EXPRESSCLUSTER X 3.0
Enhanced Features

6 September 2010

NEC Corporation

Overview

Enhancement of Virtualization Function
- New Licensing Scheme for Virtual Environment
- Easy setup of host cluster by GUI
- Non-disruptive Maintenance
- Non-disruptive Failover
- Dynamic Failover

Enhancement of Mirror Function
- Faster Data Synchronization
- Redundancy of data mirroring path

Enhancement of Remote Function
- Compression of Mirrored Data
- Other enhancements for WAN Clustering

Enhancement of GUI function
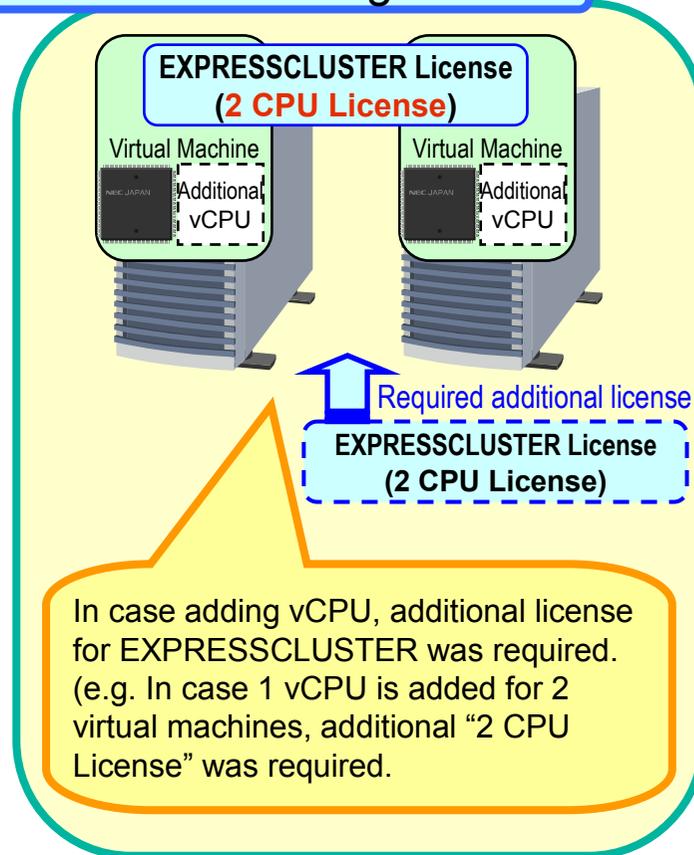- Intuitive Cluster Generation GUI
- User Friendly WebManager GUI

Other Resource Related Enhancements

Empowered by Innovation **NEC**

ENHANCEMENT OF VIRTUALIZATION FUNCTION
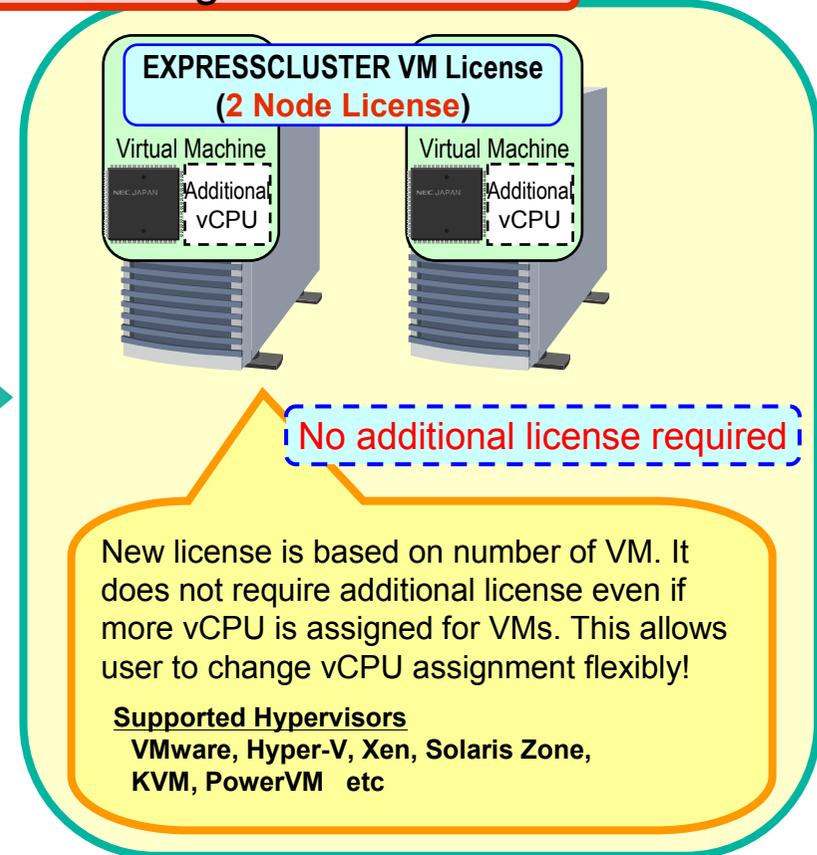
Empowered by Innovation **NEC**

New Licensing Scheme for Virtual Environment

* This licensing scheme is dedicated for Guest OS Clustering.
  In case of Host OS Clustering, CPU based license should be applied

Previous Licensing Scheme

EXPRESSCLUSTER License
(2 CPU License)

Virtual Machine | Additional vCPU
Virtual Machine | Additional vCPU

Required additional license

EXPRESSCLUSTER License
(2 CPU License)

In case adding vCPU, additional license for EXPRESSCLUSTER was required. (e.g. In case 1 vCPU is added for 2 virtual machines, additional "2 CPU License" was required.

New Licensing Scheme for VM

EXPRESSCLUSTER VM License
(2 Node License)

Virtual Machine | Additional vCPU
Virtual Machine | Additional vCPU

No additional license required

New license is based on number of VM. It does not require additional license even if more vCPU is assigned for VMs. This allows user to change vCPU assignment flexibly!

Supported Hypervisors
VMware, Hyper-V, Xen, Solaris Zone, KVM, PowerVM   etc
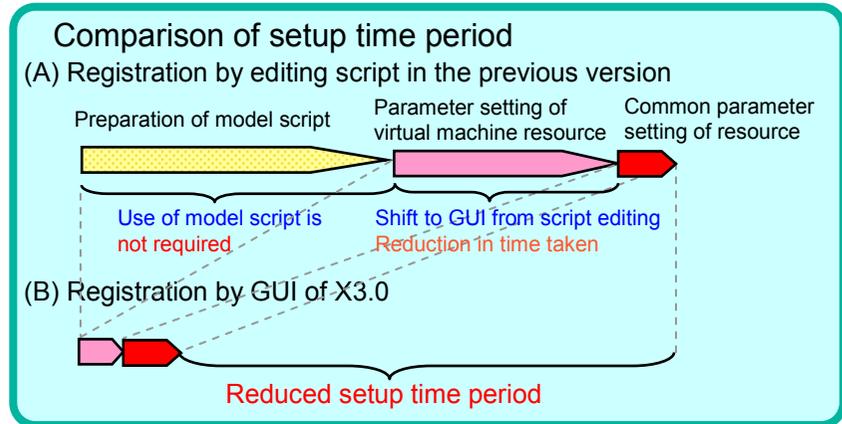
Empowered by Innovation **NEC**

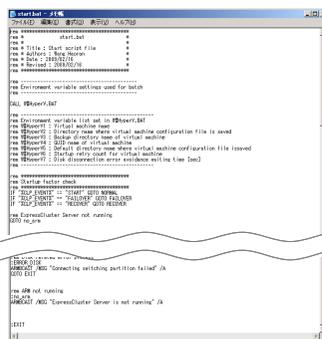# Easy setup of host level cluster by GUI (1)

Drastic reduction in time required for the setup of host cluster

▌ **Appearance of virtual machine resource**

- Start/stop script of virtual machine is now replaced by user-friendly GUI (Virtual machine resource)

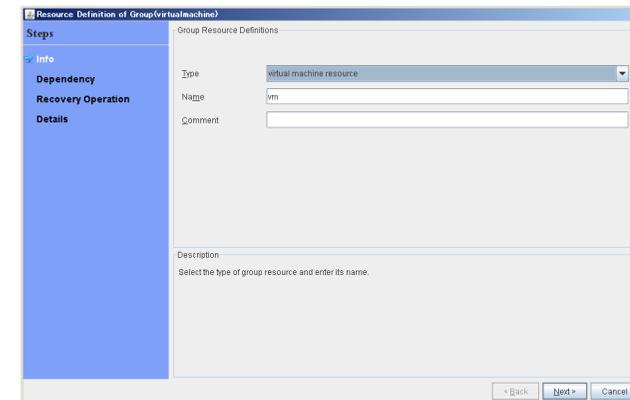- Easy setup of virtual machine monitoring by GUI (Virtual machine monitor resource)

Comparison of setup time period
(A) Registration by editing script in the previous version

Preparation of model script | Parameter setting of virtual machine resource | Common parameter setting of resource

Use of model script is not required | Shift to GUI from script editing
Reduction in time taken

(B) Registration by GUI of X3.0

Reduced setup time period

Previous

X3.0

Script editing was required

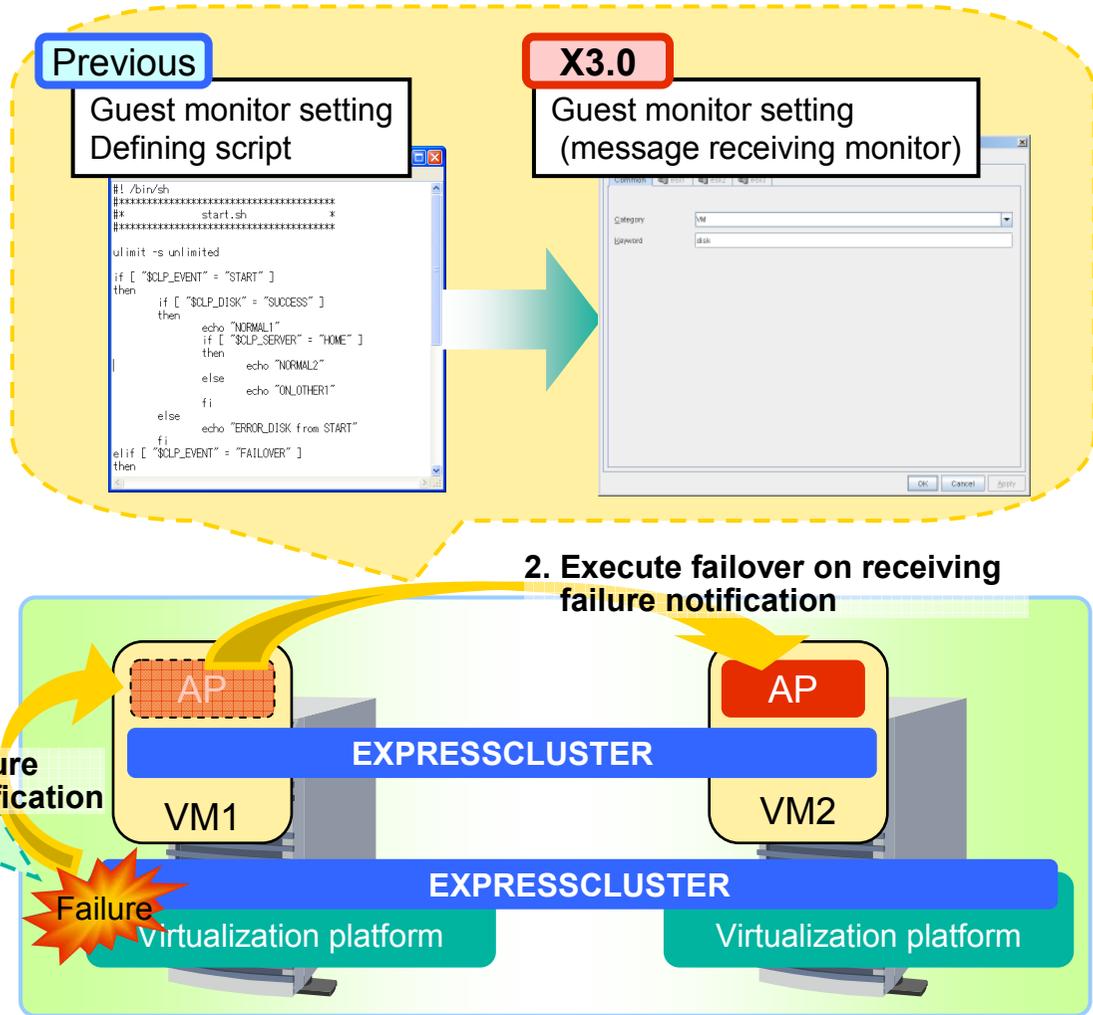Easy setup by GUI!

© NEC Corporation 2010

Empowered by Innovation **NEC**

Easy setup of host level cluster by GUI (2)

Easy setup of host and guest linkage by GUI

- Faster failover of applications by notifying guest in case any failure is detected in host
- Tuning is also possible from GUI

Previous

Guest monitor setting
Defining script

```
#! /bin/sh
#********************************
#*         start.sh           *
#********************************

ulimit -s unlimited

if [ "$CLP_EVENT" = "START" ]
then
        if [ "$CLP_DISK" = "SUCCESS" ]
        then
                echo "NORMAL1"
                if [ "$CLP_SERVER" = "HOME" ]
                then
                        echo "NORMAL2"
                else
                        echo "ON_OTHER1"
                fi
        else
                echo "ERROR_DISK from START"
        fi
elif [ "$CLP_EVENT" = "FAILOVER" ]
then
```

X3.0

Guest monitor setting
(message receiving monitor)

Common
Category   VM
Keyword   disk

OK   Cancel   Apply

Host monitor setting

[vmw1] Monitor Resource Properties

Info | Monitor(common) | Monitor(special) | Recovery Action

Recovery Action   Execute only the final action

Recovery Target   Browse

Maximum Reactivation Count   0 time

☐ Execute migration before failing over

Maximum Failover Count   0 time

▽

☑ Execute Script before Final Action   Settings

▽

Final Action   No operation

OK   Cancel   Apply

Notification setting in guest cluster

2. Execute failover on receiving failure notification

① **Failure notification**

AP   AP

EXPRESSCLUSTER

VM1   VM2

EXPRESSCLUSTER

Failure   Virtualization platform   Virtualization platform

Empowered by Innovation   NEC

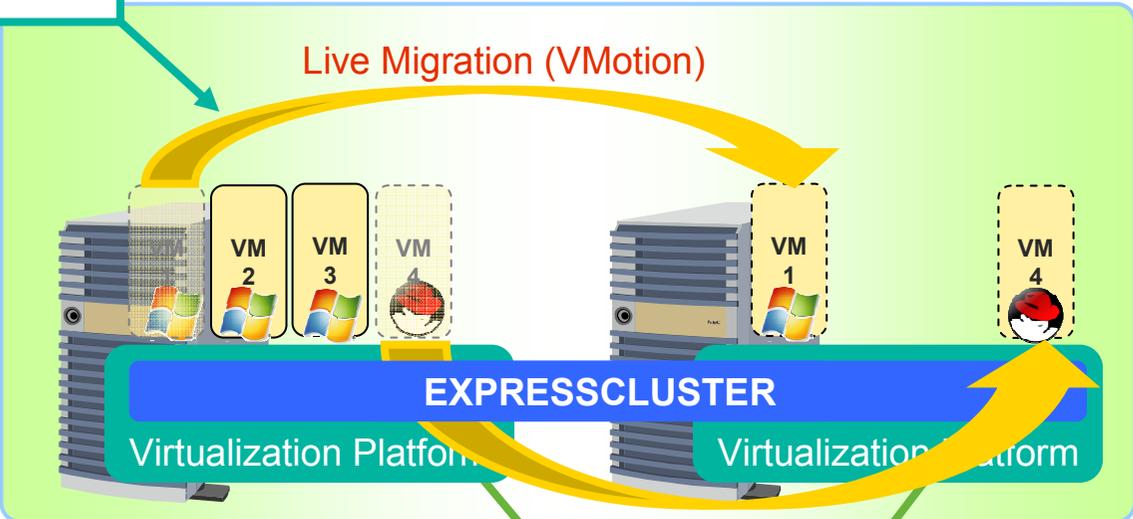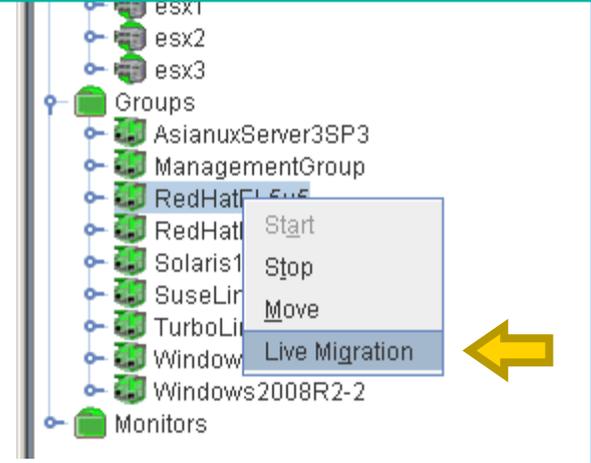# Non-disruptive Maintenance

Full support of live migration of virtualization software !
Maximum availability of virtual machine in host cluster.

Point 1

Live migration of virtual machine can be executed from WebManager and applications can be switched to standby server without stopping them !

Supports virtualization software that supports live migration
- Supports VMware and Hyper-V[1]
- Supports XenServer by update (Scheduled to be in 2010)

- esx1
- esx2
- esx3
- Groups
  - AsianuxServer3SP3
  - ManagementGroup
  - RedHatEL5u5
  - RedHatE
  - Solaris1
  - SuseLin
  - TurboLi
  - Window
  - Windows2008R2-2
- Monitors

Start
Stop
Move
Live Migration

Live Migration (VMotion)

VM 2
VM 3
VM 4
VM 1
VM 4

EXPRESSCLUSTER

Virtualization Platform
Virtualization Platform

Dynamic layout of virtual machine (VMware DRS)

Point 2

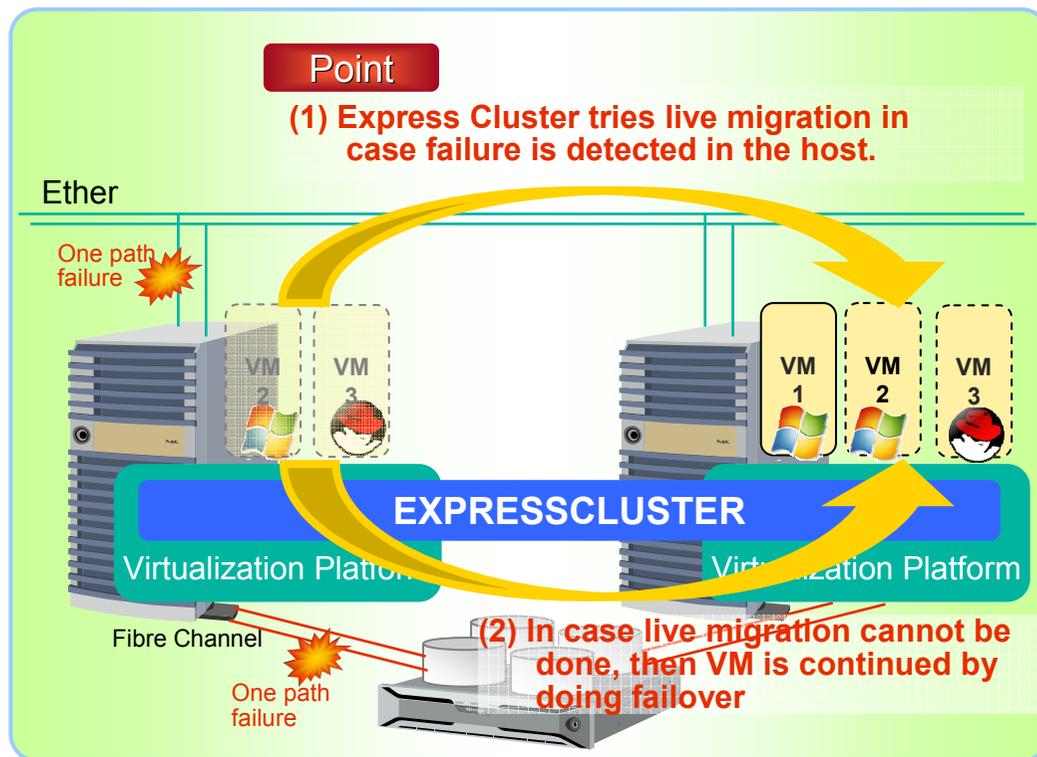Enhancement of compatibility with virtualization software !
- It is OK to execute VMotion from vCenter!
- VMotion can be also executed from EXPRESSCLUSTER
- Also supports dynamic layout of virtual machine by VMware DRS

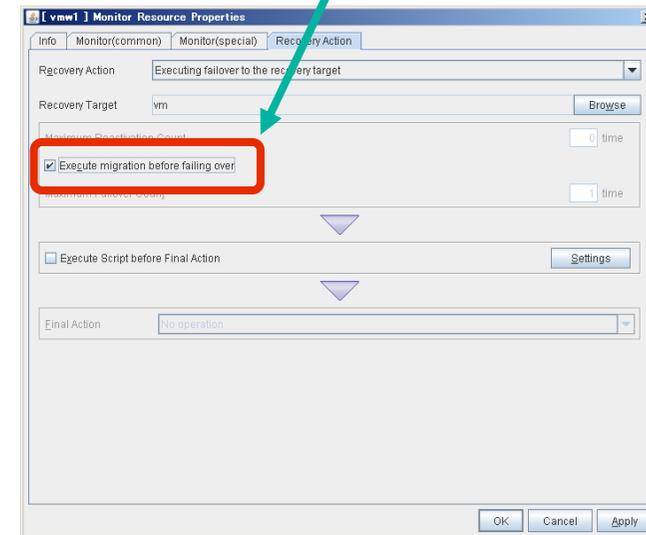vCenter

*1: Quick Migration is supported for Hyper-V

Non-disruptive Failover

Applications can be moved to standby server without disruption during failure which can be recovered by live migration. Business availability is achieved to the maximum.

Point

(1) Express Cluster tries live migration in case failure is detected in the host.

Ether

One path failure

VM 2   VM 3

VM 1   VM 2   VM 3

EXPRESSCLUSTER

Virtualization Platform   Virtualization Platform

Fibre Channel

(2) In case live migration cannot be done, then VM is continued by doing failover

One path failure

Easy setting by only checking the button !

(Setting Screen)

[vmw1] Monitor Resource Properties

Info | Monitor(common) | Monitor(special) | Recovery Action

Recovery Action   Executing failover to the recovery target

Recovery Target   vrn   Browse

Maximum Reactivation Count   0 time

☑ Execute migration before failing over

Maximum Failover Count   1 time

☐ Execute Script before Final Action   Settings

Final Action   No operation

OK   Cancel   Apply

• Supports virtualization platform that supports live migration
(supports VMware and Hyper-V*. Also XenServer will be supported through updates)
• To be precise, in configuration of FC path redundancy and NIC redundancy, it detects that failure has occurred in the one of the path and become operative for live migration
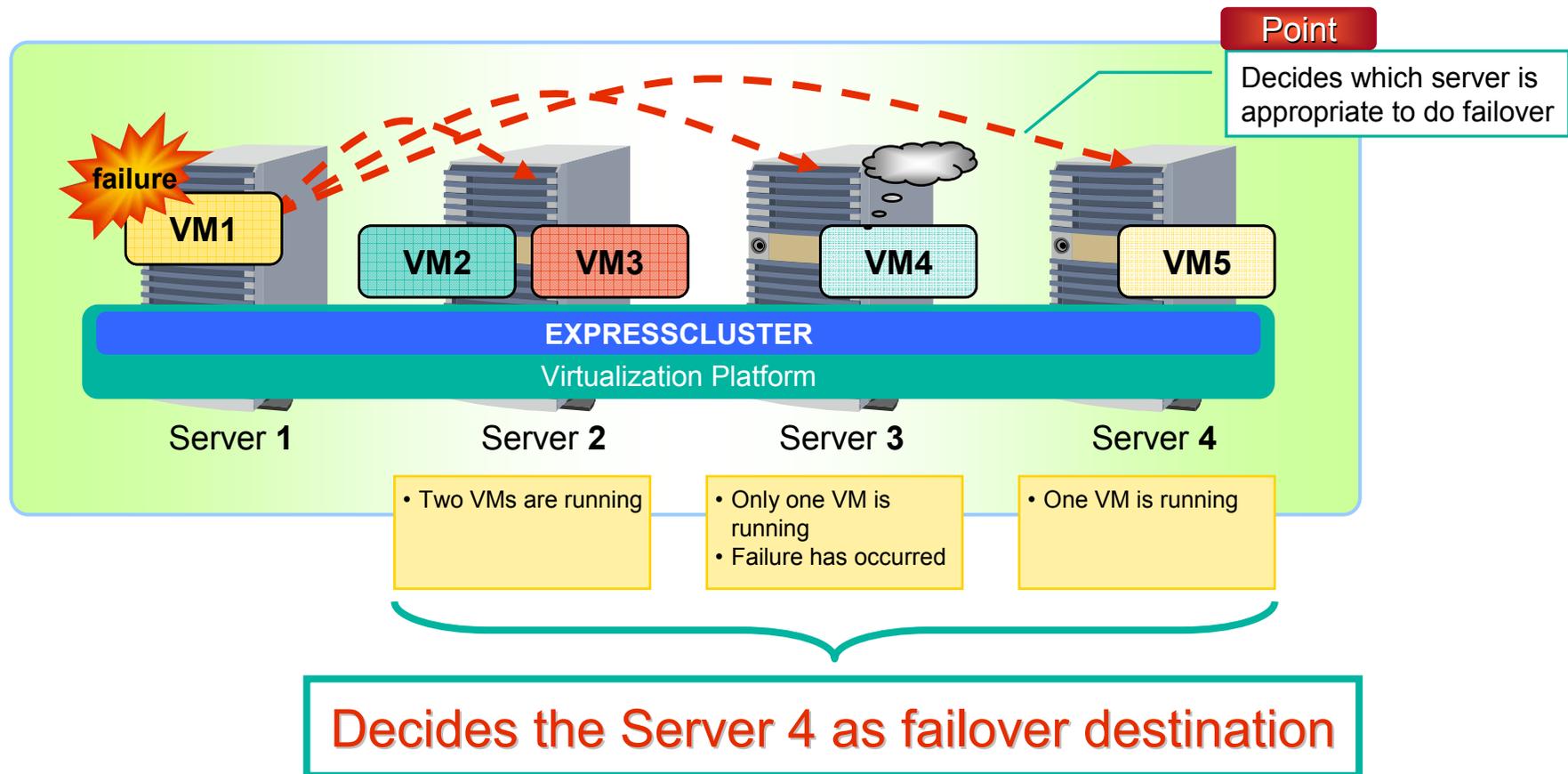
* In step (1), Hyper-V tries quick migration

Dynamic Failover

Failover will be done to the appropriate server depending upon the situation on occurrence of any failure!

This feature can also be used in bare metal environment.
This feature is efficient in configuration having more than 3 nodes.

Point

Decides which server is appropriate to do failover

failure

VM1 **VM2** **VM3** **VM4** **VM5**

EXPRESSCLUSTER
Virtualization Platform

Server **1**   Server **2**   Server **3**   Server **4**

• Two VMs are running

• Only one VM is running
• Failure has occurred

• One VM is running

Decides the Server 4 as failover destination

© NEC Corporation 2010

Empowered by Innovation **NEC**

ENHANCEMENT OF MIRROR FUNCTION

Empowered by Innovation **NEC**

Faster Data Synchronization

More powerful **FastSync™** function !

Drastic reduction in total time required for initial construction / overall construction of data mirroring by synchronization of only actual data
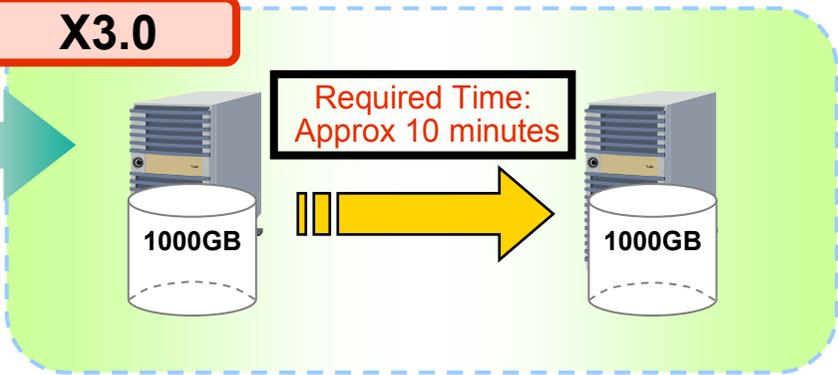
During initial construction
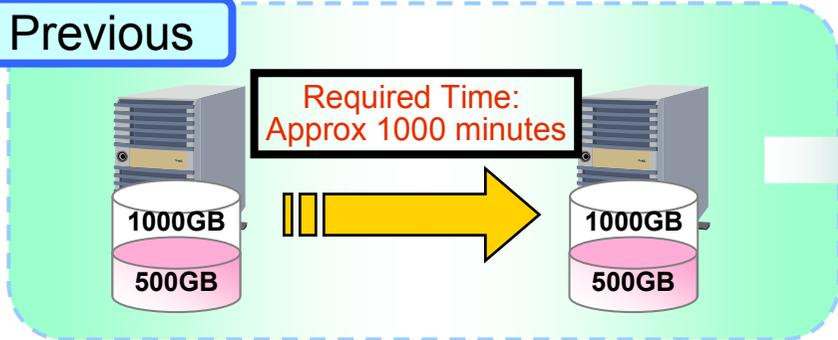
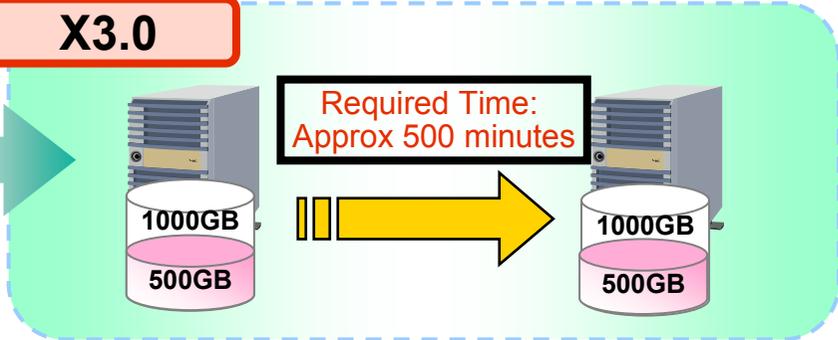(* In case actual data file is not there)

Previous

Required Time: Approx 1000 minutes

1000GB → 1000GB

X3.0

Required Time: Approx 10 minutes

1000GB → 1000GB
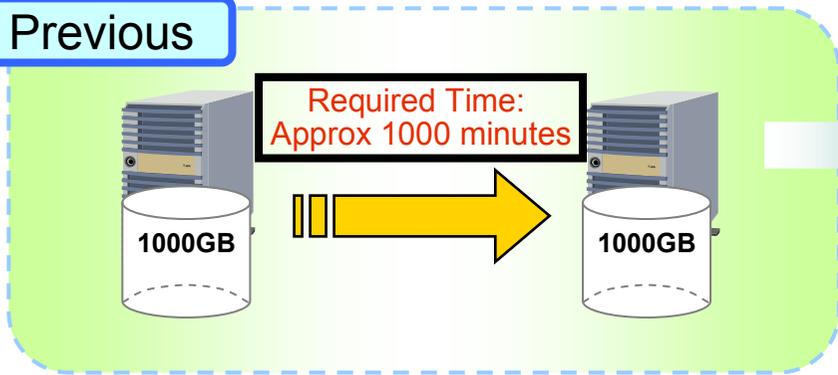
During overall construction

(* In case actual data size is 500 GB)

Previous

Required Time: Approx 1000 minutes

1000GB / 500GB → 1000GB / 500GB

X3.0

Required Time: Approx 500 minutes

1000GB / 500GB → 1000GB / 500GB

© NEC Corporation 2010

Empowered by Innovation **NEC**

Redanduncy of Data Mirroring Path

Redundancy of mirror connect is now supported and performance is improved !

Network used for each mirror set can be defined. Load can be distributed by making LAN 1 for application A and LAN 2 for application B and hence performance is improved.

Automatic switchover in case of any network failure (In case of any failure in LAN1, LAN2 will be used for both application A and application B)

Application A

Application B

LAN1 (In normal cases, used for application A)

LAN2 (In normal cases, used for application B)

Application A
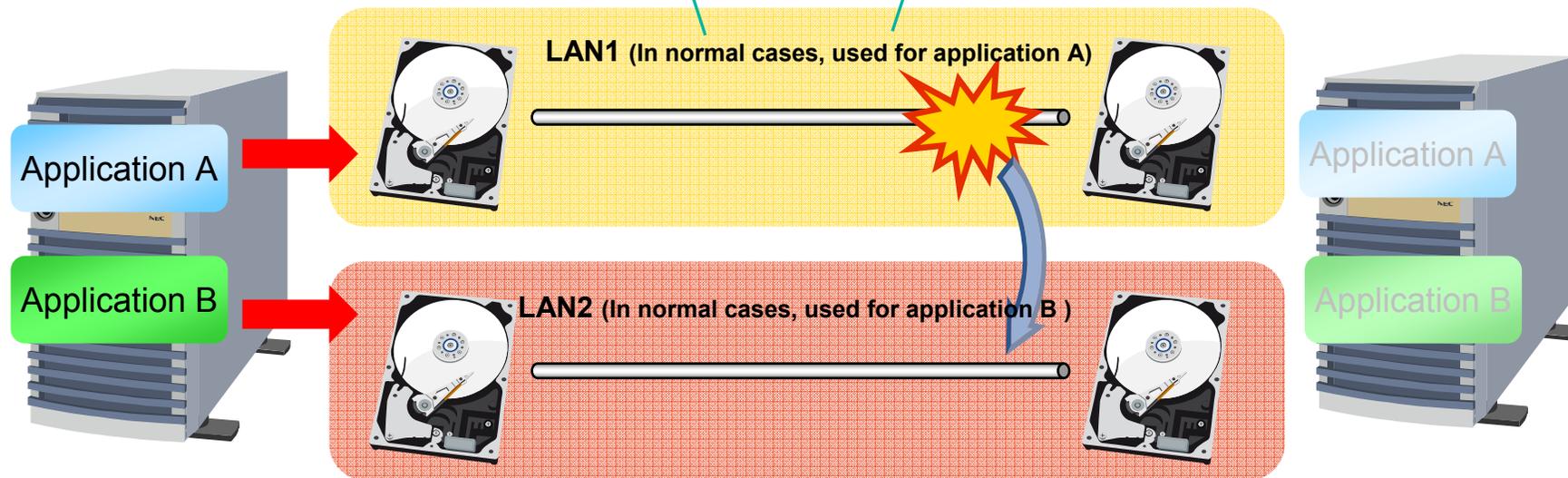
Application B

In case of using multiple mirror sets, load distribution for each application is possible and performance is improved !

© NEC Corporation 2010

Empowered by Innovation **NEC**

ENHANCEMENT OF REMOTE FUNCTION

© NEC Corporation 2010

Empowered by Innovation **NEC**

Compression of Mirrored Data

Efficient data transfer by compressing the data to be mirrored

Compress before sending it to network (Buffering)

Extract before writing it to disk

Also acts as a anti-peeping measure since it is compressed

Average 50% reduction in data size as compared to the previous version

(It is measured with mirror data assuming operation of file server. Results differ depending on file type)
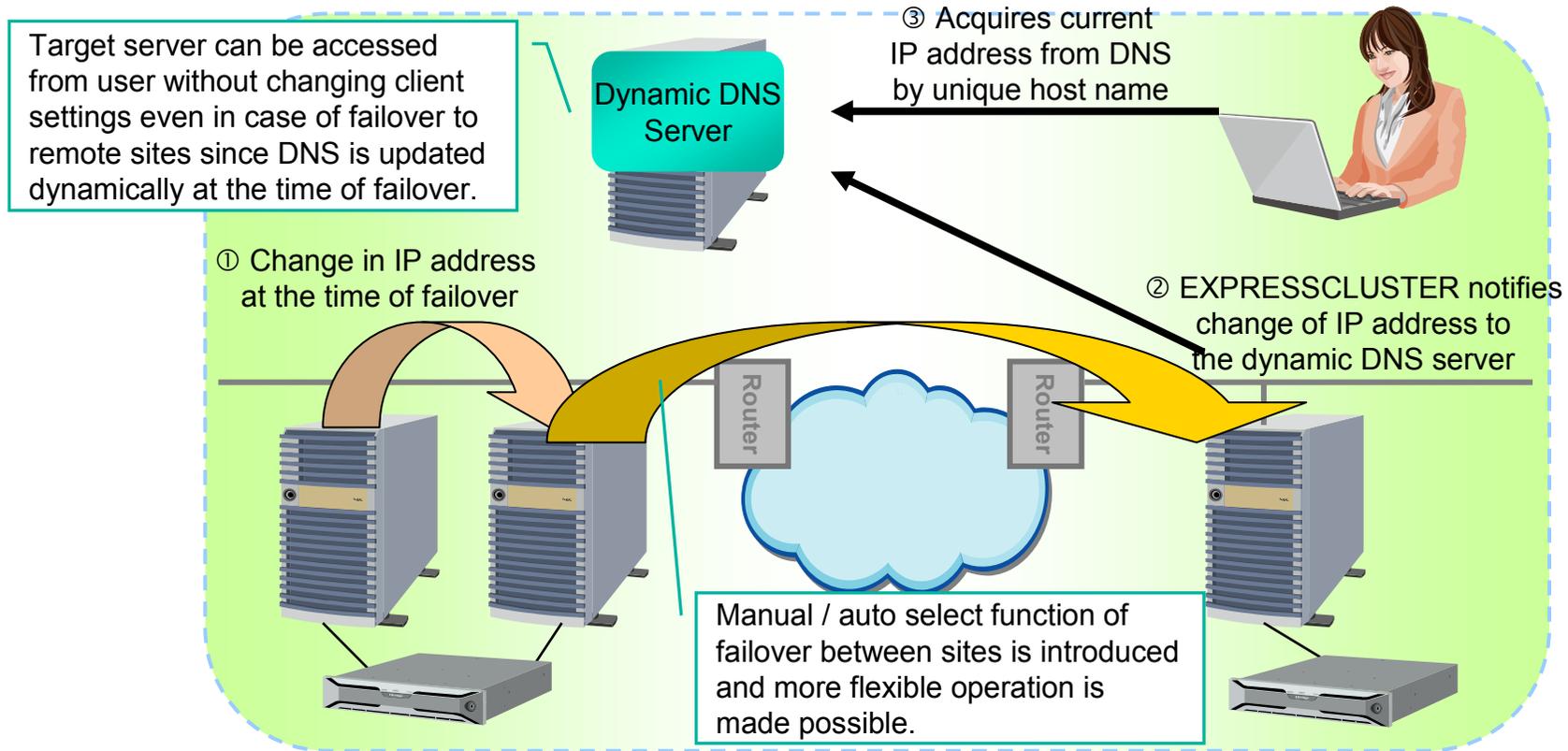*Used source CD of RHEL5 as file

* This feature is only valid in asynchronous mirroring mode.

Convenient at the time of using narrow network for remote clustering!

Empowered by Innovation **NEC**

Enhancements for WAN Clustering

- Addition of dynamic DNS function ^{*1}
- Switchover of sites in hybrid configuration is made possible by manual / auto select

Target server can be accessed from user without changing client settings even in case of failover to remote sites since DNS is updated dynamically at the time of failover.

③ Acquires current IP address from DNS by unique host name

Dynamic DNS Server

① Change in IP address at the time of failover

② EXPRESSCLUSTER notifies change of IP address to the dynamic DNS server

Router

Router

Manual / auto select function of failover between sites is introduced and more flexible operation is made possible.

Remote clustering operations are made more simpler and more convenient !

*1: Only supported by Linux version

Empowered by Innovation **NEC**

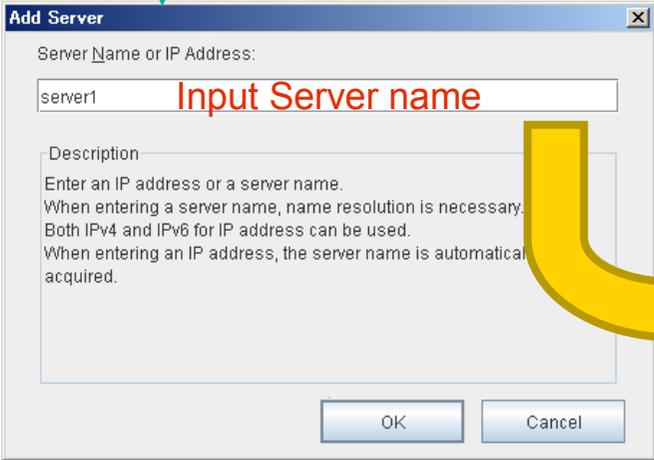# ENHANCEMENT OF GUI FUNCTION

Empowered by Innovation **NEC**

Intuitive Cluster Generation GUI

Usability enhanced! Leading to prevention of mistakes

Point 1

Steps of the current settings can be understood in a glance!

Point 2

IP address and device name are automatically acquired just by entering server name and it prevents committing mistakes!
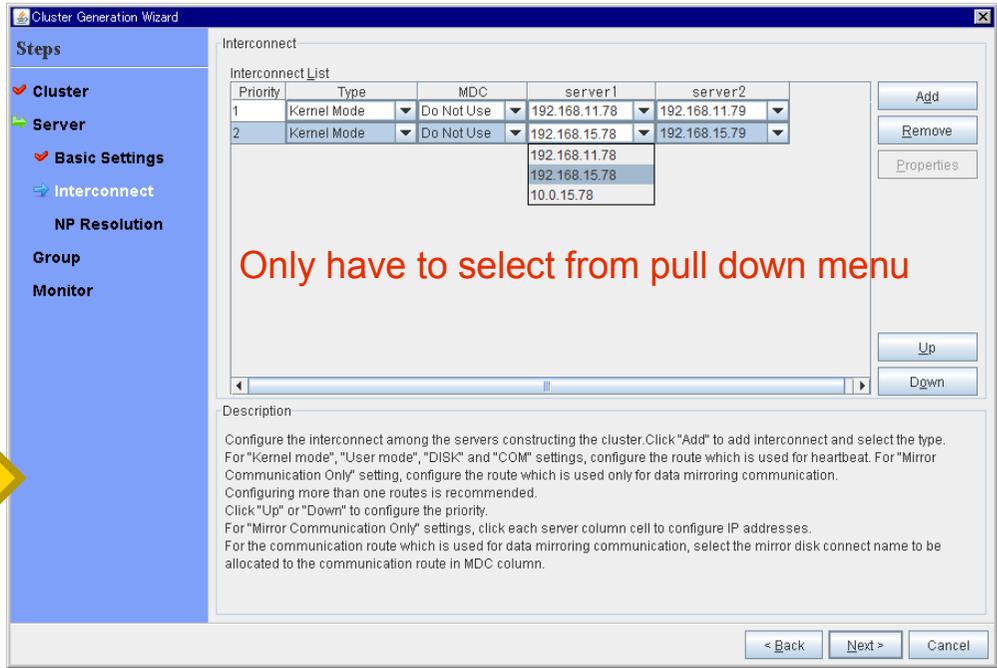
Add Server

Server Name or IP Address:

server1   Input Server name

Description

Enter an IP address or a server name.
When entering a server name, name resolution is necessary.
Both IPv4 and IPv6 for IP address can be used.
When entering an IP address, the server name is automatically acquired.

OK   Cancel

Cluster Generation Wizard

Steps

- ✔ Cluster
- → Server
  - ✔ Basic Settings
  - ⇒ Interconnect
  - NP Resolution
- Group
- Monitor

Interconnect

Interconnect List

Priority	Type	MDC	server1	server2
1	Kernel Mode	Do Not Use	192.168.11.78	192.168.11.79
2	Kernel Mode	Do Not Use	192.168.15.78	192.168.15.79
			192.168.11.78	
			192.168.15.78	
			10.0.15.78	

Add
Remove
Properties

Only have to select from pull down menu

Up
Down

Description

Configure the interconnect among the servers constructing the cluster.Click "Add" to add interconnect and select the type.
For "Kernel mode", "User mode", "DISK" and "COM" settings, configure the route which is used for heartbeat. For "Mirror Communication Only" setting, configure the route which is used only for data mirroring communication.
Configuring more than one routes is recommended.
Click "Up" or "Down" to configure the priority.
For "Mirror Communication Only" settings, click each server column cell to configure IP addresses.
For the communication route which is used for data mirroring communication, select the mirror disk connect name to be allocated to the communication route in MDC column.

< Back   Next >   Cancel

© NEC Corporation 2010

Empowered by Innovation   **NEC**
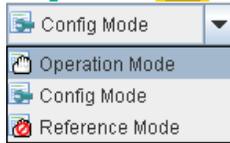
User Friendly WebManager GUI

GUI

WebManager is improved for more intuitive management

Point 1

Integrated WebManager and ClusterBuilder!
Easy to use as display can be switched by button

Config Mode
- Operation Mode
- Config Mode
- Reference Mode

Point 4

Integrated manager can also be started!

ClusterBuilder Screen

Operation Mode

cluster
- Servers
  - clg77vm1
    - lanhb1
    - lanhb2
    - diskhb1
    - pinapp1
    - failover_db
    - failover_http
  - clg77vm2
- Groups
  - failover_db
  - failover_hd
  - failover_http
  - failover_volmgr
- Monitors

Cluster Name: cluster

	clg77vm1	clg77vm2
Group Status		
failover_db	Online	Offline
failover_hd	Offline	Online
failover_http	Online	Offline
failover_volmgr	Offline	Online
Monitor Status		
userw	Normal	Normal
volmgrw_vg0	Offline	Normal

Point 2

Active group(s) can be displayed in server tree and user can understand which server is active at a glance!
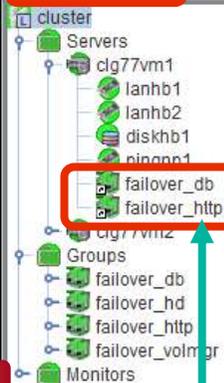
Point 3

Status of servers / group resource and monitor resource is shown in matrix display

Time		
10/07/22 14:45:26.221		
10/07/22 14:45:08.068		
10/07/22 14:45:07.000		
10/07/22 14:45:06.958		
10/07/22 14:45:06.930		
10/07/22 14:45:06.768	clg77vm1	rm
10/07/22 14:44:59.038	clg77vm1	nm

WebManager Screen

© NEC Corporation 2010

Empowered by Innovation **NEC**

Other Resource Related Enhancements

- Disk related resources are consolidated and made simpler
- Also LVM is newly supported!

Linux

Previous

Disk related resource

Disk related resource
Disk resource
raw resource
vxvol resource
vxdg resource
nas resource

X3.0

Disk related resource
Disk resource
volmgr resource (Supports LVM)
nas resource

Integration

Extension

Disk related monitor resource
Disk monitor
raw monitor
vxvol monitor
vxd monitor

Disk related monitor resource
Disk monitor
volmgr monitor (Supports LVM)

Integration

Extension

LVM supported (Only shared disk configuration)

Failover

AP — AP

EXPRESSCLUSTER

Logical Volume — Logical Volume

Volume Group

Physical Volume — Physical Volume — Physical Volume

© NEC Corporation 2010

Empowered by Innovation **NEC**

Empowered by Innovation

NEC