

How-to Guide
SAP CPM



How To... Run SAP BPC in a VMware environment

Version 1.00 – December 2008

Applicable Releases:

SAP BPC 5.x, SAP BPC 7.0 (MS), SAP BPC 7.0 (NW)
(.Net tier only)

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1 Scenario

This “How-to guide” will focus on the particularities of running SAP Business Planning and Consolidation in a VMware environment.

2 Introduction

This how-to guide applies to BPC 5.x, BPC 7.0 for the Microsoft platform, as well as the .Net tier of BPC 7.0 for the Netweaver platform.

Please note that running BPC in a Virtual Machine is NOT officially supported by SAP and this guide should not be taken as an endorsement by SAP but merely as guidance for those who decide to run BPC in a virtual environment.

This guide assumes a reasonable understanding of the VMware technologies, in particular a working knowledge of VMware ESX and ESXi 3.5. It also assumes a basic understanding of BPC, in particular of the various server roles

The screenshots in this guide have been taken using VMware ESXi 3.5, running BPC 7.0 SP02 for the Microsoft Platform, in a 2-tier topology, with both VMs running on the same VMware host, as well as a BPC 5.1 VM.

3 Hardware considerations

3.1 General server considerations

It is essential that the server hardware be on the VMware supported hardware list for the virtualization product being used.

It is also important to use CPUs that have enhanced support for virtualization.

The server hardware might have several USB ports, LPT port, COM ports, etc... All those ports consume some resources even when not utilized, so it is advisable to disable them in the BIOS. Likewise, the eventual Floppy disk drive and CD/DVD-ROM drives should be disabled once the VMware host software has been installed.

3.2 Storage

The quality of the storage is extremely important in a VMware infrastructure, especially with disk-intensive systems like databases (BPC database tier)

There are several options for storage: Direct-attached storage (DAS), Network-attached storage (NAS), and Storage-Area-Network (SAN), which comes in various technologies: Fibre-Channel, Hardware-based iSCSI and Software-based iSCSI.

Currently, Fibre-Channel SAN offers the best performance, with a bandwidth of 2 Gb/s, compared to 1 Gb/s for NAS and iSCSI SAN over Gigabit Ethernet. However, technologies are evolving and 10-Gigabit Ethernet could soon change this picture.

Software-based iSCSI should be avoided as its performance is dependant on CPU utilization. High CPU utilization by a VM could significantly decrease storage performance.

When using Ethernet-based storage, the bandwidth is essential to good performance. Therefore special attention should be given to the design of the network, in order to avoid bottlenecks. Oversubscription of the links create collisions, and recovering from those collisions results in significant performance degradation.

4 Configuration of the Virtual Machines for BPC

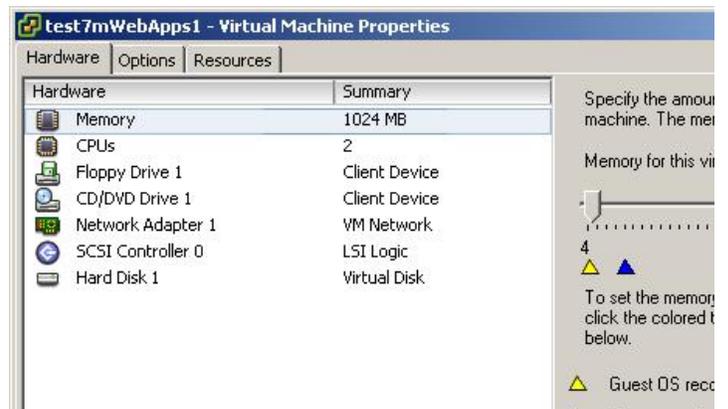
The general topology and architecture guidelines for the implementation of BPC in VMs are similar to those for physical servers. In multi-server implementations, 64-bit VMs should be used for the Database Services and Analysis Services servers, and 32-bit VMs should be used for the Web, Reporting Services and Application servers. In the case of BPC 7.0 for the Netweaver platform, the .Net tier can run on either 32-bit or 64-bit VMs, in WOW emulation mode. Because of the overhead of the WOW emulation, a 32-bit VM is preferable.

There are some steps that are specific to an installation in Virtual Machines, that should be taken before installing BPC:

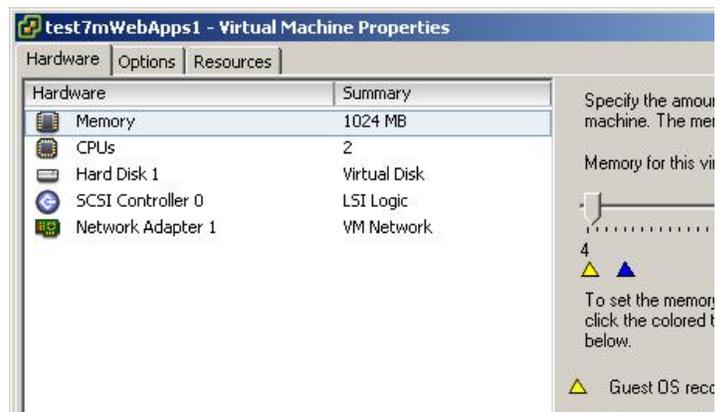
4.1 Components

Do not install any virtual hardware that is not necessary

1. By default the VMs contain a virtual Floppy Disc Drive and a Virtual CD/DVD-ROM drive.



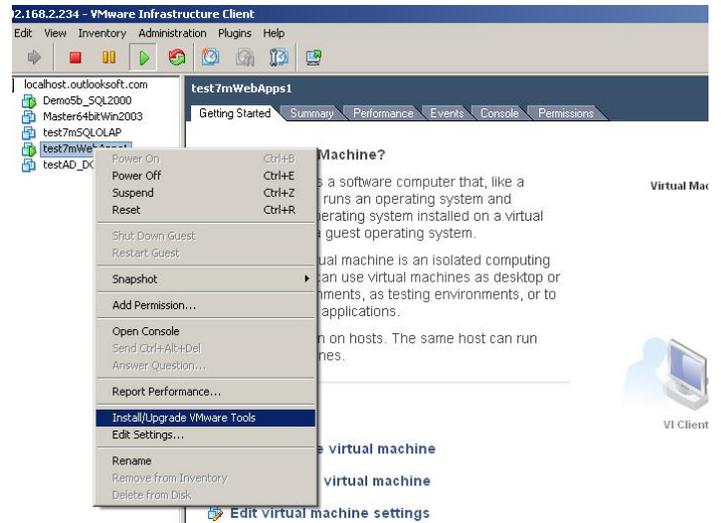
2. In most cases those are not needed past the initial setup and can be removed, freeing up some resources.



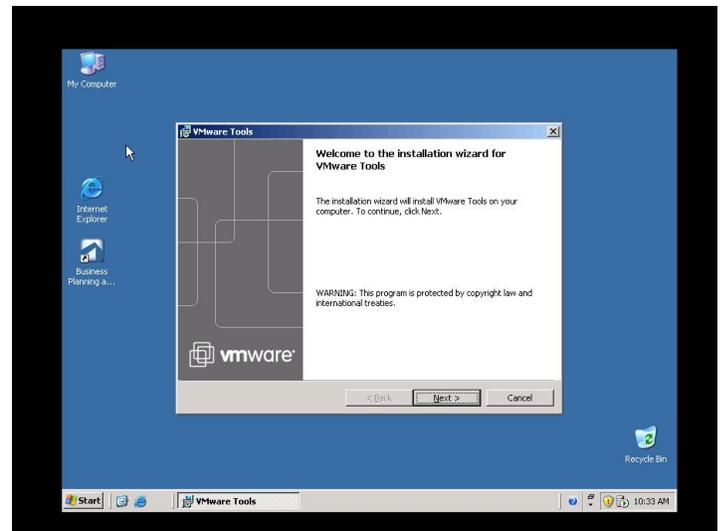
4.2 Installing VMware Tools

VMware tools provides a suite of device drivers that are specific to VMware and usually have reduced overhead compared to the drivers that emulate real hardware.

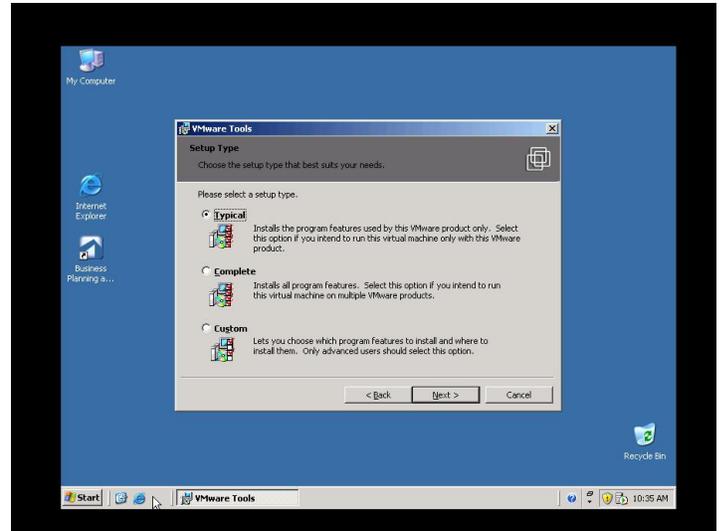
1. The installation of VMware Tools is typically initiated from the VI Client:



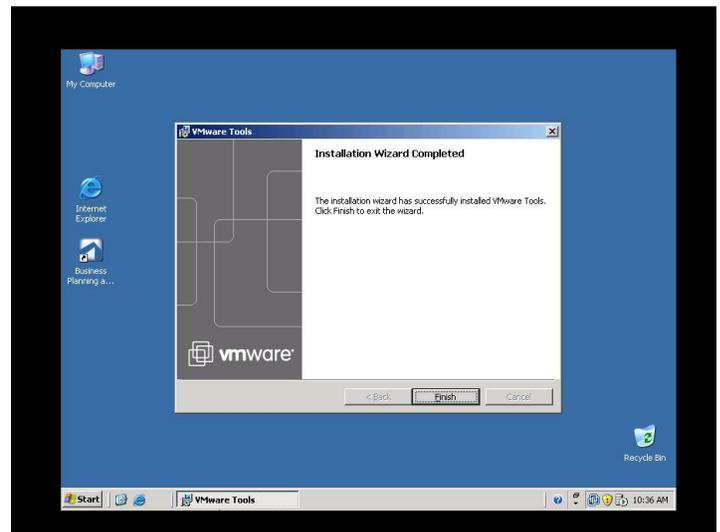
2. This will automatically start the VMware Tools setup program inside the VM



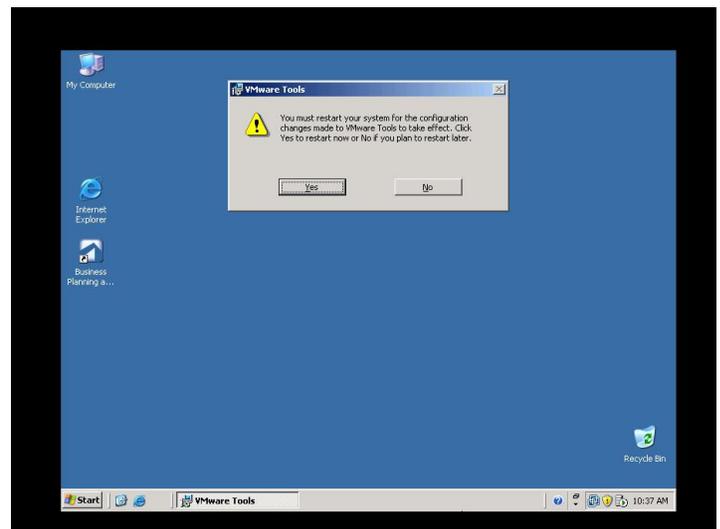
3. The default installation is fine



4. Click on Finish



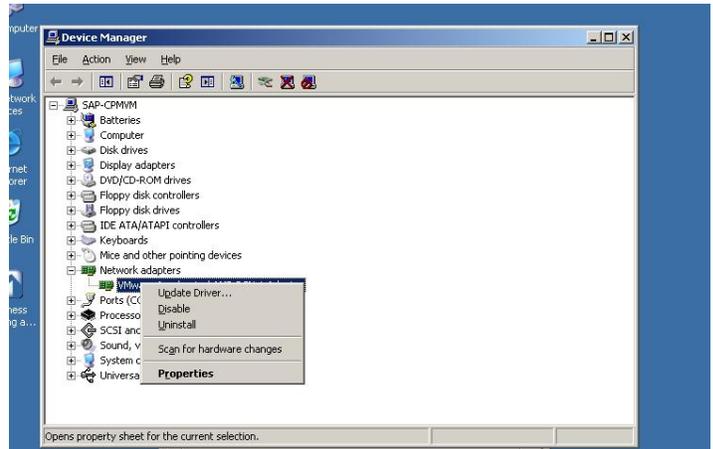
5. and reboot the Virtual Machine



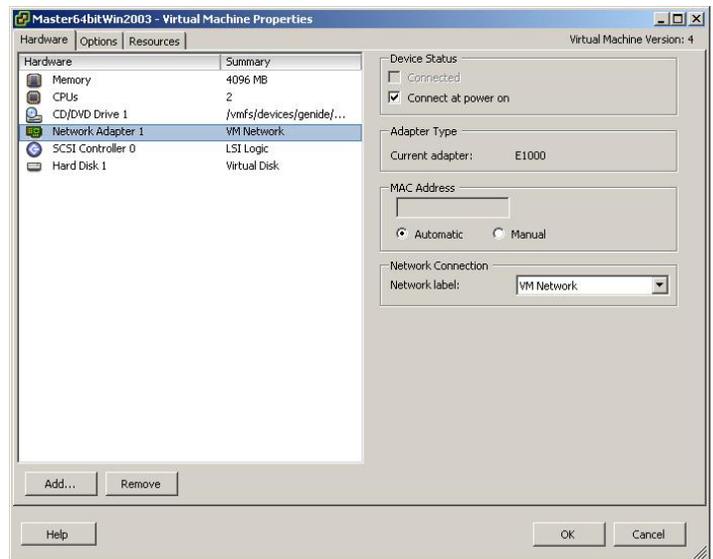
4.3 Installing the Enhanced VMxnet Network Adapter

This adapter has been designed for optimal communication with the Virtual network that is part of the ESXi server.

1. Uninstall the current adapter inside the VM, and shutdown the VM.



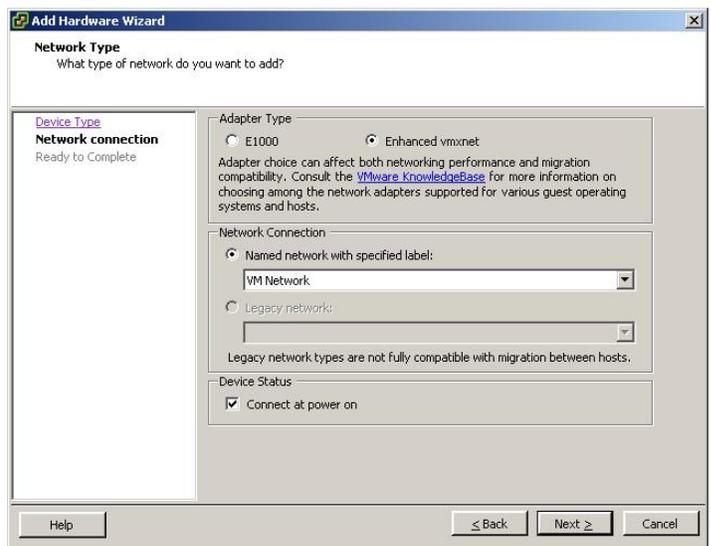
2. in VI Client, edit the VM settings, highlight the Network adapter and click on “remove”



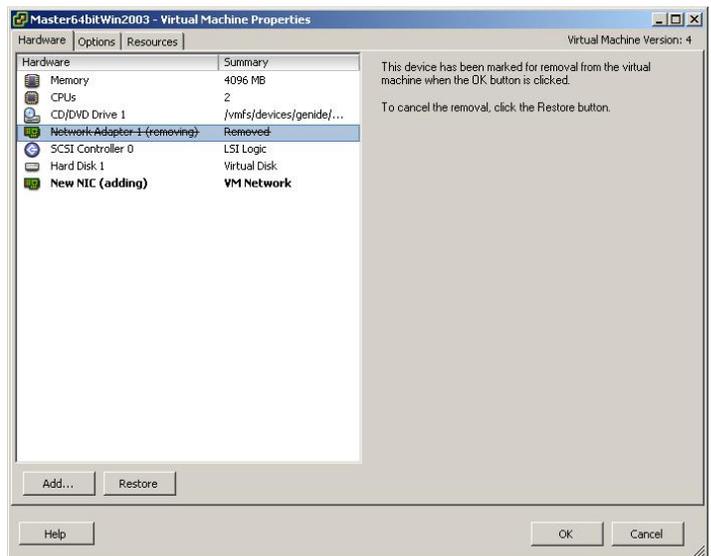
3. Click on Add, and select Ethernet Adapter.



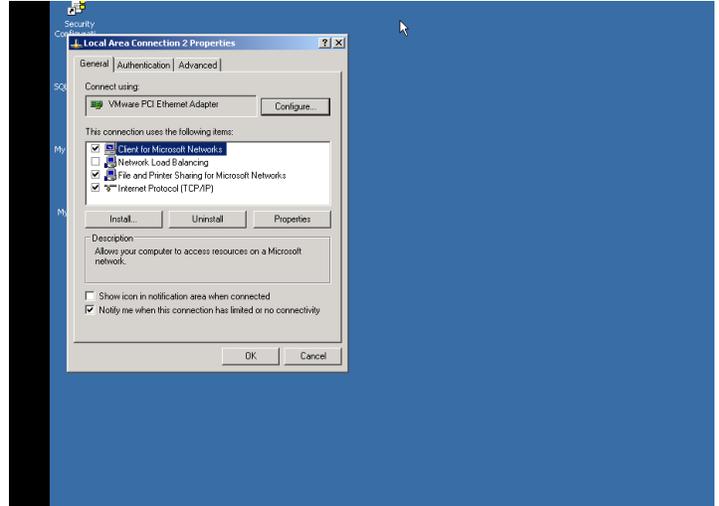
4. Select Enhanced VMxnet



5. Verify that the old adapter is being removed and the new one is being added. Power-up the VM



6. The new hardware is detected automatically (only if VMware tools have been installed). Adjust its IP configuration as necessary.



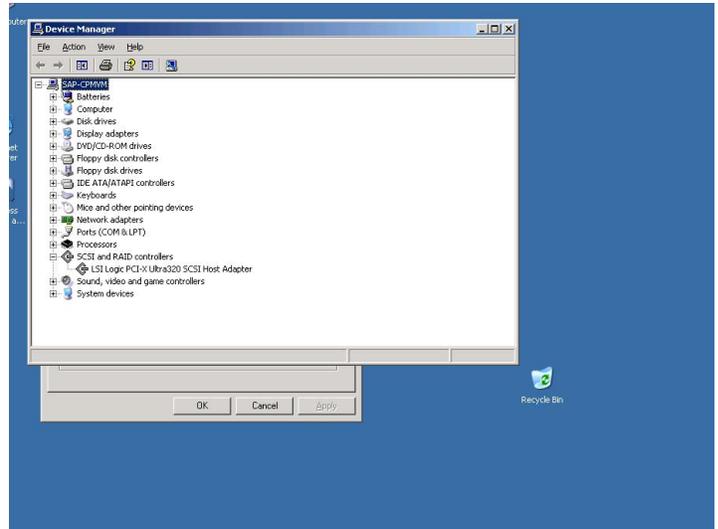
4.4 Change the storage adapter

The BusLogic SCSI adapter is slightly more efficient than the LSILogic adapter. However VMware does not recommend its use on 64-bit Windows servers. As the benefit would be marginal on a Web/App tier (which is not very disk-intensive), the only practical benefit would be for a single-server BPC implementation.

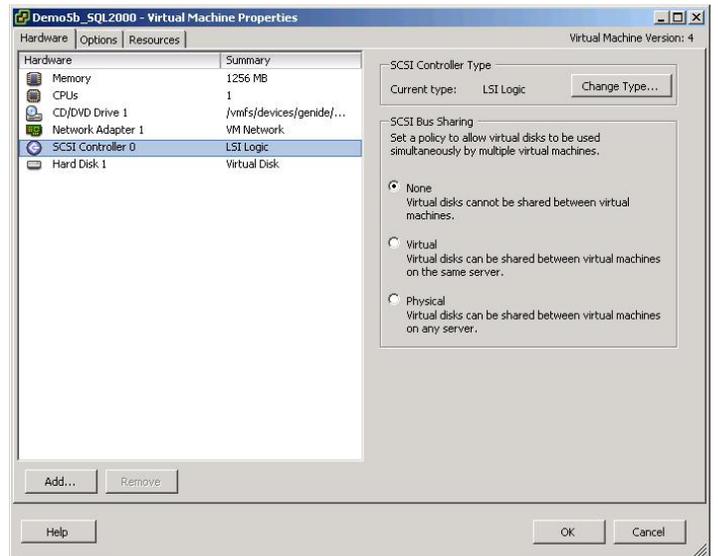
1. This operation could cause the VM to fail to boot up. Making a backup copy of the VM is ESSENTIAL!

CAUTION

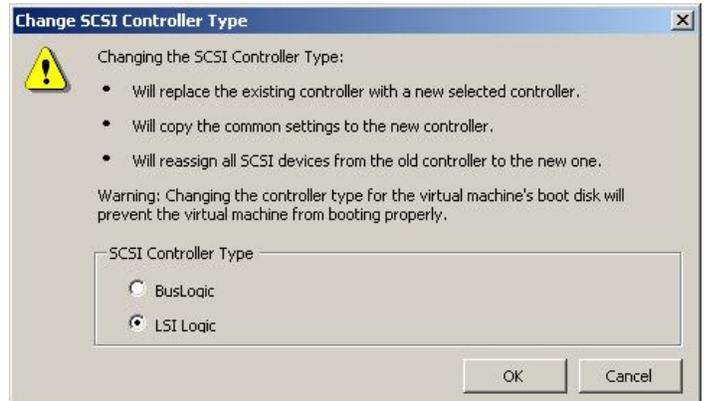
- By default, VMware uses the LSI Logic SCSI adapter. To change it, first shutdown the VM.



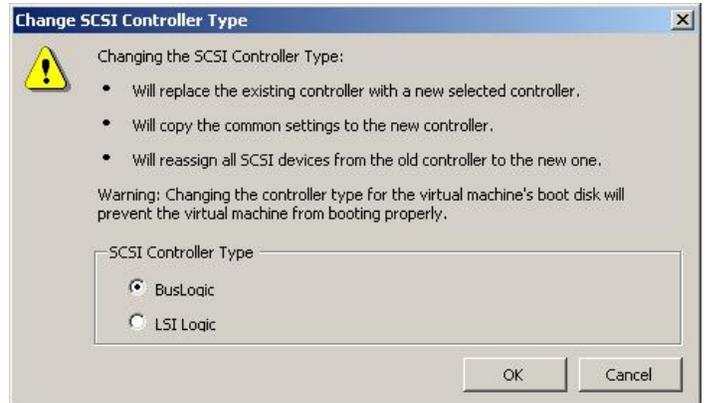
- In the VI Client, edit the settings of the VM, highlight the SCSI Controller



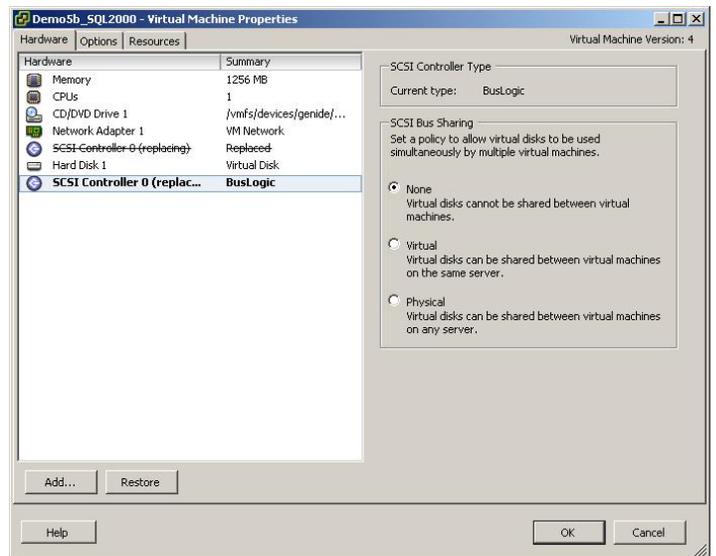
- Click on Change Type. VMware warns of potential issues.



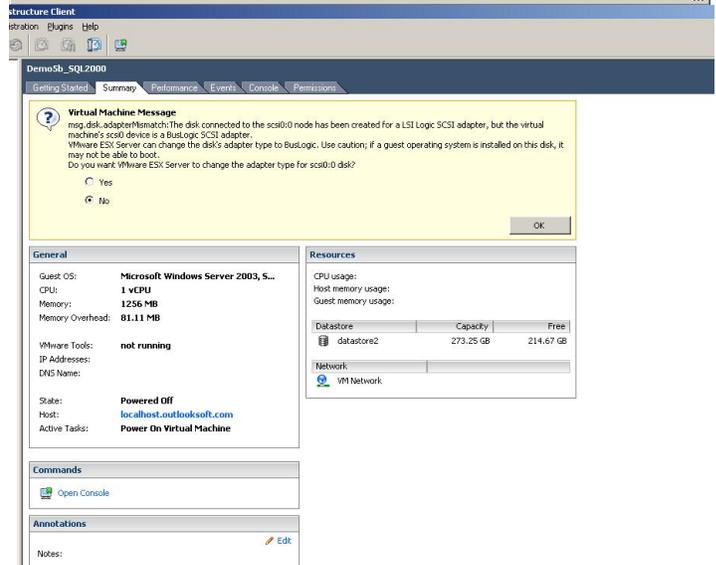
5. Select BusLogic



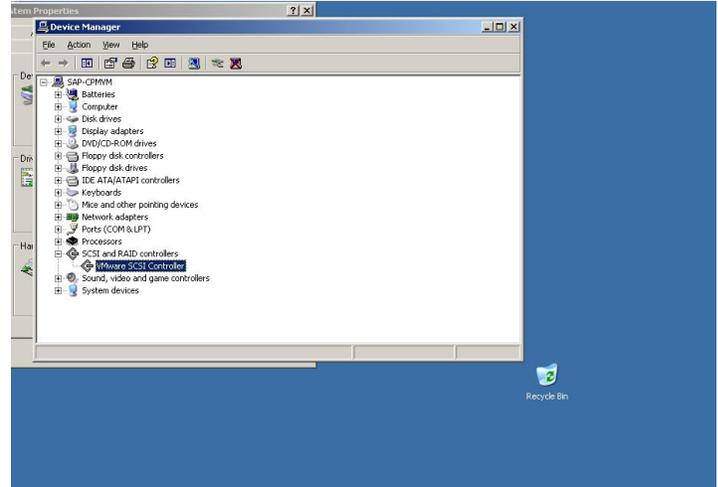
6. The setting screen indicates that the LSI Logic adapter is being removed and the Buslogic adapter is being added



7. A final warning...



- After booting up, the new adapter appears in Device Manager inside the VM.

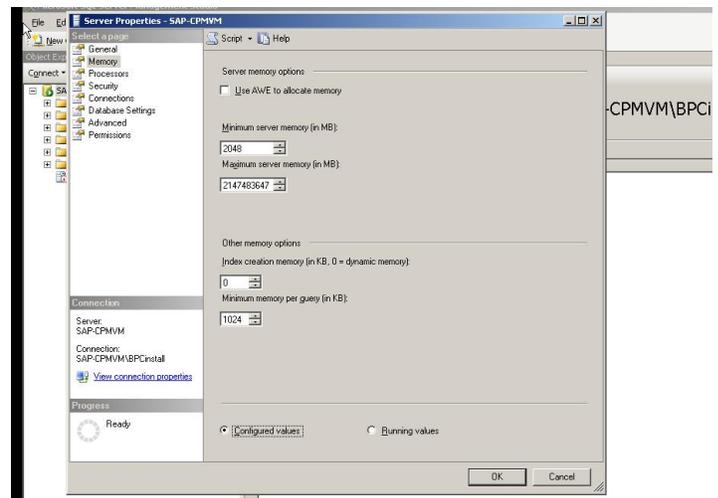


4.5 SQL Server considerations

4.5.1 Memory Allocation

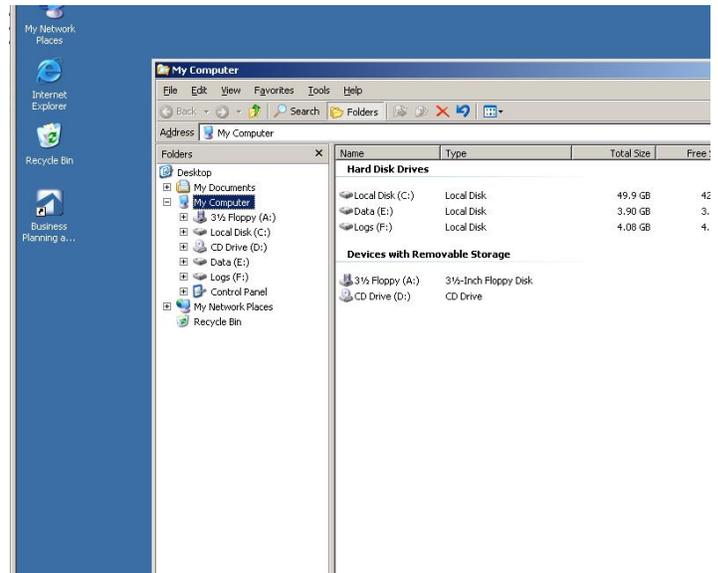
Because of the overhead associated with Memory management under VMware, SQL Server will benefit from being allocated a fixed amount of RAM

- Inside the VM, open SQL Management Studio, connect to the database server instance, right-click on the server name, and select properties. Highlight the "Memory" item, and set the minimum to an appropriate value (2 Gb in this picture).

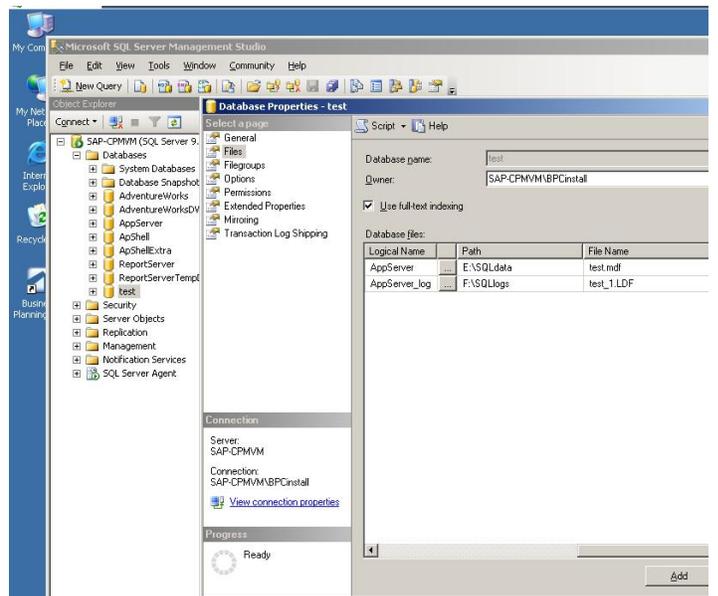


4.5.2 File location

1. As with any SQL server implementation, it is highly recommended to have the data files and the logs on separate volumes.



2. The files can be relocated by detaching the database, moving the files and re-attaching the database



4.5.3 .Net 1.1 issue

There is an issue with .Net 1.1 that seems to appear quite frequently when installing some SQL server components in a VM. The symptoms are usually some difficulties connecting to SQL, and some MSinstaller errors as well as some .Net errors in Event Viewer:

.NET Runtime Optimization Service (clr_optimization_v2.0.50727_32). failed to compile

The fix described in the Microsoft Knowledge Base at <http://support.microsoft.com/kb/928319> corrects it.

As always, a backup of the VM or at least of the registry is best practice and is strongly recommended.

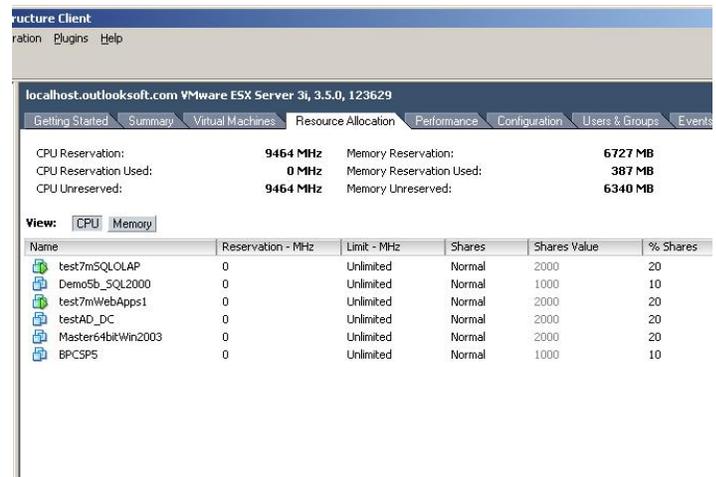
5 Resource Management

Virtualization offers some flexibility and some cost benefit compared to traditional hardware. However it is not without risks.

First, it can be very tempting to forget the limitations of the host hardware. It is indeed possible to run many VMs on a single host. But as the number of VMs increases, the resources (CPU, Memory, storage and network bandwidth) have to be shared among those VMs. This can very quickly lead to severe performance problems because of overcommitment of one or more resources.

Here are some basic rules:

1. Use Memory reservations. This is especially useful on SQL and Analysis Services tiers



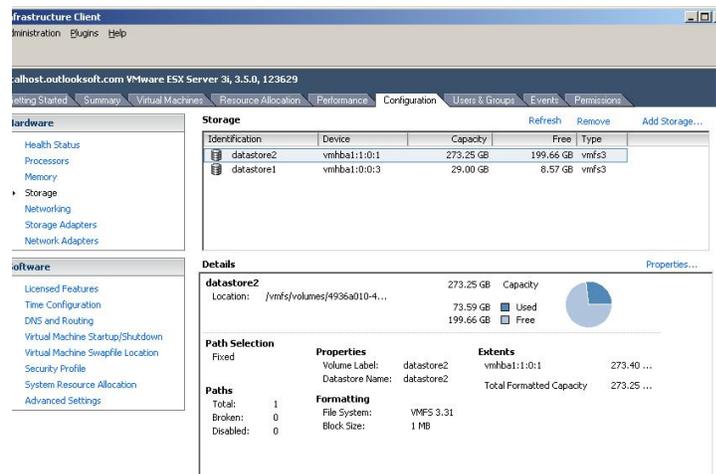
The screenshot shows the VMware Infrastructure Client interface for a VM named 'localhost.outlooksoft.com VMware ESX Server 3i, 3.5.0, 123629'. The 'Resource Allocation' tab is selected, displaying the following resource usage:

Resource	Value
CPU Reservation:	9464 MHz
CPU Reservation Used:	0 MHz
CPU Unreserved:	9464 MHz
Memory Reservation:	6727 MB
Memory Reservation Used:	387 MB
Memory Unreserved:	6340 MB

Below this, a table shows the resource allocation for several virtual machines:

Name	Reservation - MHz	Limit - MHz	Shares	Shares Value	% Shares
test7mSQLQLAP	0	Unlimited	Normal	2000	20
Demo5b_SQL2000	0	Unlimited	Normal	1000	10
test7mWebApps1	0	Unlimited	Normal	2000	20
testAD_DC	0	Unlimited	Normal	2000	20
Master64bitWin2003	0	Unlimited	Normal	2000	20
BPCSFS	0	Unlimited	Normal	1000	10

2. Use multiple datastores, and when a VM contains several virtual disks, place them on separate datastores for optimal performance.



The screenshot shows the VMware Infrastructure Client interface for the same VM, with the 'Storage' tab selected. It displays the configuration for two datastores:

Device	Capacity	Free	Type
datastore2 (vmbbs1:1:0:1)	273.25 GB	199.66 GB	vmfs3
datastore1 (vmbbs1:0:0:3)	29.00 GB	8.57 GB	vmfs3

The 'Details' section for 'datastore2' shows a pie chart indicating that 73.59 GB is used and 199.66 GB is free. The 'Path Selection' section shows that the volume label is 'datastore2' and the datastore name is 'datastore2'. The 'Paths' section shows that there is 1 total path, 0 broken paths, and 0 disabled paths. The file system is WFS 3.31 and the block size is 1 MB.

Do not use more virtual CPUs than needed. This is not an issue as long as the number of physical CPU cores exceeds the total number of Virtual CPUs. But after that, physical CPU cores have to be shared between VMs, leading to a degradation of performance.

If possible, use a separate network for the management client.

Schedule maintenance tasks very carefully. As the resources are shared, a maintenance task running on one VM can easily have a major impact on the performance of an otherwise totally unrelated VM. This can include backups, defragmentations, etc...

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