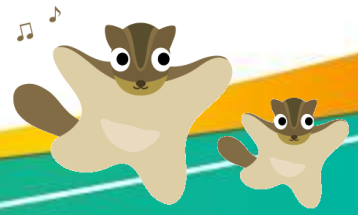
Empowered by Innovation NEC

EXPRESSCLUSTER X

High Availability for Virtualized Environment

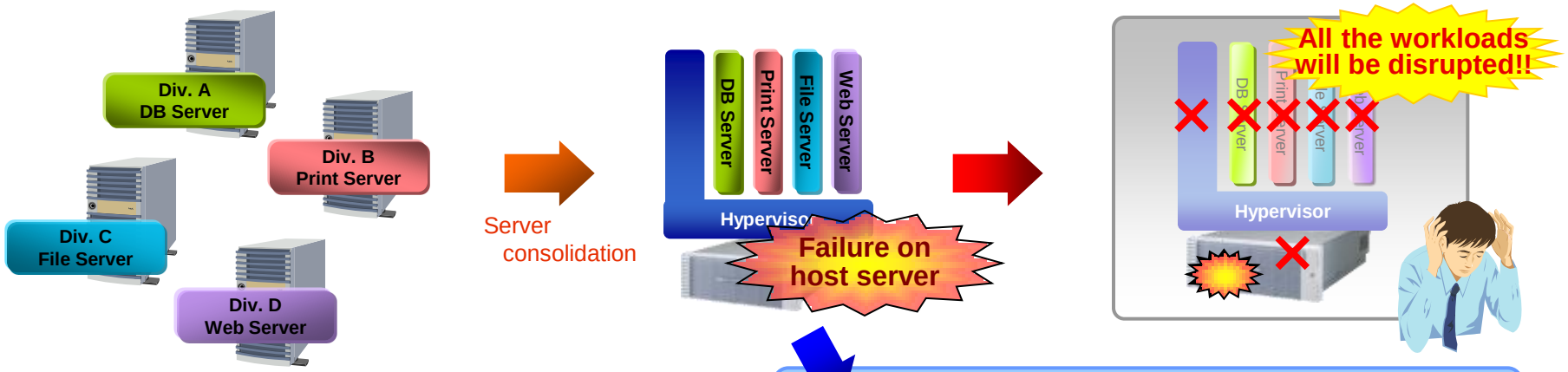
http://www.nec.com/expresscluster



NEC Corporation
System Software Division
December, 2012

Ensuring High Availability In Virtual Environment

In the virtual environment, failure on host server will cause entire system down !!



✓ Challenge

- In case of failure on the host OS, all of the guest OS will be affected and entire system will be disrupted.
- In case application running on the guest OS fails, system will be disrupted.

✓ Measures

- Cluster the virtual environment
- Cluster the guest OS or the host OS

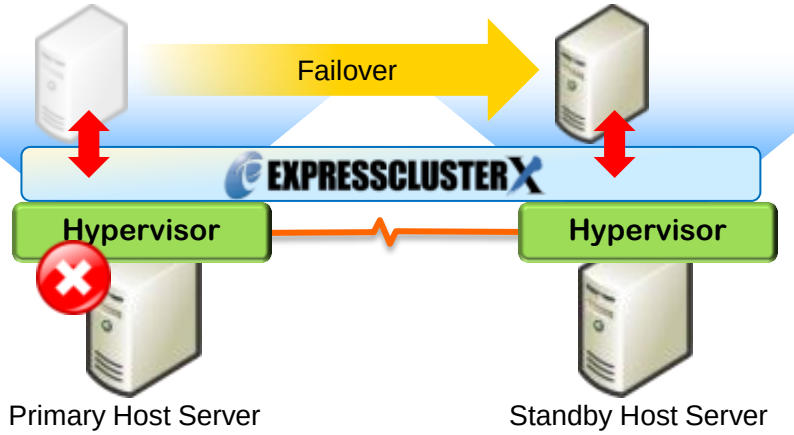
Virtual environment, in which the risk of system disruption is higher, can be also protected by EXPRESSCLUSTER X!

Broad Support of Major Hypervisors

- In order to meet rapidly growing demand for virtualization, EXPRESSCLUSTER X already supports various virtualization technologies
  - VMware vSphere
  - Microsoft Hyper-V
  - Citrix XenServer
  - Linux KVM
  - Sun Solaris Container
  - IBM Power VM

Clustering Levels Supported by EXPRESSCLUSTER X

Host Level Clustering

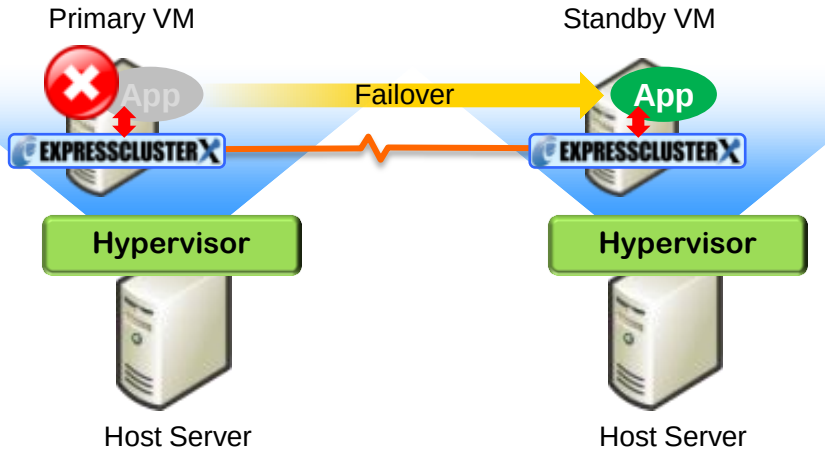


- Protects virtualized system from host level
- In case of any failure detected, virtual machine will be failed over to standby host server

<Detectable failures>

- ✓ Abnormal shutdown of the VM
- ✓ HW failure which leads to VM down
- ✓ Disk failure
- ✓ NW failure etc…

Guest Level Clustering



- Enables application-level protection
- In case of any failure detected, application will be failed over to standby VM

<Detectable failures>

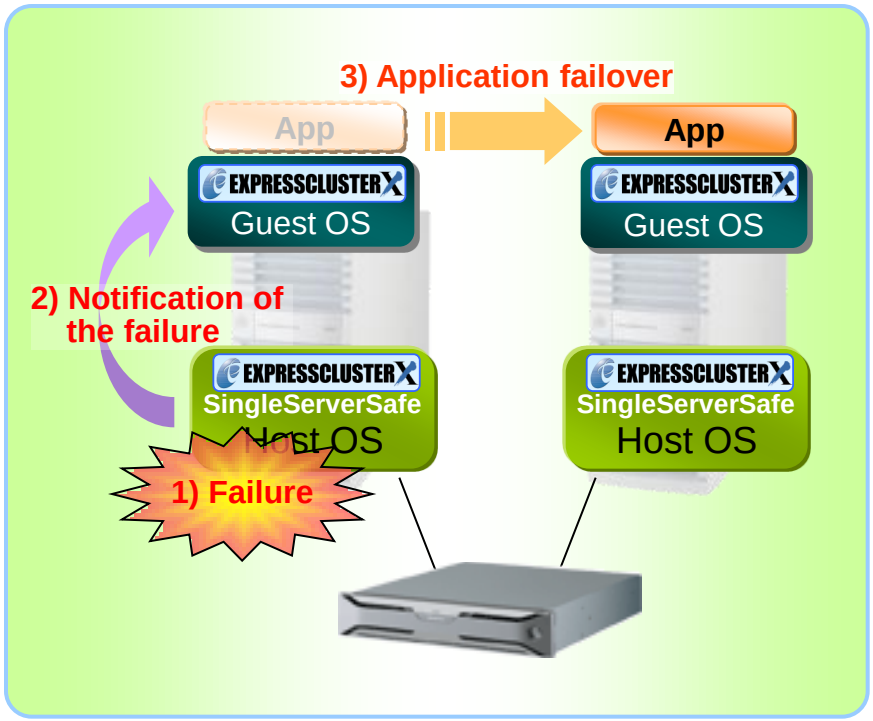
- ✓ Abnormal situation of the application
- ✓ HW failure which leads to app down
- ✓ Disk failure
- ✓ NW failure etc…

Host - Guest Linkage

Linkage between host and guest enables higher availability
by notifying each other about the failure situation

Scenario 1) Linkage for Application Failover

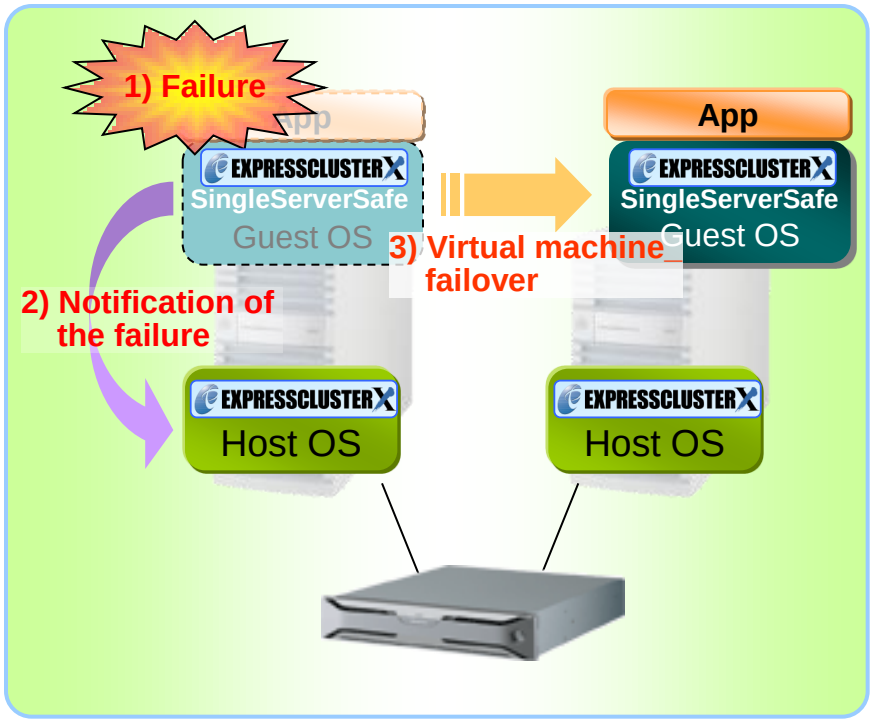
Benefit: Faster failover in case of host failure situation



"EXPRESSCLUSTER X SingleServerSafe" acts as an agent to detect failure occurred on host server

Scenario 2) Linkage for VM failover

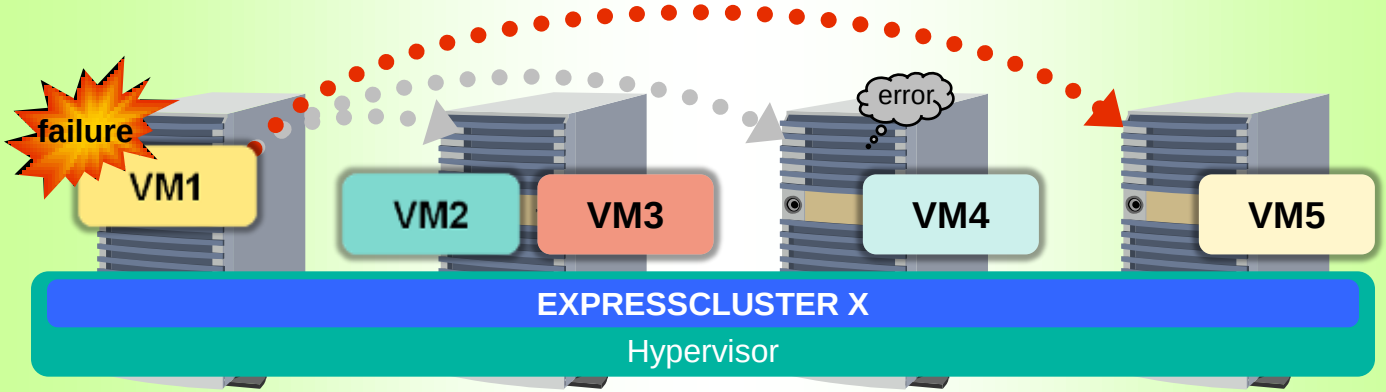
Benefit: Higher cost performance by consolidating EC license on host server



"EXPRESSCLUSTER SingleServerSafe" acts as an agent to detect failure occurred in VM

Dynamic Failover

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



	Server **1**	Server **2**	Server **3**	Server **4**
Load		Two VMs are already running	Only one VM running	Only one VM running
Healthiness		No error	One error occurred	No error

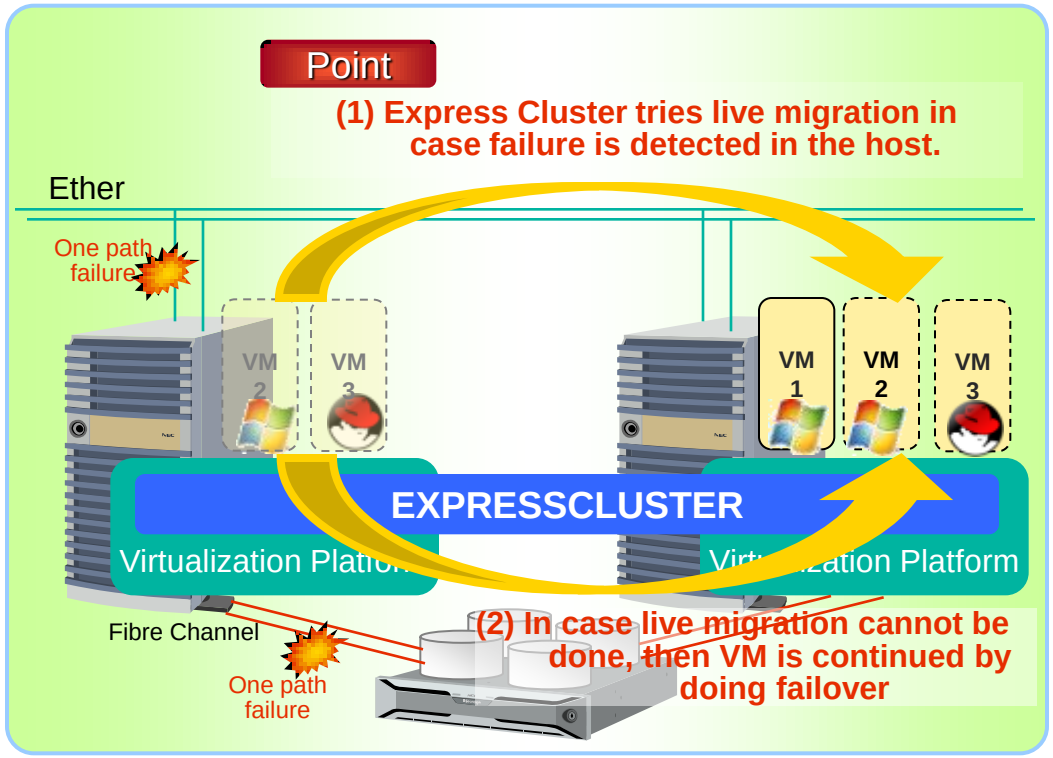
Autonomously decide “Server 4” is the most appropriate server to failover to.

- Also applicable for non-virtualized environment.

*Point to Note:
In case of physical environment, EC will failover the Application dynamically to most appropriate server. In case of host level clustering EC can failover the entire VM dynamically to most appropriate server.

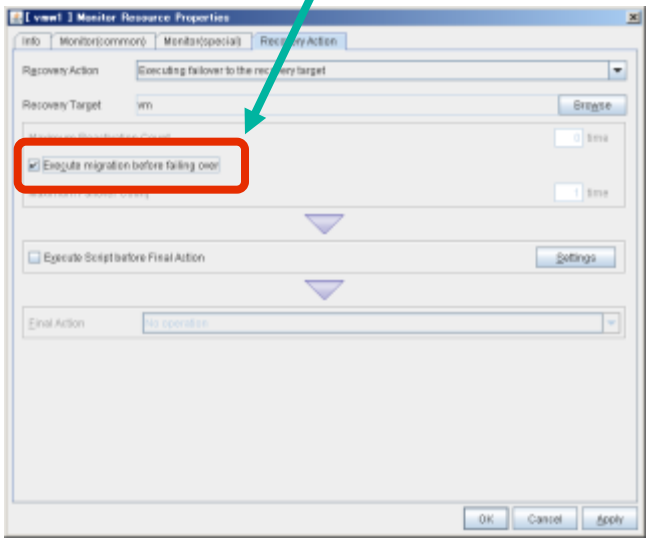
Non-disruptive Failover

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.



Easy setting by only checking the button !

(Setting Screen)



- 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

Expansion of Non-disruptive Failover Support

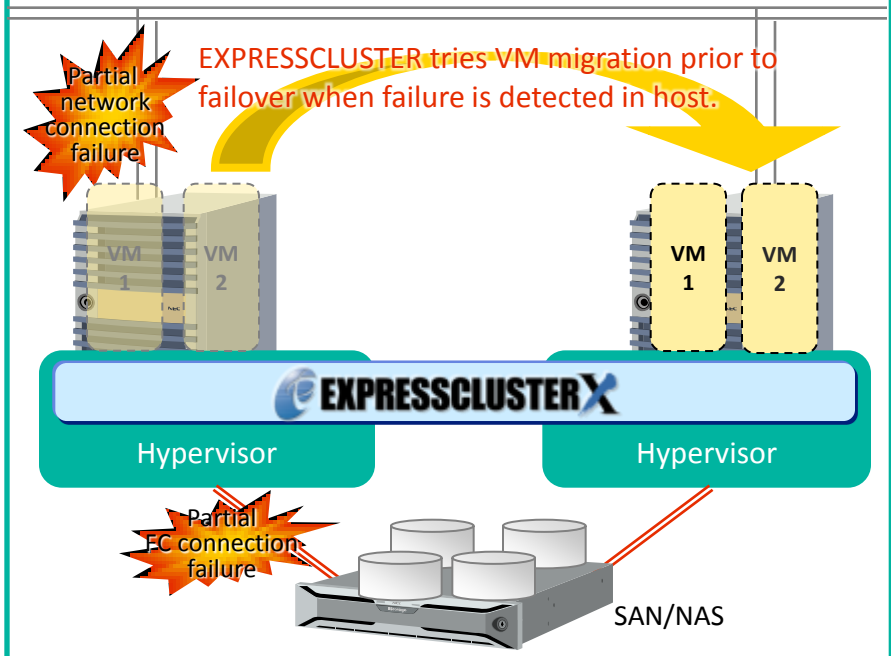
new

Windows Server 2012 Hyper-V is also supported for **Non-disruptive Failover**

Non-disruptive Failover:

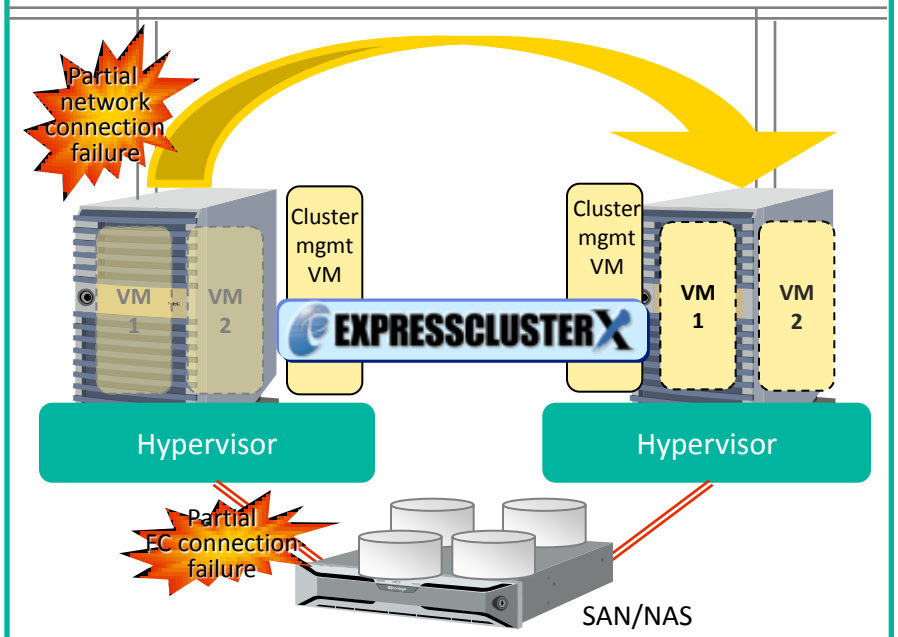
Under host-level clustering, when detecting failure, EXPRESSCLUSTER first try to perform VM migration using hypervisor features (e.g. vMotion for vSphere, Live Migration/Quick Migration for Hyper-V). If VM migration fails due to the failure, then EXPRESSCLUSTER performs VM failover. This will make recovery time much faster.

Hyper-V, vSphere 4, KVM, XenServer



◆ EXPRESSCLUSTER monitors physical resource and guest OS from hypervisor (host OS)

vSphere 5



◆ Monitoring and other VM controls can be done from cluster management VM

* This feature requires NAS for Windows Server 2012 Hyper-V

* In case of Hyper-V 1.0/2.0, EXPRESSCLUSTER performs Quick Migration

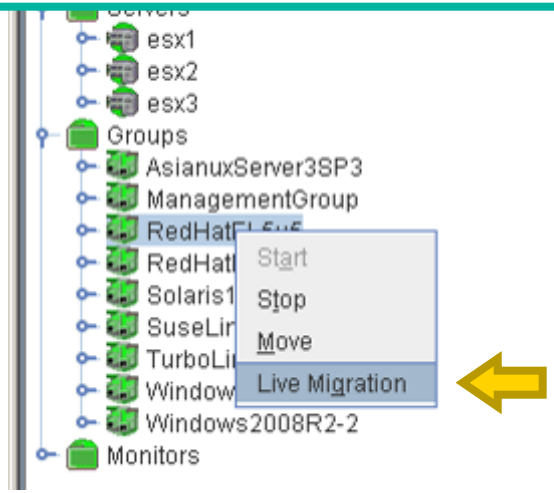
Non-disruptive Maintenance

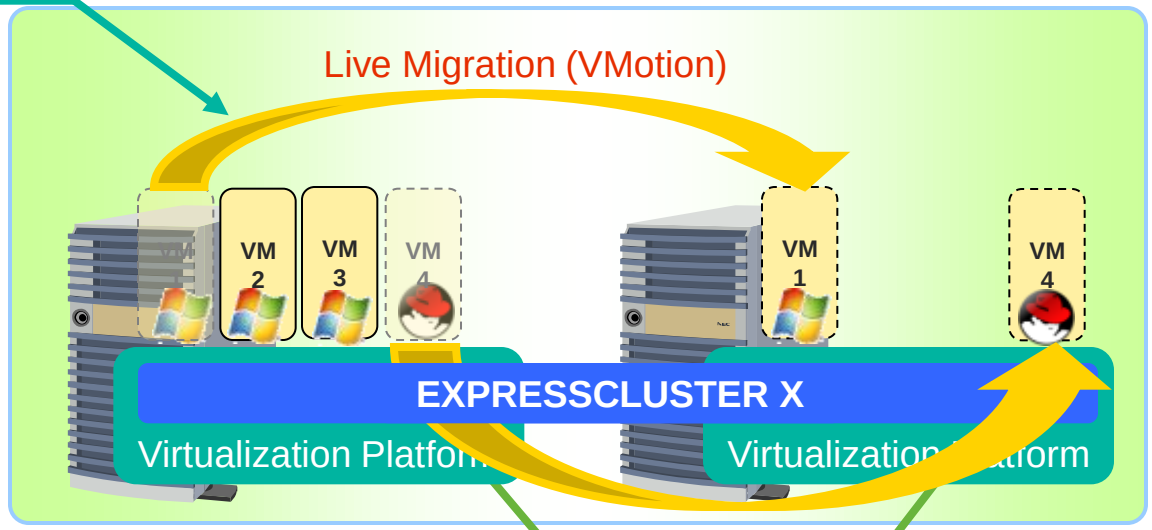
Full support of live migration of virtualization software !
Maximum availability of virtual machine in host cluster.

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)





Point 2

Enhancement of compatibility with virtualization software !
- VMotion can be executed from either EXPRESSCLUSTER or vCenter Server
- Also supports dynamic layout of virtual machine by VMware DRS

Dynamic layout of virtual machine (VMware DRS)

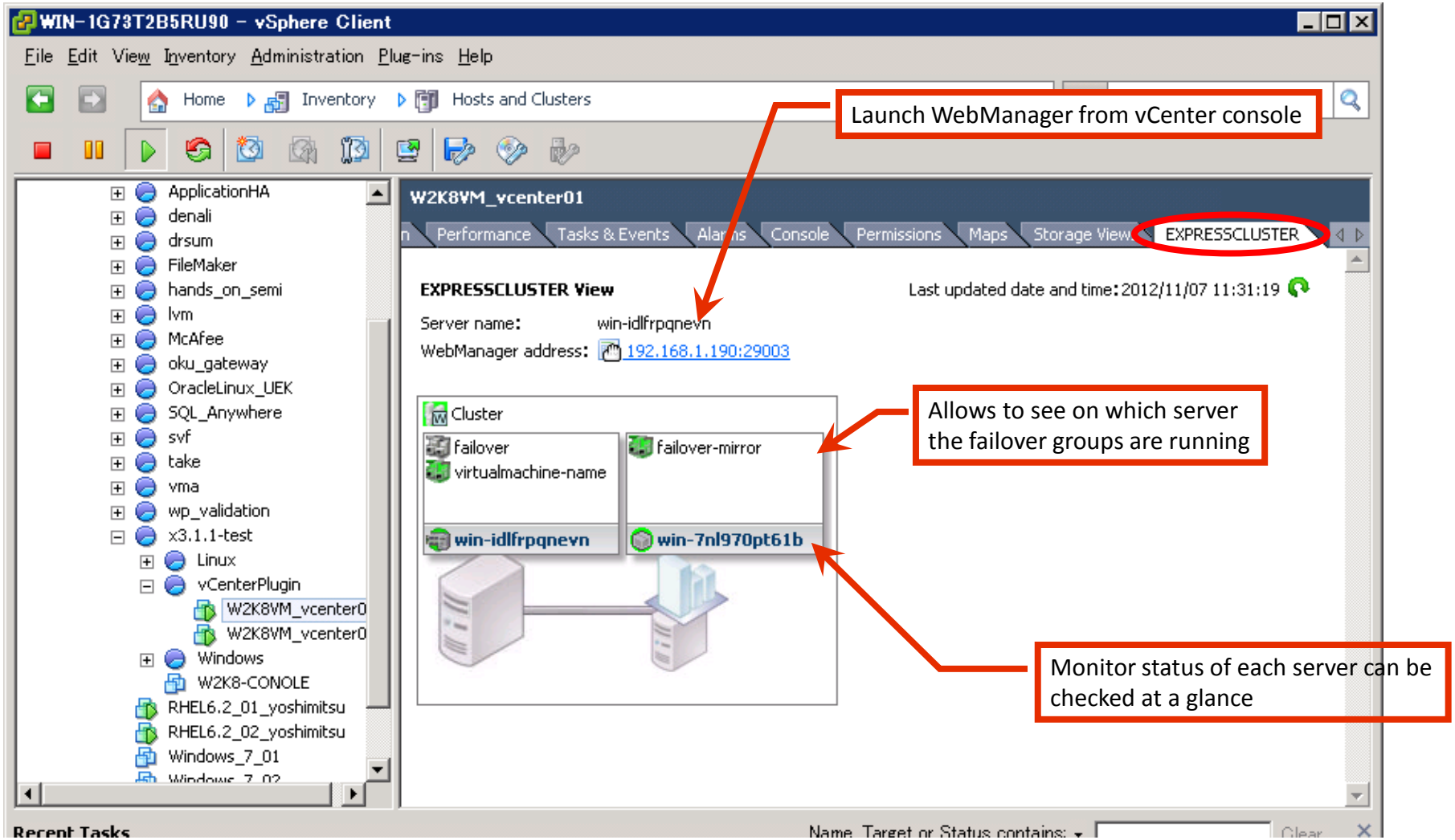
vCenter

*1: Quick Migration is supported for Hyper-V

VMware vCenter Plug-in

new

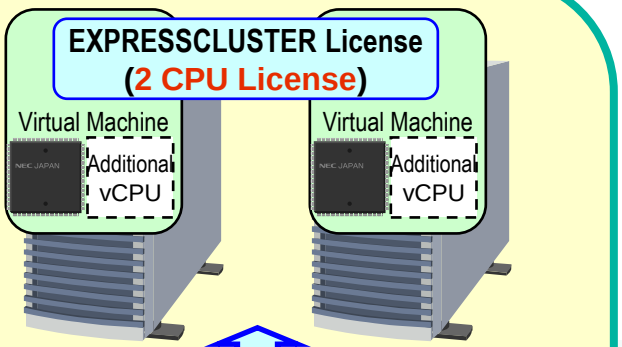
Offers higher manageability to VMware environment



Special License for Virtual Environment

Node-based license for guest level clustering
No limit on the number of vCPU

Previous Licensing Scheme

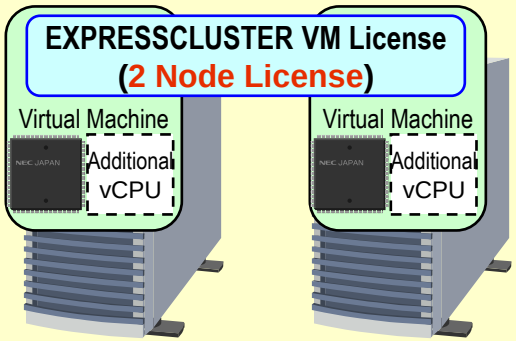


Required additional license

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



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

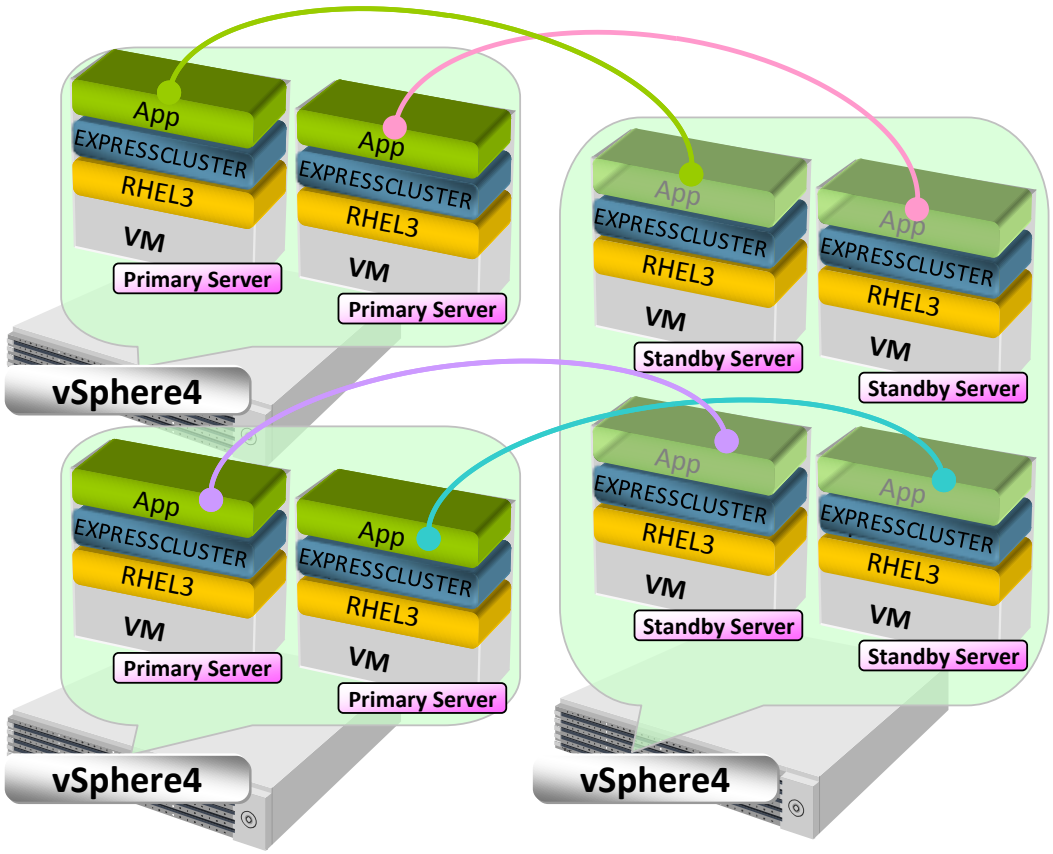
* This licensing scheme is dedicated for guest level clustering. In case of host level clustering, CPU based license should be applied

Case Studies on Virtual Environment

Major Securities Firm

EXPRESSCLUSTER + vSphere 4

- ✓ Migration to VM environment due to support end of servers
- ✓ Adopted ExpressCluster as VMware HA cannot recover failures occurred inside the virtual machine
- ✓ Availability for 400 servers of Oracle and WebSphere used for the securities trading system has been ensured by EXPRESSCLUSTER.



Before system migration …

- ✓ **Data mirroring cluster for each 2 servers.**
  - ➢ **RHEL3, Oracle, WebSphere**
  - ➢ **EXPRESSCLUSTER LE Ver3.x**
- ✓ **Total 200 sets of cluster (400 servers)**

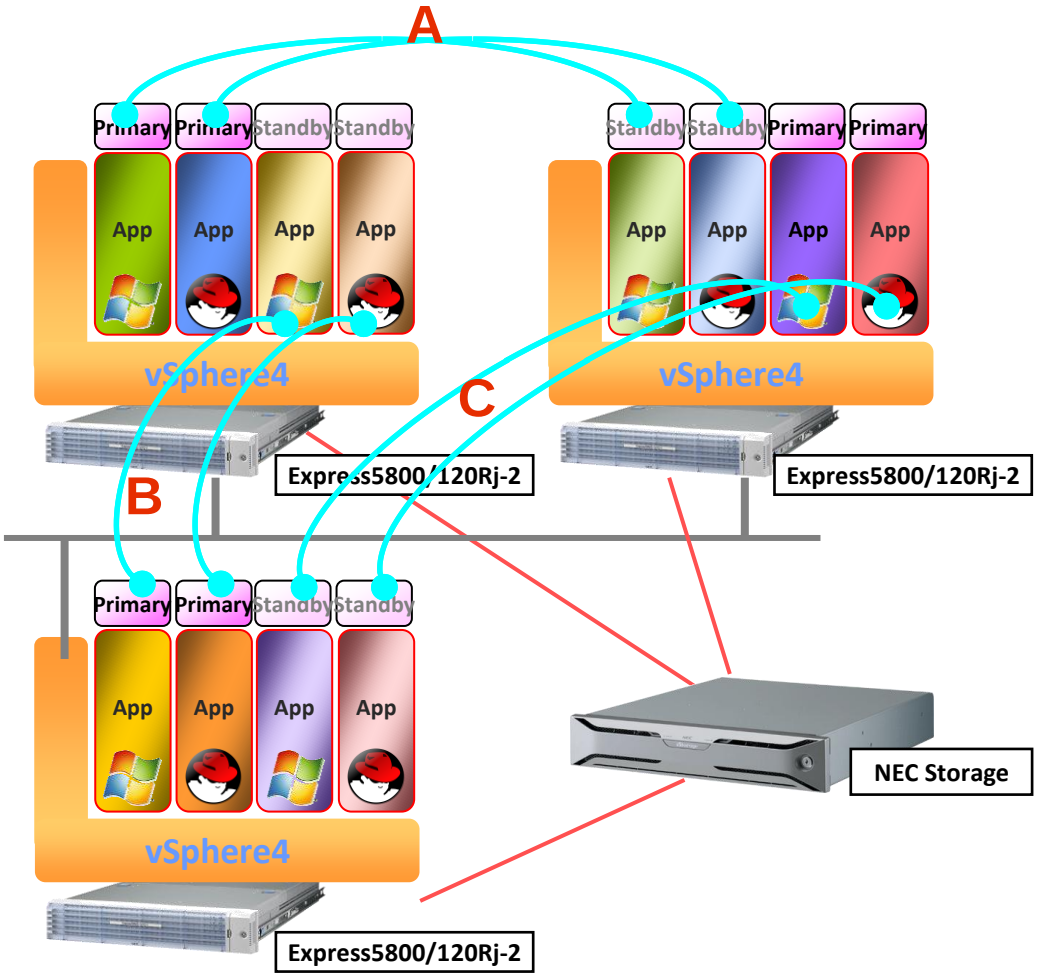
Migration to virtual environment

After migration …

- ✓ **Shared disk clustering for 2 servers**
  - ➢ **RHEL3, Oracle, WebSphere**
  - ➢ **EXPRESSCLUSTER SE Ver3.x**
- ✓ **8 virtual machines on 3 physical servers**
  - ➢ **Merged standby VM to single physical server**

Internet Service Provider

- ✓ Billing system for users of the service
- ✓ All physical machine acts as primary server and also standby server
- ✓ Integrated management of multiple clusters including Windows & Linux1



Point

- ✓ Application: Custom application for the billing system
- ✓ OS: Windows Server 2003 / RHEL5
- ✓ 2 node clustering of virtual machines
  - ➢ EXPRESSCLUSTER X 2.0 for Windows
  - ➢ EXPRESSCLUSTER X 2.0 for Linux
- ✓ 4 virtual machines on each physical server
  - ➢ Optimization of CPU usage by allocating 2 active & 2 standby server on each physical machine
- ✓ Integrated management of both Windows and Linux clusters by EXPRESSCLUSTER Integrated Manager

Thank You

An Integrated High Availability and Disaster Recovery Solution

For more product information & request for trial license,
visit >> http://www.nec.com/expresscluster

For more information, feel free to contact us - info@expresscluster.jp.nec.com

NEC brings together and integrates technology and expertise to create
the ICT-enabled society of tomorrow.
We collaborate closely with partners and customers around the world,
orchestrating each project to ensure all its parts are fine-tuned to local needs.

Every day, our innovative solutions for society contribute to
greater safety, security, efficiency and equality, and enable people to live brighter lives.

Empowered by Innovation