Note Language: English   Version: 50 Validity: Valid Since 26.05.2009

Summary

Symptom
You want to use an SAP system productively on Windows on virtualized hardware.

More Terms
VMware, VMware ESX Server, VMware GSX Server, Microsoft Virtual Server, Microsoft Hyper-V, Windows Server 2008, XEN

Cause and Prerequisites
You can use virtualization to reduce costs in the computer center. To run an SAP system productively on virtualized hardware, you must adhere to different guidelines when you use the virtualization solution and when you configure the SAP system.

Solution
This note provides information about the support of SAP applications that are based on the SAP NetWeaver Application Server. For the support of other SAP applications on virtualized hardware, directly contact the responsible person of the individual SAP applications.

1. General guidelines
When you use virtualization, you should adhere to the following guidelines:

- o   All virtual machines that run in parallel on a host should require no more than 100% of the memory and 80% of the central processing unit capacity of the host. The 20% overhead is the minimum for the service overhead that the virtualization requires during the optimal configuration. If this is tuned optimally for the SD benchmark (flat memory model, no protection, and so on) and if you have several parallel benchmarks, 80% of the performance of a non-virtualized hardware are reached.

- o   For standard configurations that are better suited for universal, practical requirements (for example, several parallel application modules, or background jobs) than the tuning for an SD benchmark, a scaling of 60% was reached in internal tests. This applies under the prerequisite that sufficient memory is available, and paging does not occur.

- o   System calls within a virtualized machine result in performance losses. This affects memory management, network communication and disk I/O. A system configuration that has a high paging rate in the operating system or a low cache quality and therefore a high displacement in the database buffer will lead to considerably poorer performance in the virtualized environment.

- o   The SAP NetWeaver application server is very suitable for virtualization since the architecture was optimized for a high scalability. The database access is minimized with caches and the communication is outsourced to dispatcher and gateway. Through this, a virtualized SD dialog application can be just as fast as a non-virtualized application. In comparison, applications that

actually access the database, or communicate or print using the network, are significantly slower. For release upgrades and Unicode migrations in a virtual environment, runtimes that are up to five times longer than the runtimes in a non-virtualized environment occurred.

o   An optimum utilization of resources (CPU, main memory, network) is reached for a virtualization if the resources are shared between multiple occasionally used virtual machines. However, in productive systems, this may lead to bottlenecks. The behavior of several parallel virtual machines is only predictable if all machines use reserved resources. For productive use, resources must be reserved. If the memory usage or the CPU usage is too high and several virtual machines compete for it at the same time, the performance may deteriorate.

An introduction to the virtualization of an SAP system on Windows is available in the document 'Virtualizing SAP applications on Windows'. This is available at:
https://www.sdn.sap.com/irj/scn/go/portal/prtroot/docs/library/uuid/70f6325 8-bff1-2a10-9db6-cda6ef202bfc

2. Virtualization solutions supported by SAP in productive operation

For a productive use of SAP systems on virtualized hardware, SAP supports the virtualization solutions VMware ESX Server (Version 3.x and vSphere) and Hyper-V. SAP supports exclusively the 64-bit Windows system as the operating system for the virtual machine for AMD and Intel processors. All SAP applications that are based on SAP NetWeaver Application Server ABAP and Java and are supported on non-virtualized hardware are also supported on these operating system versions.
However, the following SAP support restrictions apply:

o   For SAP support, the key figures for virtualization must be visible. Since the SAP systems that are currently delivered do not contain monitoring for the virtualization, you must activate this using Note 1104578.

o   You must reserve the main memory for the Java stack (no memory overcommittment), and sufficient physical memory must be available because the garbage collector must be able to access the entire Java heap. Information about the Java VM settings is available in Note 723909.

o   We have tested the SAP NetWeaver application server on VMware and Hyper-V (see below). We determined complete transparency on all supported platforms. However, note the following points:

   -   We did not test additional SAP components or third-party components (for example, Adobe Document Services) that are installed with the SAP system. Therefore, problems that occur may result in a delay in SAP support.

   -   SAP components, such as TREX, MDW, and others, are very resource-intensive. Information about operating TREX on virtualized hardware is available in Note 1303814, information about MDW is available in Note 1336014.

- If the third-party software supplier ensures only restricted support on virtualized hardware for their product, this restriction also applies to the use of the software in an SAP environment. In this case, SAP must pass on the full support restriction on the part of the third-party to the customers. The customer is responsible for checking the restrictions on the part of the third-party.

o Note the support statements issued by your database manufacturer with regard to your virtualization solution.

VMware ESX Server Version 3.x and vSphere

VMware ESX Server 3.0 is the first virtualization solution for Industry Standard Server and Microsoft Windows that meets the prerequisites of SAP applications. ESX Server provides the following:

o 64-bit guest support for large address spaces

o Hypervisor technology without overhead of a host operating system

o Hardware support using the new AMD and Intel Virtualization technology

o Multiprocessor support for up to four virtual CPUs (ESX Server 3.x) or up to eight virtual CPUs (vSphere)

During tests and benchmarking, SAP applications on VMware proved to be highly reliable and stable. Currently, no problems are known that would restrict a use of SAP applications on VMware.
In addition, published benchmarks from Dell, HP, IBM, and Fujitsu Siemens display good performance. During measurements of an individual virtual machine, the physical processors had a performance capacity of approximately 90%. In internal SAP tests with optimal configuration, approximately 80% of the maximum capacity of a non-virtualized environment was used with a full utilization of the virtual machines on a hardware.

Tips regarding the configuration of a virtual machine on VMware for a use in the SAP environment is available in Note 1056052.

For the use of an SAP system on virtualized hardware on VMware, the following SAP support statements apply in addition to the statements made above:
If a problem occurs in the SAP application or infrastructure and this problem points to a cause within VMware, SAP will transfer the problem to VMware support. As a result, the solution for the problem may be delayed and we may not be able to fulfill Service Level Agreements that were agreed for non-virtualized environments. SAP and VMware have defined a process for a common solution to this problem.

SAP is testing SAP applications on VMware ESX. The VMware infrastructure contains a series of additional components for management, high availability, migration, development support and more. We are not checking these components and their compatibility with SAP applications. If problems occur in connection with these infrastructure components, contact VMware support directly.

Support by the database manufacturer

All database manufacturers respond in the same way as SAP when problems
occur and reserve the right to transfer the problem to VMware. Together
with your hardware partner, you must ensure that the configuration of your
virtual hardware provides sufficient scope for when there is a high
workload, because the performance of databases strongly depends on disk
I/O, network, and other areas of system performance.
In addition, check the release and support information provided by your
database manufacturer.

    o   Support by Oracle
       Note 1173954 contains additional support statements regarding
       Oracle databases on VMware within the SAP environment.

    o   Support on MaxDB
       For information concerning the support for virtual systems on
       MaxDB, refer to Note 1142243.

    o   Support by Microsoft
       For information about the support for Microsoft products on virtual
       hardware, refer to the Microsoft Knowledge Base article 956893.

    o   Support by IBM
       DB2 is supported with VMware. For detailed support information
       about VMware on DB2, see Note 1130801.

Microsoft Windows 2008 Hyper-V

Hyper-V is integrated in Windows Server 2008 as virtualization solution,
and was released by Microsoft in July 2008. Hyper-V meets all requirements
for the operation of SAP applications on 64-bit guest operating systems.
Especially adapted versions of the guest operating systems Windows Server
2003 and Server 2008 are designed to reduce the overhead of the
virtualization.
We tested its application on Hyper-V on Windows Server 2008 as guest
operating system with four virtual CPUs and on Windows Server 2003 as guest
operating system with two virtual CPUs. All internal tests showed a high
reliability and stability. Currently, no problems are known that would
restrict a use of SAP applications on Hyper-V.
During measurements of an individual virtual machine, 100% of the
performance of the physical machine was reached. No overhead caused by
virtualization could be detected. For parallel SAP systems on several
virtual machines, we could not detect a loss of performance as long as less
than 50% of the possible server utilization was reached. If the server is
utilized more than 50%, a significant performance loss was measured within
the virtual machine. It seems that the virtual machine requires more CPU
resources than assigned. However, this is only visible when several virtual
machines are utilized. For Hyper-V, we also measured 60% of the performance
of a non-virtualized server with full utilization of a server with several
virtual machines that run SAP ERP applications.

Tips regarding the configuration of a virtual machine on VMware for use in
the SAP environment is available in Note 1246467.

Support by the database manufacturer
Check the your database manufacturer's releases and support information.

    o   Support by Oracle
       For information about the support of virtual systems on Oracle, see
       Note 1329848.

o   Support on MaxDB
For information concerning the support for virtual systems on
MaxDB, refer to Note 1142243.

o   Support by Microsoft
For support of virtual systems on MS SQL Server, see the Knowledge
Base article 956893.

o   Support by IBM
Support information is not currently available.

3. Virtualization solutions that are not supported for the use of SAP systems

The following virtualization solutions are not supported by SAP:

XEN and Linux
XEN is integrated in several Linux distributions and uses a virtual system
format compatible with Microsoft Hyper-V. In theory, it is possible to use
a Windows guest operating system on Linux or a Linux guest operating system
on Windows. We are not currently planning to evaluate this type of
combination for SAP applications.

VMware, GSX Server, VMware workstation, Microsoft Virtual Server
Due to their restriction to 32-bit, single CPU, and host/guest operation,
these virtualization products are not suitable for productive SAP systems.
However, it may be advisable to use these products to operate
non-production systems (demo systems, test systems, development systems,
and so on).

Other virtualization solutions
In addition to the virtualization solutions, a range of other products for
an operating system virtualization, hardware virtualization and shared-OS
virtualization with isolated containers is offered. Examples are HP
Integrity VM, Hitachi Virtage, and Parallels Virtuozzo. These products are
not taken into consideration during the SAP validation and release process,
and are not tested by SAP. For this reason, we do not support these
products. If you use one of these products, ensure that your technology
partner provides support should problems occur.
The following applies to these additional virtualization solutions:
If problems such as performance loss or system terminations occur that can
be traced to the relevant virtualization solution, or that impair the
system availability, it may be required to reproduce the problems on
physical hardware. With a system standstill, SAP support will recommend the
deinstallation of the virtualization as immediate solution.

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                    BC-OP-NT-ESX Windows on VmWare ESX

The Note is release-independent

Related Notes

Number	Short Text
1329848	Oracle Support for Windows Server 2008 Hyper-V
1303814	TREX 7.1: Usage of TREX on Virtual Machines (VM)
1223407	Using the SCM Optimizer in virtual environments
1173954	Support of Oracle for VMWare and XEN
1158363	"vm-support" - Exporting Diagnostic Data from VMware
1142243	MaxDB release for virtual systems
1130801	DB2 LUW, DB2 z/OS release note for VMWare and XEN
1104578	Virtualization on Windows: Enhanced monitoring
1098847	Virtual Machine Support
1056052	Windows: VMware ESX Server 3 configuration guideline