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WHITE PAPER

Integrated System Continuity Solutions for Virtual System Consolidation

Introduction

Virtualization and server consolidation address the needs of today's data center environment by taking a large step forward towards a more rational, efficient, and flexible system infrastructure. Virtual system consolidation is especially attractive by using virtualization technology to enable consolidation of multiple virtual systems on to a single physical server to improve overall system flexibility and resource utilization.

However, consolidating multiple virtual systems on to a single physical host server presents a risky situation. In essence, this creates a single point of failure, meaning a potentially disastrous situation could happen if that physical server fails. A single server failure presents far-reaching damages that can bring down many critical applications and data at the same time.
In order to realize the benefits of virtual system consolidation while minimizing risk of business disruption due to system failures, appropriate system continuity solution is essential. In particular, integrated system continuity solution for critical applications and data to enable overall system high availability or disaster recovery is now an essential consideration for any non-trivial virtual system consolidation initiative.

A single physical server failure can literally halt vital business operations in its tracks by losing many virtual systems running critical applications and data at the same time.

Virtualization Risks

Virtual servers have several glaring vulnerabilities, the most significant of which is having a single point of failure. The saying of "putting all of your eggs in one basket" is an apt description; failure of a single virtual server running multiple virtual machines can literally halt a critical business operation in its tracks by losing data, damaging/freezing critical applications, and dropping communications and messages. Such disruptions can quickly ripple through the entire business, causing lost business opportunities, reduced revenue generation, and damage to the company's reputation.

Virtual servers can also adversely affect businesses by increasing an IT department's workload management responsibilities. In addition, virtual servers can experience performance bottlenecks due to limitations of the physical server resources, such as memory and CPU performance. However, these issues pale in comparison to the potentially devastating effects of system level service outages making system continuity an absolutely critical concern.

When considering virtual system continuity solution it is essential to determine whether the solution can adequately detect and recover from the major types of failure that could cause system level service outages:

- Physical host machine failure – whole machine failure such as unexpected system shutdown due to power supply failure.

- Physical host machine component failure – individual component failure such as disk I/O and media failure, memory errors, network I/O failure, or fan failure, that cause degraded system performance or partial machine failure. Typically, component failures are warning signs for impending machine failure.
- Virtual server failure – virtual server software itself could fail due to various causes including design or implementation defects, resource (e.g. memory, disk) exhaustion, and malicious attacks (e.g. virus).
- Virtual machine failure – each virtual server will typically run multiple virtual machines and each virtual machine can crash and fail just like physical machines.
- Virtual machine component failure – each virtual machine contains various virtual components such virtual disks, virtual network interfaces and they can fail and cause system level service outages.
- Application failure – application running in a virtual machine can fail and cause system level service outages.

In general, virtual systems are already relatively complex to properly implement and maintain even without addressing the system continuity issues. So, system continuity solutions that can not detect and recover from all major types of failure in a comprehensive manner will only exacerbate system complexity problems and increase cost of ownership.

ExpressCluster Solutions

System continuity issues for virtual systems continue to be a concern for IT departments around the globe. While there are some solutions on the market, they come with many hindrances, such as operational complexity issues and cost of ownership problems.

In contrast, NEC ExpressCluster™ is especially well suited to address these issues and provide a comprehensive system continuity solution for virtual systems based on popular virtualization servers including VMWare® ESX/Server, and Microsoft® Virtual Server. ExpressCluster is designed to minimize operational complexity in a single streamlined solution.

Furthermore, ExpressCluster also address the system continuity needs of physical systems equally well. Given that most data centers running virtual systems also run many conventional physical systems ExpressCluster can further reduce operational complexity and cost by providing a single unified system continuity solution for virtual and physical systems.

Flexible Configurations

ExpressCluster is easily configured to work with a number of different situations. The following are three examples of how ExpressCluster can be used to provide virtual system continuity solutions:

- **Virtual Server Clustering**
  Virtual server clustering (Figure 1) can be performed with a single ExpressCluster across two virtual servers running on separate physical host machines with shared external storage. ExpressCluster monitors and protects the virtual server as well as each individual virtual machine running on the virtual server. In case of a virtual server or virtual machine failure, ExpressCluster can automatically failover the failed virtual server or virtual machine to the standby machine.

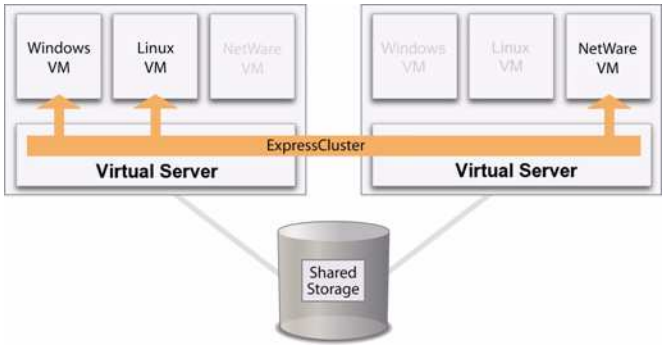

Figure 1: Virtual Server Clustering

- **Virtual Machine Clustering**
  Using ExpressCluster for virtual machine clustering (Figure 2) is similar to virtual server clustering but on a more granular scale. For separate virtual machines (complete with their own guest OS with optional virtual disks that mirror each other), individual ExpressCluster configurations can protect each VM running on the virtual server. In virtual machine clustering configurations, ExpressCluster is able to monitor and detect specific resource (e.g. virtual disk, application) failure within a VM and move the resource to a standby VM.

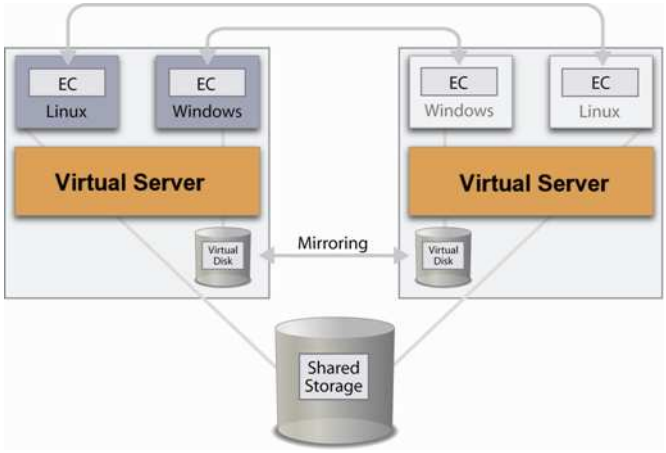

Figure 2: Virtual Machine Clustering

- **Physical and Virtual Machine Clustering**
  ExpressCluster can be used with virtual server to provide cost effective standby server consolidation (Figure 3). Each primary physical server can be clustered with a standby VM through ExpressCluster. This protection prevents the need for a one-to-one physical server ratio when addressing backup concerns. By minimizing the requirements for physical servers, ExpressCluster lowers the cost of ownership for system continuity solutions.

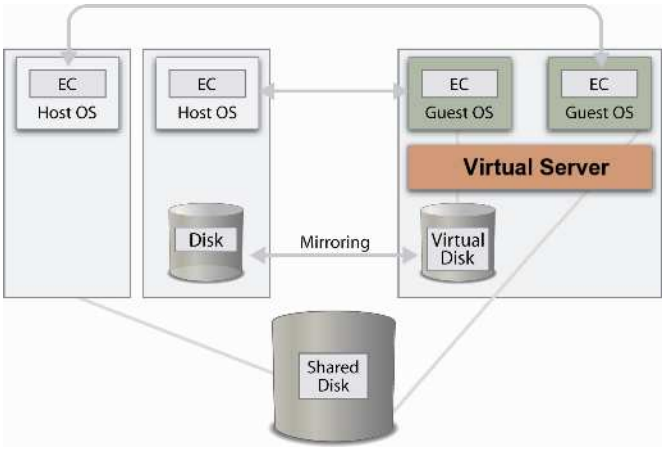

Figure 3: Physical and Virtual Machine Clustering

ExpressCluster is flexible and easy to use so users can mix and match the configurations illustrated in the

examples to meet their specific needs.

ExpressCluster Advantages

Cost-Effective

ExpressCluster delivers lower cost of ownership with its support for less expensive standard editions of popular operating systems and applications. In addition, in virtual server clustering configurations, ExpressCluster is licensed based on the number of populated CPU sockets in a physical server - further reducing the cost of virtual server based system continuity solutions.

For example, a physical server with two populated CPU sockets running a virtual server only requires two ExpressCluster CPU licenses – regardless of the number of virtual machines running on the virtual server. This can be significantly more cost effective than solutions that require license for each virtual machine.

Rich Functionality

ExpressCluster offers rich monitoring and recovery functionality across a variety of primary and standby system resources:

- Operating System
- Disk I/O
- Network Interface
- Applications
- Network Nodes

ExpressCluster offers continuous monitoring to determine each resource's health status. When a problem is detected, ExpressCluster immediately jumps into action with recovery to minimize system service outage.

Smooth Scalability

The speed of modern business produces the need for scalability based on any situation. ExpressCluster offers high cluster scalability that allows for smooth adjustment to optimize resource utilization according to dynamic business needs. Workload migration becomes a fast, simple process through the use of:

- Scale-down procedures that reduce electricity costs and heat output by temporarily powering down unnecessary servers under excess system capacity conditions
- Scale-up procedures designed for workload redistribution to achieve desired system performance levels through new server additions

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