

BENEFIT FROM

VMware® Infrastructure 3 and Stratus® Continuous Availability:

Going Beyond High Availability for
Business-Critical Virtualization



Abstract

The combination of VMware® Infrastructure 3 (VI3) and Stratus® Continuous Availability servers provides the most comprehensive solution for IT infrastructure availability in the industry. VMware VI3, encompassing VMware ESX Server and other components, is the most widely deployed software suite for optimizing and managing industry-standard IT environments through virtualization. Stratus Technologies is the company whose fault-tolerant servers set the standard for uptime.

This paper details how VMware and Stratus together address the full spectrum of planned and unplanned downtime challenges: server hardware failures, operating system failures, server maintenance, operating system maintenance, disaster recovery, support and services. Also presented are scenarios describing how you can use VMware VI3 and Stratus ftServer® systems at your data center and remote sites.

Server Hardware Failure

VMware ESX Server with VMware High Availability (HA), which is now included with the VMware Infrastructure 3 (Standard Edition), can provide automatic restart of virtual machines running on a failed conventional server, but users will be faced with downtime of a few minutes, loss of in-process transactions and loss of in-memory application data as well as application state information.

Stratus ftServer systems eliminate downtime associated with server hardware failures and protect in-process transactions as well as in-memory application data. These Continuous Availability, fault-tolerant servers rely on a fully duplicated hardware architecture with core CPU-memory components that run together in lockstep. The systems automatically detect their own hardware failures and remove a malfunctioning component from service while a partner component continues uninterrupted operation. Proven in the field to deliver 99.999% or better uptime, the ftServer architecture uses Intel® Xeon® processors and industry-standard operating systems.

Operating System Failure

VMware ESX Server provides a highly reliable, small-footprint hypervisor that manages physical x86 hardware and I/O devices. Operating systems, such as Microsoft® Windows®, Linux® and Solaris™, run as guests. Each virtualized guest OS instance typically runs a reduced set of applications compared with a non-virtualized server environment. A reduction in application interaction combined with virtualization of hardware and I/O dramatically reduces the complexity of the guest OS environment, resulting in improved operating system availability. In the event of an unpreventable OS crash, VMware ESX Server allows the associated virtual machine to be restarted quickly for fast recovery.

Stratus Continuous Availability technology adds hardened drivers to ESX Server to further reduce the chances of driver-induced failures. Stratus ftServer systems also recover transparently from hardware component failures and mask these failures from the hypervisor and guest operating systems, eliminating another possible cause of operating system failure.

Application Failure

VMware ESX Server allows applications to run in fully isolated virtual machines. This eliminates application conflicts typical of non-virtualized environments. Such conflicts are one of the leading causes of application failure. This is particularly true of Windows environments, which helps explain the predominance of those environments in the initial move to virtualization. Recovery from unpreventable application failures can be performed rapidly by restarting the

associated virtual machine on the same server or on a different server, which minimizes application downtime.

Stratus ftServer systems further improve application availability by masking all hardware component errors from the application and by eliminating server failures that would otherwise introduce application downtime.

Server Hardware Maintenance

To allow a server to be taken offline for maintenance, VMware ESX Server allows all virtual machines to be moved from a server to other servers within a VMware cluster. VMware VMotion™ can be used to move virtual machines online to eliminate all application downtime. After you complete maintenance on the target server, virtual machines can be moved back to the server to rebalance load within the cluster.

Stratus ftServer systems support online maintenance for most hardware maintenance operations. This capability reduces the operational time associated with offloading and rebalancing virtual machines for servers that must be taken down for maintenance.

Operating System Maintenance

The most common maintenance operation associated with operating systems is the application of minor updates and patches. The introduction of new service packs, major update releases or new operating system versions is less frequent, but can result in more significant interruptions to your IT infrastructure.

VMware ESX Server virtualization significantly reduces downtime and improves the reliability of operating system maintenance by allowing operating system updates, either major or minor, to be implemented and tested in a non-disruptive virtual machine test environment that accurately duplicates the production environment. After changes are implemented and tested, you apply updates to the production environment by stopping production virtual machines and restarting them using the updated virtual machine image. These steps involve only a few minutes of downtime that can be scheduled for off-hours.

Operating system maintenance also includes VMware ESX Server itself. ESX Server maintenance is best handled by migrating all virtual machines from the target physical server to other servers using VMotion, installing updates or new versions on the target server, and then migrating the virtual machines back to the target server — again, using VMotion. This process permits ESX Server maintenance with zero application downtime but does require the extra capacity of at least one additional server.

Application Maintenance

Application maintenance operations range from simple patches all the way to major version upgrades that include database structure changes. The burden of limiting the impact of application upgrades falls on the application developer.

VMware ESX Server does provide some assistance for application upgrades. Similar to operating system upgrades, ESX Server allows upgrades to be installed and tested within a contained virtual machine environment and then moved into production by stopping the old virtual machines and starting the new ones. Any database conversions must be managed separately.

Disaster Recovery

VMware ESX Server virtualization removes the configuration dependencies of servers at the backup site by abstracting the underlying hardware. In a physical environment, servers at the production and backup sites must be identically configured to eliminate unnecessary time and complexity in the failover process.

In a virtualized environment, a single set of equipment can even be used to provide backup for applications running at multiple production sites. Benefits include significant equipment savings and reduced maintenance costs. Production virtual machine definitions can be moved to a backup site and used with only minor edits — primarily the assignment of different IP addresses. Disaster recovery testing is also simpler because of the ease of configuring the virtual environment, and the flexibility of using far less hardware in a test environment.

Customer Support

One-stop support for VMware environments continues the Stratus tradition of 24/7, worldwide support for critical applications in the world's largest global corporations. A comprehensive support offering will cover the Stratus hardware and software, VMware ESX Server and both Windows and Red Hat® Enterprise Linux guest operating systems. You can turn to a single, trusted vendor to support your entire critical virtualization infrastructure. Custom support will be available for other operating systems. You have the option of getting guest OS support directly from the OS supplier or from another supplier.

These support services will make use of the Stratus ActiveService™ network for proactive, remotely enabled event resolution:

- The VMware ESX Server Subscription Service will include the unique capability of root-cause analysis for any problems associated with ESX Server.
- Virtual Machine Root Cause (vmRC) Support will add the unique capability of root-cause analysis for Windows or Red Hat Linux guest operating systems purchased directly from Stratus.

Figure 1: VMware VI3 + Stratus Continuous Availability

Availability Challenge	VMware VI3	Stratus ftServer Systems
Server failure	<ul style="list-style-type: none"> • Failure detection and virtual machine restart with VMware HA 	<ul style="list-style-type: none"> • Prevent server failure; no application downtime or loss of transactions or data • Server consolidation with virtualization increases the workload on each server making server hardware failure more costly
Operating system failure	<ul style="list-style-type: none"> • VMware reliable hypervisor • Failure detection and virtual machine restart with VMware HA 	<ul style="list-style-type: none"> • Stratus hardened drivers • Mask and ride through all hardware errors
Application failure	<ul style="list-style-type: none"> • Isolate applications in virtual machines, eliminating application conflicts • Restart application within virtual machine on same or different server 	<ul style="list-style-type: none"> • Mask and ride through all hardware errors • Eliminate application downtime caused by server failure
Server maintenance	<ul style="list-style-type: none"> • vMotion online migration frees server for maintenance with zero application downtime 	<ul style="list-style-type: none"> • Online hardware maintenance
Operating system maintenance	<ul style="list-style-type: none"> • Install and test changes in new virtual machine then migrate to new virtual machine during off-hours 	
Application maintenance	<ul style="list-style-type: none"> • Install and test changes in new virtual machine then migrate to new virtual machine during off-hours 	
Disaster recovery	<ul style="list-style-type: none"> • Removes physical configuration dependencies of remote site equipment • Allows production virtual machine definitions to be used with only minor edits at the backup site 	
Support		<ul style="list-style-type: none"> • Single-vendor support covers hardware, ESX Server and guest OS, including ability to root-cause problems in any area
Virtualization Services		<ul style="list-style-type: none"> • Set of virtualization services include VMware installation, virtualization assessment, design, implementation and migration

Professional Services

In addition, Stratus Professional Services will be offered to get your virtualization effort up and running quickly, and to support your uptime requirements throughout the lifecycle of your solution. Planned services for ESX Server, virtualization design and virtualization deployment include:

- VMware Jumpstart installation service
- Virtualization Assessment
- Virtualization Design and Implementation
- Physical to Virtual Server Migration

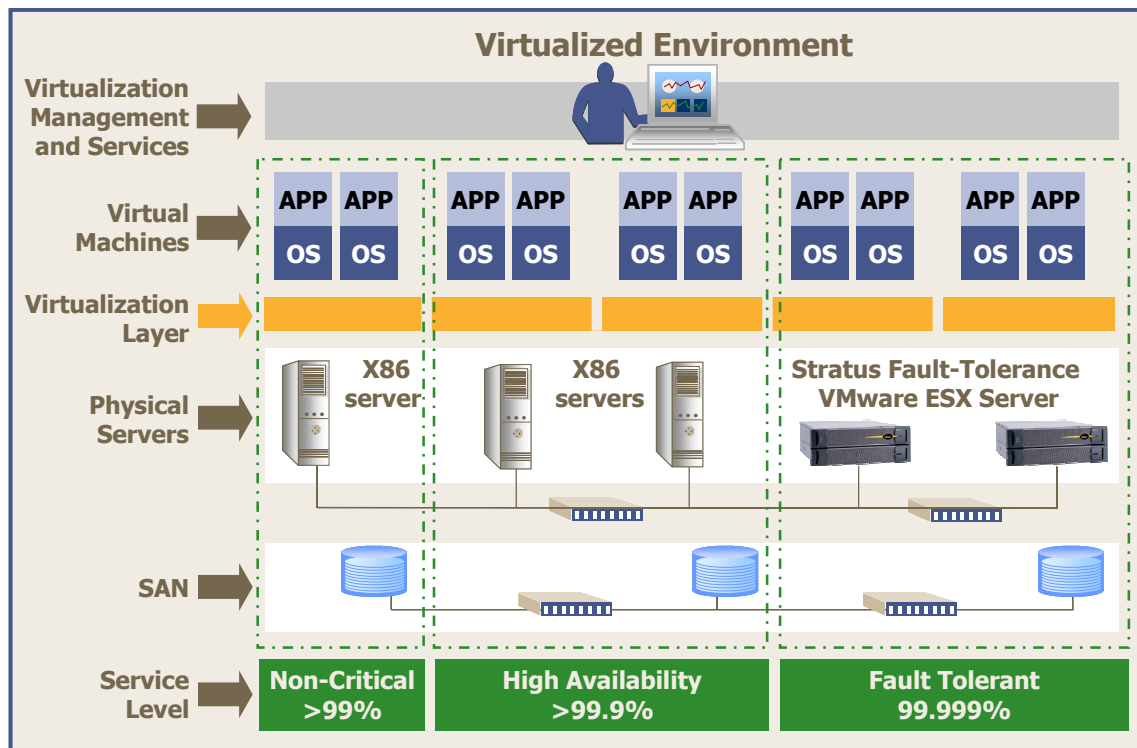
Usage Scenarios: Data Center and Remote Site

Given its high concentration of servers, applications and IT expertise, the data center is prime territory for virtualization. However, remote and distributed sites often have demanding availability requirements that VMware and Stratus address while reducing the complexity otherwise involved in assuring uptime.

Stratus Continuous Availability in a Data Center Environment

Stratus' Intel-architecture servers integrate seamlessly with existing VMware infrastructures, making it easy to add continuously available Stratus servers for selected applications that need higher levels of uptime. Typically, that existing infrastructure is characterized by many servers in a VMware cluster sharing a storage area network (SAN). Conventional servers may be configured for applications requiring high availability and Stratus fitServer systems for applications requiring continuous availability.

Figure 2: Stratus Continuous Availability in a Mixed Data Center Environment



ESX Server virtual machines will run identically on Stratus and non-Stratus server hardware. VMware HA, VMware Distributed Resource Scheduler (DRS) and VMotion will likewise work between Stratus and non-Stratus servers.

Incorporating Stratus Continuous Availability positions you to support tiered levels of service, with the agility to upgrade virtual machines to a higher level of availability on demand.

Stratus Continuous Availability in a Remote Site

Stratus and VMware can provide extremely high levels of availability for smaller remote sites while eliminating the complexity of a SAN. Options are:

- A single-system option offers a single fault-tolerant Stratus server running VMware ESX Server. This configuration provides protection for all classes of hardware and software failure, but will require downtime for ESX Server upgrades. The benefits of VMware HA, DRS and VMotion are not available in this configuration. This configuration requires ftScalable™ storage in the first release of ESX Server on ftServer systems, but will be able to use internal storage in a future release.
- A dual-system option includes ftScalable storage, a direct-attach shared-storage subsystem available from Stratus. This switchless SAN configuration adds the capabilities of VMware HA, VMware DRS and VMotion without the added complexity of a switched fabric SAN.

Access to Additional Operating Systems

Technically, Stratus' support of ESX Server will allow any ESX-supported guest operating system to run successfully on Stratus servers. The issue in offering additional guest operating systems is simply one of support. The current plan is to offer full support for Windows and Red Hat® Enterprise Linux® operating systems — the guest operating systems that Stratus sells and supports today — while offering custom support for the others. You always have the choice of getting guest OS support directly from the OS provider or other supplier.

Conclusion

The combination of VMware VI3 and Stratus Continuous Availability ftServer systems provides the most reliable base on the market for your most important business applications. VMware and Stratus together address the complete scope of planned and unplanned downtime challenges.

What's more, because Stratus' Intel-architecture servers integrate seamlessly with existing VMware infrastructures, it is simple to add continuously available ftServer systems both at the data center and remote sites. This groundbreaking virtualization solution offers the powerful, industry-leading tools of VI3 at availability levels surpassing those previously available only on mainframe-class virtualization solutions, but on industry-standard hardware at far below mainframe costs.

About Stratus Technologies

Stratus Technologies is a global solutions provider focused exclusively on helping its customers achieve and sustain the availability of information systems that support their critical business processes. Based upon its 27 years of expertise in server and services technology for continuous availability, Stratus is a trusted solutions provider to customers in manufacturing, life sciences, telecommunications, financial services, public safety, transportation & logistics and other industries. **For more information, visit www.stratus.com.**

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