

EMC Virtual Infrastructure for SAP Enabled by EMC Symmetrix with Auto-provisioning Groups, Symmetrix Management Console, and VMware vCenter Converter

A Detailed Review

EMC Information Infrastructure Solutions

Abstract

This white paper demonstrates the ease of use and timesaving advantages of using VMware vCenter Converter and EMC® Auto-provisioning Groups with the Symmetrix® Management Console to migrate SAP physical hosts to a virtual environment. This solution provides a low-risk, speedy alternative to completely rebuilding an SAP environment and describes how to convert the SAP database server and preserve the data.

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Executive summary

Problem statement

Many SAP customers use server consolidation to reduce their infrastructure costs. However, they are often forced to build a new virtual environment for their SAP landscapes. They are also interested in a risk-free approach to converting their physical SAP systems to virtual machines, with near zero downtime.

Solution

EMC[®] Symmetrix[®] with Auto-provisioning Groups and Symmetrix Management Console (SMC) can complement VMware vCenter Converter by offering a simple, low risk, minimally disruptive way to convert a physical SAP server to a virtual machine.

This solution involves migrating (converting) an SAP environment on a Microsoft Windows 2008 host running an Oracle 10g database from a physical system to a virtual machine running on VMware vSphere.

Key results

VMware vCenter Converter, along with EMC's Auto-provisioning technology, can reduce the time required to complete a typical SAP system migration from a physical server to a VMware virtualized SAP system by 30 percent. Alternatively, in cases where VMware vSphere is already set up in the data center, you can reduce the time it takes to convert the physical server to a virtualized system by 80 percent.

The testing for this solution reveals that an organization that needs to convert their SAP environment to virtual servers can do so up to three times faster when compared with deploying to a physical environment. If the environment already has a VMware vSphere installation, they can further reduce the overall migration time to less than two days.

This white paper also explains how you can use EMC Symmetrix Auto-provisioning to move from a physical environment to a virtual environment in a simple and safe manner. With Auto-provisioning Groups, you do not actually *move* the data from one location to another; instead, you only re-provision the storage using the tools within the Symmetrix Management Console (SMC). Furthermore, because the SAP data storage location does not change, you can fail back to the physical configuration without any risks. In this case, you should use the SMC to move the data back to its original location.

By virtualizing their SAP landscapes companies are completing the first phase in their journey to the private cloud.

Introduction

Overview

This white paper includes the following sections:

Topic	See Page
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Technology environment	6
Converting the environment	10
Failing back from the virtual to the physical	13

Purpose

The purpose of this solution is to demonstrate the ease of use and timesaving advantages of running VMware Converter with EMC storage to convert a physical server to a vSphere virtual machine. Many SAP customers are looking to find a way to cut their costs and move their SAP environments from a physical to a virtual setting. The challenges include building a completely new server environment and then performing the migration in an easy and straightforward way.

Note

Although this document highlights physical-to-virtual conversions for SAP environments, it can also apply to other applications in a similar way.

Scope

This white paper describes:

- How easy it is to virtualize SAP environments using VMware Converter.
- How you can allocate storage for new virtualized SAP environments using EMC Auto-provisioning technology in a simple way.
- How minimal risk is involved during the SAP migration to the virtualized environment because failback is simple and quick since the SAP data storage location does not change.

This document does not provide a comprehensive guide to every aspect of deploying a SAP on vSphere.

Audience

This white paper is intended for customers, partners, and EMC employees, including IT planners, SAP architects, Basis administrators, and any others involved in evaluating, acquiring, managing, operating, or designing an SAP landscape infrastructure.

This paper also assumes that you are familiar with:

- VMware vSphere 4 technology
 - SAP guidelines and recommendations regarding virtualized environments
-

Technology overview

Introduction This section describes the components used in this solution

- VMware technology and components
 - VMware vCenter Converter
 - EMC Auto-provisioning Groups
-

VMware technology and components

VMware ESX vSphere (v4.0 u1) is a robust, production-proven virtualization layer that abstracts processor, memory, storage and networking resources from physical server hardware and creates pools of resources that multiple virtual machines can share. This allows enterprises to reduce hardware and operating costs by sharing resources across a virtual environment.

The following table describes the VMware components.

Component	Description
VMware ESX Server	Also known as the hypervisor. The ESX server is installed directly on the server hardware, inserting a virtualization layer between the hardware and the operating system. Sharing the physical server resources among a number of virtual machines increases hardware utilization and decreases capital cost.
Virtual Machine	A complete system with processors, memory, networking, storage, and BIOS that enables operating systems and software applications to run in a virtualized environment without any modifications.
Virtual Center Management Server (vCenter)	The central point for configuring, provisioning, and managing the virtual IT infrastructure.
Virtual Machine Disk (VMDK)	The virtual disk assigned a virtual machine. This disk contains the OS binaries or application data for the virtual machine.
Virtual Machine File System (VMFS)	A high performance clustered file system for VMware ESX.
VMware Consolidated Backup (VCB)	An optional module that provides an easy to use, centralized facility for virtual machine agent-free backup.

VMware vCenter Converter

VMware vCenter Converter Enterprise is a plug-in for vCenter Server 4.X that provides an integrated solution for migrating both physical and virtual machines to VMware vSphere. You can use VMware vCenter Converter to create, edit, and monitor physical-to-virtual and virtual-to-virtual migration tasks through the vCenter Server user interface. In addition, you can use vCenter Converter to directly import supported third-party images to virtual machines that vCenter Server manages.

VMware vCenter Converter also provides the ability to export virtual machines

managed by VMware vCenter Server to hosted VMware platforms such as VMware Workstation, VMware Server, VMware ACE, and VMware Fusion. There are two versions of VMware Converter:

- The Enterprise version, which is included with VMware vCenter Server
- The stand-alone version, which is used by smaller companies without VMware vSphere.

**EMC
Symmetrix
Auto-
provisioning
Groups**

EMC Symmetrix Auto-provisioning Groups provide storage and system administrators with a simplified model for storage provisioning. Administrators can implement Auto-provisioning Groups using the `symaccess` CLI command with Solutions Enabler 7.0 and later, or by using the Symmetrix Management Console (SMC).

The fundamental concept of Auto-provisioning Groups is to logically group related objects and create a view that associates the related groups together. The following table describes the logical groups you can use to implement Auto-provisioning Groups.

Term	Description
Auto-provisioning Groups	An EMC storage feature that simplifies storage device provisioning, monitoring, and management. For example, you can use this feature to add storage devices to your SAP system and have those devices automatically available (masked) to all servers (initiator groups) in a clustered SAP environment. Auto-provisioning Group types include: <ul style="list-style-type: none"> • Storage groups • Port groups • Initiator groups
Initiator group	A logical grouping of up to 32 Fibre Channel initiators (HBA ports) identified by World Wide Names (WWNs) or eight iSCSI names or a combination of both.
Port group	A logical grouping of Fibre Channel and/or iSCSI Symmetrix front-end director ports.
Storage group	A logical grouping of up to 4,096 Symmetrix devices.
Masking view	An association between one initiator group, one port group, and one storage group. When you create a masking view, the devices in the storage group are mapped to the ports in the port group and masked to the initiators in the initiator group.

With Auto-provisioning Groups, related initiators (HBAs) are grouped in an initiator group, related front-end ports are grouped into a port group, and related devices are grouped into a storage group. A masking view associates the groups together. At the time the masking view is created, all required mapping and masking tasks are performed automatically in a single operation. This approach dramatically reduces the complexity of the procedure and simplifies storage allocation.

Figure 1 shows an example of how VMAX™ Auto-provisioning can present a range of storage volumes (database instance devices) to an SAP clustered system so that all SAP servers have access to them. You can use the VMAX storage array's technology to group the storage system devices for the SAP servers. The servers recognize their storage through ports on the storage network. The storage network includes the Fibre ports that are on the SAP server itself, the Fibre ports on the network switch, and the Fibre ports on the VMAX array, as displayed in Figure 1.

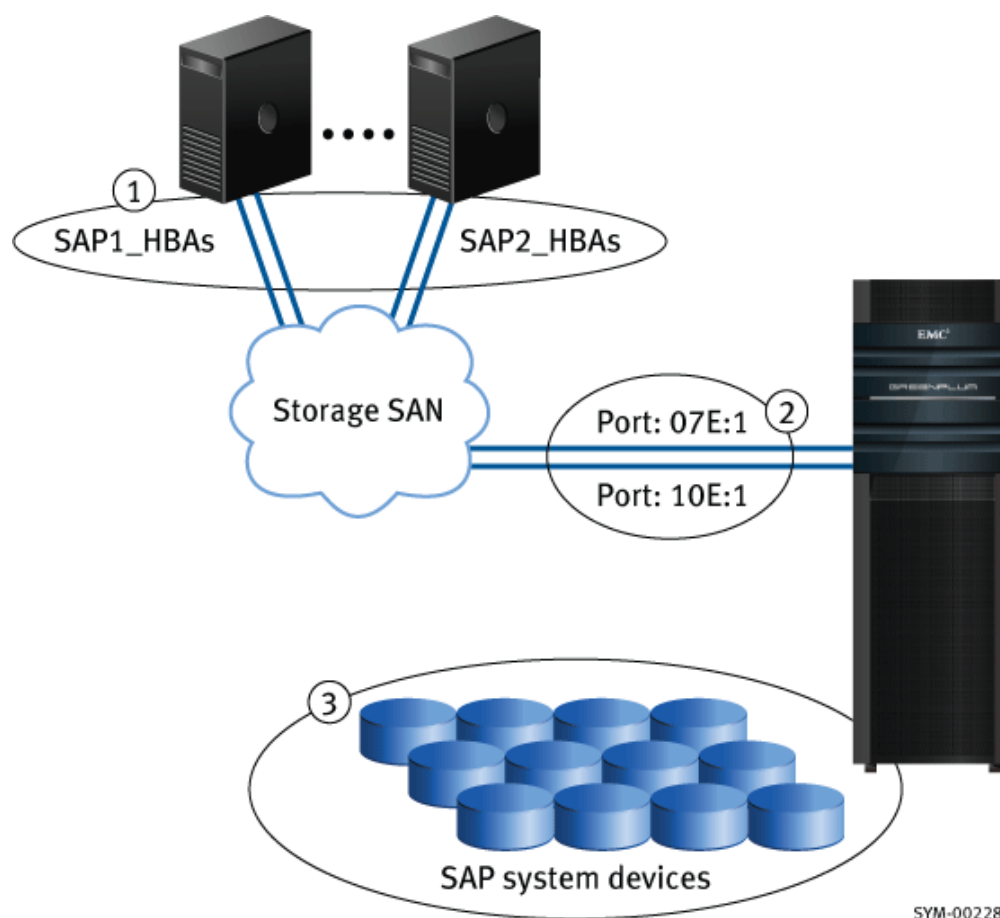


Figure 1. SAP and Auto-provisioning Groups

For example, the following steps demonstrate Auto-provisioning Groups based on the example in Figure 1.

1. Host Bus Adapters (HBAs) installed on the SAP server allow access to the storage network. Use the SMC software to create an initiator group that provides access from the HBAs to the storage.
2. The port group contains the ports on the storage array that will connect to the switch that is part of the storage network (SAN) In this example, these ports are 07E:1 and 10E:1.
3. The devices that will contain the SAP data are placed into a storage group.

All of these groupings are put together to create an overall masking view for the SAP server.

EMC Symmetrix Management Console

Symmetrix Management Console (SMC) is a Symmetrix tool that provides companies with an alternative to using scripts when making IT infrastructure changes. It provides a GUI that lets you easily manage a Symmetrix array and runs on open systems hosts connected directly or remotely to it.

Large SAP enterprise data centers have stringent change control processes that ensure reliable execution of any modification to their IT infrastructure. They often implement changes using fully documented and thoroughly reviewed scripts so that all storage administrators can execute them consistently. The SMC provides an alternative to using scripts.

Figure 2 shows the SMC GUI that helps system administrators easily manage a Symmetrix system. You can run SMC on open systems hosts connected directly or remotely to a Symmetrix array for which you wish to allocate and manage storage.

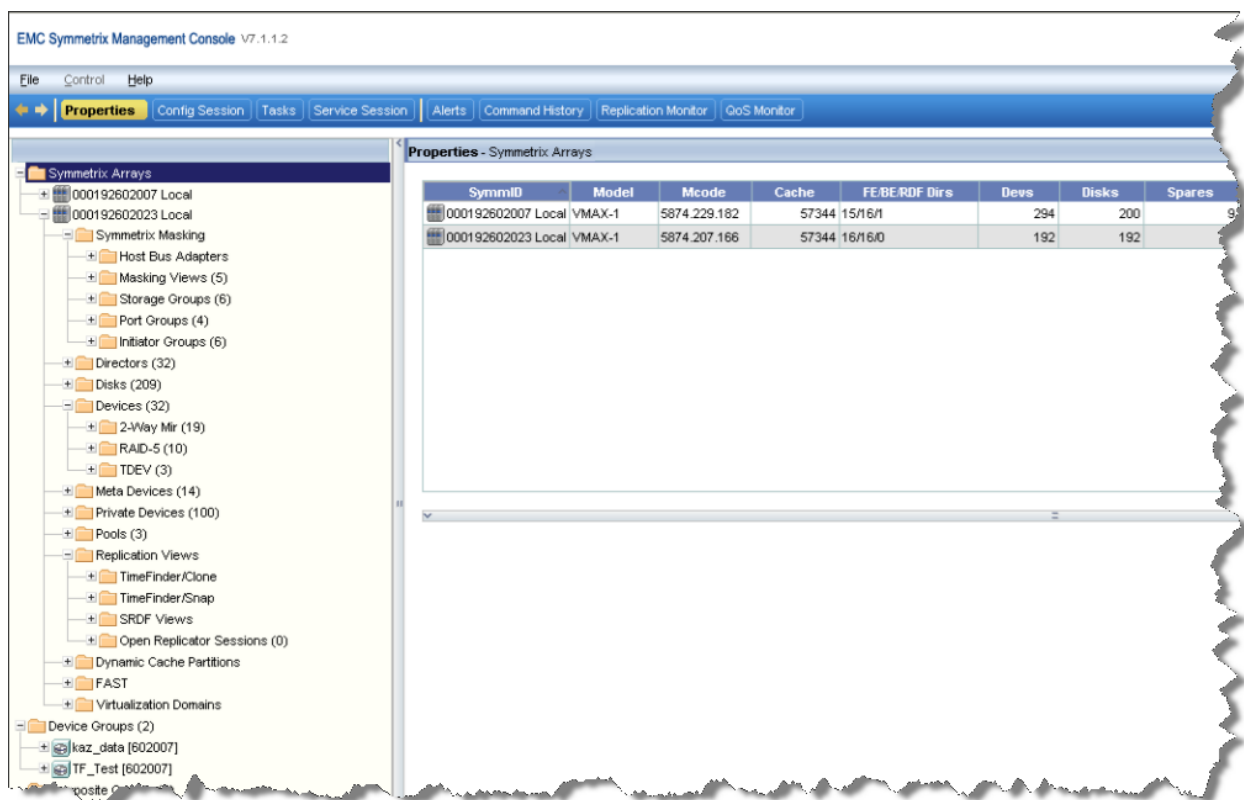


Figure 2. Symmetrix Management Console

Technology environment

Overview

This solution involves migrating (converting) an SAP environment with an Oracle database on a Microsoft Windows 2008 physical system to a virtual machine running on VMware vSphere Server.

Physical environment

Figure 3 shows the high-level architecture of the solution's environment. In this situation, a physical server is being converted to a virtual server running on VMware ESX connected to SAN storage.

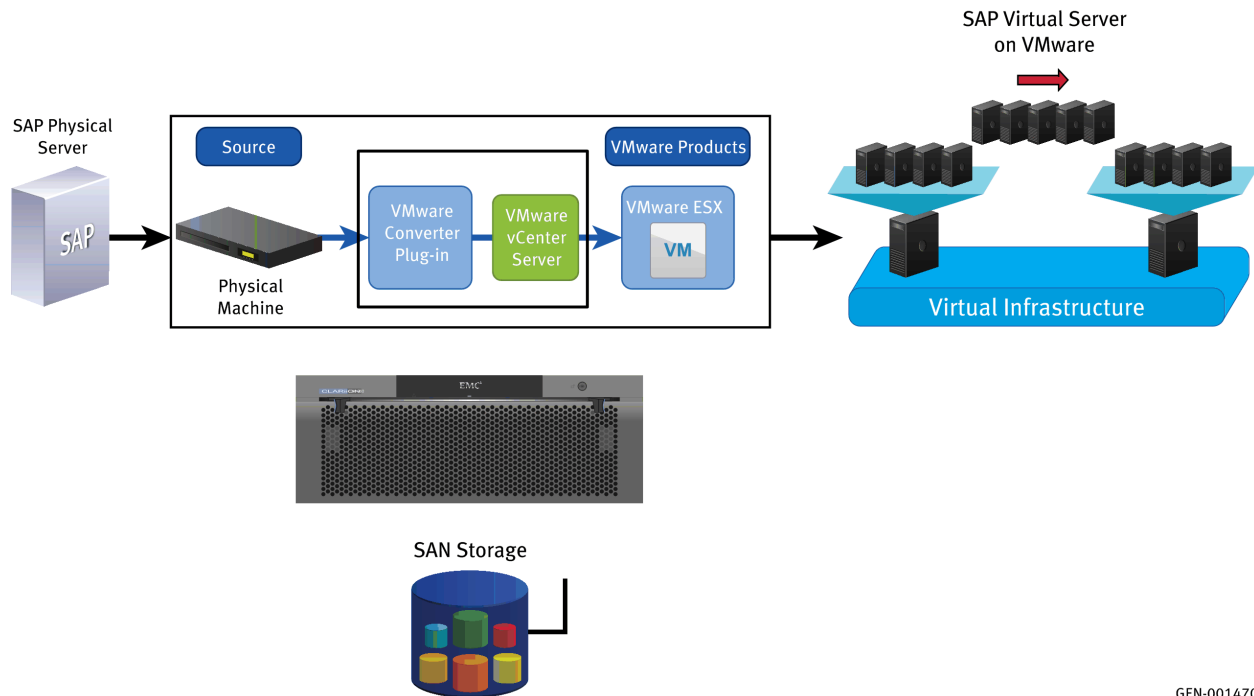


Figure 3. Solution's architecture

GEN-001470

Environment profile

The following table lists the software running in the solution's environment.

Details	Quantity
SAP ECC 6.0 IDES running on Windows 2008 Server (64bit)	1
Oracle Database Software v10.2.0.4 (required for SAP)	1
Windows 2008 Server running on physical host and virtual machine (which runs on vSphere 4.0 u1)	2
Approximately 750 GB of SAN storage (EMC VMAX storage)	

Virtual server environment

The following table describes the virtual server environment's equipment and configuration.

Equipment	Quantity	Configuration
Hardware		
VMware ESX server	2	Intel platform with: <ul style="list-style-type: none">• Dual Quad-core X5570 CPU• 96 GB RAM
Virtual machine		
Windows 2008 Enterprise Edition (x64)	1	Running on VMware ESX server
Infrastructure Management Host	1	Windows 2008 Server (x32) Virtual Machine running: <ul style="list-style-type: none">• Symmetrix Management Console 7.1.1• Solutions Enabler 7.1.1

Physical server environment

The following table lists the physical equipment used in this solution.

Equipment	Quantity	Configuration
SAP Server running on Windows 2008 Enterprise Edition (x64)	1	Intel platform with: <ul style="list-style-type: none">• Dual Quad-core E5540 CPU• 48 GB RAM
VMware vCenter v4.0 Host (Windows 2008 Server, x64)	1	Intel platform with: <ul style="list-style-type: none">• Two 2 GHZ Intel Processors• 8 GB RAM
Storage Array	2	Symmetrix VMAX with: <ul style="list-style-type: none">• Enginuity™ 5874 Q409SR• 2x VMAX engines
Path Management Software	2	EMC PowerPath® installed: <ul style="list-style-type: none">• Version 5.3.1 on physical SAP host• Version 5.4.1 on VMware ESX host

SAP database layout

The following table describes the layout of the SAP database:

Device	Volume Size (GB)	Technology	Protection
SAP data	400	FC	RAID-5 (3+1)
SAP Executables	30	FC	RAID-1
Oracle data	30	FC	RAID-1
Oracle pagefile	75	FC	RAID-1
Oracle archive	20	FC	RAID-1
Oracle Redo Log1	10	FC	RAID-1
Oracle Redo Log2	10	FC	RAID-1

Converting the environment from physical to virtual

Overview

In this solution, the SAP environment is configured on a physical Windows 2008 Enterprise Edition Server (x64) using Oracle v10.2.0.4. The database devices reside on VMAX storage and the physical host configuration is cloned to a virtual machine using VMware Converter Enterprise.

During the cloning operation, the server name and IP address remain the same. Upon completion, the SAP database is available to the SAP virtual machine by copying the VMAX volume information from the physical host storage group to the virtual host storage group. The process does not copy data over the network; the data stays in the same physical location, as shown in Figure 4.

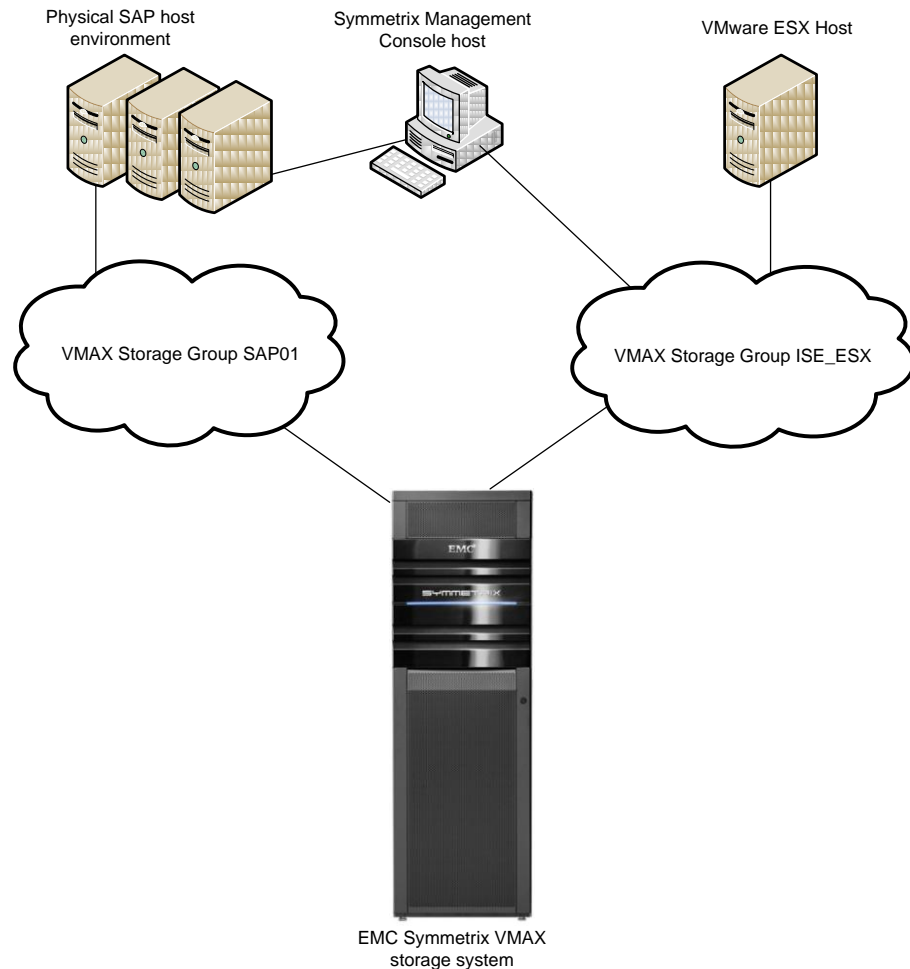


Figure 4. Presenting the SAP data to the virtual host

Timeline

When comparing the amount of time it takes to deploy an SAP system to a new physical environment (server upgrade, for example) or to a virtual environment, this solution shows that the amount of time required is reduced from just over three weeks to about six days. If the customer already has VMware vSphere set up in their IT infrastructure, the time required is reduced to less than two days.

Figure 5 shows a high-level timeline for a typical SAP target system deployment in both a physical and virtual environment. The VM Converter run time varies depending on the network's configuration and performance.

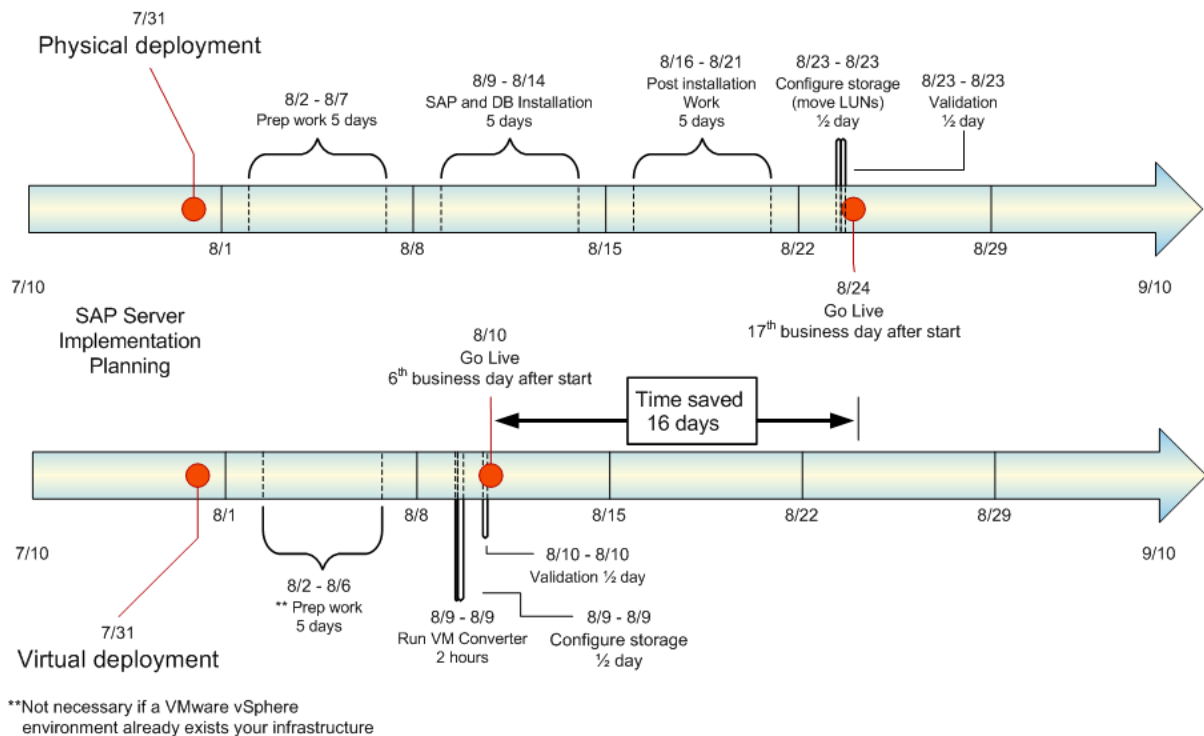


Figure 5. Comparing an SAP deployment to physical and virtual environments

During an SAP deployment to a physical server, an estimated five days of post-installation work is required as shown in Figure 5. That work includes reviewing the host information, running SGEN and all the profile and op-mode configuration requirements, and validating the system from the SAP Basis perspective.

Procedure

The following basic procedure uses VMware vSphere Converter and the EMC SMC software to migrate SAP from a physical to a virtual environment.

1. From the VMware vSphere console, run the VMware vSphere Converter wizard to copy the physical SAP host configuration to a VMware virtual machine (VM).
2. Note the database volume layout of the physical SAP host (as the disk lettering order may change on the virtual SAP host).
3. Bring down the SAP database and power down the SAP physical server.
4. Power up the SAP virtual machine
5. Edit network/domain settings to "workgroup," and reboot. After the VM boots up, edit the network/domain settings to "domain," then reboot again. **
6. Use SMC to add the SAP database disks on the VMAX array to the ESX host.
7. Run the disk scan process on the ESX host(s) and assign the SAP database volumes to the SAP virtual machine.
8. Run the disk scan process on the SAP virtual machine and adjust the volume letters (if needed).
9. Bring up the SAP database and application.

Note

For this physical-to-virtual conversion, there is no need to migrate the SAP database on the SAN storage. This process provides for a simpler fail-back to the physical host, if needed.

**When cloning a Windows 2008 server (to simplify the conversion cutover process), the server hardware identifier changes. Due to this change, you will need to perform, two server reboots to enable the cloned host to log into the network domain.

The following sections illustrate the steps you should take to perform the conversion.

Physical host properties

Figure 6 shows the physical host environment before the conversion. The device manager lists the physical server components for the server used in this solution (SAP01). The SAP application console tool that started and stopped the database shows the physical host used for the source of the migration.

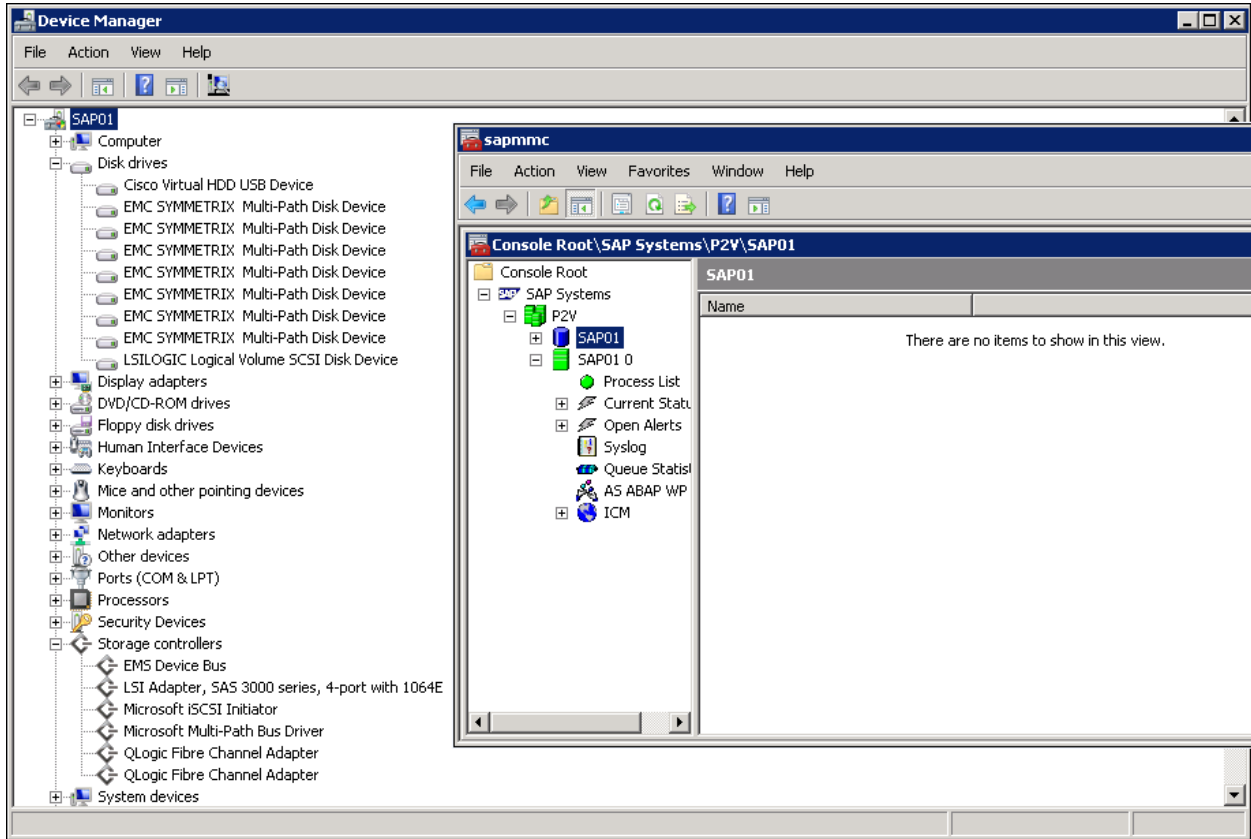


Figure 6. Pre-conversion environment

Launching the VMware Converter wizard

To convert a physical server to a virtual machine, launch the VMware converter wizard by right-clicking on the ESX server from the vCenter console and choose **Import Machine**, as shown below:

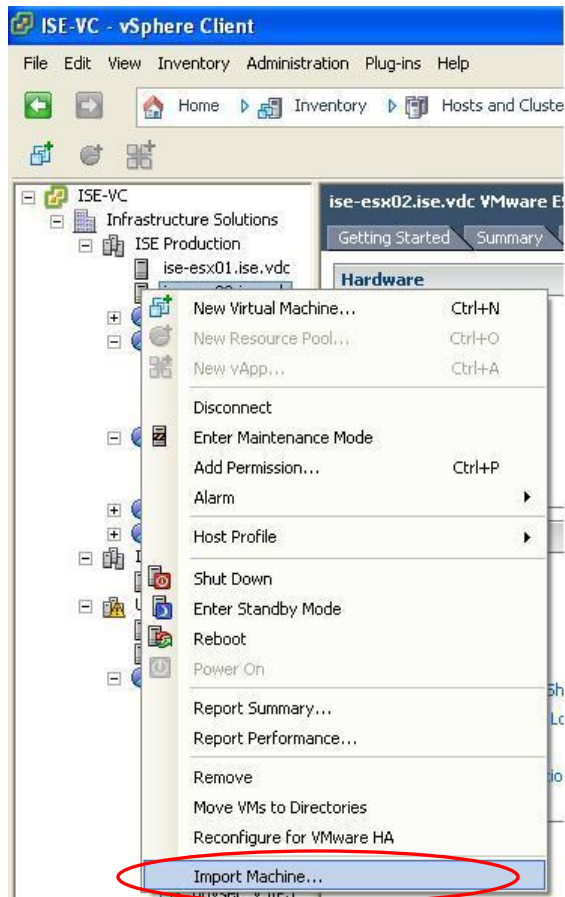


Figure 7. Initiating the VMware vSphere Converter

The wizard initializes as shown below.

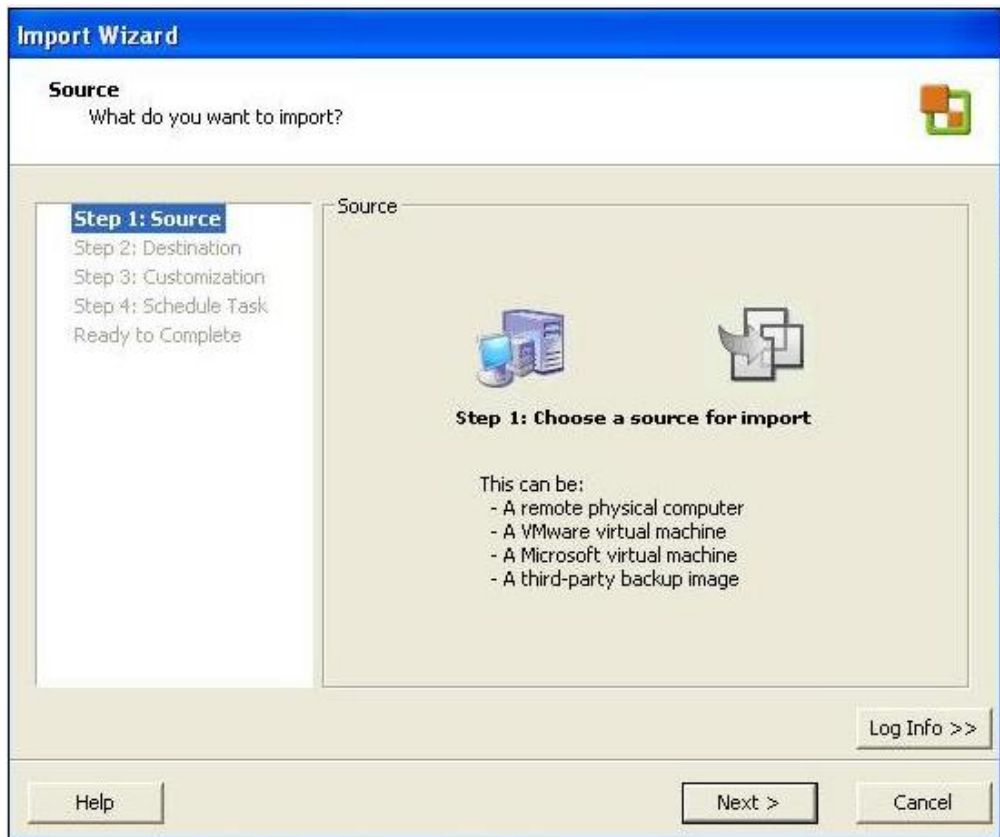


Figure 8. Running the VMware vSphere Converter

Follow the wizard (13 steps) to convert the physical environment to a virtual one. This wizard prompts you for the following information:

- Physical host name and IP address
- Physical host volumes being migrated (see Figure 9)
- Destination ESX host (on which the virtual machine will reside)
- Virtual machine network configuration
- VMware tools to install on the virtual machine (recommended)
- Whether to run conversion task now, or schedule it to run later

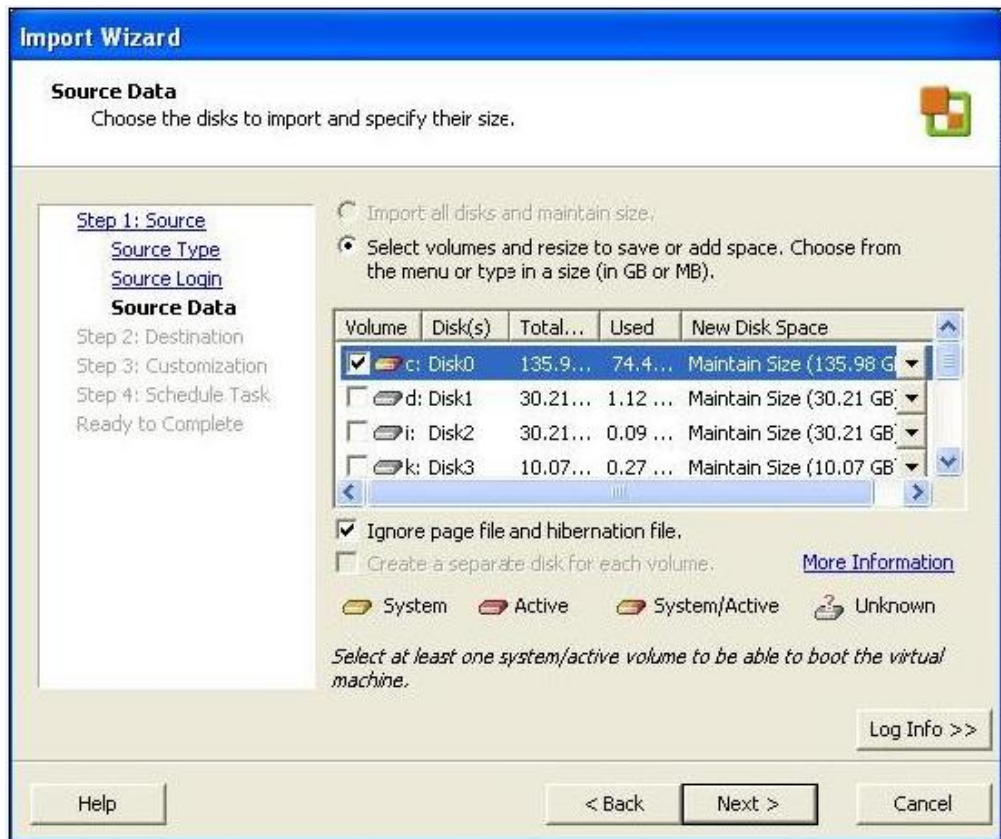


Figure 9. Physical host volumes to be migrated

Figure 9 shows that the database volumes are not selected because this conversion involves migrating only the server boot device. The location of the data volumes does not change.

Conversion complete

You can view the **Task & Events** tab of the vSphere Client screen to check the status of the conversion and confirm that it completes successfully. This screen shows the start time and end time of the conversion process (approximately 55 minutes).

The **Task Details** section at the bottom of the screen in Figure 10 lists the actions performed during the conversion, and the length of time it took to process that task.

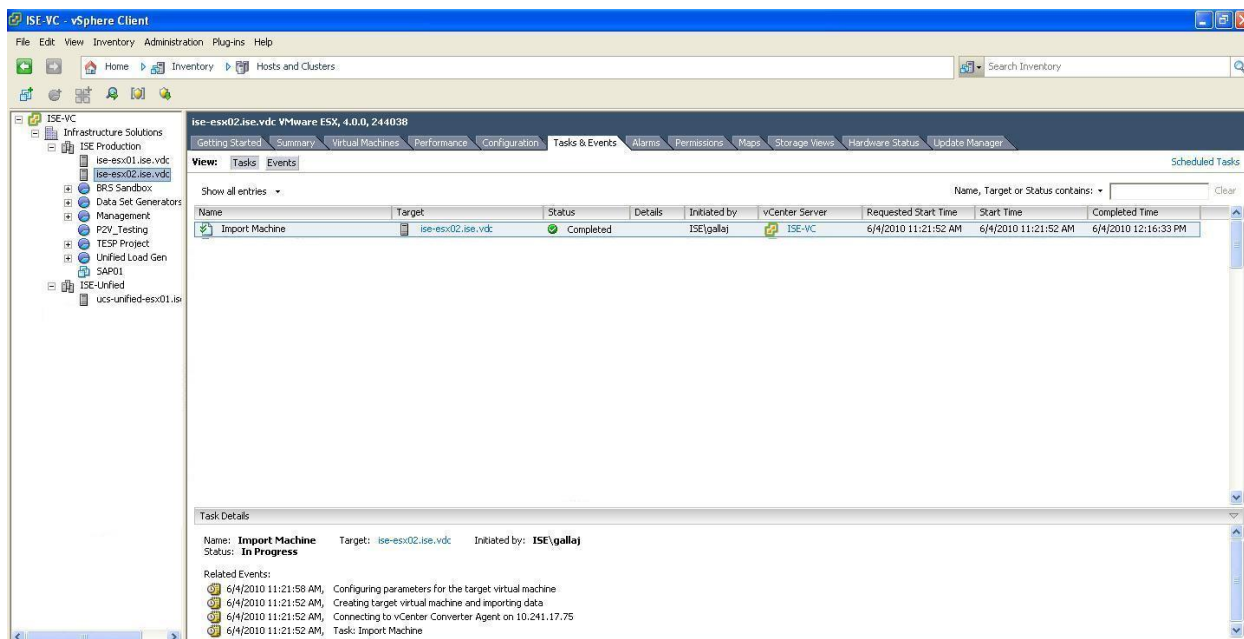


Figure 10. Confirming the conversion completion

Provisioning the storage to the virtual environment

Once you complete all of the steps from the VMware vSphere Converter from the SMC console, copy the storage volume information from the physical SAP host to the virtual ESX host. This does not copy the actual data from one storage system to another; it simply copies the location where data resides within the Symmetrix VMAX volume. Figure 11 shows the VMAX volumes assigned to the physical SAP host.

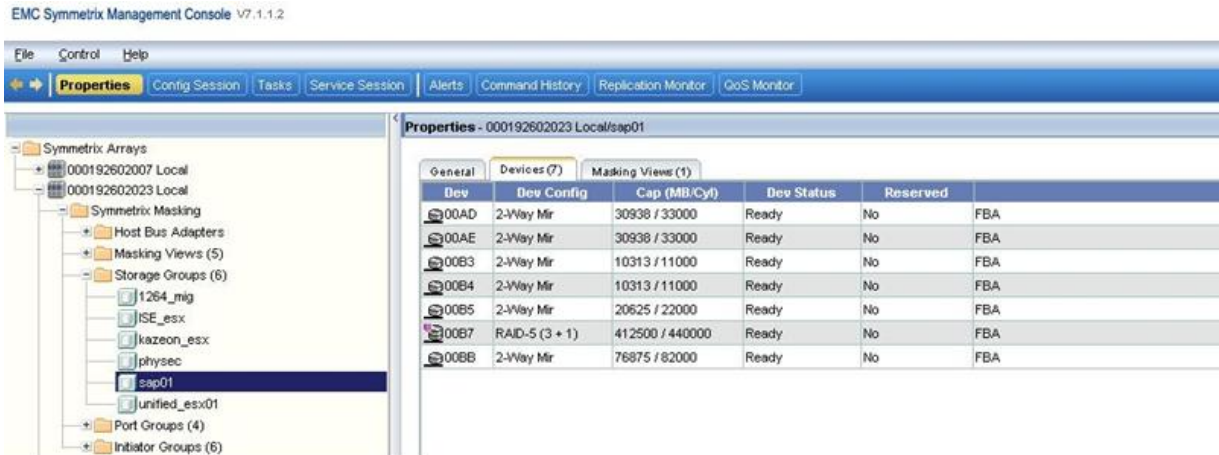


Figure 11. Symmetrix Management Console

To assign these volumes to the virtual host, right-click on the VMware host storage group and choose **Modify Storage Group**, as shown in Figure 12.

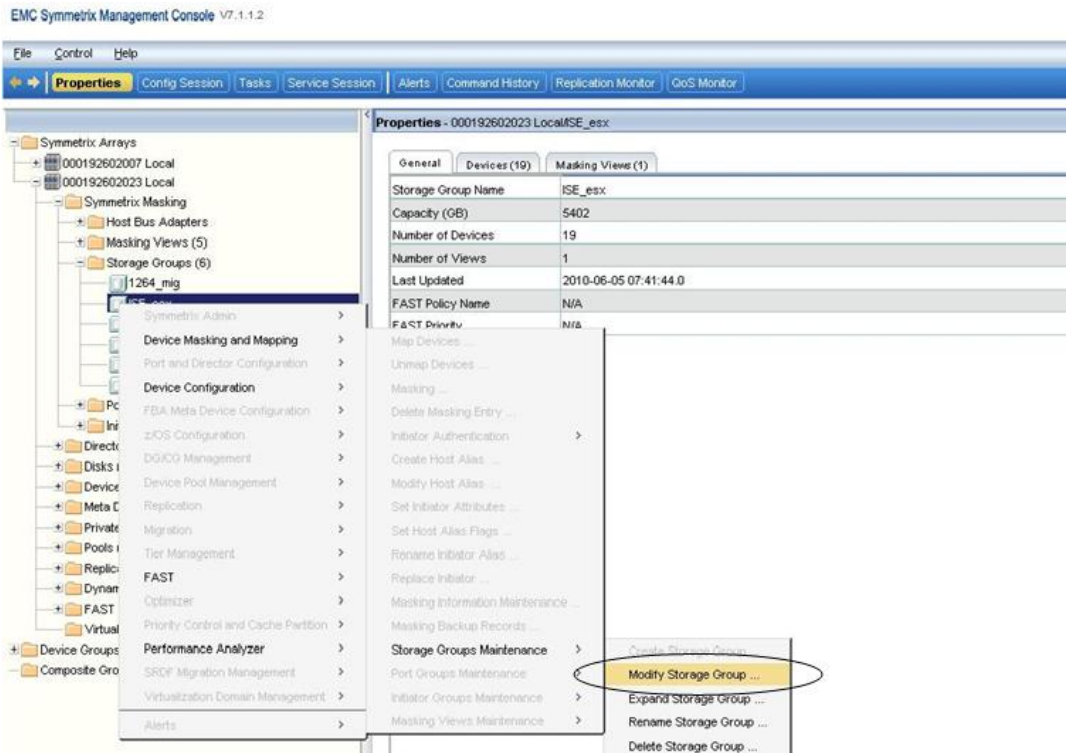


Figure 12. Modifying the storage group information

Next, select the volumes you wish to move to the VMware host from the physical SAP host, as shown in Figure 13, then click **OK**.

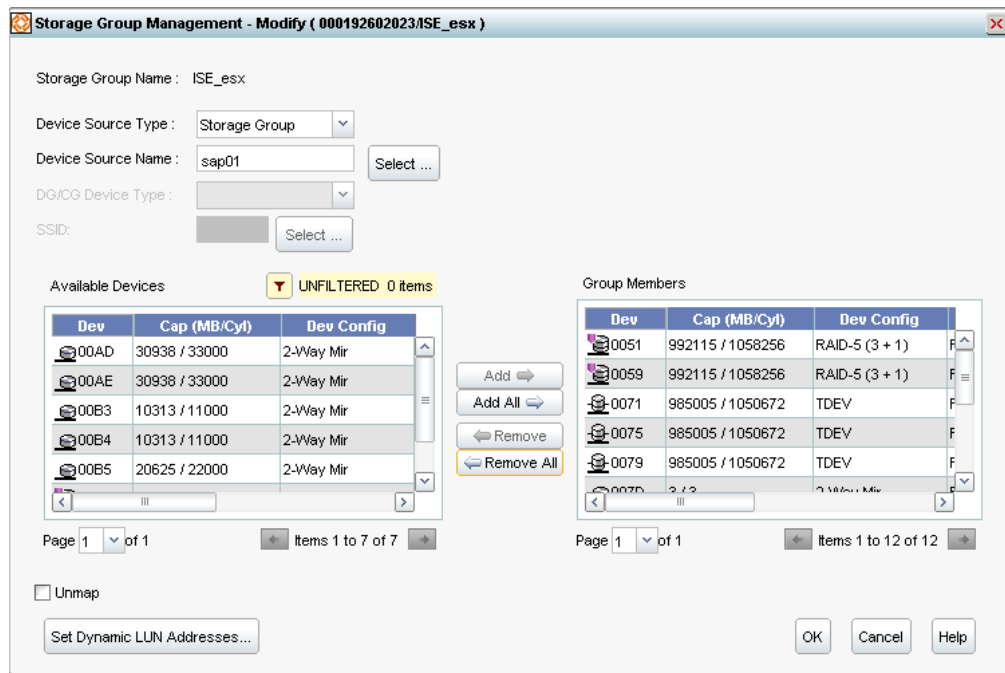


Figure 13. Adding SAP data volumes to the virtual host

The SAP volumes are now available to the VMware host, as shown in Figure 14.

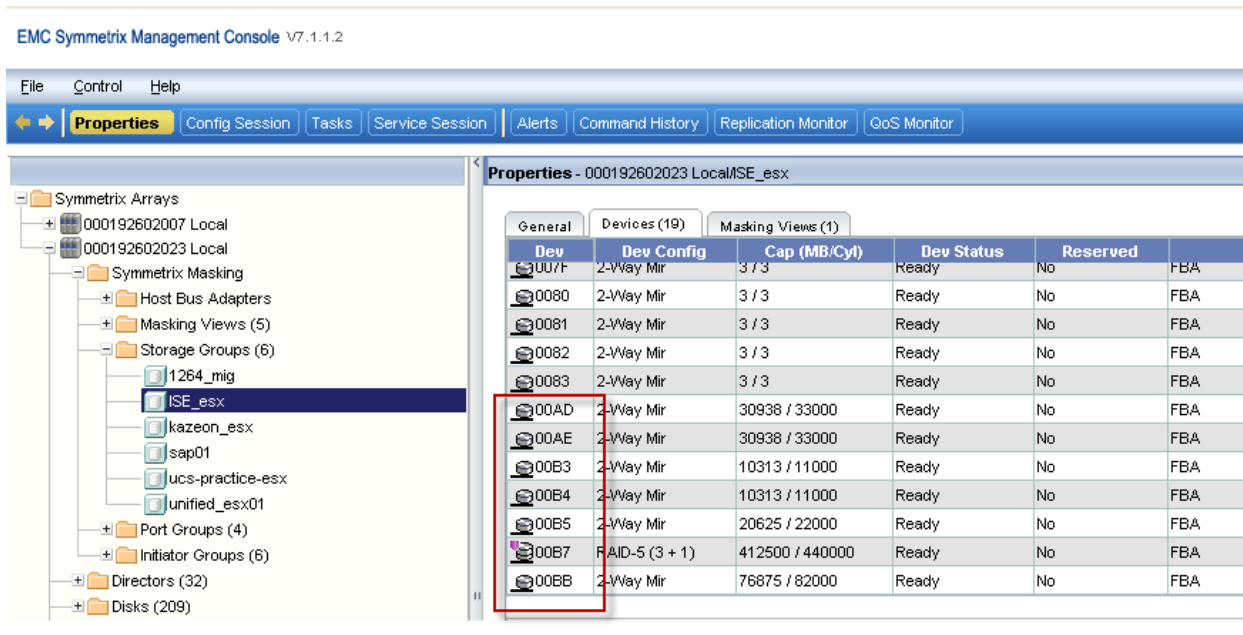


Figure 14. Storage volumes available to the virtual host

To initiate a scan so that the VMware ESX host can discover the SAP devices, click **Rescan**, as shown in Figure 15.

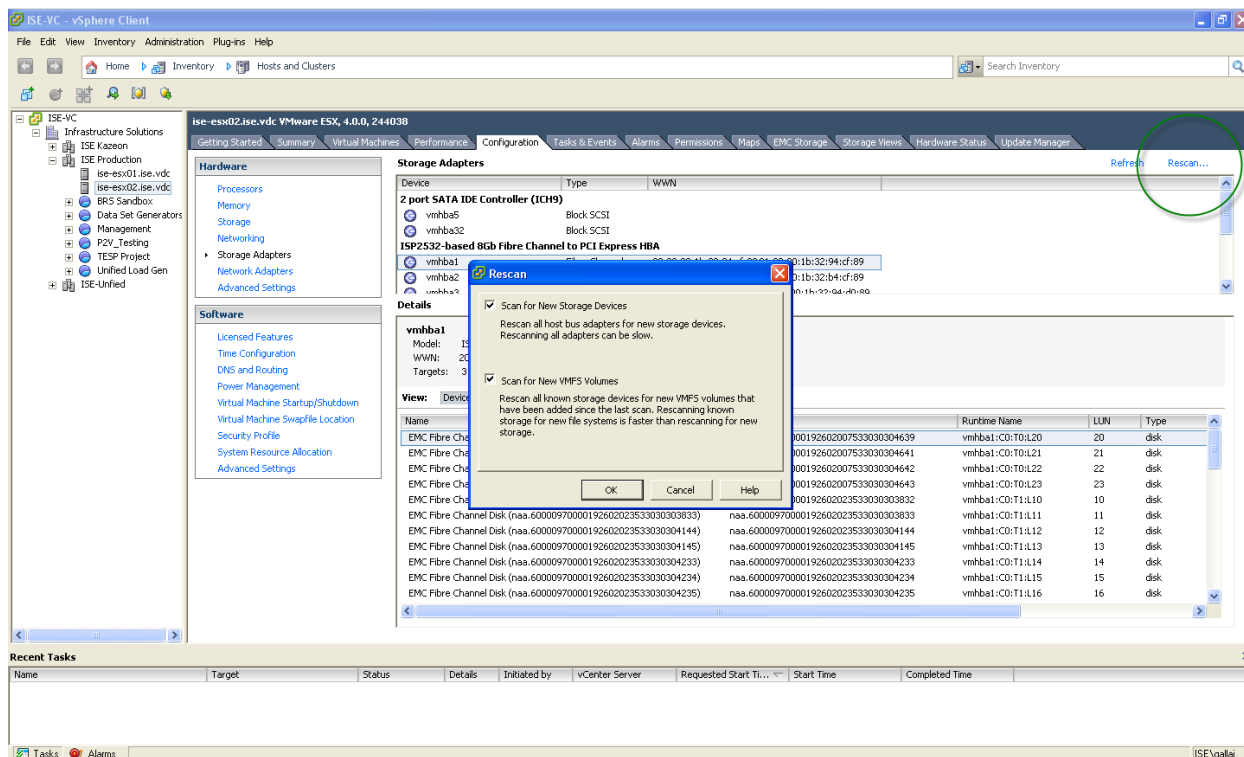


Figure 15. Running the Rescan

Check both boxes if you want to scan for both storage devices and new VMFS volumes. Click **OK**. When the Rescan task is complete, look at the **Recent Tasks** window to see its status, as shown in Figure 16.

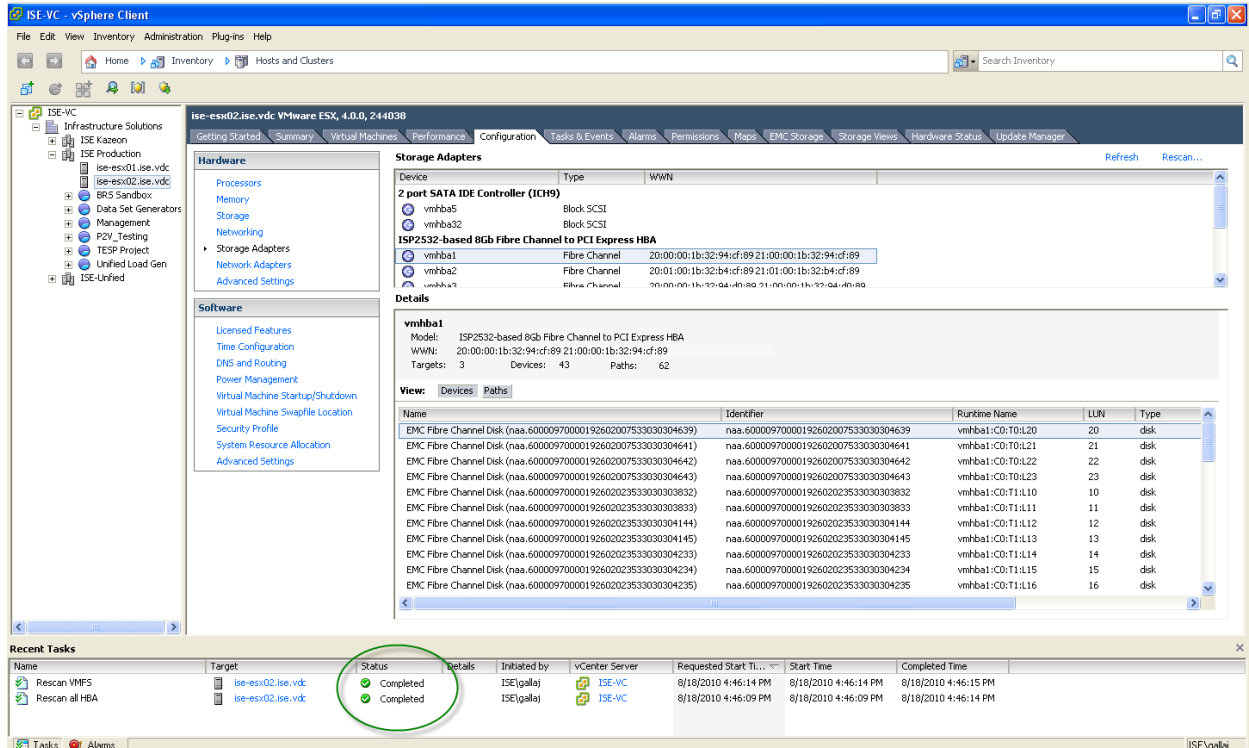


Figure 16. Rescan complete

The new virtual environment

You can view the new SAP virtual machine from the VMware vCenter Console, as shown in Figure 17.

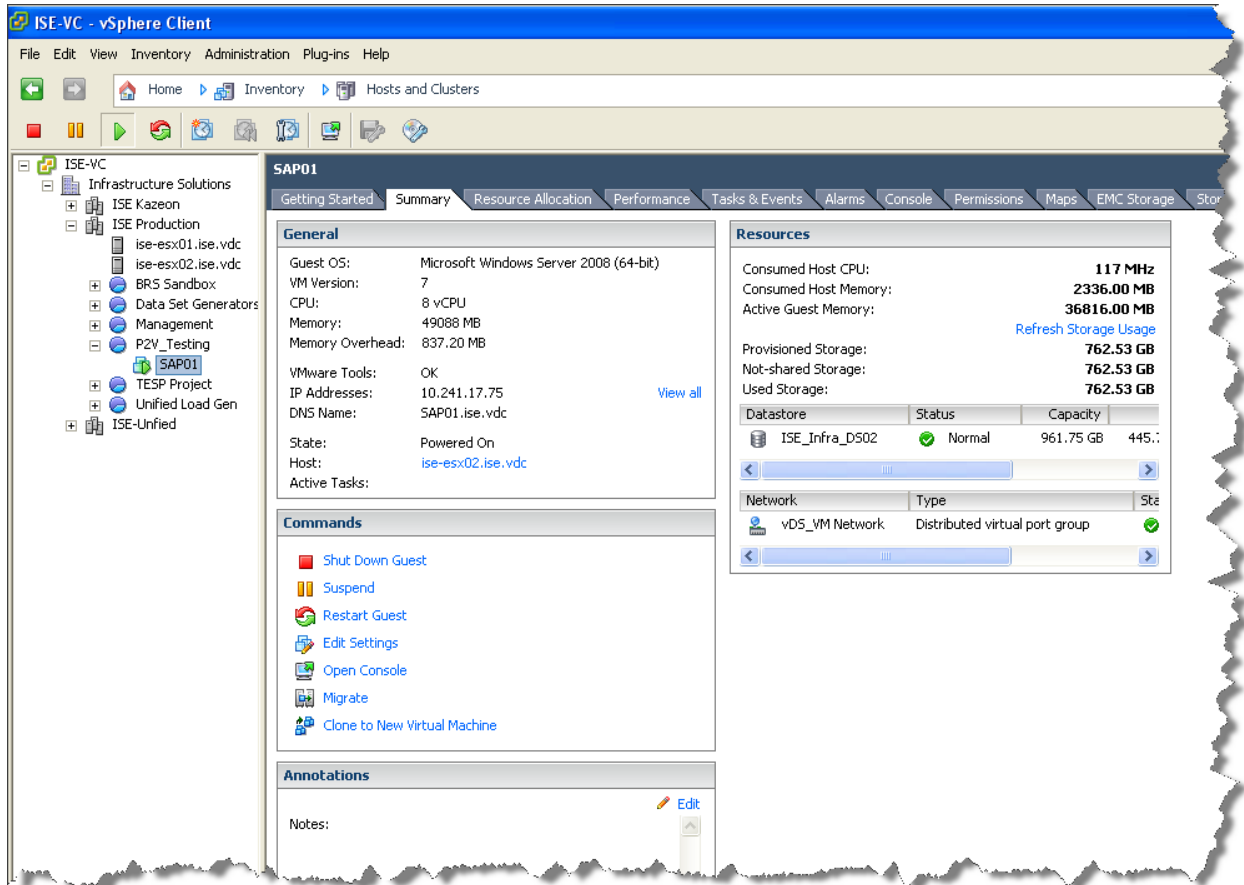


Figure 17. SAP virtual machine when viewed using VMware vCenter Console

Figure 18 shows that SAP is now running on a virtual machine. You can see the VMware tools **Properties** dialog box as well as the SCSI device in the **Device Manager**.

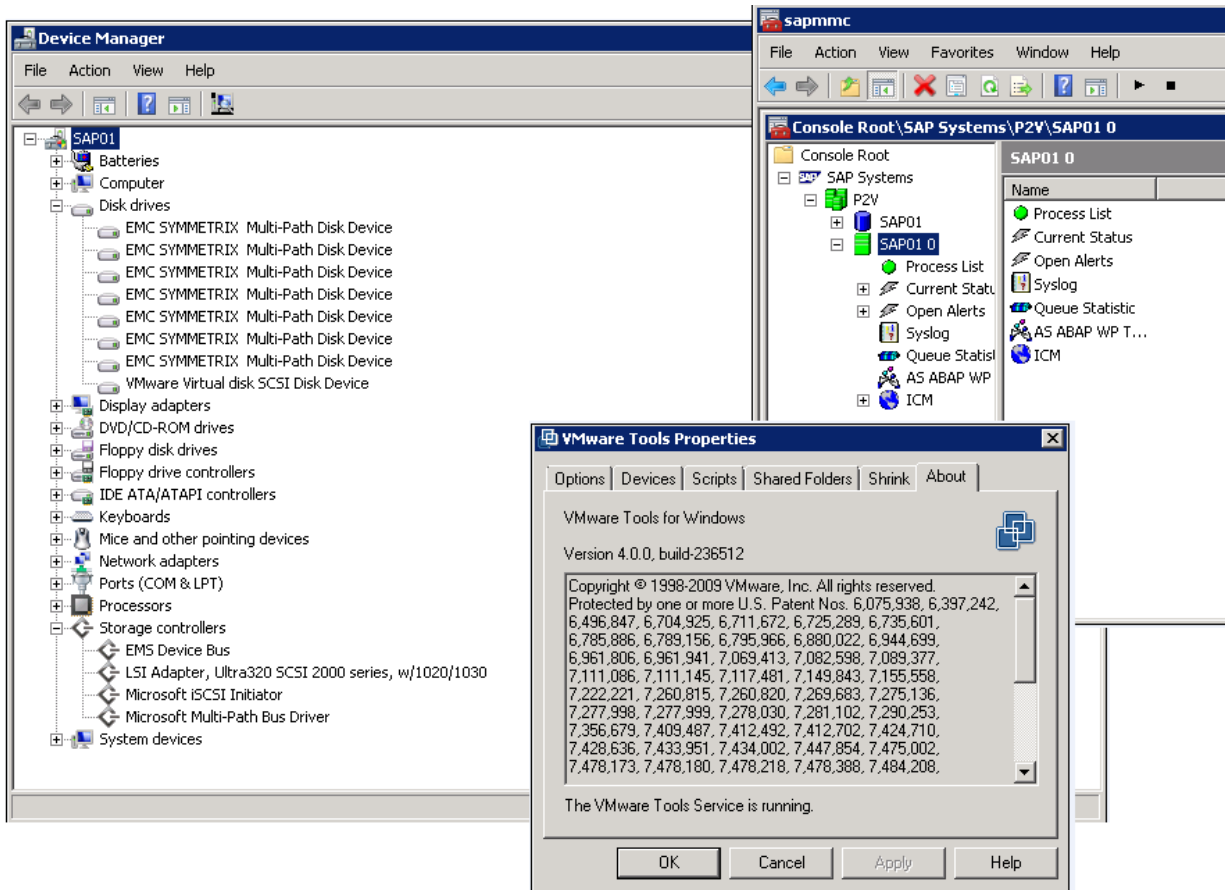


Figure 18. SAP running on a virtual machine

Failing back from the virtual to the physical environment

If a problem occurs while running the SAP database on the VMware virtual machine, you can run a fail-back operation to return to the physical host. This is a simple and quick task, and involves the following steps:

1. Bring down the SAP database and shutdown the SAP virtual machine.
2. Power up the SAP physical server
3. Edit the network domain settings and reboot the server twice to update the network domain information to access the physical server.
4. Bring up the SAP database and application(s) on the physical server.

Note

You can also use the Symmetrix Management Console to change the VMAX devices from the ESX server to the physical server if you choose to keep the SAP environment on the physical host. However, this is not required if you want the SAP environment to remain on the virtual host.

The amount of time this process takes depends on your physical server's hardware. During this testing scenario, the failback took approximately 15 minutes.

Conclusion

Summary

Migrating a SAP installation from a physical environment to a virtual environment saves time and provides a safer method of deployment than rebuilding a brand new environment. Today, SAP customers are turning to virtualization in order to meet their business requirements. This solution provides SAP customers with a quick, low-risk method for converting an SAP system from a physical to a virtual environment. By virtualizing their SAP landscapes, companies are completing the first phase in their journey to the private cloud.

The solution also illustrates an easy method to failback to the physical environment should it be necessary to try again at another point in time. Converting a physical SAP host to a VMware virtual machine is a straightforward and time-saving process when compared with manual migration.

Key findings

This solution demonstrates the following findings:

- Migrating a physical SAP server to a VMware virtual machine is a safe and timesaving process when accomplished using VMware vCenter Converter.
 - The VMware Converter wizard provides a simple to use tool to guide you through the conversion process.
 - During the migration, the SAP database remains online until the server cutover to the new machine.
 - Failback is quick and simple if you need to return to the physical environment after the conversion has completed. In addition, the risk to the data is minimal since the location of the data does not change.
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Next steps

EMC can help accelerate assessment, design, implementation, and management while lowering the implementation risks and cost of creating an SAP replication solution.

To learn more about this and other solutions, contact an EMC representative or visit www.emc.com/sapsolutions.

References

White papers

For additional information, see the white papers listed below.

- *SAP Solutions on VMware vSphere 4 Best Practice Guidelines* (December 2009)
 - *SAP/ERP 6.0 Using SAP NetWeaver 7.0 Document Version 22.00* (August 26, 2009 Material Number 50076317)
 - *Storage Tiering for SAP and EMC Symmetrix VMAX with Enginuity 5874 Applied Technology* (h6731)
 - *EMC Symmetrix VMAX and VMware Virtual Infrastructure Applied Technology* (h6209)
-

Product documentation

For additional information, see the product documents listed below.

- *vCenter Converter Administration Guide* (vCenter Converter for vCenter Server 4.0 u1) P/N EN-000135-02
 - *ESX Configuration Guide Update 1* (ESX 4.0 vCenter Server 4.0) EN-000262-00
 - *vCenter Converter Release Notes* (v4.0 u1)
-

Other documentation

For additional information, see the document entitled *SAP OS/DB Migration Check*.
