(Distribute the controlscript to all nodes)
8. `cmcheckconf -P /etc/cmcluster/package_name/pkg.conf`
(Verify the package configuration file)
9. `cmapplyconf -P /etc/cmcluster/package_name/pkg.conf`
(Compile the package into the config file)

M C/ServiceGuard Online Reconfiguration

- Ability to change cluster configuration while cluster is running
- Online node functionality
 - Add a new node
 - Remove an existing node
- Online package functionality
 - Add a package
 - Delete a package
 - Modify some package attributes while package is running
 - Modify entire package while cluster and other packages continue to run but modified package is down

High Availability Cluster SAM

Enhance HA Cluster SAM

- All ServiceGuard functionality available in SAM :
 - Cluster Configuration
 - Cluster Administration
 - Package Configuration
 - Package Administration
- Concurrent monitoring of "syslog.log" output
- Concurrent monitoring of "pkgctl.log" output
- Monitoring cluster status and events