Virtualizing SAP Applications on Windows

Applies to:

Virtualization of SAP applications on Windows

Summary

This article explains all you need to know to get started on virtualization with SAP applications on Windows. It helps you plan how to run an SAP application on a virtualized Windows system.

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Table of Content

Introduction

Are you planning to run an SAP application on a virtualized Windows system? This short article tells you all you need to know to get started on virtualization with SAP on Windows.

For more information on virtualization on Windows and supported virtualization solutions for SAP systems, see:

- SAP Note 1409608 *Virtualization on Windows* (SMP login required)

- SAP Note 1374671 *High Availability in Virtual Environment on Windows* (SMP login required)

- http://www.sdn.sap.com/irj/sdn/windows-virtualization

Supported Hardware

In recent years, hardware vendors have been bringing out systems that are strongly designed as virtualization hosts and have introduced major benefits that boost CPU performance, network bandwidth, and I/O capabilities.

SAP supports all x64-based CPUs of the newer generation. Examples of effective processors used in the latest SAP-internal are the Intel Xeon 7500 ("Nehalem-EX") and 5600 ("Westmere") processor.

If you use CPUs of the first x64 generation (sold in 2006/2007), note that there are several known problems with the virtualized SAP system, including a significant impact on performance.

Therefore, if you want to use existing hardware to virtualize your SAP system, you need to check the following list of published SAP standard benchmarks:

http://www.sap.com/solutions/benchmark/sd2tier.epx.

Supported Windows Guest Operating Systems

SAP supports Windows 64-bit for Intel and AMD processors (x64) as guest operating systems in a virtual landscape.

Virtualization Software

There are two primary vendors of virtualization technology today on Windows, VMware and Microsoft.

Both virtualization vendors support the hardware improvement on virtualization in upcoming versions of their hypervisors. The performance benefits of a newer version of the virtualization software are remarkable, so that an upgrade of the virtualization software to a current version is recommended by SAP.

- VMware ESX Server 3.x and ESX Server 4.0 (vSphere)

  SAP supports this for SAP applications based on SAP NetWeaver '04 SR1 (kernel 6.40) and higher.

  Relevant SAP Notes (SMP login required):

  - 1056052 *VMware ESX 3.x or vSphere configuration*
  - 1409604 *Virtualization on Windows: Enhanced Monitoring*

  Useful whitepapers to start with SAP on VMware are:

  - *SAP Solutions on VMware vSphere 4 - Best Practice Guidelines*
    http://www.vmware.com/resources/techresources/10086

  - *Virtualized SAP Performance with VMware vSphere 4*
    http://www.vmware.com/resources/techresources/10026

  - *SAP Solutions on VMware vSphere: High Availability*
    http://www.vmware.com/resources/techresources/10031

Further whitepapers with guidelines for configuring SAP on VMware are available at:
http://www.vmware.com/solutions/partners/alliances/sap-whitepapers.html

- Microsoft Hyper-V on Windows Server 2008 and Windows Server 2008 R2

  SAP supports this for SAP applications based on SAP NetWeaver '04 SR1 (kernel 6.40) and higher.

  Relevant SAP Notes (SMP login required):

  - o 1246467 *Hyper-V configuration guide*
  - o 1409604 *Virtualization on Windows: Enhanced Monitoring*

  The white paper *Best Practices for SAP on Hyper-V* describes best practices for implementing a Hyper-V™-virtualized solution for SAP applications on Microsoft® Windows Server® 2008 and Microsoft® Windows Server® 2008 R2.

Configure and Size the Virtual Machine for SAP

In general, you can treat a virtual machine just like any standard server. For the installation of an SAP system, there is technically no difference between the installation on a physical or on a virtual machine.

In an SAP landscape, the hardware vendor is typically responsible for sizing the physical machine. The vendor mostly uses the SAP Quicksizer that helps to calculate the required sizing recommendation for main memory, number of CPUs, disk I/O, and the network throughput.

This sizing recommendation for the SAP system in a native environment is not 100% suitable for running the SAP system in a virtual machine. Note that in a virtual landscape, you should also take into account resources for the overhead of virtualization management as well as headroom for competing virtual machines with shared physical resources.

Check the resource recommendations of the virtualization vendor and generously calculate the resources for the virtual machine. Furthermore, running an SAP system on a virtual platform with shared resources might lead to performance issues. If you plan to run a performance-critical SAP application in a virtual environment, you can achieve more stable performance if you use "Memory Reservation" to reserve the amount of memory configured for the virtual machine. This ensures that the virtual machine running the SAP instance always has the full amount of memory available.

In addition, setting the "CPU Reservation" to the amount of CPUs configured for the virtual machine ensures more reliable performance for performance-critical applications.

Choose the Optimum SAP Memory Model

Windows Server 2003 as Guest OS

For SAP systems running on Windows Server 2003, use the classical view memory model and check Microsoft hot fix 931308. Due to technical problems described in SAP note 1316558, the Flat Memory Model is no longer supported on Windows Server 2003.

Windows Server 2008 as Guest OS for CPU-Bound Systems

For CPU-bound systems with sufficient memory resources, SAP recommends using the Flat Memory Model in a virtual environment. This model reduces the number of system calls because all user contexts are permanently mapped in all work processes.

This results in bigger process working sets that should fit to the physical memory, which avoids paging by the operating system. The extra memory depends on the activity of the users. SAP calculates that about 30% more physical memory is necessary.

For more information about configuration of the Flat Memory Model, see SAP note 1002587 (SMP login required).

As memory protection is highly optimized in Windows Server 2008, leave the memory protection activated.

Since SAP support always requires a protected memory, do **not** switch off the memory protection in production systems.

Windows Server 2008 as Guest OS – Memory-Bound Systems

For memory-bound systems, use the classical SAP view memory model.

Configure the Database – SQL Server Only

On an SAP central system, the same hardware is shared by SQL Server and the SAP central instance. We recommend allocating about 30% to 40% of the physical memory to SQL Server.

For example, on a server with 6 GB physical memory, allocate 2 GB to SQL Server.

On an SAP central system, we recommend setting the minimum and maximum server memory to the same value to avoid dynamic allocations.

The following SQL script sets the minimum and maximum server memory to 2 GB:

```
exec sp_configure 'min server memory (MB)', 2048
exec sp_configure 'max server memory (MB)', 2048
reconfigure with override
```

If you have additional SAP application servers, you might have to increase the amount of memory for SQL Server. Note that this decreases the amount of memory for the SAP central instance.

Clone a Virtual Machine Running an SAP Instance

In general, the easiest way to clone a virtual machine is to copy its virtual hard disks and to attach the copied files in the newly created virtual machine. By running Sysprep on the newly created machine, you can initialize its host name and UUID. Since two systems cannot exist on the same network with duplicate names and SIDs, the newly created machine is unique within the network.

Some virtualization technologies like VMware also provide mechanisms to create a template for deployment of a virtual machine. These deployment procedures do not work as easily as expected with a virtual machine running SAP.

The reason is that the host name of the virtual machine and the <SAPSID> of the SAP system are stored during the installation of the SAP system. When you run Sysprep on the VM, only the Windows configuration is reinitialized, but not the configuration of the SAP system.

For test, **training**, or **temporary SAP systems** that must not be identified by the network, it might be sufficient to copy the virtual disks and to use a Windows image that is an exact duplicate of the original system. In this case, the resulting virtual machine must run in an isolated environment, as running with duplicate host names within the network is not possible.

Note that the resulting SAP system also uses the same <SAPSID> and the same host name as the original SAP system on the original host.

For any SAP system that you have to access over the network or that needs to be identified by a unique <SAPSID>, you have to apply the following section: "Deploy a Virtual Machine Running an SAP Instance".

Deploy a Virtual Machine Running an SAP Instance

To deploy a virtual machine, the host name, MAC address, and UUID of each target virtual machine must be unique. Otherwise, you cannot run the source and target virtual machines on the same network at the same time.

Prepare Windows for Deployment

You can prepare the Windows configuration for deployment by creating a system image of the source virtual machine in which various user and machine settings and log files have been cleaned up. The most efficient way is to capture an image of the source virtual machine and then deploy that image onto other new virtual machines.

For some virtualization solutions such as VMware ESX Server, you can create an image directly from the VirtualCenter software, choosing the item *Clone to Template*.

For other virtualization solutions like Hyper-V, you have to create the image manually with the system preparation tool Sysprep. On Windows Server 2008, Sysprep is delivered as part of the operating system whereas on Windows Server 2003, Sysprep is located in the package `\Support\Tools\Deploy.cab` on the Windows 2003 SP1 CD.

Reconfigure the SAP System Configuration

To reconfigure the SAP system parameters, you must perform a homogeneous system copy to rename the <SAPSID> and the host name of the SAP configuration.

For more information about how to perform a system copy, see the *System Copy Guide* for your SAP system at:

http://service.sap.com/instguides → *<SAP System>* → *<Release>* → *Installation*

With the growing importance of virtualized systems, it is essential to have simple tools for renaming the host and <SAPSID> of an SAP system. Currently, only a homogeneous system copy is supported to reconfigure the host name and <SAPSID> of an SAP system, but SAP is working on a simpler procedure.

SAP System Monitoring

Activate Advanced SAP System Monitoring

Each virtualization solution brings its own monitoring and management tools, but for SAP services like Early Watch, key configuration information about the virtualization must be visible in SAP system monitoring in a vendor-independent way.

The current SAP monitoring tools for Windows do not distinguish between a system operating on physical hardware and a system operating on virtual hardware.

Since you can assign the physical hardware to several guest operating systems at the same time, there is important information missing about which native resources are available to the virtual system.

For this issue, SAP has enhanced transaction OS07 using virtualization-specific data. To achieve this, we have introduced new metrics for configuration data and real-time monitoring to the SAP monitoring infrastructure.

For each virtualization solution, the data collection needs to be extended to provide the additional configuration and metric information in the SAP environment. Check SAP note 1409604 (SMP login required) for setting up the enhanced monitoring of your virtualized SAP system

Install the Virtualization-Specific Tools from Your Vendor

Most virtualization technologies include virtual machine additions or tools that help improve the performance and user friendliness of interacting with the guest from the host. For any virtual machine running an SAP system, installing these tools is mandatory because they are basic for delivering data for advanced SAP system monitoring. Install the most recent version of these tools in your virtual system.

These tools are:

- VMware: VMware tools

- Hyper-V: Integrated Component Services

Understand the Key Figures of Monitoring

The following SAP notes describe the key figures of monitoring:

- [1482272](#) *The key figures of virtualization data*
- [1260719](#) *SAPOSCOL: Detailed virtualization data*

List of SAP Notes Mentioned in this Article

(SMP login required)

- [1409608](#)   *Virtualization on Windows*
- [1409604](#)   *Virtualization on Windows: Enhanced Monitoring*
- [1246467](#)   *Hyper-V configuration guideline*
- [1374671](#)   *High Availability in Virtual Environment on Windows*
- [1056052](#)   *VMware ESX 3.x or vSphere configuration*
- [1482272](#)   *The key figures of virtualization data*
- [1260719](#)   *SAPOSCOL: Detailed virtualization data*
- [1002587](#)   *Flat memory model*
- [1316558](#)   *System hang situations on Windows Server 2003*

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