Wonderware System Platform 2012

Superior Agility with VMware vSphere 5

June 2012

Deployment and Technical Considerations Guide

vmware®

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Introduction

Virtualization is rapidly transforming the IT landscape and fundamentally changing the way people consume computer resources. Powerful x86 servers were originally designed to run only one dedicated Operating System [OS] resulting in a tight coupling between operating systems and hardware. Virtualization breaks this bond between the OS and hardware by making it possible to run multiple Operating Systems and their respective applications on the same physical server simultaneously and in fully independent instances (Virtual Machines). This immediately increases the utilization and flexibility of hardware investments.

After being virtualized in a vSphere virtual machine, the operating system and applications are no longer constrained by the limits imposed by residing on a single physical machine – the operating system has been decoupled from the hardware. The transformation is global with the virtual equivalents of physical elements such as switches and storage operating within the vSphere virtual infrastructure that efficiently span the enterprise.

This document provides direction to those interested in running Invensys Wonderware System Platform 2012 on VMware® vSphere™ 5.0. It provides basic information on the architecture of System Platform 2012 deployment, draws comparisons between Wonderware on physical and virtual deployments as well as the value of utilizing the VMware platform.

Executive Summary

VMware provides a robust, production-proven, high performance virtualization layer that abstracts server hardware resources and allows their sharing by multiple virtual machines. Unique memory management including memory compression and advanced scheduling capabilities of the vSphere host allow for the highest consolidation ratios and the best application performance, in many cases, even better than physical servers.

VMware vSphere virtualizes and aggregates the underlying physical hardware resources across multiple systems and provides pools of virtual resources to the datacenter.

Deploying Invensys Wonderware on VMware vSphere 5 delivers many immediate wins

- Reducing hardware footprint through server consolidation
- Elimination of planned downtime
- Reduction of unplanned downtime
- Increased lifecycle and longevity

In addition, virtualizing on vSphere enables your workloads to take advantage of advanced vSphere features such as High Availability [HA], Distributed Resource Scheduler [DRS], and Fault Tolerance [FT] without any modifications or changes to the operating system.

This paper is written as an overview for experienced Invensys Wonderware customers who are looking for ways to reduce TCO, maximize ROI and eliminate the complexities and overhead of deploying Wonderware on physical servers. This paper assumes that the reader has an advanced knowledge of the Invensys Wonderware suite as well as a general understanding of virtualization concepts.

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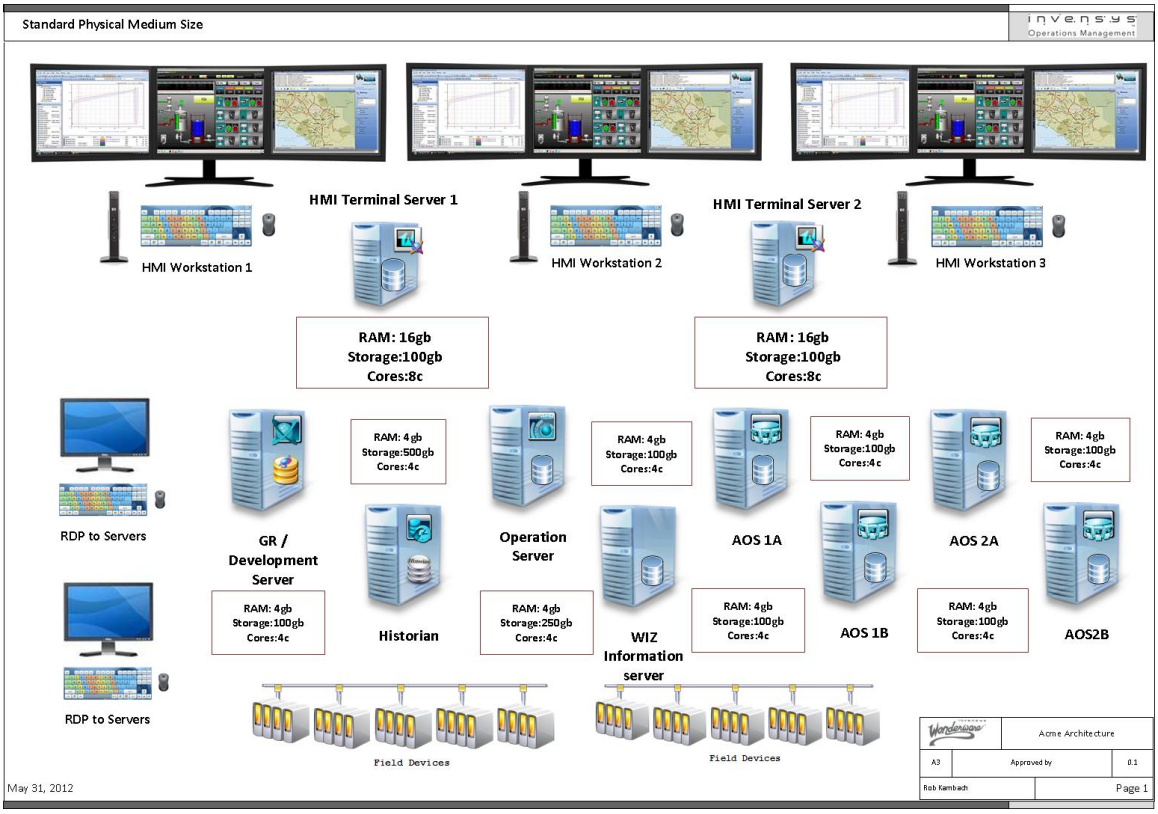
VMware and Invensys – An Overview

Invensys Wonderware System Platform 2012 – Software Solutions for Real-Time Success

Wonderware is the market leader in real-time operations management software. Wonderware software delivers significant cost reductions associated with designing, building, deploying, and maintaining secure and standardized applications for manufacturing and infrastructure operations. Invensys' solutions enable companies to synchronize their production and industrial operations with business objectives, obtaining the speed and flexibility to attain sustained profitability.

Figure 1: Typical medium-scale Wonderware deployment



VMware vSphere

VMware's leading virtualization solutions provide multiple benefits to IT administrators and users. Virtualization refers to the abstraction of compute resources from the underlying hardware. A layer of virtualization software called the hypervisor is added between the hardware and operating system on a physical server. This virtualization layer allows multiple operating system instances to run concurrently within virtual machines on a *single computer*. It dynamically partitions and shares the available physical resources such as CPU, storage, memory, and I/O devices among multiple virtual machines.

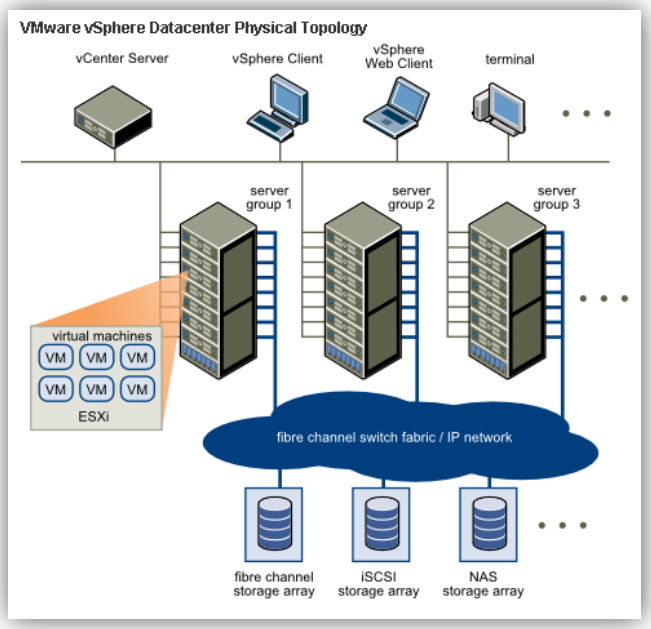
The VMware hypervisor enables the operating system within the virtual machine, called the guest operating system, to run unmodified and to behave as if it is running on physical hardware.

A summary of the value of this abstraction layer includes the following:

- **Consolidation**: VMware technology allows multiple application servers to be consolidated onto one physical server, with little or no decrease in overall performance.
- **Ease of Provisioning:** VMware virtualization encapsulates an application into an image that can be duplicated or moved, greatly reducing the cost of application provisioning and deployment.
- **Manageability:** Virtual machines may be moved from server to server with no downtime using VMware vMotion™, which simplifies common operations like hardware maintenance and reduces planned downtime.
- **Availability:** Unplanned downtime can be reduced and higher service levels can be provided to an application. VMware High Availability (HA) ensures that in the case of an unplanned hardware failure, any affected virtual machines are restarted on another host in a VMware cluster.

A typical VMware vSphere deployment with each of its key components is shown in the figure below.

Figure 2: High level example of a VMware vSphere Virtual Infrastructure deployment



Architecting vSphere for Wonderware System Platform 2012

Building a vSphere environment

As a typical Invensys customer, Acme Corp. begins to consider the business case for migrating Wonderware System Platform 2012. Acme decides to build an off-process test environment with VMware vSphere 5 that can be used by various groups within the organization to evaluate System Platform 2012 and determine benefits of the potential migration.

VMware components and Hardware

To create the test environment with minimal effort and expense, Acme Corp deploys the following hardware and software components:

- VMware vSphere 5.0 Update 1
- VMware vCenter Server
- VMware vSphere Storage Appliance*
- 2 HP ProLiant DL 380 G7 servers**
    - Intel Xeon 56xx Series processors
    - 12 Processors [2 Sockets with 6 Cores per socket]
    - 192 GB RAM

The HP servers are deployed in a vSphere VSA Cluster with the VMware vSphere Storage Appliance shared storage solution. The vSphere VSA Cluster aggregates compute resources from both servers into pools of CPU, RAM, and storage capacity providing a set of compute and datastore pools that are accessible by all hosts within the datacenter. This creates a redundant shared storage solution without the need for a costly dedicated SAN\NAS*** device.

*The choice of vSphere storage is dependent upon numerous factors including budget, performance, growth forecasts, etc., and are outside the scope of this paper. Please see the VMware publication vSphere Storage for guidance on the various storage approaches for a vSphere deployment.

**The servers are selected from VMware's Hardware Compatibility List, which lists all supported servers, peripherals, storages arrays, and more.

***vSphere supports a number of other shared storage solutions and protocols such as Network Attached Storage [NAS] or a dedicated Storage Area Network [SAN].

Although shared storage is not required to deploy vSphere, advanced features such as vMotion, HA, DRS, and FT require a shared storage infrastructure.

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VMware Licensing

The VMware Licensing requirements to deploy this vSphere infrastructure:

- VMware vCenter Standard 5.0
  - 1 instance
- VMware vSphere Enterprise 5.0
  - 12 CPUs
- VMware vSphere Storage Appliance
  - 1 Instance

Please see Comparing vSphere 5 Editions for more details.

Wonderware System Platform 2012 components

The following Wonderware components will be deployed in virtual machines running Windows 2008 R2 or Windows 7 as prescribed by Wonderware best practices and related documentation.

1. IAS 2012 [3.5]
2. InTouch 2012 [10.1 in version 2.0]
3. Wonderware Historian 2012 [10.0]
4. Wonderware Operations and Performance 4.0
   a. SP1 or Later

Required Microsoft Operating Systems

1. Server Requirements
   a. Windows 2008 R2*
2. Client Requirements
   a. RDP sessions from Terminal Services, Thin Clients*

*Refer to the Wonderware Compatibility Matrix for additional supported OSes.

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Figure 3: Virtualizing the Computer – Physical against Virtual

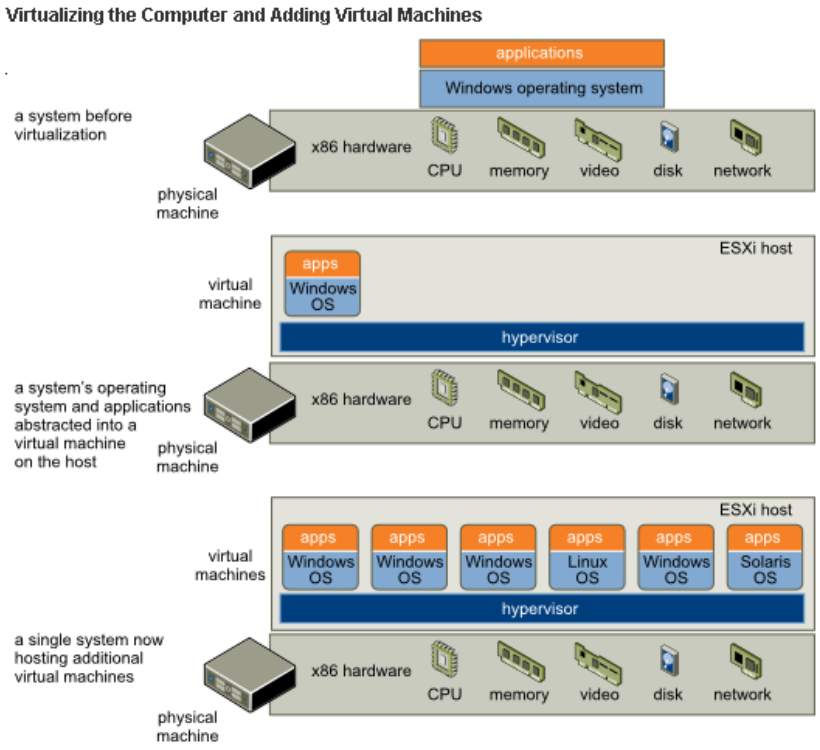
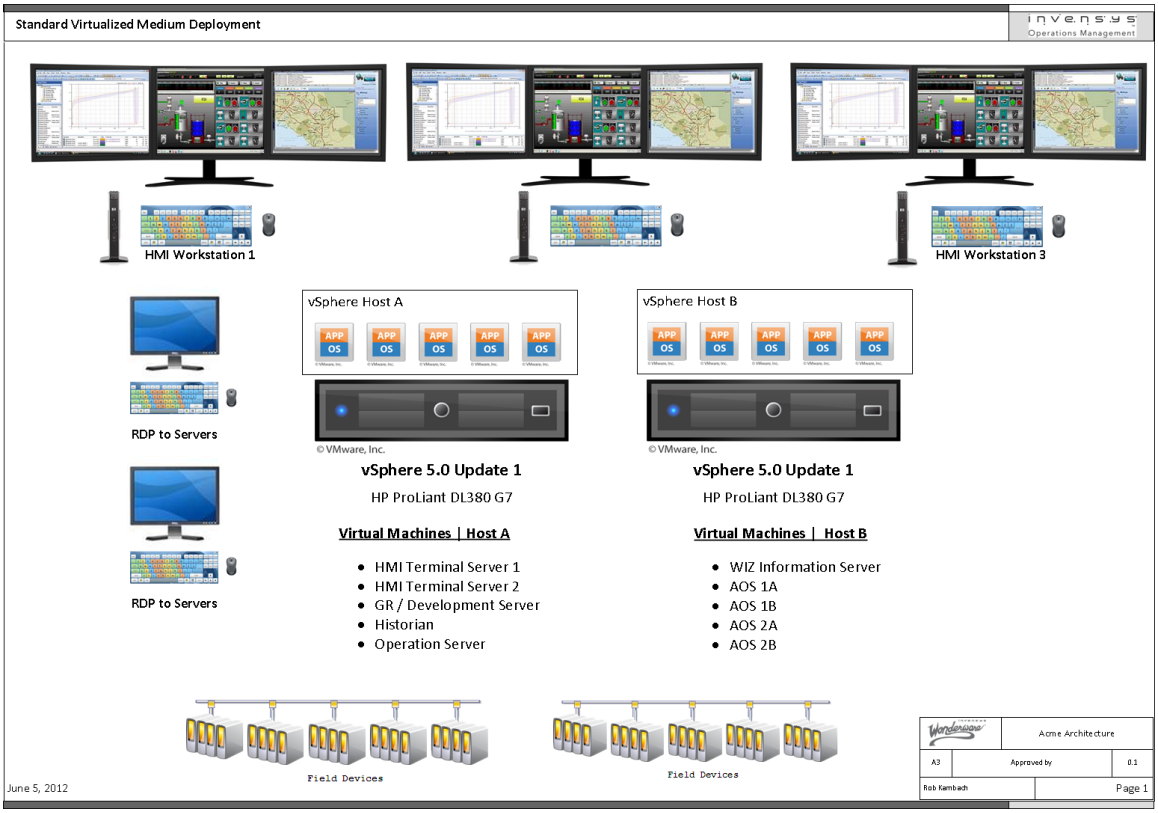


Table 1: Wonderware Deployment comparison – Physical against Virtual

Invensys Component	**Physical**	**Virtual**
HMI Terminal Server 1	Dedicated Physical Host	vSphere Cluster 1
HMI Terminal Server 2	Dedicated Physical Host	vSphere Cluster 1
GR / Development Server	Dedicated Physical Host	vSphere Cluster 1
Historian	Dedicated Physical Host	vSphere Cluster 1
Operation Server	Dedicated Physical Host	vSphere Cluster 1
WIZ Information Server	Dedicated Physical Host	vSphere Cluster 1
AOS 1A	Dedicated Physical Host	vSphere Cluster 1
AOS 1B	Dedicated Physical Host	vSphere Cluster 1
AOS 2A	Dedicated Physical Host	vSphere Cluster 1
AOS 2B	Dedicated Physical Host	vSphere Cluster 1
Total Physical Hosts:	**10 Hosts**	**1 vSphere VSA Cluster [2 Hosts]**

Figure 4: Wonderware Deployment Virtualized



With this vSphere virtual platform, Acme has quickly and efficiently built a complete virtualized test environment, collapsing what would normally be deployed on 10 physical servers into a fully managed vSphere VSA Cluster of 2 Hosts. This new vSphere VSA Cluster provides all compute resources required to run the 10 Wonderware Servers as VMware Virtual Machines.

Benefits of Virtualizing Wonderware

Simple and Effective Production, Test, and Development

Virtualizing Wonderware with vSphere 5 provides a solid and robust foundation which yields immediate benefits for Wonderware in:

- Virtual Machines | extended lifecycle
- Simple and effective evaluation, test, and development
- Simple and reliable business continuity and disaster recovery
- Higher availability with less complexity
- VMware vMotion for unprecedented control of Wonderware servers
- Rapid provision with VMware templates
- Simplified IT operations

VMware Infrastructure allows organizations to build a logical architecture that exactly mimics their own production environment, but requires a fraction of the hardware. The flexibility that virtualization provides allows organizations to use a more realistic, less error prone testing process in developing and testing their infrastructure design. VMware Infrastructure helps IT staff avoid the lengthy re-configuration tasks required in a physical server-based test lab. Post-rollout, a VMware Infrastructure test lab provides an easy and affordable way to maintain a completely isolated test and development configuration that mirrors the production environment. This can yield valuable long-term benefits for continual testing, troubleshooting, training, and maintenance of Invensys Wonderware.

Virtual Machines | Extended Lifecycle

Many businesses require running their applications and operating systems for as long as possible without making any changes to them. Most organizations replace hardware every 3 to 5 years and are oftentimes forced to follow the hardware vendor's schedule. New hardware may require upgrades to operating systems yet newer operating systems may not be able to run older applications.

VMware vSphere virtual machines provide an abstraction called virtual hardware that isolates operating systems from changes in physical hardware. Virtual hardware is typically supported for 9 years or more. Running older applications and operating systems in virtual machines allows such applications to be used without changes for longer than they might be on physical hardware. Running applications in virtual machines also reduces the cost of retesting applications each time the physical hardware is changed.

In order to make the concept of virtual hardware work, VMware has created virtual devices that emulate a chipset, BIOS, memory, network adapter, storage adapter, and other devices. These virtual devices are implemented in software and function in exactly the same way as their physical counterparts—for example, the behavior of the virtual Intel network adapter is identical to that of the equivalent physical Intel network adapter. The guest operating system interacts with the hypervisor's abstraction layer of virtual hardware and not the physical hardware.

A virtual machine has an associated version number that corresponds to the version of virtual hardware it is running. The virtual hardware version, in turn, refers to the set of virtual hardware capabilities available in a given VMware ESX release. For example the virtual hardware version in vSphere 5, virtual hardware version 8, supports 32-way virtual CPUs, while the virtual hardware version in vSphere 4.0, virtual hardware version 4, supports 8-way virtual CPUs.

Installing an application in a VMware virtual machine with a specific virtual hardware version allows that application to be used, without change, for the entire supported duration of the virtual hardware version. When a physical hardware server is changed or upgraded, there is no impact to the application or to the guest operating system as long as it is running on the same virtual hardware. The supported duration of each virtual machine version is typically quite long. Each virtual hardware version is supported on at least three major versions of ESX. For example, VMware virtual hardware version 8 has a supported duration of more than 10 years. During this period, users can upgrade the virtual machine's underlying hardware and vSphere versions with no impact to the application running in the virtual machine.

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The table in Figure 3 below, "Duration of VMware Virtual Hardware Support" highlights information on ESX virtual hardware versions and VMware support policy regarding each virtual hardware version.

Table 2: Duration of VMware Virtual Hardware Support

Virtual Hardware Version	First vSphere version to support virtual hardware version		Last vSphere version to support virtual hardware version		
	vSphere Version	**Release Date**	**VSphere Version**	**End of Support***	**End of Technical Guidance**
4	ESX Server 3.x	2007/DEC/10	ESXi 5.0	2010/MAY/21	2015/MAY/21
7	ESX\ESXi 4.x	2009/MAY/21	ESXi 5.0	2014/MAY/21	2016/MAY/21
8	ESXi 5.0	2011/AUG/24	ESXi 5.0	2016/AUG/24	2018/AUG/24

*End of general support, or combination of general plus extended support, depending on life cycle policies for last ESX release that supports a given virtual hardware version.

Simple and Effective Evaluation, Test and Development

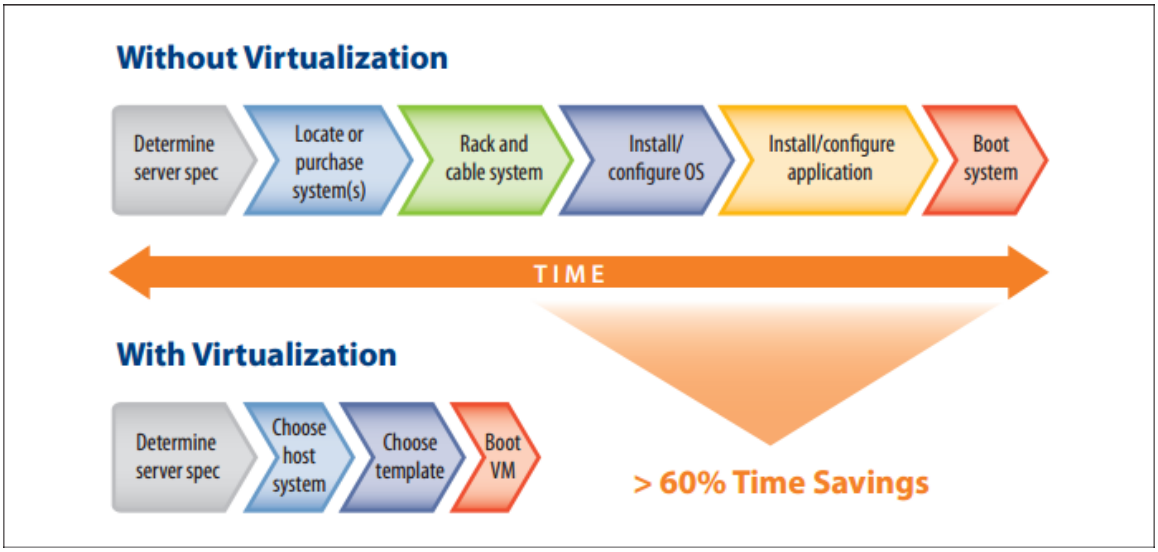
VMware virtualization is a proven way to begin evaluating Wonderware with minimal hardware commitment and maximum flexibility. With today's powerful multi-core 64-bit servers, it is possible to configure dozens of independent virtual machines on a single ESX server. Entire Invensys Wonderware deployments including GAF and ERP Integration server environments deployed as virtual machines can be staged on a relatively small number of physical servers. This immediately creates a fully operational Wonderware deployment which enables the testing of new Wonderware features, upgrade scenarios, as well as train users and IT staff.

In addition, the time taken to procure servers in a virtualized environment is drastically reduced when compared to physical server procurement. The ability to immediately "spin-up" new servers as business demands require enables organizations to become much more agile and flexible (see Figure 6).

Flexibility is a primary trait of virtual machines transforming the testing of virtual machines on different hardware or storage platforms into a simple task of copying a few files. Testing varying memory or processor configurations merely requires a reboot of the virtual machine, and testing patches and service packs can be controlled with VMware virtual machine snapshots and rollback capabilities.

After the evaluation process is complete and Wonderware has been deployed to production, virtual machines also make it possible to maintain a complete and affordable replica of the production Wonderware environment running in parallel with the production systems. This off-process environment drastically reduces the costs and manpower required to maintain a Wonderware lab environment. An environment which mirrors a production deployment is highly valuable for training, testing patches, and new service packs before they are rolled out into production. Additionally, training new IT staff on Wonderware operations or testing new configurations can be done without impact to the production environment.

Figure 5: Virtualization accelerates the server provisioning process by as much as 60%



Example:

As a typical Invensys customer, Acme Corp. begins to consider the business case for migrating to Wonderware System Platform 2012. Acme decides to build an off-process test environment that can be used by various groups within the organization to evaluate System Platform 2012 and determine benefits of the potential migration. With this simple test platform, Acme Corp. is able to build a test environment that exactly models their proposed production environment allowing them to adjust the environment as constraints are identified. They experiment with various virtual network topologies and components and adjust their configurations quickly and efficiently. Acme also simulates loads against various numbers of test users to understand the performance dynamics of their design in a fully isolated environment. With VMware Converter, they are also able to convert existing physical Wonderware servers into virtual machines, allowing Acme IT Teams to test various migration scenarios in an isolated test environment.

Simple and Reliable Business Continuity and Disaster Recovery

VMware vSphere 5 simplifies Wonderware business continuity [BC] and disaster recovery (DR) by reducing hardware compatibility constraints and, through consolidation, the number of servers required at the DR site. Hardware independence allows the Wonderware virtual machines to restart on any supported ESX server, and Wonderware server management is simplified, using virtual machine encapsulation.

An important benefit of virtualization is abstraction of the operating system and application from the underlying physical server hardware. This is extremely useful in disaster recovery scenarios, because it eliminates the traditional requirement of physical server-based disaster recovery to provide identical hardware at the DR site. Any virtual machine can be brought online on any supported ESX server without worrying about hardware or software compatibility. The ability to run multiple virtual machines on a single server also reduces the costs of a DR solution through consolidation of Wonderware components and services on fewer physical servers than would normally be required. Thus, having all the necessary Wonderware components running in virtual machines at a DR site can be with minimal hardware and can help speed recovery in a disaster situation.

Regardless of the make and model of the physical server hosting the virtual machines in production, virtual machines can be brought online on any VMware-supported vSphere Host at the DR site. In addition, older servers freed up from other VMware Infrastructure consolidation projects are commonly re-purposed to host a DR site, minimizing the overall lifecycle costs of hardware.

Finally, virtual machine encapsulation means that an entire Wonderware deployment can be contained in a small set of files which simplifies replication to DR sites. Moving an entire virtual machine can be accomplished with a simple file copy.

Example:

Acme Corp. adopts more stringent disaster recovery requirements as part of their Wonderware virtualization initiative. Their new objectives state that they will restore their Wonderware system to full functionality in less than 24 hours of a total loss to their primary datacenter. Designing the Wonderware environment to meet this requirement is critical to the success of this project.

Acme Corp. has decided to deploy VMware Site Recover Manager [SRM] in order to fully automate the failover\failback process. Acme Corp. has contracted to lease an R2 disaster recovery site approximately 500 miles from its primary R1 datacenter. VMware vSphere Hosts, VMware vCenter Management Server and Site Recovery Manager instances have been deployed at both R1 and R2 facilities. Leveraging the vCenter SRM management interface, Acme deploys vSphere Replication [vR], a direct Host-to-Host replication infrastructure built into the underlying vSphere Hosts and supporting flexible RPOs of 15 minutes to 24hours. By leveraging SRM, Acme Corp. has eliminated the requirement of having identical storage arrays across sites. Because vSphere Replication does not require a SAN the solution can be deployed much more easily, quickly and cost-effectively.

Acme Corp's administrators use the vCenter Management console to create and manage recovery plans, discover and display virtual machines protected by SRM, specify virtual machine recover boot sequences, and customize the IP address changes of SRM-protected virtual machines.

By automating the entire failover\failback process from R1 to R2, Acme has removed a tedious and error-prone task ensuring that critical process solutions are able to withstand disasters.

Higher Availability | Less Complexity

The VMware vSphere platform can be leveraged to provide a wide-range of availability options. VMware High Availability [HA] provides protection from server hardware failure that is *independent* of the operating system or applications and works for every virtual machine running on VMware vSphere. To aid in dynamic load balancing of Wonderware virtual machines, VMware DRS can be used to balance workloads automatically. Solutions built on VMware HA and DRS can be deployed with minimal configuration changes and provide a robust availability solution. These solutions can also be enhanced to provide higher levels of availability by combining them with more traditional clustering and replication options.

By leveraging the inherent benefits of a virtualization-based platform, a Wonderware deployment using VMware vSphere offers a variety of availability options. Each of these options provides different levels of both protection and cost, capable of meeting the unique high availability requirements of any Wonderware environment. The VMware vSphere platform leverages two powerful features as the basis for building high availability solutions:

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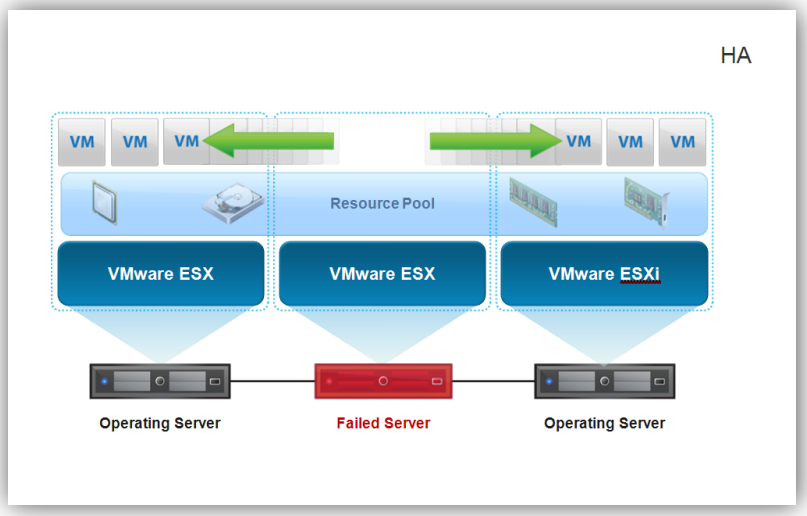
VMware High-Availability (HA)

VMware HA provides a simple, low-cost protection for every virtual machine by guarding them against physical host failure. In the event of server hardware outage, VMware HA will automatically restart all virtual machines on another VMware vSphere Host (see figure 6), minimizing disruption to the Wonderware environment. VMware HA is simple to set up and protects every virtual machine without any modifications to the virtual machine's operating system.

Example:

One of the 2 vSphere Hosts has experienced an outage due to a faulty memory region in RAM. The Host has crashed taking down all Virtual Machines with it. VMware High Availability is immediately aware of the fact that this host is no longer online due to the loss of a heartbeat pulse. The HA engine immediately restarts the affected Virtual Machines which we running on the failed server. After a few moments of downtime, all the effected Virtual Machines have been restarted on the remaining Host, fully available and online.

Figure 6: VMware High Availability



VMware vSphere Dynamic Resource Scheduler

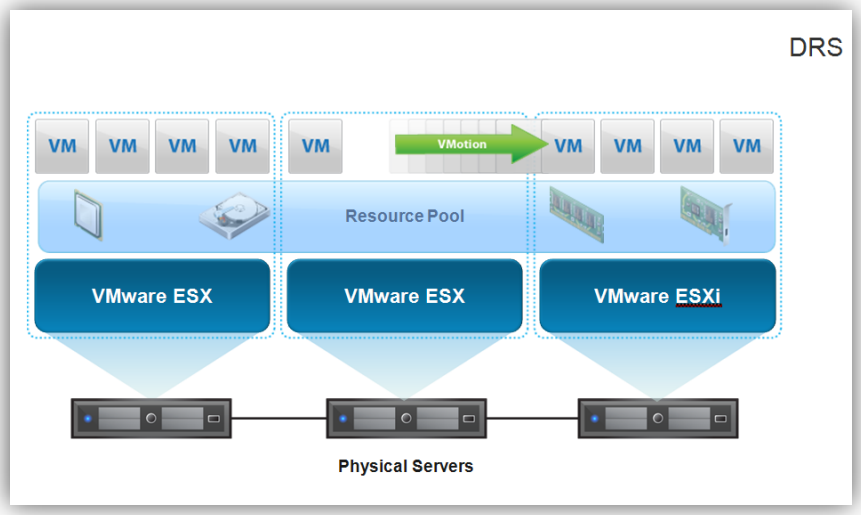
With VMware DRS, virtual machines are dynamically load balanced across an entire pool of server resources. The DRS engine collects resource usage information for all hosts and virtual machines and generates recommendations for virtual machine placement. These recommendations can be applied manually or automatically. DRS can dynamically load balance all virtual machines in the environment by shifting workloads across the entire pool of ESX servers (see Figure 7). This ensures that critical Wonderware virtual machines in the environment will always have the CPU and RAM resources they need to maintain optimal performance.

Solutions built using VMware HA and VMware DRS provide out-of-the-box high availability for the entire Wonderware environment without requiring any Microsoft or other third-party clustering software. For Wonderware environments deployed with VMware vSphere, the VMware HA and DRS solution provides a new alternative that leverages the simplicity of standalone virtual machines while providing complete server hardware redundancy for every virtual machine. VMware HA is focused on hardware failure, not on operating system or software failure.

Example:

Acme Corp. begins load testing their Wonderware Virtual Machines through intensive simulations. Distributed Resource Scheduler is constantly monitoring the Virtual Machines, the underlying vSphere Hosts, and the rate at which the various compute resources are being consumed. DRS detects that certain virtual machines are consuming much more compute resources than others. Based on this information, DRS, using vMotion technology, intelligently redistributes both the heavy-load Virtual Machine and the more idle Virtual Machines across the vSphere Hosts. By moving more idle Virtual Machines away from the heavy-load Virtual Machines, DRS ensures that all compute resources are ready and available during this time of peak usage. Once the load simulations are completed, DRS will automatically detect the reduced load and evenly redistribute the Virtual Machines back across the Cluster.

Figure 7: vSphere Distributed Resource Scheduler



VMware vSphere Fault Tolerance

vSphere Fault Tolerance (FT) provides continuous availability for applications in the event of server failures, by creating a live shadow instance of a virtual machine that is in virtual lockstep with the primary instance (see Figure 8). By allowing instantaneous failover between the two instances in the event of hardware failure, FT eliminates even the smallest chance of data loss or disruption.

FT can be easily turned on or off for individual virtual machines. Since it leverages existing vSphere HA clusters, any number of virtual machines in this cluster can be protected with FT. Applications that require continuous protection during certain critical periods of time, such as quarter end processing, can utilize FT for higher assurance of availability during those time periods.

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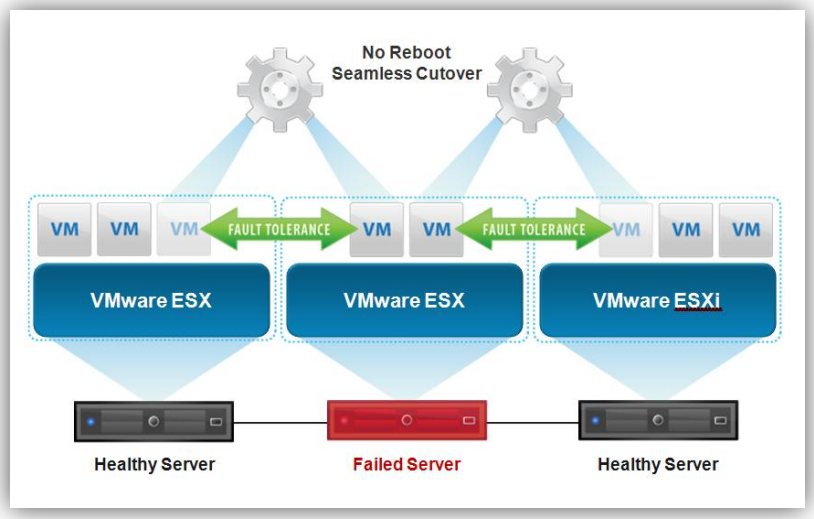
Example:

Acme Corp has decided that the Wonderware Historian Virtual Machine is of critical importance due to industry compliance among other reasons. Acme enables Fault Tolerance [FT] on the Historian Virtual Machine and with a few simple steps in the Virtual Center administrative interface, the Historian VM is now fully protected by a secondary, "shadow" VM.

FT relies on VMware vLockstep technology to establish and maintain an active secondary virtual machine that runs in virtual lockstep with the primary virtual machine. The secondary virtual machine resides on a different host and executes exactly the same sequence of virtual (guest) instructions as the primary virtual machine. The secondary observes the same inputs as the primary and is ready to take over at any time without any data loss or interruption of service, in case the primary fails. Both virtual machines are managed as a single unit but run on different physical hosts.

Figure 8: vSphere Fault Tolerance



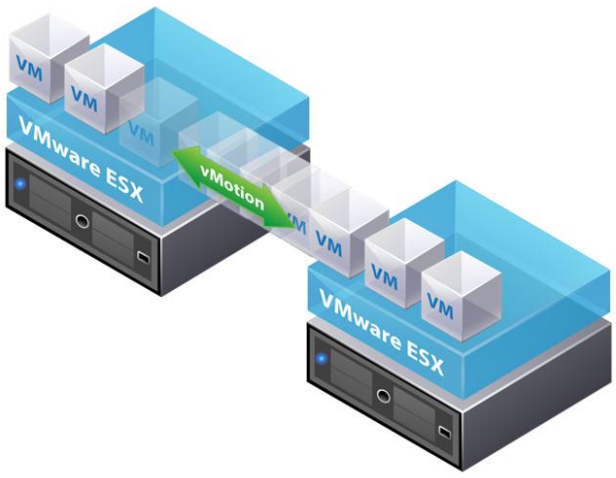
VMware VMotion | Unprecedented Control

Earlier, we learned that Virtual machines decouple the operating system and applications from the underlying hardware, allowing supporting infrastructure to grow and change rapidly. VMotion allows any virtual machine to be migrated across physical servers, even servers from different vendors with different hardware configurations. Planned downtime can be minimized and a more flexible infrastructure makes the Wonderware environment more resilient. In an environment without virtualization, this level of flexibility does not exist.

Due to the critical importance of maintaining uptime in the process solutions industry and the care that must be taken when designing, deploying and maintaining industrial control systems, such deployments tend to be relatively static, meaning that the workload is more intimately tied to the hardware platform on which it runs. As a result, hardware upgrades to the Wonderware infrastructure tend to directly correspond to the release and upgrade cycle of the Wonderware application itself. With frequent changes that are sometimes required in the business world, the static nature of the Wonderware system infrastructure can limit the ability to meet changing demands in the organization's process solutions environment.

Example: As part of Acme's ongoing maintenance processes, they regularly update the BIOS and other firmware on their server hardware. To accomplish this without disruption, Acme uses vMotion to move all virtual machines off of an affected server. Heavily loaded Wonderware servers can be moved online to a different ESX server with no loss of service. Virtual machines can even be moved onto servers from different vendors with different hardware configurations. Once all virtual machines are migrated off of a server, Acme updates the BIOS and all firmware, reboots and then uses VMotion to move virtual machines back on the server. They repeat this process for their entire server infrastructure. This is just one example of how VMware VMotion can be used to provide new levels of flexibility and reduce downtime on critical Wonderware servers.

Figure 9: vSphere vMotion



Rapid Provision with VMware Templates

Virtual machine templates can speed deployment times by eliminating repetitive OS installation and patching tasks. New virtual machines can have their core configuration deployed in a matter of minutes, allowing rapid provisioning of applications into production and reduction of manual work required during their deployment. Organizations using virtual machine templates have reported a significant reduction in server deployment times, from as much as several weeks to provision and deploy physical servers, to a matter of minutes in the VMware virtual machine environment.

Deploying a new Wonderware server can take many hours, by the time you configure the hardware and storage, install the operating system and patches, and install the associated applications and updates. This process must be repeated for each and every server instance, which can result in very long deployment times, especially for large, complex architectures.

Alternatively, a virtual machine template can be configured and stored once for each type of server in the environment, allowing administrators to keep a virtual library of all server images. This can save countless hours when deploying new systems, particularly for larger Wonderware deployments that may have to deploy hundreds of new servers to support an organization. To save time and reduce outages in software troubleshooting scenarios, it may be faster in some cases to deploy a new virtual machine from a template, configure Wonderware, and then connect existing databases to the new virtual machine. Once the databases are connected to the new virtual machine and service is restored the old virtual machine is freed up for other tasks, such as performing advanced troubleshooting and diagnostics. Alternatively, the virtual machine can simply be decommissioned.

Example: As part of Acme's ongoing physical Wonderware deployment infrastructure, a library of Ghost images are stored and used to build out new physical servers. Acme leverages VMware Converter and converts the Ghost images into Virtual Machines, applies all requisite patches, updates, antivirus, etc., and creates master templates. By leveraging templates, each subsequent virtual machine is deployed into the virtual environment in a matter of minutes. This saves Acme's IT staff countless hours during initial deployment. The template libraries remain on–hand for future deployments, training, troubleshooting, or to meet the changing service levels. Another important aspect of templates over other imaging technologies is the ability to quickly and efficiently update the template. This is done by converting the template into a Virtual Machine, starting the machine, applying the required updates, shutting down, and converting back to template.

Simplified IT Operations

Virtual machines offer an excellent way to consolidate older legacy systems that may still be required in a process solutions environment. VMware Converter is a free tool that organizations can use to easily convert older systems and applications running on physical machines into virtual machines. Legacy systems converted to virtual machine operation benefit from the performance of new hardware and eliminate their dependence on hardware configurations that are difficult or impossible to effectively maintain. IT can reduce a variety of expenditures related to keeping old servers and legacy system applications in production.

Converting an existing Wonderware physical server to a VMware virtual machine, using the free VMware Converter tool, is a simple and cost effective way to keep these systems in production while eliminating dependence on older hardware and configurations. Once virtualized, the converted virtual machine can benefit from running on new, more powerful 64-bit servers. The older physical servers being replaced can be decommissioned or re-purposed for test and development environments, or disaster recovery.

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Example: Acme must maintain several legacy Wonderware deployments for training and regulatory requirements. These application servers are currently running on older server hardware and would be very difficult to migrate to more modern hardware. Using the free VMware Converter tool, Acme converts these physical servers into VMware virtual machines. These virtual machines are consolidated on the newer 64-bit server hardware deployed in the Wonderware environment and the older servers being replaced are retired (after 8 years in operation). This allows Acme to utilize unused capacity on their new ESX servers to host the legacy systems on new, more easily maintained hardware. This further improves overall reliability, in addition to saving money on power, cooling, maintenance, support, and rack space.

Conclusion

The critical nature of process solutions and distributed control systems demands that any platform chosen to host Wonderware System Platform 2012 deployments be as reliable and proven as the traditional methods of hosting and deployment. To meet the needs of a continually shifting business landscape, today's process control environments must also be highly available, flexible, and cost efficient. Using VMware vSphere 5 as the preferred platform for System Platform 2012, deployments can help to better align your platform's environment to customer's business goals. Features such as VMware High Availability and Fault Tolerance greatly decrease downtime associated with server hardware failure and allow for more rapid recovery of critical services. virtual machine templates, virtual appliances and snapshots help with troubleshooting and resolving numerous deployment obstacles and greatly enhance efficiency in the development cycle.

By decoupling the OS and associated applications from the underlying hardware, VMware vMotion greatly enhances the resilience and agility of your Wonderware deployment, allowing for on-the-fly hardware replacements and upgrades, and the ability to quickly scale to changing workloads.

Finally, VMware vSphere 5 helps to maintain a cost-effective Wonderware 2012 environment by maximizing utilization of computing power through conservative resource requirement sizing and taking advantage of other physical server consolidation opportunities. The robust feature set of VMware vSphere 5 can help to reduce management costs by eliminating many mundane and repetitive tasks and freeing up IT administrators for other challenges that are strategically important to the business.

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Resources

For more information about VMware and related products, use the links and references below.

VMware References

- vSphere 5 Documentation including hardware compatibility list and release notes: http://www.vmware.com/support/pubs/vi_pubs.html
- vSphere Storage: http://pubs.vmware.com/vsphere-50/topic/com.vmware.ICbase/PDF/vsphere-esxi-vcenter-server-50-storage-guide.pdf
- vSphere 5 Documentation including hardware compatibility list and release notes: http://www.vmware.com/support/pubs/vi_pubs.html
- VMware Documentation: http://www.vmware.com/support/pubs/
- VMware Licensing: http://www.vmware.com/support/licensing/
- Application Performance Troubleshooting: http://www.vmware.com/resources/techresources/10066
- Performance Best Practices for VMware vSphere 5.0: http://www.vmware.com/pdf/Perf_Best_Practices_vSphere5.0.pdf
- VMware Proven Best Practices (VIOPS): http://communities.vmware.com/community/viops
- VMware Solutions/Product/Partner Podcasts: http://www.vmware.com/technical-resources/podcasts/
- VMware Global Support KB: http://kb.vmware.com
- VMware Global Support Videos: http://blogs.vmware.com/kbtv/
- VMware TV: http://www.youtube.com/user/vmwaretv
- VMworld TV: http://www.youtube.com/user/VMworldTV
- VMware KB TV: http://www.youtube.com/user/VMwareKB

Invensys Wonderware References

- Virtualization guide System Platform for VMWARE implementation
- Technote 820 System Platform 2012 support for VMWARE Esxi5.0.

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