

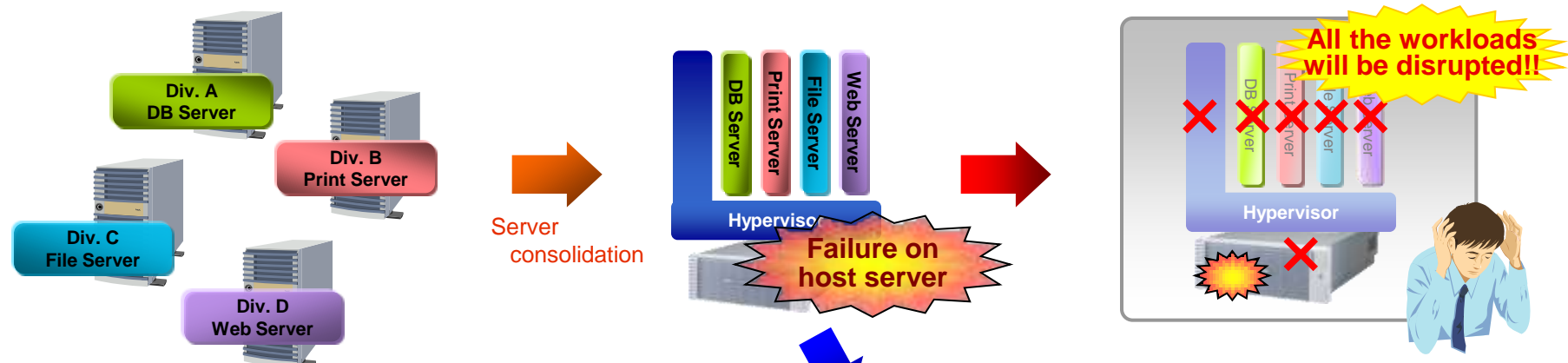
The logo for ExpressCluster X features a blue circular icon on the left containing a white stylized 'e'. To its right, the word 'EXPRESSCLUSTER' is written in a bold, black, sans-serif font. The final character 'X' is significantly larger and rendered in a blue, brush-stroke style.

# **EXPRESSCLUSTER X**

**High Availability for Virtualized Environment**

# Ensuring High Availability In Virtual Environment

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

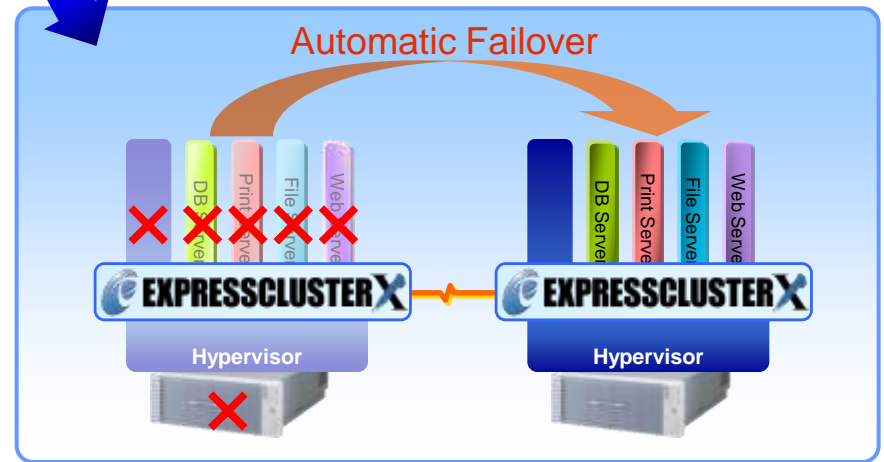


## ✓ Challenge

- 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

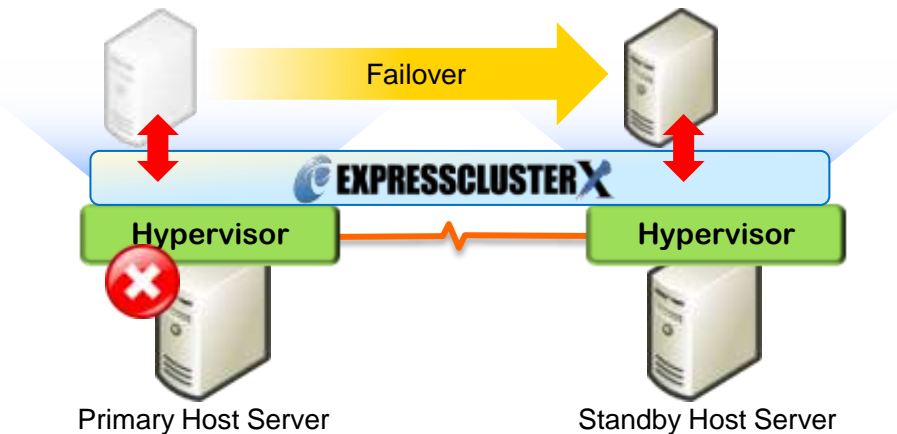
*“2010 will be the first year in which the number of deployed virtual servers will outnumber the number of physical ones.*

-- IDC Analyst : Cindy Borovick



# Clustering Levels Supported by EXPRESSCLUSTER X

## Host Level Clustering

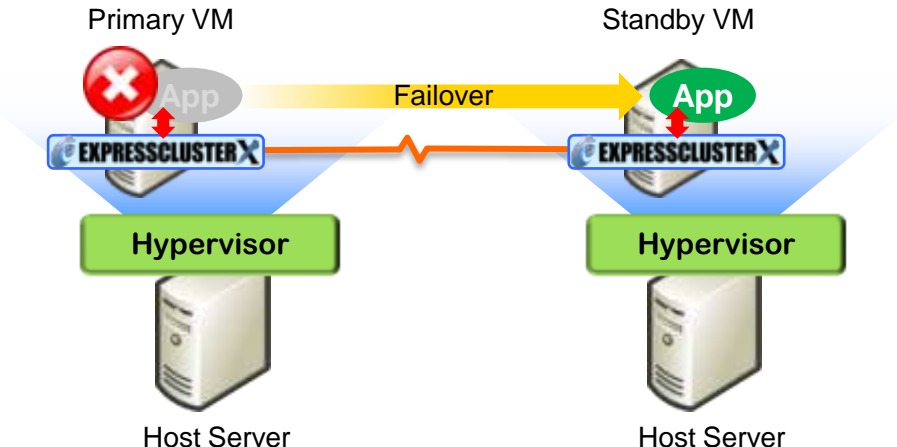


- Protects virtualized system from host level
- In case of any failure detected, virtual machine will be failed over to standby host server

### <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>

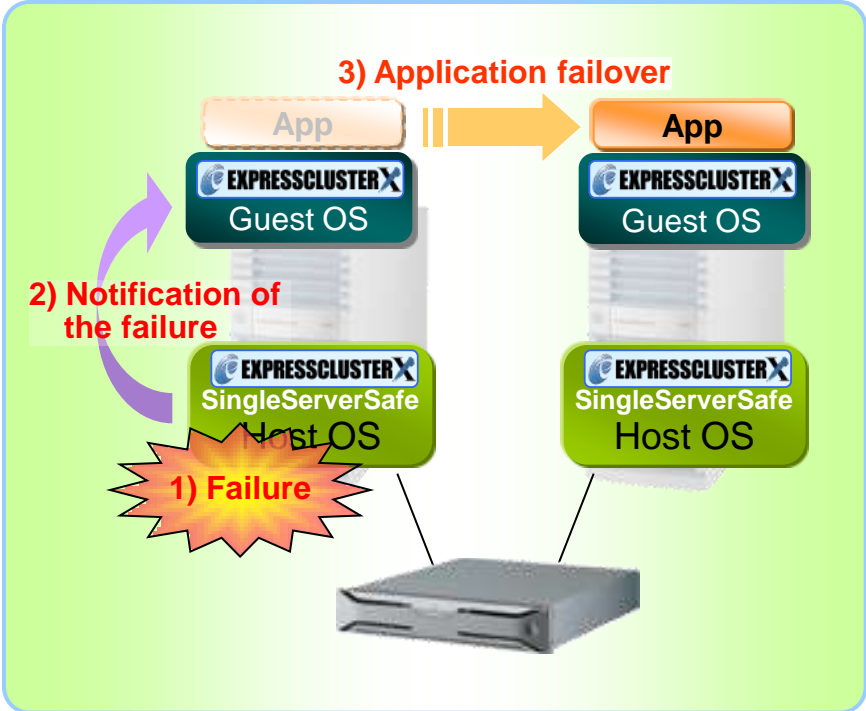
- ✓ Abnormal situation of the application
- ✓ HW failure which leads to app down
- ✓ Disk failure
- ✓ NW failure etc...

# 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

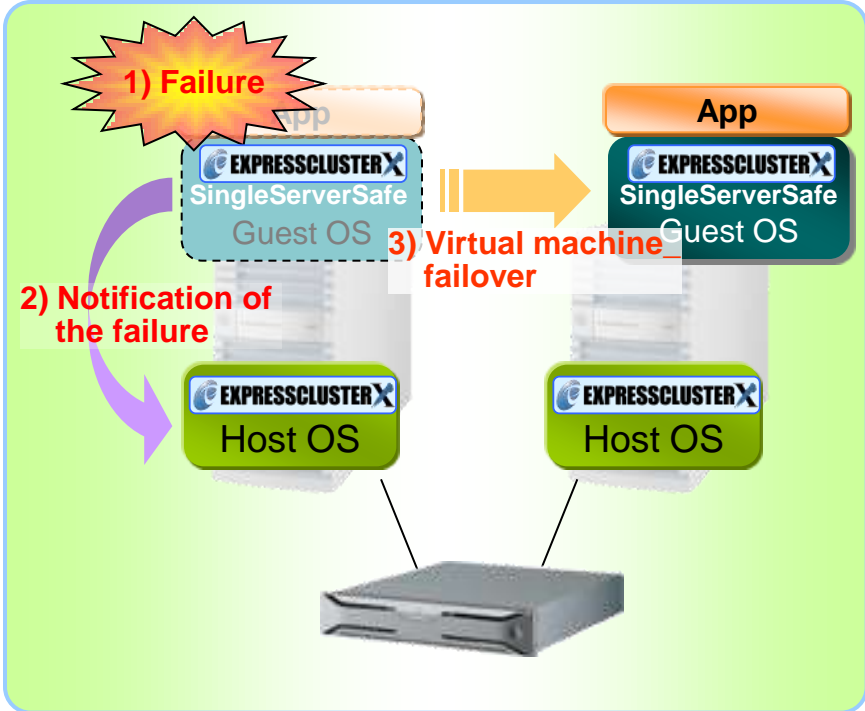
**Benefit:** Faster failover in case of host failure situation



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

## Scenario 2) Linkage for VM failover

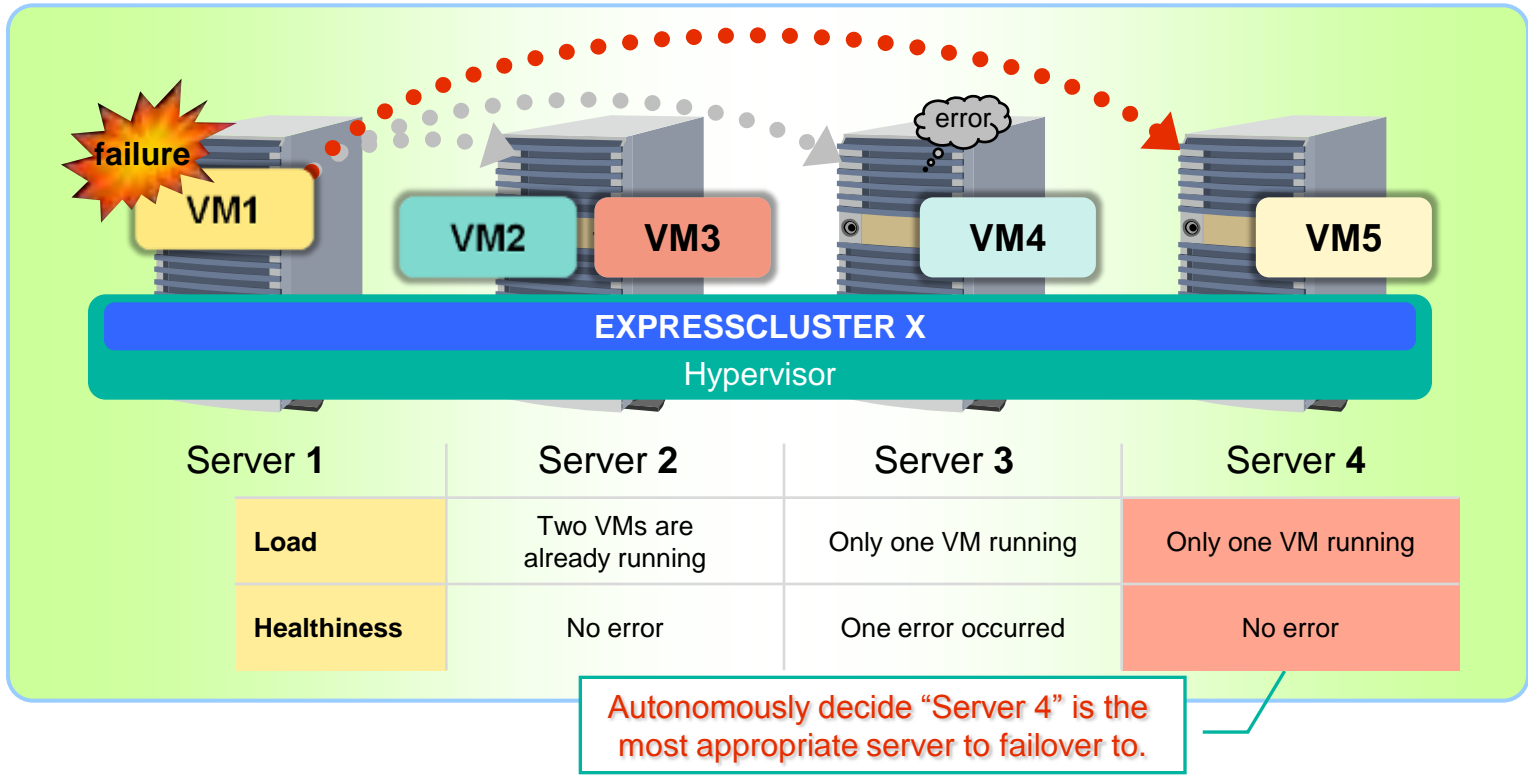
**Benefit:** Higher cost performance by consolidating EC license on host server



“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!

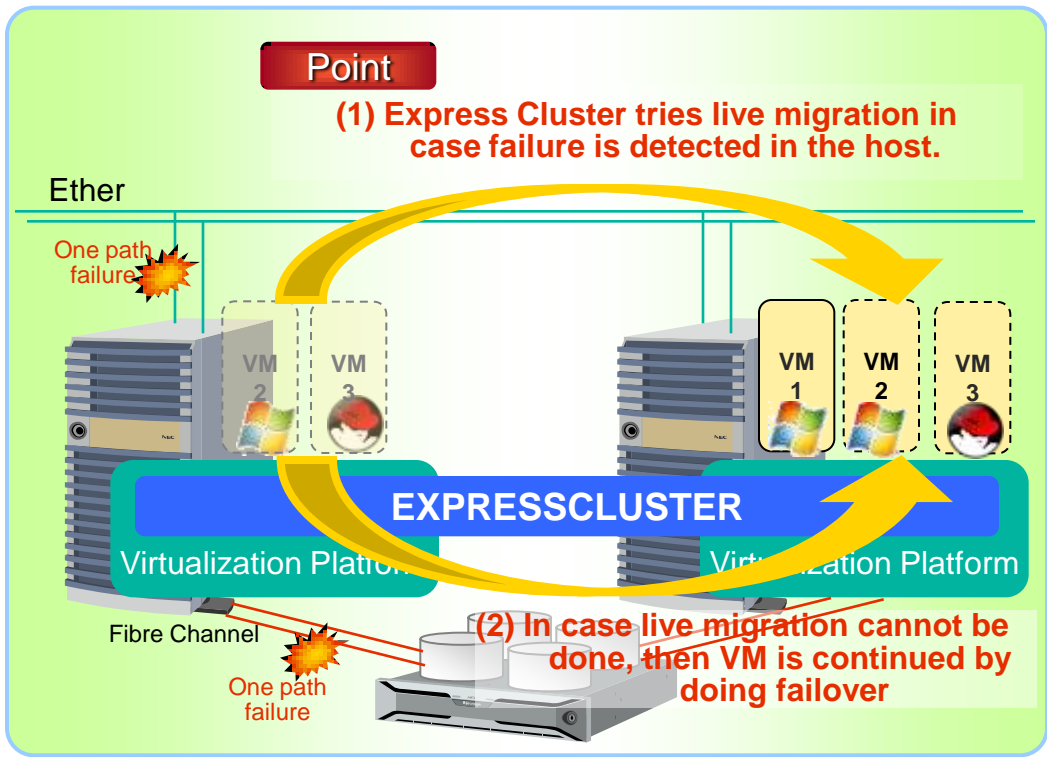


Also applicable for non-virtualized environment.

\*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.

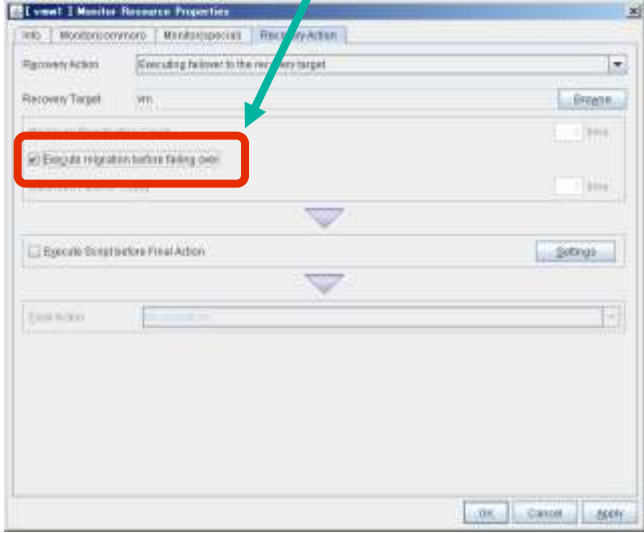
# Non-disruptive Failover

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

# Non-disruptive Maintenance

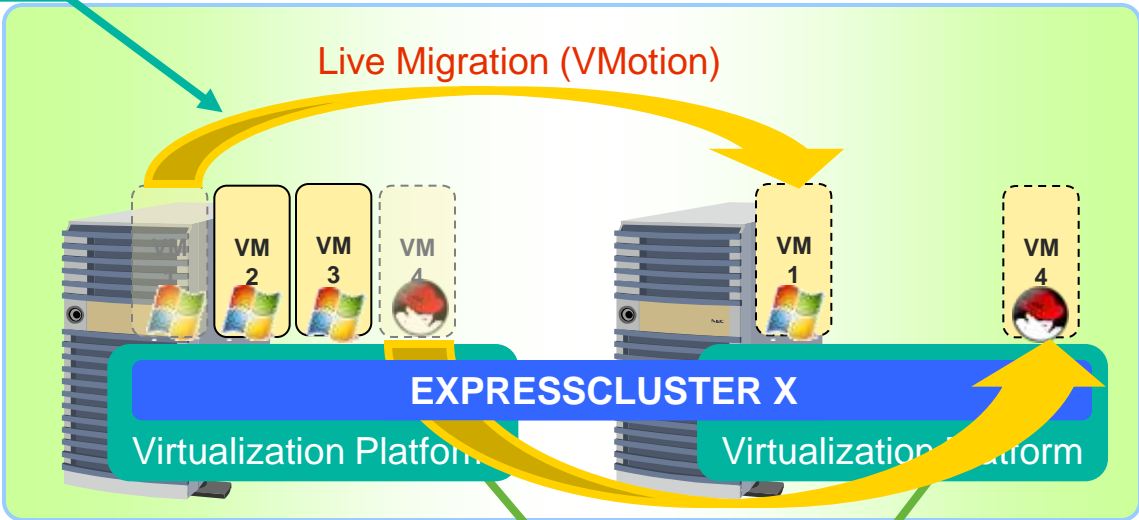
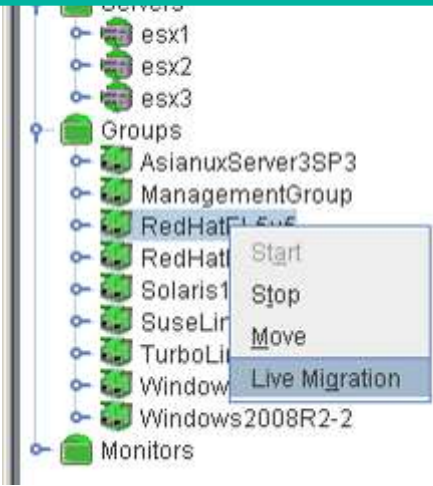
Full support of live migration of virtualization software !  
 Maximum availability of virtual machine in host cluster.

**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

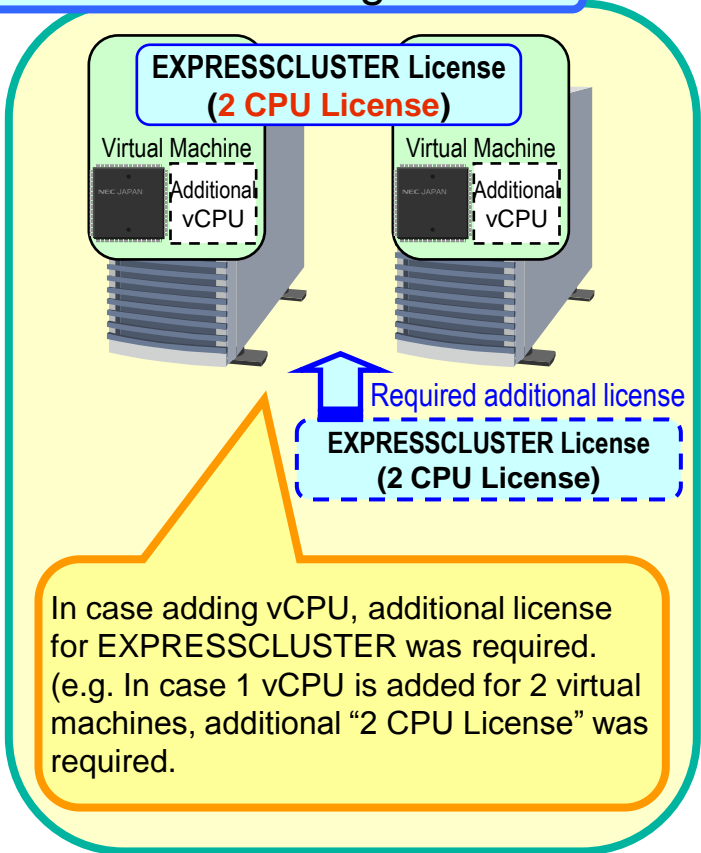


\*1: Quick Migration is supported for Hyper-V

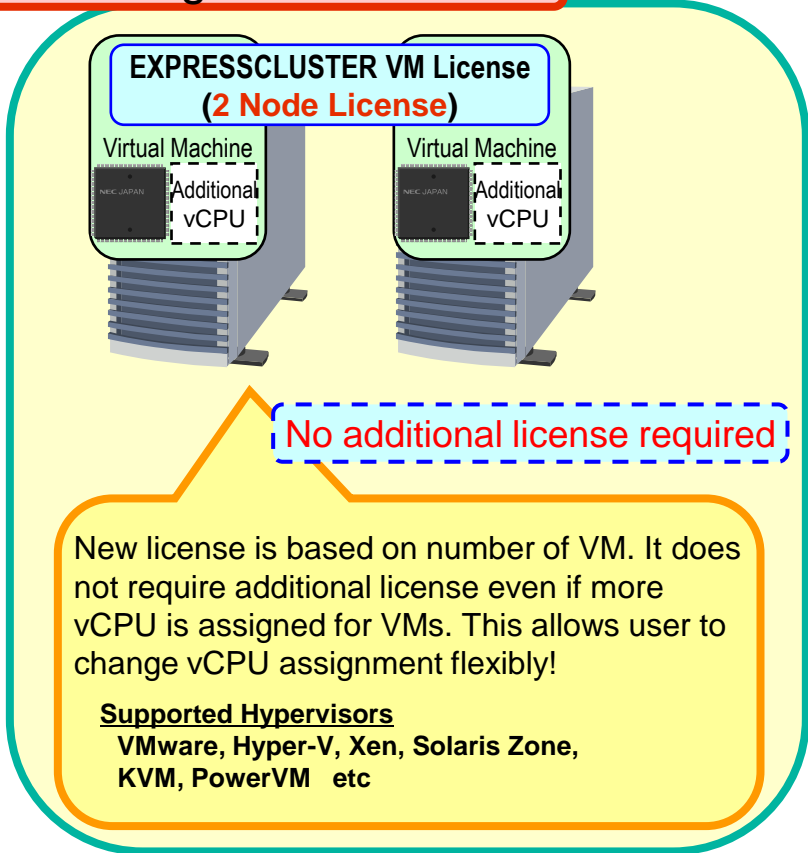
# Special License for Virtual Environment

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

## Previous Licensing Scheme



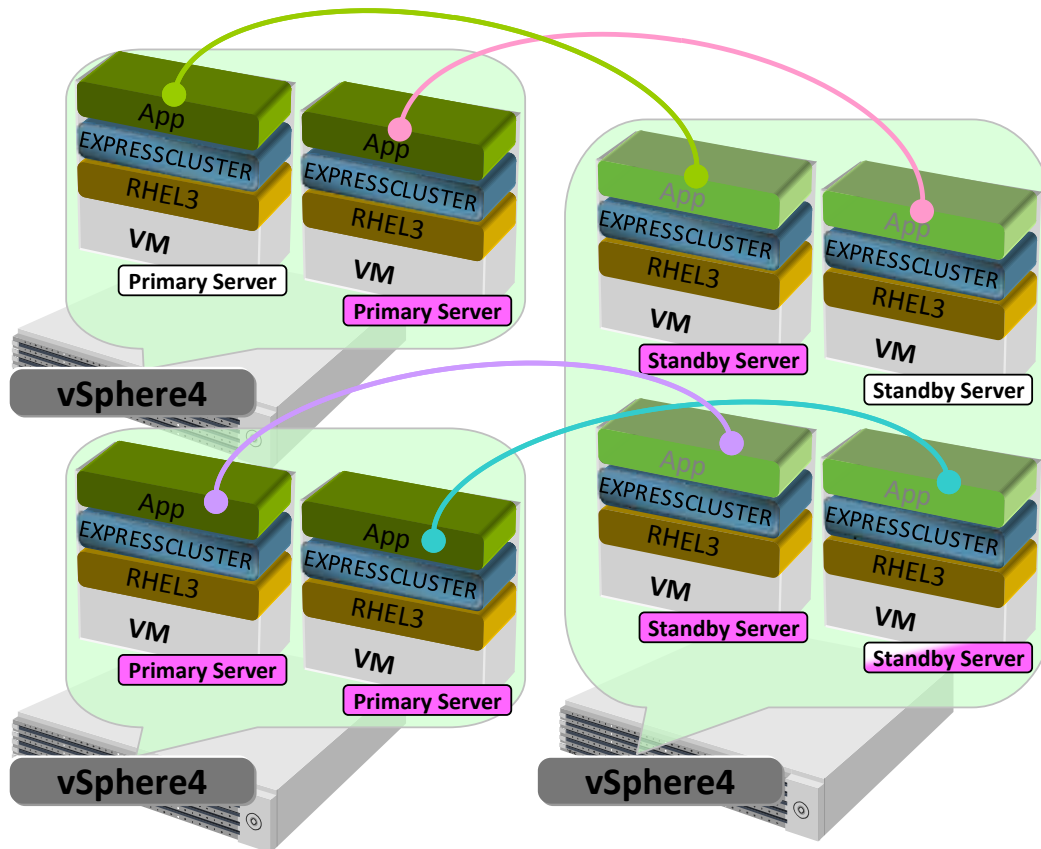
## New Licensing Scheme for VM



\* 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

- ✓ 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)

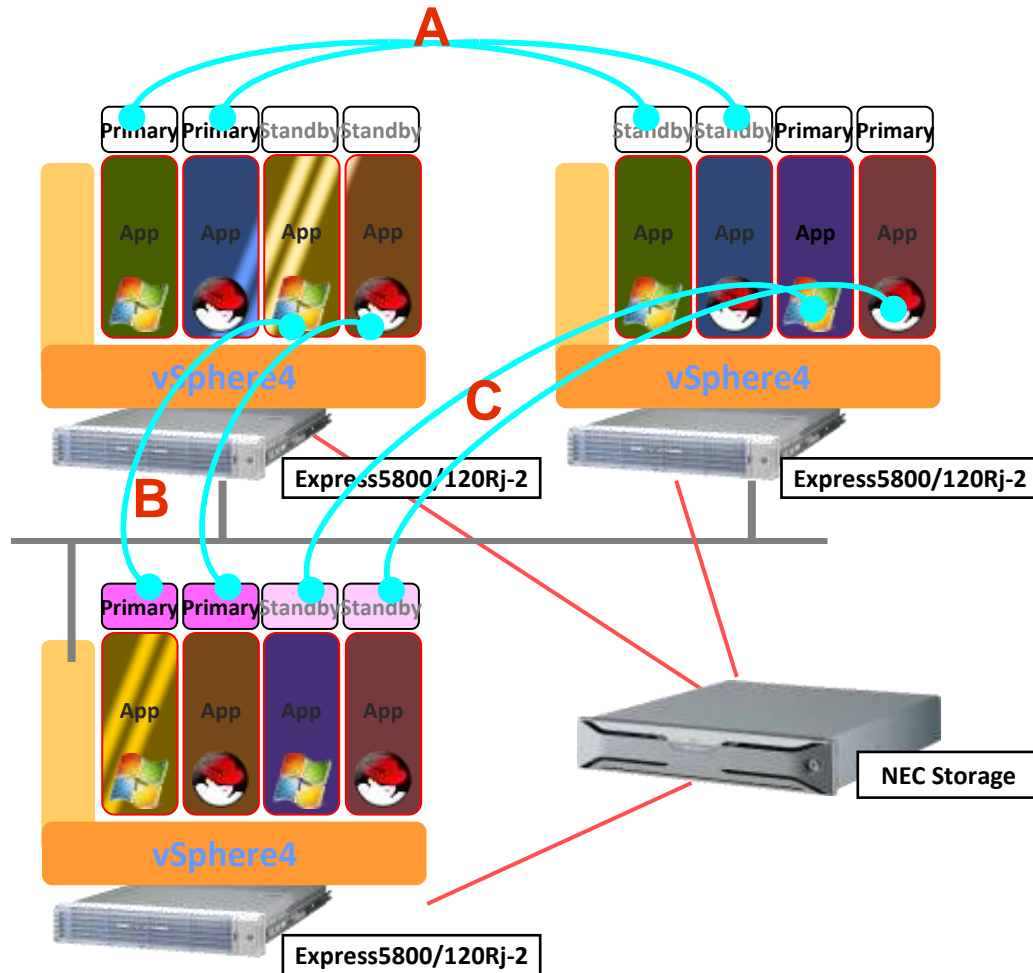


Migration to virtual environment

### 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

- ✓ 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

Empowered by Innovation

**NEC**