

Chapter 12. Troubleshooting

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This chapter provides answers to commonly asked questions. In order to improve your user experience with Oracle VM VirtualBox, it is recommended to read this section to learn more about common pitfalls and get recommendations on how to use the product.

12.1. Procedures and Tools

12.1.1. Categorizing and Isolating Problems

More often than not, a virtualized guest behaves like a physical system. Any problems that a physical machine would encounter, a virtual machine will encounter as well. If, for example, Internet connectivity is lost due to external issues, virtual machines will be affected just as much as physical ones.

If a true Oracle VM VirtualBox problem is encountered, it helps to categorize and isolate the problem first. Here are some of the questions that should be answered before reporting a problem:

- Is the problem specific to a certain guest OS? Or a specific release of a guest OS? Especially with Linux guest related problems, the issue may be specific to a certain distribution and version of Linux.
- Is the problem specific to a certain host OS? Problems are usually not host OS specific, because most of the Oracle VM VirtualBox code base is shared across all supported platforms, but especially in the areas of networking and USB support, there are significant differences between host platforms. Some GUI related issues are also host specific.
- Is the problem specific to certain host hardware? This category of issues is typically related to the host CPU. Because of significant differences between VT-x and AMD-V, problems may be specific to one or the other technology. The exact CPU model may also make a difference because different CPUs support different features, which may affect certain aspects of guest CPU operation.
- Is the problem specific to guest SMP? That is, is it related to the number of virtual CPUs (VCPUs) in the guest? Using more than one CPU usually significantly affects the internal operation of a guest OS.
- Is the problem specific to the Guest Additions? In some cases, this is obvious, such as a shared folders problem. In other cases such as display problems, it may be less obvious. If the problem is Guest Additions specific, is it also specific to a certain version of the Guest Additions?
- Is the problem specific to a certain environment? Some problems are related to a particular environment external to the VM. This usually involves network setup. Certain configurations of external servers such as DHCP or PXE may expose problems which do not occur with other, similar servers.
- Is the problem a regression? Knowing that an issue is a regression usually makes it significantly easier to find the solution. In this case, it is crucial to know which version is affected and which is not.

12.1.2. Collecting Debugging Information

For problem determination, it is often important to collect debugging information which can be analyzed by Oracle VM VirtualBox support. This section contains information about what kind of information can be obtained.

Every time Oracle VM VirtualBox starts up a VM, a so-called *release log file* is created, containing lots of information about the VM configuration and runtime events. The log file is called `VBox.log` and resides in the VM log file folder, which is `$HOME/VirtualBox VMS/VM-name/Logs` by default.

When starting a VM, the configuration file of the last run will be renamed to `.1`, up to `.3`. Sometimes when there

is a problem, it is useful to have a look at the logs. Also when requesting support for Oracle VM VirtualBox, supplying the corresponding log file is mandatory.

For convenience, for each virtual machine, VirtualBox Manager can show these logs in a window. Select a virtual machine from the machine list on the left and click **Logs** in the machine tools menu.

The release log file, `VBox.log`, contains a wealth of diagnostic information, such as Host OS type and version, Oracle VM VirtualBox version and build. It also includes a complete dump of the guest's configuration (CFGM), detailed information about the host CPU type and supported features, whether hardware virtualization is enabled, information about VT-x/AMD-V setup, state transitions (such as creating, running, paused, stopping), guest BIOS messages, Guest Additions messages, device-specific log entries and, at the end of execution, final guest state and condensed statistics.

In case of crashes, it is very important to collect *crash dumps*. This is true for both host and guest crashes. For information about enabling core dumps on Linux, Oracle Solaris, and macOS systems, refer to the following core dump article on the Oracle VM VirtualBox website:

http://www.virtualbox.org/wiki/Core_dump.

You can also use **VBoxManage debugvm** to create a dump of a complete virtual machine. See [Section 8.45, "VBoxManage debugvm"](#).

For network related problems, it is often helpful to capture a trace of network traffic. If the traffic is routed through an adapter on the host, it is possible to use Wireshark or a similar tool to capture the traffic there. However, this often also includes a lot of traffic unrelated to the VM.

Oracle VM VirtualBox provides an ability to capture network traffic only on a specific VM's network adapter. Refer to the following network tracing article on the Oracle VM VirtualBox website for information on enabling this capture:

http://www.virtualbox.org/wiki/Network_tips.

The trace files created by Oracle VM VirtualBox are in `.pcap` format and can be easily analyzed with Wireshark.

12.1.3. Using the VBoxBugReport Command to Collect Debug Information Automatically

The **VBoxBugReport** command is used to collect debug information automatically for an Oracle VM VirtualBox installation. This command can be useful when you need to gather information to send to Oracle Support.

The following examples show how to use **VBoxBugReport**.

By default, the command collects **VBoxSVC** process logs, device settings, and global configuration data for an Oracle VM VirtualBox host.

```
$ VBoxBugReport
...
0% - collecting VBoxSVC.log.10...
7% - collecting VBoxSVC.log.9...
...
64% - collecting VBoxSVC.log.1...
71% - collecting VBoxSVC.log...
78% - collecting VirtualBox.xml...
85% - collecting HostUsbDevices...
92% - collecting HostUsbFilters...
100% - compressing...
```

```
Report was written to '2019-03-26-13-32-02-bugreport.tgz'
```

The results are saved as a compressed tar file archive in the same directory where the command is run.

To specify a different output file location:

```
$ VBoxBugReport --output ~/debug/bug004.tgz
```

To output all debug information to a single text file, rather than a `tgz` file:

```
$ VBoxBugReport --text
```

To collect information for a specific VM, called `Windows_10`:

```
$ VBoxBugReport Windows_10
```

This command collects machine settings, guest properties, and log files for the specified VM. Global configuration information for the host is also included.

To collect information for several VMs, called `Windows_7`, `Windows_8`, and `Windows_10`:

```
$ VBoxBugReport Windows_7 Windows_8 Windows_10
```

To collect information for all VMs:

```
$ VBoxBugReport --all
```

To show a full list of the available command options, run **VBoxBugReport --help**.

12.1.4. The Built-In VM Debugger

Oracle VM VirtualBox includes a built-in VM debugger, which advanced users may find useful. This debugger enables you to examine and, to some extent, control the VM state.

Warning

Use the VM debugger at your own risk. There is no support for it, and the following documentation is only made available for advanced users with a very high level of familiarity with the x86/AMD64 machine instruction set, as well as detailed knowledge of the PC architecture. A degree of familiarity with the internals of the guest OS in question may also be very helpful.

The VM debugger is available in all regular production versions of Oracle VM VirtualBox, but it is disabled by default because the average user will have little use for it. There are two ways to access the debugger:

- Using a debugger console window displayed alongside the VM
- Using the **telnet** protocol on port 5000

The debugger can be enabled in the following ways:

- Start the VM directly using **VirtualBoxVM --startvm**, with an additional `--dbg`, `--debug`, or `--debug-command-line` argument. See the **VirtualBoxVM --help** command usage help for details.
- Set the `VBOX_GUI_DBG_ENABLED` or `VBOX_GUI_DBG_AUTO_SHOW` environment variable to `true` before launching the Oracle VM VirtualBox process. Setting these variables, only their presence is checked, is effective even when the first Oracle VM VirtualBox process is the VM selector window. VMs subsequently launched from the selector will have the debugger enabled.
- Set the `GUI/Dbg/Enabled` extra data item to `true` before launching the VM. This can be set globally or on a per VM basis.

A new **Debug** menu entry is added to the Oracle VM VirtualBox application. This menu enables the user to open

the debugger console.

The VM debugger command syntax is loosely modeled on Microsoft and IBM debuggers used on DOS, OS/2, and Windows. Users familiar with symdeb, CodeView, or the OS/2 kernel debugger will find the Oracle VM VirtualBox VM debugger familiar.

The most important command is **help**. This will print brief usage help for all debugger commands. The set of commands supported by the VM debugger changes frequently and the **help** command is always up-to-date.

A brief summary of frequently used commands is as follows:

- **stop**: Stops the VM execution and enables single stepping
- **g**: Continue VM execution
- **t**: Single step an instruction
- **rg**, **rh**, and **r**: Print the guest, hypervisor, and current registers
- **kg**, **kh**, and **k**: Print the guest, hypervisor, and current call stack
- **da**, **db**, **dw**, **dd**, **dq**: Print memory contents as ASCII, bytes, words, dwords, and qwords
- **u**: Unassemble memory
- **dg**: Print the guest's GDT
- **di**: Print the guest's IDT
- **dl**: Print the guest's LDT
- **dt**: Print the guest's TSS
- **dp***: Print the guest's page table structures
- **bp** and **br**: Set a normal and recompiler breakpoint
- **bl**: List breakpoints
- **bc**: Clear a breakpoint
- **writecore**: Write a VM core file to disk. See [Section 12.1.5, “VM Core Format”](#)

See the built-in **help** for other available commands.

The VM debugger supports symbolic debugging, although symbols for guest code are often not available. For Oracle Solaris guests, the **detect** command automatically determines the guest OS version and locates kernel symbols in guest's memory. Symbolic debugging is then available. For Linux guests, the **detect** commands also determines the guest OS version, but there are no symbols in the guest's memory. Kernel symbols are available in the file `/proc/kallsyms` on Linux guests. This file must be copied to the host, for example using **scp**. The **loadmap** debugger command can be used to make the symbol information available to the VM debugger. Note that the `kallsyms` file contains the symbols for the currently loaded modules. If the guest's configuration changes, the symbols will change as well and must be updated.

For all guests, a simple way to verify that the correct symbols are loaded is the **k** command. The guest is normally idling and it should be clear from the symbolic information that the guest operating system's idle loop is being executed.

Another group of debugger commands is the set of **info** commands. Running **info help** provides complete usage

information. The information commands provide ad-hoc data pertinent to various emulated devices and aspects of the VMM. There is no general guideline for using the **info** commands, the right command to use depends entirely on the problem being investigated. Some of the **info** commands are as follows:

- **cfgm**: Print a branch of the configuration tree
- **cpuid**: Display the guest CPUID leaves
- **ioport**: Print registered I/O port ranges
- **mmio**: Print registered MMIO ranges
- **mode**: Print the current paging mode
- **pit**: Print the i8254 PIT state
- **pic**: Print the i8259A PIC state
- **ohci**, **ehci**, **xhci**: Print a subset of the OHCI, EHCI, and xHCI USB controller state
- **pcnet0**: Print the PCnet state
- **vgatext**: Print the contents of the VGA framebuffer formatted as standard text mode
- **timers**: Print all VM timers

The output of the **info** commands generally requires in-depth knowledge of the emulated device or Oracle VM VirtualBox VMM internals. However, when used properly, the information provided can be invaluable.

12.1.5. VM Core Format

Oracle VM VirtualBox uses the 64-bit ELF format for its VM core files created by **VBoxManage debugvm**, see [Section 8.45, “VBoxManage debugvm”](#). The VM core file contains the memory and CPU dumps of the VM and can be useful for debugging your guest OS. The 64-bit ELF object format specification can be obtained at:

<http://downloads.openwatcom.org/ftp/devel/docs/elf-64-gen.pdf>.

The overall layout of the VM core format is as follows:

```
[ ELF 64 Header]
[ Program Header, type PT_NOTE ]
  → offset to COREDESCRIPTOR
[ Program Header, type PT_LOAD ] - one for each contiguous physical memory range
  → Memory offset of range
  → File offset
[ Note Header, type NT_VBOXCORE ]
[ COREDESCRIPTOR ]
  → Magic
  → VM core file version
  → VBox version
  → Number of vCPUs etc.
[ Note Header, type NT_VBOXCPU ] - one for each vCPU
[ vCPU 1 Note Header ]
  [ DBGFCORECPU - vCPU 1 dump ]
[ Additional Notes + Data ] - currently unused
[ Memory dump ]
```

The memory descriptors contain physical addresses relative to the guest and not virtual addresses. Regions of memory such as MMIO regions are not included in the core file.

The relevant data structures and definitions can be found in the Oracle VM VirtualBox sources under the

following header files: `include/VBox/dbgcorefmt.h`, `include/iprt/x86.h` and `src/VBox/Runtime/include/internal/ldrELFCommon.h`.

The VM core file can be inspected using **elfdump** and GNU **readelf** or other similar utilities.

12.2. General Troubleshooting

12.2.1. Guest Shows IDE/SATA Errors for File-Based Images on Slow Host File System

Occasionally, some host file systems provide very poor writing performance and as a consequence cause the guest to time out IDE/SATA commands. This is normal behavior and should normally cause no real problems, as the guest should repeat commands that have timed out. However, guests such as some Linux versions have severe problems if a write to an image file takes longer than about 15 seconds. Some file systems however require more than a minute to complete a single write, if the host cache contains a large amount of data that needs to be written.

The symptom for this problem is that the guest can no longer access its files during large write or copying operations, usually leading to an immediate hang of the guest.

In order to work around this problem, the true fix is to use a faster file system that does not exhibit such unacceptable write performance, it is possible to flush the image file after a certain amount of data has been written. This interval is normally infinite, but can be configured individually for each disk of a VM.

For IDE disks use the following command:

```
VBoxManage setextradata VM-name
"VBoxInternal/Devices/piix3ide/0/LUN#[x]/Config/FlushInterval" [b]
```

For SATA disks use the following command:

```
VBoxManage setextradata VM-name
"VBoxInternal/Devices/ahci/0/LUN#[x]/Config/FlushInterval" [b]
```

[x] specifies the disk. For IDE, 0 represents device 0 on the primary channel, 1 represents device 1 on the primary channel, 2 represents device 0 on the secondary channel, and 3 represents device 1 on the secondary channel. For SATA, use values between 0 and 29. This configuration option applies to disks only. Do not use this option for CD or DVD drives.

The unit of the interval ([b]) is the number of bytes written since the last flush. The value for it must be selected so that the occasional long write delays do not occur. Since the proper flush interval depends on the performance of the host and the host filesystem, finding the optimal value that makes the problem disappear requires some experimentation. Values between 1000000 and 10000000 (1 to 10 megabytes) are a good starting point. Decreasing the interval both decreases the probability of the problem and the write performance of the guest. Setting the value unnecessarily low will cost performance without providing any benefits. An interval of 1 will cause a flush for each write operation and should solve the problem in any case, but has a severe write performance penalty.

Providing a value of 0 for [b] is treated as an infinite flush interval, effectively disabling this workaround. Removing the extra data key by specifying no value for [b] has the same effect.

12.2.2. Responding to Guest IDE/SATA Flush Requests

If desired, the virtual disk images can be flushed when the guest issues the IDE FLUSH CACHE command. Normally these requests are ignored for improved performance. The parameters below are only accepted for disk drives. They must not be set for DVD drives.

To enable flushing for IDE disks, issue the following command:

```
$ VBoxManage setextradata VM-name "VBoxInternal/Devices/piix3ide/0/LUN#[x]/Config/IgnoreFlush" 0
```

[x] specifies the disk. Enter 0 for device 0 on the primary channel, 1 for device 1 on the primary channel, 2 for device 0 on the secondary channel, or 3 for device 1 on the secondary channel.

To enable flushing for SATA disks, issue the following command:

```
$ VBoxManage setextradata VM-name "VBoxInternal/Devices/ahci/0/LUN#[x]/Config/IgnoreFlush" 0
```

The value [x] that selects the disk can be a value between 0 and 29.

Note that this does not affect the flushes performed according to the configuration described in [Section 12.2.1, “Guest Shows IDE/SATA Errors for File-Based Images on Slow Host File System”](#). Restoring the default of ignoring flush commands is possible by setting the value to 1 or by removing the key.

12.2.3. Performance Variation with Frequency Boosting

Many multicore processors support some form of frequency boosting, which means that if only one core is utilized, it can run possibly 50% faster or even more than the rated CPU frequency. This causes measured performance to vary somewhat as a function of the momentary overall system load. The exact behavior depends strongly on the specific processor model.

As a consequence, benchmarking on systems which utilize frequency boosting may produce unstable and non-repeatable results. This is especially true if benchmark runs are short, of the order of seconds. To obtain stable results, benchmarks must be run over longer periods of time and with a constant system load apart from the VM being tested.

12.2.4. Frequency Scaling Effect on CPU Usage

On some hardware platforms and operating systems, CPU frequency scaling may cause CPU usage reporting to be highly misleading. This happens in situations when the host CPU load is significant but not heavy, such as between 15% to 30% of the maximum.

Most operating systems determine CPU usage in terms of time spent, measuring for example how many nanoseconds the systems or a process was active within one second. However, in order to save energy, systems can significantly scale down CPU speed when the system is not fully loaded. When the CPU is running at for example one half of its maximum speed, the same number of instructions will take roughly twice as long to execute compared to running at full speed.

Depending on the specific hardware and host OS, this effect can very significantly skew the CPU usage reported by the OS. The reported CPU usage can be several times higher than what it would have been had the CPU been running at full speed. The effect can be observed both on the host OS and in a guest OS.

12.2.5. Inaccurate Windows CPU Usage Reporting

CPU usage reporting tools which come with Windows, such as Task Manager or Resource Monitor, do not take the time spent processing hardware interrupts into account. If the interrupt load is heavy, with thousands of interrupts per second, CPU usage may be significantly underreported.

This problem affects Windows as both host and guest OS. Sysinternals tools, such as Process Explorer, do not suffer from this problem.

12.2.6. Poor Performance Caused by Host Power Management

On some hardware platforms and operating systems, virtualization performance is negatively affected by host CPU power management. The symptoms may be choppy audio in the guest or erratic guest clock behavior.

Some of the problems may be caused by firmware and/or host operating system bugs. Therefore, updating the firmware and applying operating systems fixes is recommended.

For optimal virtualization performance, the C1E power state support in the system's BIOS should be disabled, if such a setting is available. Not all systems support the C1E power state. On Intel systems, the `Intel C State` setting should be disabled. Disabling other power management settings may also improve performance. However, a balance between performance and power consumption must always be considered.

12.2.7. GUI: 2D Video Acceleration Option is Grayed Out

To use 2D Video Acceleration within Oracle VM VirtualBox, your host's video card should support certain OpenGL extensions. On startup, Oracle VM VirtualBox checks for those extensions, and, if the test fails, this option is silently grayed out.

To find out why it has failed, you can manually execute the following command:

```
$ VBoxTestOpenGL --log "log_file_name" --test 2D
```

It will list the required OpenGL extensions one by one and will show you which one failed the test. This usually means that you are running an outdated or misconfigured OpenGL driver on your host. It can also mean that your video chip is lacking required functionality.

12.3. Windows Guests

12.3.1. No USB 3.0 Support in Windows 7 Guests

If a Windows 7 or Windows Server 2008 R2 guest is configured for USB 3.0 (xHCI) support, the guest OS will not have any USB support at all. This happens because Windows 7 predates USB 3.0 and therefore does not ship with any xHCI drivers. Microsoft also does not offer any vendor-provided xHCI drivers through Windows Update.

To solve this problem, it is necessary to download and install the Intel xHCI driver in the guest. Intel offers the driver as the USB 3.0 eXtensible Host Controller (xHCI) driver for Intel 7 Series/C216 chipsets.

Note that the driver only supports Windows 7 and Windows Server 2008 R2. The driver package includes support for both 32-bit and 64-bit OS variants.

12.3.2. Windows Bluescreens After Changing VM Configuration

Changing certain virtual machine settings can cause Windows guests to fail during start up with a bluescreen. This may happen if you change VM settings after installing Windows, or if you copy a disk image with an already installed Windows to a newly created VM which has settings that differ from the original machine.

This applies in particular to the following settings:

- The ACPI and I/O APIC settings should never be changed after installing Windows. Depending on the presence of these hardware features, the Windows installation program chooses special kernel and device driver versions and will fail to startup should these hardware features be removed. Enabling them for a Windows VM which was installed without them does not cause any harm. However, Windows will not use these features in this case.
- Changing the storage controller hardware will cause bootup failures as well. This might also apply to you if you copy a disk image from an older version of Oracle VM VirtualBox to a new virtual machine. The default subtype of IDE controller hardware used by Oracle VM VirtualBox is PIIX4. Make sure that the storage

controller settings are identical.

12.3.3. Windows 0x101 Bluescreens with SMP Enabled (IPI Timeout)

If a VM is configured to have more than one processor (symmetrical multiprocessing, SMP), some configurations of Windows guests crash with an 0x101 error message, indicating a timeout for interprocessor interrupts (IPIs). These interrupts synchronize memory management between processors.

According to Microsoft, this is due to a race condition in Windows. A hotfix is available from Microsoft.

If this does not help, please reduce the number of virtual processors to 1.

12.3.4. Windows 2000 Installation Failures

When installing Windows 2000 guests, you might run into one of the following issues:

- Installation reboots, usually during component registration.
- Installation fills the whole hard disk with empty log files.
- Installation complains about a failure installing `msgina.dll`.

These problems are all caused by a bug in the hard disk driver of Windows 2000. After issuing a hard disk request, there is a race condition in the Windows driver code which leads to corruption if the operation completes too fast. For example, the hardware interrupt from the IDE controller arrives too soon. With physical hardware, there is a guaranteed delay in most systems so the problem is usually hidden there. However, it should be possible to also reproduce it on physical hardware. In a virtual environment, it is possible for the operation to be done immediately, especially on very fast systems with multiple CPUs, and the interrupt is signaled sooner than on a physical system. The solution is to introduce an artificial delay before delivering such interrupts. This delay can be configured for a VM using the following command:

```
$ VBoxManage setextradata VM-name "VBoxInternal/Devices/piix3ide/0/Config/IRQDelay" 1
```

This sets the delay to one millisecond. In case this does not help, increase it to a value between 1 and 5 milliseconds. Please note that this slows down disk performance. After installation, you should be able to remove the key, or set it to 0.

12.3.5. How to Record Bluescreen Information from Windows Guests

When Windows guests run into a kernel crash, they display a bluescreen error. Depending on how Windows is configured, the information will remain on the screen until the machine is restarted or it will reboot automatically. During installation, Windows is usually configured to reboot automatically. With automatic reboots, there is no chance to record the bluescreen information which might be important for problem determination.

Oracle VM VirtualBox provides a method of halting a guest when it wants to perform a reset. In order to enable this feature, use the following command:

```
$ VBoxManage setextradata VM-name "VBoxInternal/PDM/HaltOnReset" 1
```

12.3.6. No Networking in Windows Vista Guests

With Windows Vista, Microsoft dropped support for the AMD PCNet card that legacy versions of Oracle VM VirtualBox used to provide as the default virtual network card. For Windows Vista guests, Oracle VM VirtualBox now uses an Intel E1000 card by default.

If, for some reason, you still want to use the AMD card, you need to download the PCNet driver from the AMD

website. This driver is available for 32-bit Windows only. You can transfer it into the virtual machine using a shared folder. See [Section 4.3, “Shared Folders”](#).

12.3.7. Windows Guests may Cause a High CPU Load

Several background applications of Windows guests, especially virus scanners, are known to increase the CPU load notably even if the guest appears to be idle. We recommend to deactivate virus scanners within virtualized guests if possible.

12.3.8. Long Delays When Accessing Shared Folders

The performance for accesses to shared folders from a Windows guest might be decreased due to delays during the resolution of the Oracle VM VirtualBox shared folders name service. To fix these delays, add the following entries to the file `\windows\system32\drivers\etc\lmhosts` of the Windows guest:

```
255.255.255.255      VBOXSVR #PRE
255.255.255.255      VBOXSRV #PRE
```

After doing this change, a reboot of the guest is required.

12.3.9. USB Tablet Coordinates Wrong in Windows 98 Guests

If a Windows 98 VM is configured to use the emulated USB tablet (absolute pointing device), the coordinate translation may be incorrect and the pointer is restricted to the upper left quarter of the guest's screen.

The USB HID (Human Interface Device) drivers in Windows 98 are very old and do not handle tablets in the same way as modern operating systems do. To work around the problem, use the following command:

```
$ VBoxManage setextradata VM-name "VBoxInternal/USB/HidMouse/0/Config/CoordShift" 0
```

To restore the default behavior, remove the key or set its value to 1.

12.3.10. Windows Guests are Removed From an Active Directory Domain After Restoring a Snapshot

If a Windows guest is a member of an Active Directory domain and the snapshot feature of Oracle VM VirtualBox is used, it could be removed from the Active Directory domain after you restore an older snapshot.

This is caused by automatic machine password changes performed by Windows at regular intervals for security purposes. You can disable this feature as shown in the following article from Microsoft:

<http://support.microsoft.com/kb/154501>.

12.3.11. Windows 3.x Limited to 64 MB RAM

Windows 3.x guests are typically limited to 64 MB RAM, even if a VM is assigned much more memory. While Windows 3.1 is theoretically capable of using up to 512 MB RAM, it only uses memory available through the XMS interface. Versions of HIMEM.SYS, the Microsoft XMS manager, shipped with MS-DOS and Microsoft Windows 3.x can only use up to 64 MB on standard PCs.

This is a known HIMEM.SYS limitation. Windows 3.1 memory limits are described in detail in Microsoft Knowledge base article KB 84388.

It is possible for Windows 3.x guests to utilize more than 64 MB RAM if a different XMS provider is used. That could be a newer HIMEM.SYS version, such as that shipped with Windows 98, or a more capable third-party memory manager, such as QEMM.

12.4. Linux and X11 Guests

12.4.1. Linux Guests May Cause a High CPU load

Some Linux guests may cause a high CPU load even if the guest system appears to be idle. This can be caused by a high timer frequency of the guest kernel. Some Linux distributions, for example Fedora, ship a Linux kernel configured for a timer frequency of 1000Hz. We recommend to recompile the guest kernel and to select a timer frequency of 100Hz.

Linux kernels shipped with Red Hat Enterprise Linux, as well as kernels of related Linux distributions, such as CentOS and Oracle Linux, support a kernel parameter *divider=N*. Hence, such kernels support a lower timer frequency without recompilation. We suggest you add the kernel parameter *divider=10* to select a guest kernel timer frequency of 100Hz.

12.4.2. Buggy Linux 2.6 Kernel Versions

The following bugs in Linux kernels prevent them from executing correctly in Oracle VM VirtualBox, causing VM boot crashes:

- The Linux kernel version 2.6.18, and some 2.6.17 versions, introduced a race condition that can cause boot crashes in Oracle VM VirtualBox. Please use a kernel version 2.6.19 or later.
- With hardware virtualization and the I/O APIC enabled, kernels before 2.6.24-rc6 may panic on boot with the following message:

```
Kernel panic - not syncing: IO-APIC + timer doesn't work! Boot with
apic=debug and send a report. Then try booting with the 'noapic' option
```

If you see this message, either disable hardware virtualization or the I/O APIC as described in [Section 3.5, "System Settings"](#), or upgrade the guest to a newer kernel.

See <http://www.mail-archive.com/git-commits-head@vger.kernel.org/msg30813.html> for details about the kernel fix.

12.4.3. Shared Clipboard, Auto-Resizing, and Seamless Desktop in X11 Guests

Guest desktop services in guests running the X11 window system such as Oracle Solaris and Linux, are provided by a guest service called **VBoxClient**, which runs under the ID of the user who started the desktop session and is automatically started using the following command lines when your X11 user session is started if you are using a common desktop environment such as Gnome or KDE.

```
$ VBoxClient --clipboard
$ VBoxClient --display
$ VBoxClient --seamless
```

If a particular desktop service is not working correctly, it is worth checking whether the process which should provide it is running.

The **VBoxClient** processes create files in the user's home directory with names of the form `.vboxclient-*.pid` when they are running in order to prevent a given service from being started twice. It can happen due to misconfiguration that these files are created owned by root and not deleted when the services are stopped, which will prevent them from being started in future sessions. If the services cannot be started, you may wish to check whether these files still exist.

12.5. Oracle Solaris Guests

12.5.1. Certain Oracle Solaris 10 Releases May Take a Long Time to Boot with SMP

When using more than one CPU, Oracle Solaris 10 10/08, and Oracle Solaris 10 5/09 may take a long time to boot and may print warnings on the system console regarding failures to read from disk. This is a bug in Oracle Solaris 10 which affects specific physical and virtual configurations. It is caused by trying to read microcode updates from the boot disk when the disk interrupt is reassigned to a not yet fully initialized secondary CPU. Disk reads will time out and fail, triggering delays of about 45 seconds and warnings.

The recommended solution is upgrading to at least Oracle Solaris 10 10/09 which includes a fix for this problem. Alternative solutions include restricting the number of virtual CPUs to one or possibly using a different storage controller.

12.5.2. Older Solaris Releases Do Not Work with E1000 Ethernet

Solaris releases before Solaris 10 1/06, including Solaris 9, Solaris 10 1/05 (GA), and Solaris 10 3/05 (HW2), are unable to communicate through the Intel E1000 card. The Solaris e1000g driver does not enable PCI bus mastering for the network adapter and is therefore unable to send and receive data. This problem appears to be specific to the e1000g driver and does not reflect general Solaris driver behavior.

The AMD PCnet emulation (using the Solaris pcn driver) can be used instead of Intel E1000. Solaris 10 1/06 (U1) and later releases do not have this problem and work with the emulated E1000 ethernet controller.

12.6. Windows Hosts

12.6.1. Drag'n Drop not Working

Microsoft Windows uses technologies like UAC (User Account Control) and UIPI (User Interface Privilege Isolation) to prevent and/or mitigate security issues. By default, UAC and UIPI are enabled.

When a Oracle VM VirtualBox VM process is running with a higher so-called privilege level than another process that wants to interact with the VM process via drag'n drop (or system clipboard), Windows prevents this by default due to security reasons. This results in Oracle VM VirtualBox not being able to receive any Windows messages for drag'n drop. To make this work, the Oracle VM VirtualBox VM process must be running with the same (or lower) privilege level as the process its interacting with using drag'n drop. Disabling UAC and/or UIPI is not recommended.

12.6.2. VBoxSVC Out-of-Process COM Server Issues

Oracle VM VirtualBox makes use of the Microsoft Component Object Model (COM) for interprocess and intraprocess communication. This enables Oracle VM VirtualBox to share a common configuration among different virtual machine processes and provide several user interface options based on a common architecture. All global status information and configuration is maintained by the process `VBoxSVC.exe`, which is an out-of-process COM server. Whenever an Oracle VM VirtualBox process is started, it requests access to the COM server and Windows automatically starts the process. Note that it should never be started by the end user.

When the last process disconnects from the COM server, it will terminate itself after some seconds. The Oracle VM VirtualBox configuration XML files are maintained and owned by the COM server and the files are locked whenever the server runs.

In some cases, such as when a virtual machine is terminated unexpectedly, the COM server will not notice that the client is disconnected and stay active for a longer period of 10 minutes or so, keeping the configuration files locked. In other rare cases the COM server might experience an internal error and subsequently other processes fail to initialize it. In these situations, it is recommended to use the Windows task manager to kill the process

`VBoxSVC.exe`.

12.6.3. CD and DVD Changes Not Recognized

In case you have assigned a physical CD or DVD drive to a guest and the guest does not notice when the medium changes, make sure that the Windows media change notification (MCN) feature is not turned off. This is represented by the following key in the Windows registry:

```
HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Cdrom\Autorun
```

Certain applications may disable this key against Microsoft's advice. If it is set to 0, change it to 1 and reboot your system. Oracle VM VirtualBox relies on Windows notifying it of media changes.

12.6.4. Sluggish Response When Using Microsoft RDP Client

If connecting to a Virtual Machine using the Microsoft RDP client, called a Remote Desktop Connection, there can be large delays between input such as moving the mouse over a menu and output. This is because this RDP client collects input for a certain time before sending it to the RDP server.

The interval can be decreased by setting a Windows registry key to smaller values than the default of 100. The key does not exist initially and must be of type DWORD. The unit for its values is milliseconds. Values around 20 are suitable for low-bandwidth connections between the RDP client and server. Values around 4 can be used for a gigabit Ethernet connection. Generally values below 10 achieve a performance that is very close to that of the local input devices and screen of the host on which the Virtual Machine is running.

Depending whether the setting should be changed for an individual user or for the system, set either of the following.

```
HKEY_CURRENT_USER\Software\Microsoft\Terminal Server Client\Min Send Interval
```

```
HKEY_LOCAL_MACHINE\Software\Microsoft\Terminal Server Client\Min Send Interval
```

12.6.5. Running an iSCSI Initiator and Target on a Single System

Deadlocks can occur on a Windows host when attempting to access an iSCSI target running in a guest virtual machine with an iSCSI initiator, such as a Microsoft iSCSI Initiator, that is running on the host. This is caused by a flaw in the Windows cache manager component, and causes sluggish host system response for several minutes, followed by a "Delayed Write Failed" error message in the system tray or in a separate message window. The guest is blocked during that period and may show error messages or become unstable.

Setting the `VBOX_DISABLE_HOST_DISK_CACHE` environment variable to 1 enables a workaround for this problem until Microsoft addresses the issue. For example, open a command prompt window and start Oracle VM VirtualBox like this:

```
set VBOX_DISABLE_HOST_DISK_CACHE=1
VirtualBox
```

While this will decrease guest disk performance, especially writes, it does not affect the performance of other applications running on the host.

12.6.6. Bridged Networking Adapters Missing

If no bridged adapters show up in the **Networking** section of the VM settings, this typically means that the bridged networking driver was not installed properly on your host. This could be due to the following reasons:

- The maximum allowed filter count was reached on the host. In this case, the MSI log would mention the `0x8004a029` error code returned on NetFlt network component install, as follows:

```
VBoxNetCfgWinInstallComponent: Install failed, hr (0x8004a029)
```

You can try to increase the maximum filter count in the Windows registry using the following key:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\Network\MaxNumFilters
```

The maximum number allowed is 14. After a reboot, try to reinstall Oracle VM VirtualBox.

- The INF cache is corrupt. In this case, the install log at `%windir%\inf\setupapi.dev.log` would typically mention the failure to find a suitable driver package for either the **sun_VBoxNetFlt** or **sun_VBoxNetFltmp** components. The solution then is to uninstall Oracle VM VirtualBox, remove the INF cache (`%windir%\inf\INFCACHE.1`), reboot and try to reinstall Oracle VM VirtualBox.

12.6.7. Host-Only Networking Adapters Cannot be Created

If a host-only adapter cannot be created, either with the VirtualBox Manager or the **VBoxManage** command, then the INF cache is probably corrupt. In this case, the install log at `%windir%\inf\setupapi.dev.log` would typically mention the failure to find a suitable driver package for the `sun_VBoxNetAdp` component. Again, as with the bridged networking problem described above, the solution is to uninstall Oracle VM VirtualBox, remove the INF cache (`%windir%\inf\INFCACHE.1`), reboot and try to reinstall Oracle VM VirtualBox.

12.7. Linux Hosts

12.7.1. Linux Kernel Module Refuses to Load

If the Oracle VM VirtualBox kernel module, **vboxdrv**, refuses to load you may see an `Error inserting vboxdrv: Invalid argument` message. As root, check the output of the **dmesg** command to find out why the load failed. Most probably the kernel disagrees with the version of **gcc** used to compile the module. Make sure that you use the same compiler that was used to build the kernel.

12.7.2. Linux Host CD/DVD or Floppy Disk Drive Not Found

If you have configured a virtual machine to use the host's CD or DVD drive or floppy disk drive, but this does not appear to work, make sure that the current user has permission to access the corresponding Linux device file. For example, for a CD or DVD drive this may be `/dev/hdc`, `/dev/scd0`, `/dev/cdrom` or similar. On most distributions, the user must be added to a corresponding group, usually called **cdrom** or **cdrw** or **floppy**.

On supported Linux distributions, Oracle VM VirtualBox uses **udev** to locate hardware such as CD/DVD drives and floppy disk drives.

12.7.3. Strange Guest IDE Error Messages When Writing to CD or DVD

If the experimental CD or DVD writer support is enabled with an incorrect host or guest configuration, it is possible that any attempt to access the CD or DVD writer fails and simply results in guest kernel error messages for Linux guests or application error messages for Windows guests. Oracle VM VirtualBox performs the usual consistency checks when a VM is powered up. In particular, it aborts with an error message if the device for the CD or DVD writer is not writable by the user starting the VM. But Oracle VM VirtualBox cannot detect all misconfigurations. The necessary host and guest OS configuration is not specific for Oracle VM VirtualBox, but a few frequent problems are listed here which occurred in connection with Oracle VM VirtualBox.

Special care must be taken to use the correct device. The configured host CD or DVD device file name, in most cases `/dev/cdrom`, must point to the device that allows writing to the CD or DVD unit. For CD or DVD writer units connected to a SCSI controller or to a IDE controller that interfaces to the Linux SCSI subsystem, common for some SATA controllers, this must refer to the SCSI device node, such as `/dev/scd0`. Even for IDE CD or DVD writer units this must refer to the appropriate SCSI CD-ROM device node, such as `/dev/scd0`, if the **ide-scsi** kernel module is loaded. This module is required for CD or DVD writer support with some early 2.6 kernels. Many Linux

distributions load this module whenever a CD or DVD writer is detected in the system, even if the kernel would support CD or DVD writers without the module. Oracle VM VirtualBox supports the use of IDE device files, such as `/dev/hdc`, provided the kernel supports this and the **ide-scsi** module is not loaded.

Similar rules, except that within the guest the CD or DVD writer is always an IDE device, apply to the guest configuration. Since this setup is very common, it is likely that the default configuration of the guest works as expected.

12.7.4. VBoxSVC IPC Issues

On Linux, Oracle VM VirtualBox makes use of a custom version of Mozilla XPCOM (cross platform component object model) for interprocess and intraprocess communication (IPC). The process **VBoxSVC** serves as a communication hub between different Oracle VM VirtualBox processes and maintains the global configuration, such as the XML database. When starting an Oracle VM VirtualBox component, the processes **VBoxSVC** and **VBoxXPCOMIPCD** are started automatically. They are only accessible from the user account they are running under. **VBoxSVC** owns the Oracle VM VirtualBox configuration database which normally resides in `~/.config/VirtualBox`, or the appropriate configuration directory for your operating system. While it is running, the configuration files are locked. Communication between the various Oracle VM VirtualBox components and **VBoxSVC** is performed through a local domain socket residing in `/tmp/.vbox-username-ipc`. In case there are communication problems, such as an Oracle VM VirtualBox application cannot communicate with **VBoxSVC**, terminate the daemons and remove the local domain socket directory.

12.7.5. USB Not Working

If USB is not working on your Linux host, make sure that the current user is a member of the `vboxusers` group. Please keep in mind that group membership does not take effect immediately but rather at the next login. If available, the **newgrp** command may avoid the need for a logout and login.

12.7.6. PAX/grsec Kernels

Linux kernels including the grsec patch, see <http://www.grsecurity.net/>, and derivatives have to disable `PAX_MPROTECT` for the **VBox** binaries to be able to start a VM. The reason is that Oracle VM VirtualBox has to create executable code on anonymous memory.

12.7.7. Linux Kernel vmalloc Pool Exhausted

When running a large number of VMs with a lot of RAM on a Linux system, say 20 VMs with 1 GB of RAM each, additional VMs might fail to start with a kernel error saying that the vmalloc pool is exhausted and should be extended. The error message also tells you to specify `vmalloc=256MB` in your kernel parameter list. If adding this parameter to your GRUB or LILO configuration makes the kernel fail to boot, with an error message such as `failed to mount the root partition`, then you have probably run into a memory conflict of your kernel and initial RAM disk. This can be solved by adding the following parameter to your GRUB configuration:

```
uppermem 524288
```

12.8. Oracle Solaris Hosts

12.8.1. Cannot Start VM, Not Enough Contiguous Memory

The ZFS file system is known to use nearly all available RAM as cache if the default system settings are not changed. This may lead to a heavy fragmentation of the host memory preventing Oracle VM VirtualBox VMs from being started. We recommend to limit the ZFS cache by adding the following line to `/etc/system`, where `xxxx` bytes is the amount of memory usable for the ZFS cache.

```
set zfs:zfs_arc_max = xxxx
```