

How to Create a Windows El Torito Bootable CD/DVD-ROM

SUMMARY

The contents of this document are, in part, derived from the El Torito Bootable CD-ROM Format Specification version 1.0 from Phoenix Technologies and IBM and from the white paper "Constructing a Bootable CD" version 0.5 from Phoenix Technologies. For additional information regarding the El Torito Specification, please refer to these documents.

What Is El Torito?

El Torito is a specification written by Phoenix Technologies and IBM for bootable CD-ROMs. The El Torito specification allows for the creation of a CD-ROM as an image of a hard disk drive or a floppy drive. When you make an image of a hard disk, the CD-ROM will boot as drive C and all hard disk drive letters will be shifted up one letter. When booting a floppy disk image, the CD-ROM will be identified as drive A. The original drive A will become drive B and the original drive B will be unavailable.

What Is Needed to Be Able to Use a Bootable CD-ROM?

The system BIOS must be capable of supporting a bootable CD-ROM. If the system BIOS has this capability, an EIDE (ATAPI) CD-ROM drive attached to the system should be able to boot from the compact discs.

If the CD-ROM drive is a SCSI drive, the SCSI BIOS must also support bootable compact discs.

Note that some system's BIOS may have a setting to control the boot order between drive A, drive C, and the CD-ROM drive. Some systems, although able to support bootable compact discs, may give no such indication. Even though they may allow you to change the boot priority between floppy disk and hard disk drive but give no option for booting from a compact disc, the system may still support this feature. Such systems always place the priority on a bootable compact disc so that, if one is inserted, the system will boot from it.

What Can Be Done with a Bootable CD-ROM?

Anything that can be run from a hard disk drive or floppy at DOS can be run from a CD with one exception: Since a CD is read only the program must not attempt to write data to the CD or it will fail.

Before getting started

Read the important notes before getting started

Important notes:

- 1) This tutorial is based on **virtual machine** software – *VMware Workstation*, the result maybe not same as with build on physical machine (*I never try to build image from physical machine because the build process is complex than build from virtual machine*).
- 2) Please **do not** ask for *Microsoft* to support on the image created based on this project, *Microsoft* does not provide support for this project.
- 3) This *document* and the *software* come with **absolutely no warranty** for any **data lost** or **damages**, so use it at your own risk.
- 4) Any information provided on this *document* and the *software* included are tend for **educational purposes only**, **do not use it for illegal purposes**.

Getting started

Creating the Bootable Windows Live CD/DVD from Start to Finish

1. Items needed for create a bootable Windows CD/DVD-ROM:

For physical machine:

- **Physical hard drive** that has capacity in **less than 4GiB (2^{32} – 1 Bytes)**.
- System **BIOS** that has boot from CD/DVD-ROM capability.
- **CD/DVD writer**.
- Blank CD/DVDs.
- About **3 times** more **free spaces** than the size of the boot project (*Because you will need those free spaces for whole hard drive imaging and make bootable ISO from it*).
- Disk imaging software (*For example: SelfImage*).
- **ETBoot Builder** (*A bootable El Torito ISO image creation program included with this document*).
- **ETPatchBoot** (*A bootable ISO image included with this document*).

For virtual machine:

- **VMware Workstation** or similar x86 virtualization software. (*I recommend VMware Workstation*).
- Free disk spaces (*depend on the size of your boot project*).
- CD/DVD writer (*Optional, if required to burn a disc*).
- Disk imaging software (*Optional, if required*).
- **ETBoot Builder** (*A bootable El Torito ISO image creation program included with this document*).
- **ETPatchBoot** (*A bootable ISO image included with this document*).

2. Creating and configuring a target virtual machine:

Before creating a target virtual machine, you should consider the followings:

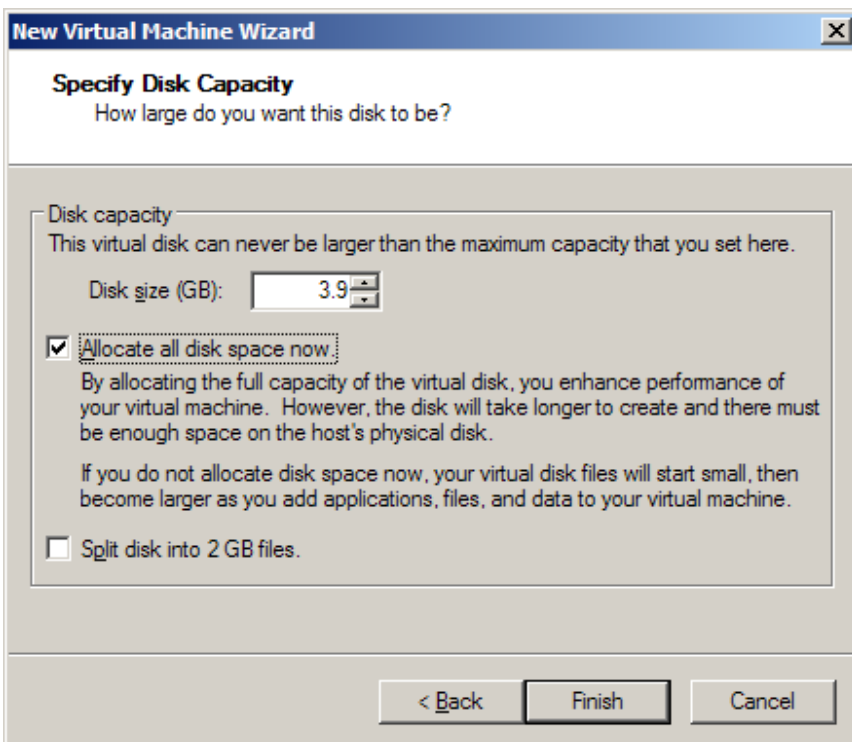
- Which version of Windows are you going to use.
- Final boot image size.
- Size of the final bootable CD/DVD-ROM image.

The limitations for creating the CD/DVD-ROM boot image:

- Maximum size for the bootable hard disk image is less than 4GiB ($2^{32} - 1$ Bytes).
- Only one partition is allowed in the bootable hard disk image.

Well, let's begin the build process:

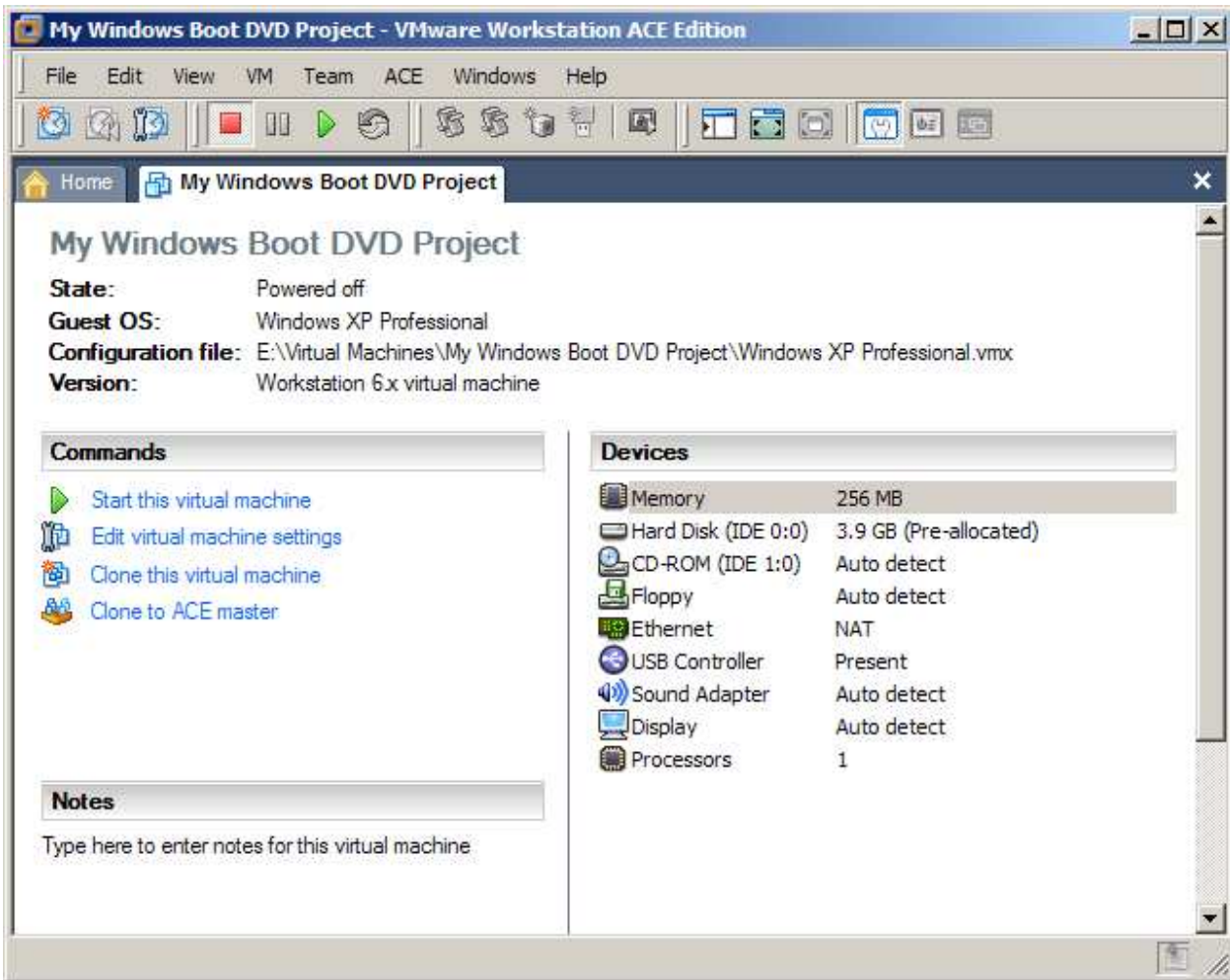
Now open VMware Workstation, and then create a new virtual machine with the most suitable configuration for your target Windows installation, use similar configuration for virtual hard disk or the configuration you desired to use, just make sure the virtual hard disk size is smaller than 4GiB:



Check the “Allocate all disk space now.” for resources and time saving with the final boot image creation process.

Press Finish button to complete this step.

After done the above steps, you will be able to see the similar screen depend on your settings:



3. Installing and Configuring Windows on the virtual machine:

Well known tested working Windows version (any x64 version will not work):

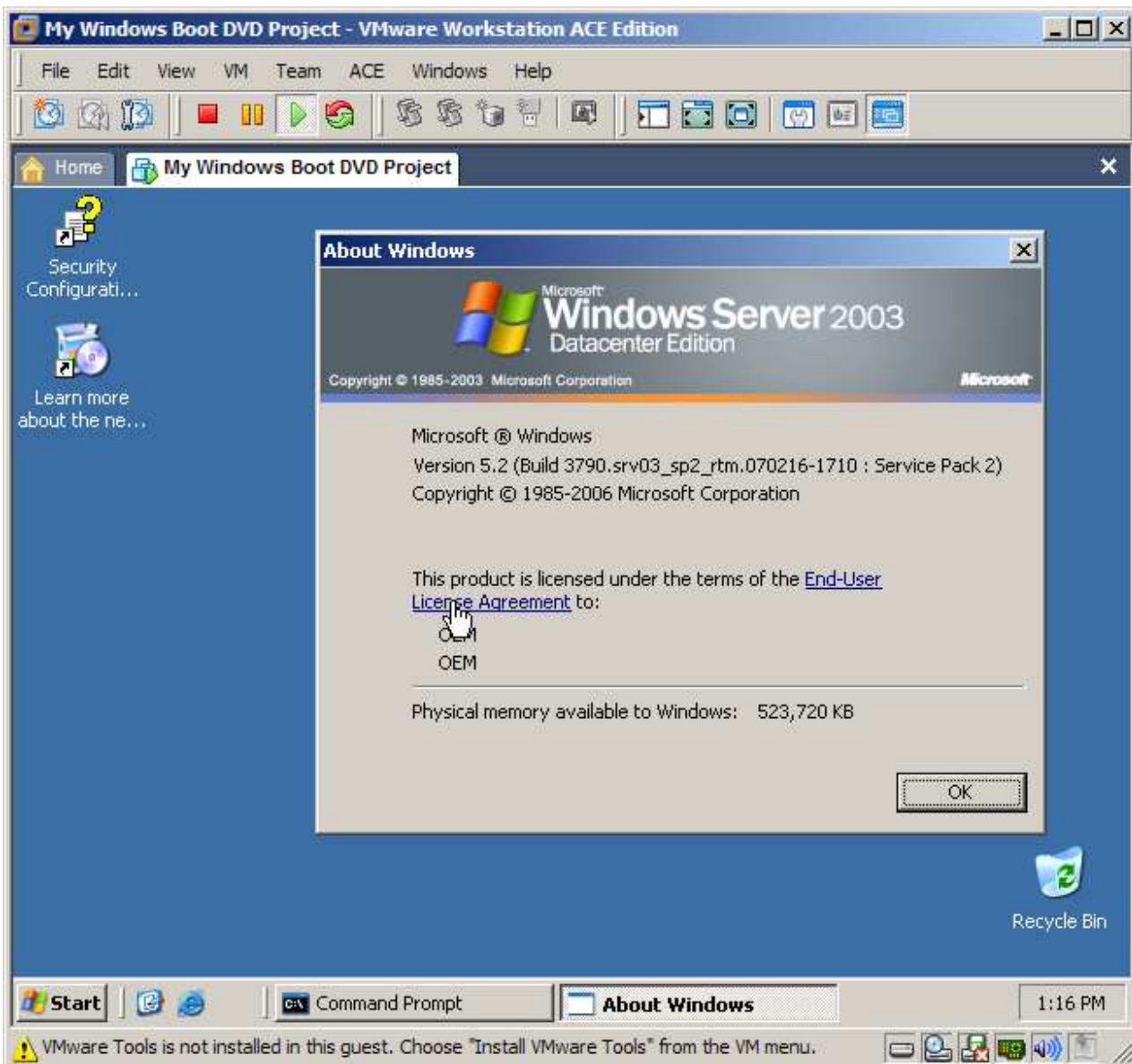
- Windows XP
- Windows Server 2003

The next thing to do is to install the Windows that you want to make a bootable CD/DVD-ROM on this virtual machine, I used Windows Server 2003 for this tutorial.

I recommend to make a backup of the virtual machine after the Windows installation complete to prevent something goes wrong on middle way.

You can apply software installation, updates, tweaks and whatever for this Windows.

This is the Windows desktop after a successful Windows installation:



After applying and installing anything you want, I recommend you to do the following as you are prepared to make a bootable CD/DVD-ROM image:

- Deletes all useless temporary files, installation .log files.
- Apply NTFS compression to the virtual hard disk, if applicable.
- Defragment the virtual hard disk.

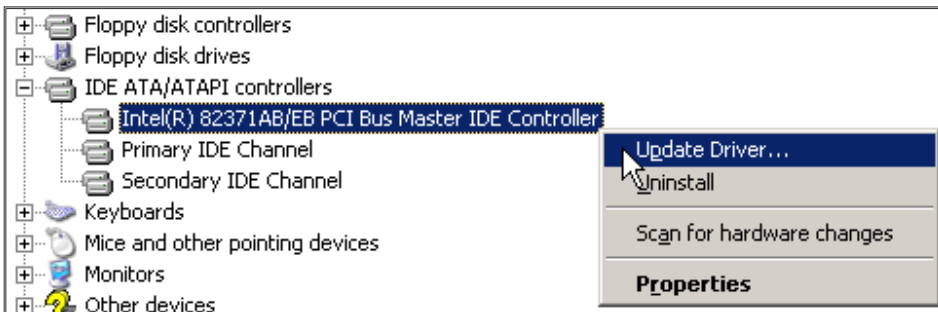
The above information described may reduce the boot time on CD/DVD-ROM.

4. Updating IDE Controller drivers:

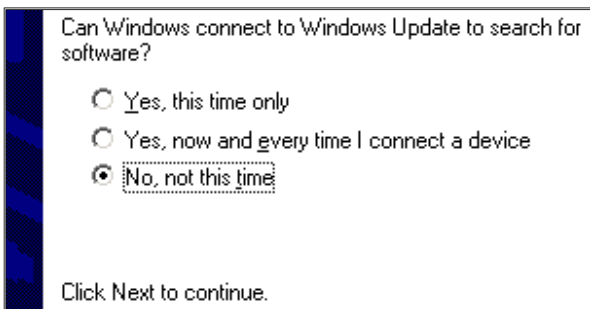
This step is required for make the final image boot on another machine.

Open **Device Manager**, expand **IDE ATA/ATAPI controllers**.

Now you have to update **all available Controller drivers** under **IDE ATA/ATAPI controllers** section to **Standard Controller**:

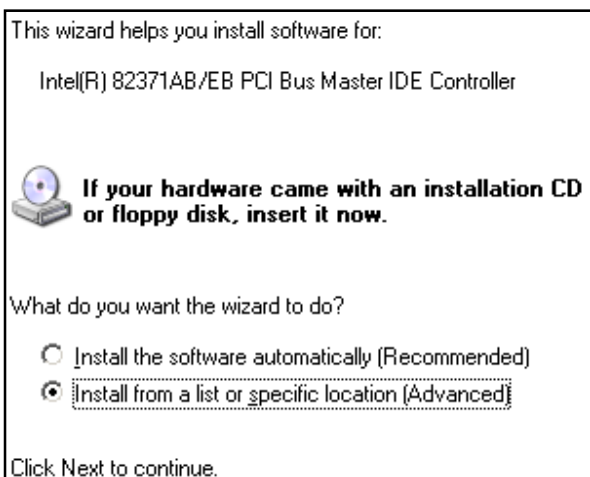


The **Hardware Update Wizard** will come out after click on **Update Driver...**



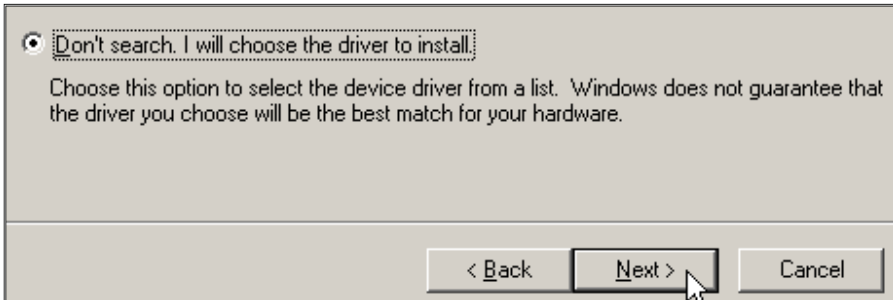
Choose: *No, not this time*,

Click **Next >** button.

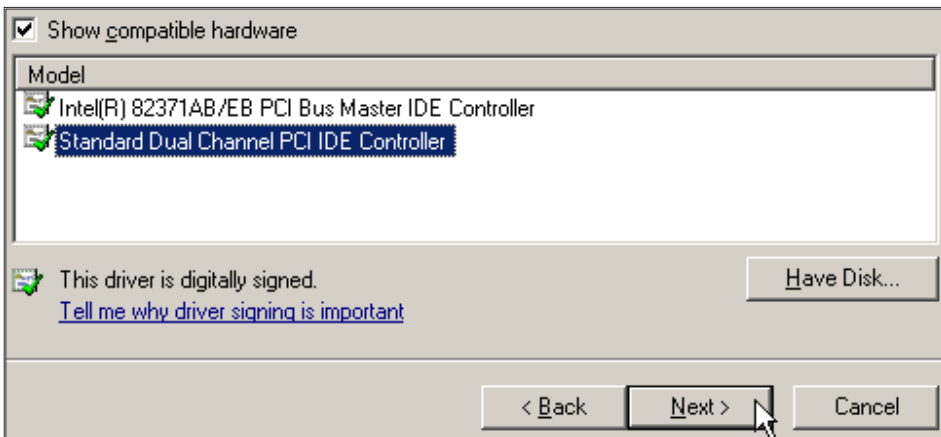


Choose: *Install from a list or specific location (Advanced)*,

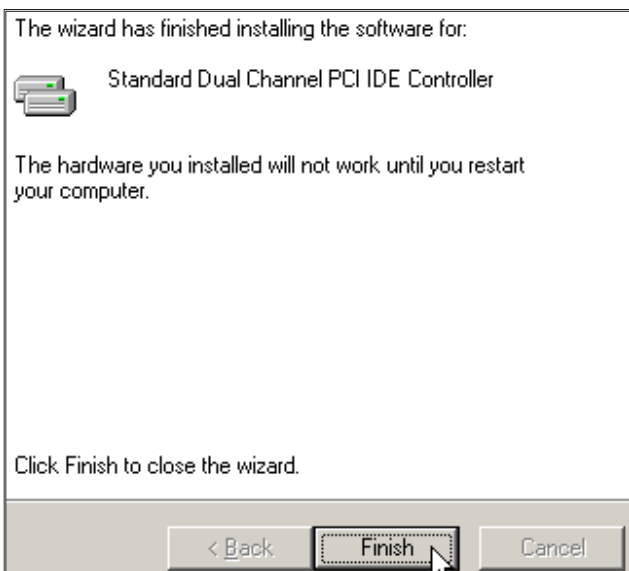
Click **Next >** button for the next step.



Choose: *Don't search. I will choose the driver to install*,
Click **Next >** button.



Now choose *Standard* driver for the current compatible driver,
Click **Next >** button again.

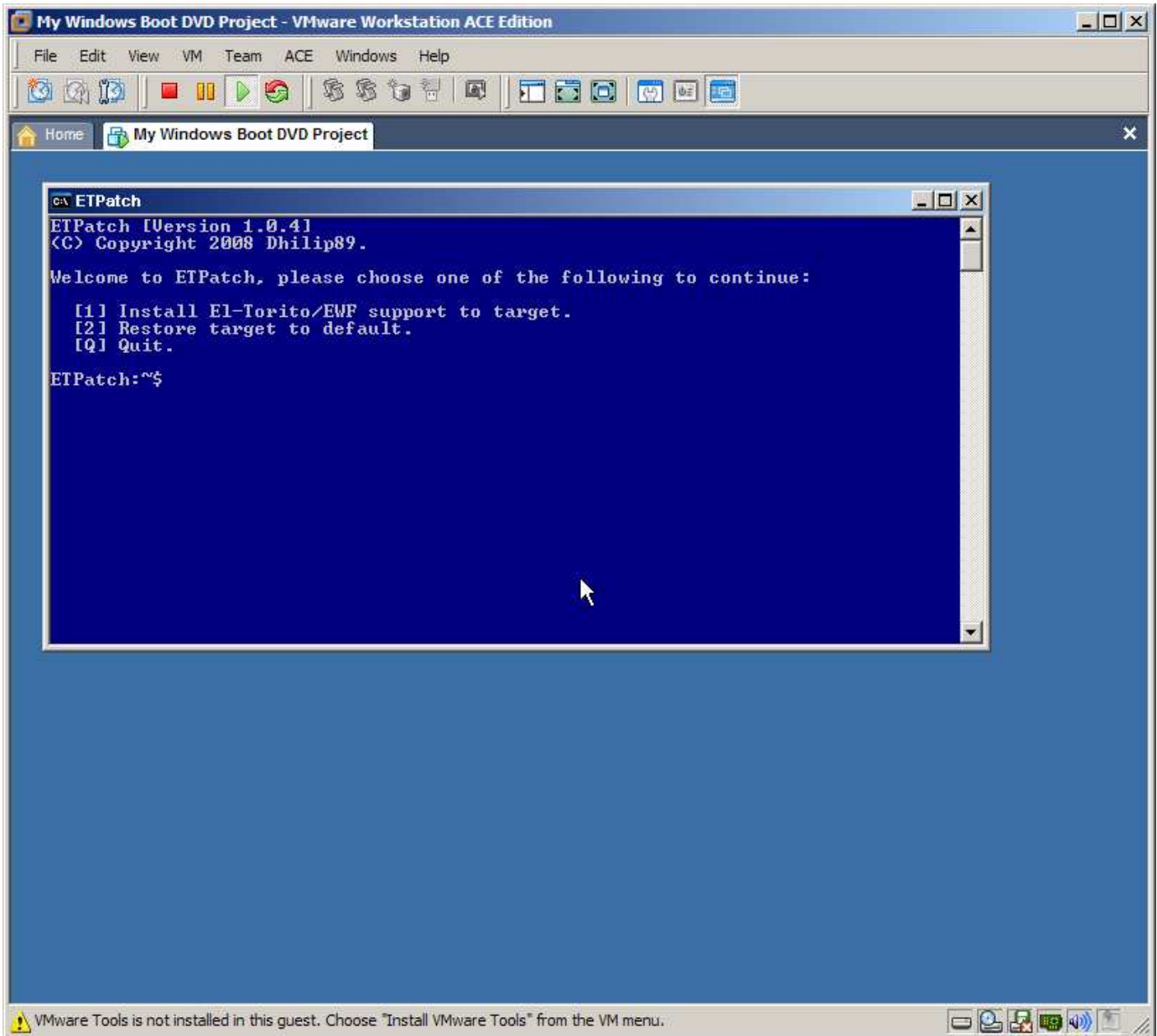


Click **Finish** to complete this step.

5. Using ETPatch to enable El Torito/EWF support on target:

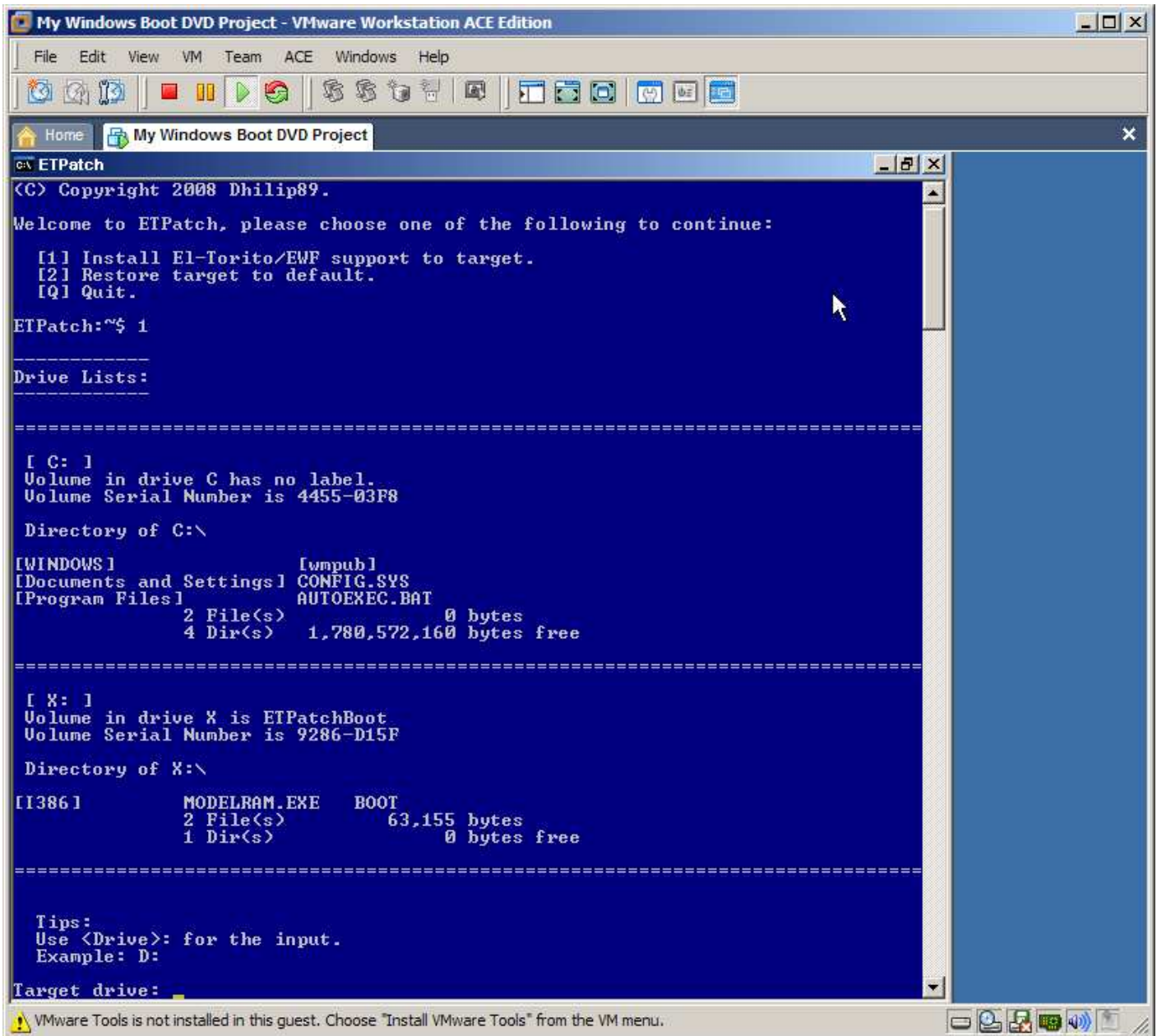
Shutdown the virtual machine (if still running) then edits the CD-ROM in virtual machine to use **ETPatchBoot.iso** which is come with this document, power on virtual machine and boot from CD-ROM.

After a successful boot from CD-ROM, you will see the **ETPatch** appear on the screen:



Choose **1** to install El Torito/EWF support to the existing target Windows installation.

After the choice, the screen will appear as the following:

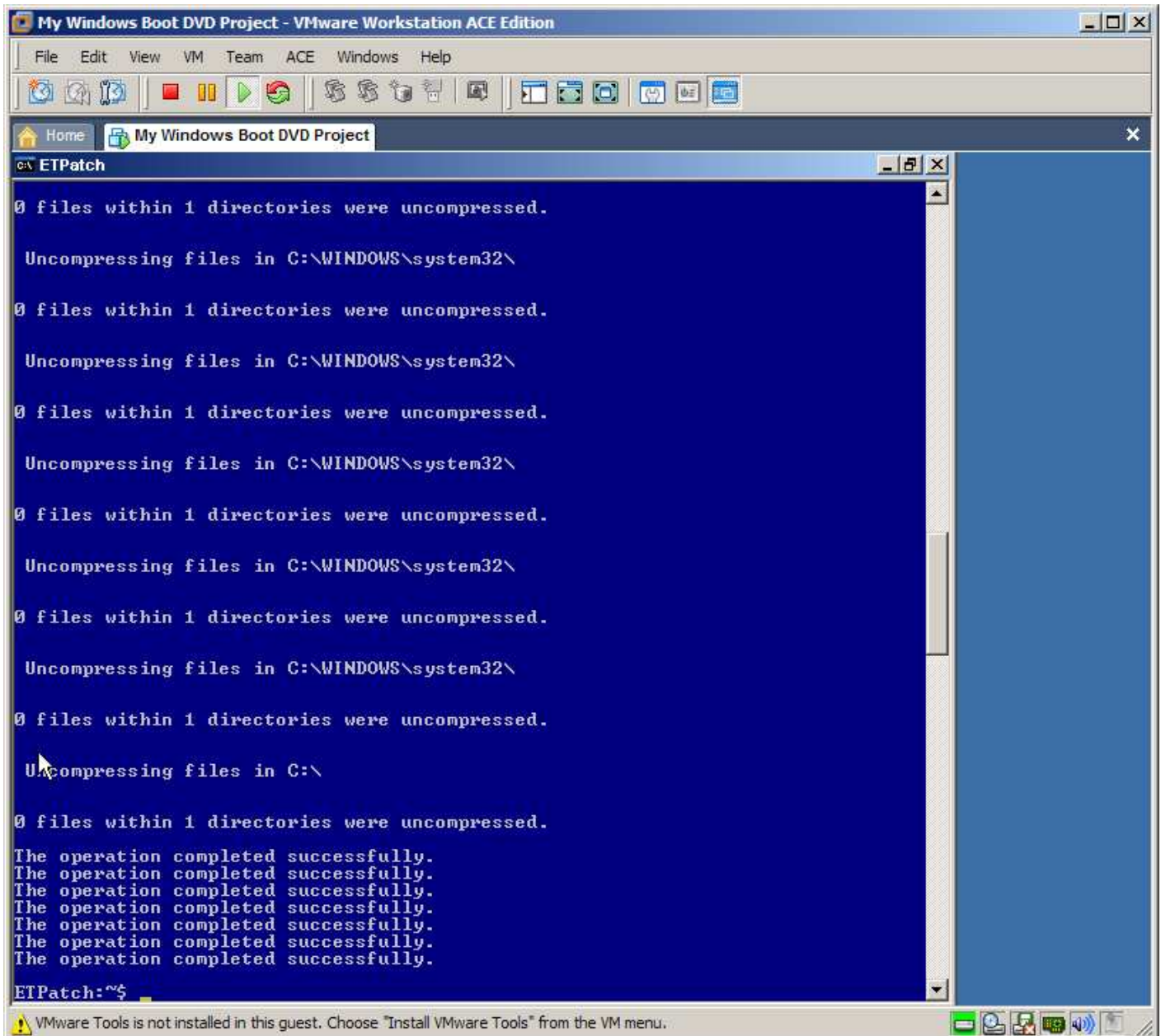


The **ETPatch** list all available mounted partition, just enter where the Windows installed. This is what I enter to the **ETPatch**:

Target drive: C:

Target WinDir: WINDOWS

You will see the following screen after a proper **Target drive** and Target **WinDir** input:



Type **exit** or close the **ETPatch** window if you are ready to reboot the machine.

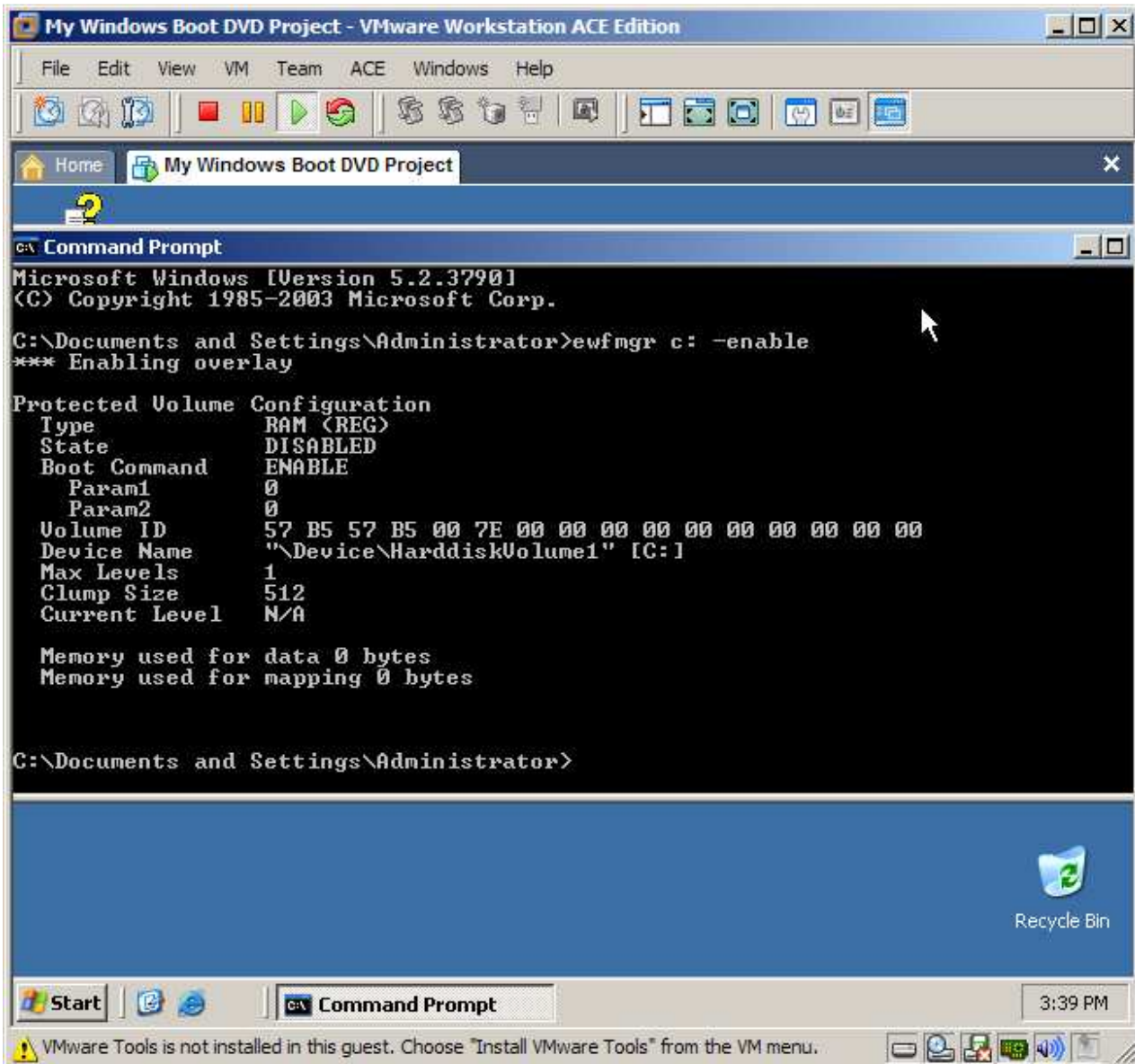
```
ETPatch:~$ exit
```

6. Enabling EWF on target Windows:

Now boot into the target Windows normally, and make sure everything is running fine.

Open **Command Prompt**, type the following in the command prompt window:

```
ewfmgr c: -enable
```



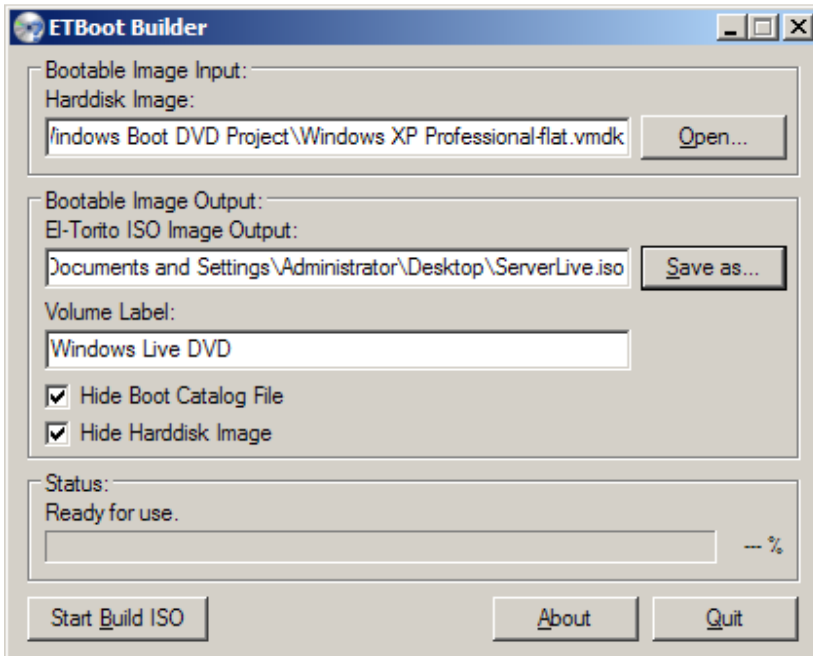
Well, this Windows is ready to make bootable CD/DVD-ROM image.

Shut down the virtual machine now.

7. Using ETBoot Builder to create bootable ISO image:

This step is about to create a bootable CD/DVD-ROM ISO image.

Now open **ETBoot Builder** that comes with this document to begin the creation of bootable ISO image.



Open the **flat virtual disk image** inside your virtual machine folder, and then choose the path where you want to save the bootable ISO image.

Options:

- Hide Boot Catalog File: This will make the *boot.catalog* file invisible in the CD/DVD-ROM.
- Hide Hard disk Image: This will make the *hard disk image* invisible in the CD/DVD-ROM.

Click the **Start Build ISO** button to begin the bootable CD/DVD-ROM ISO image creation, you can stop it at any time.

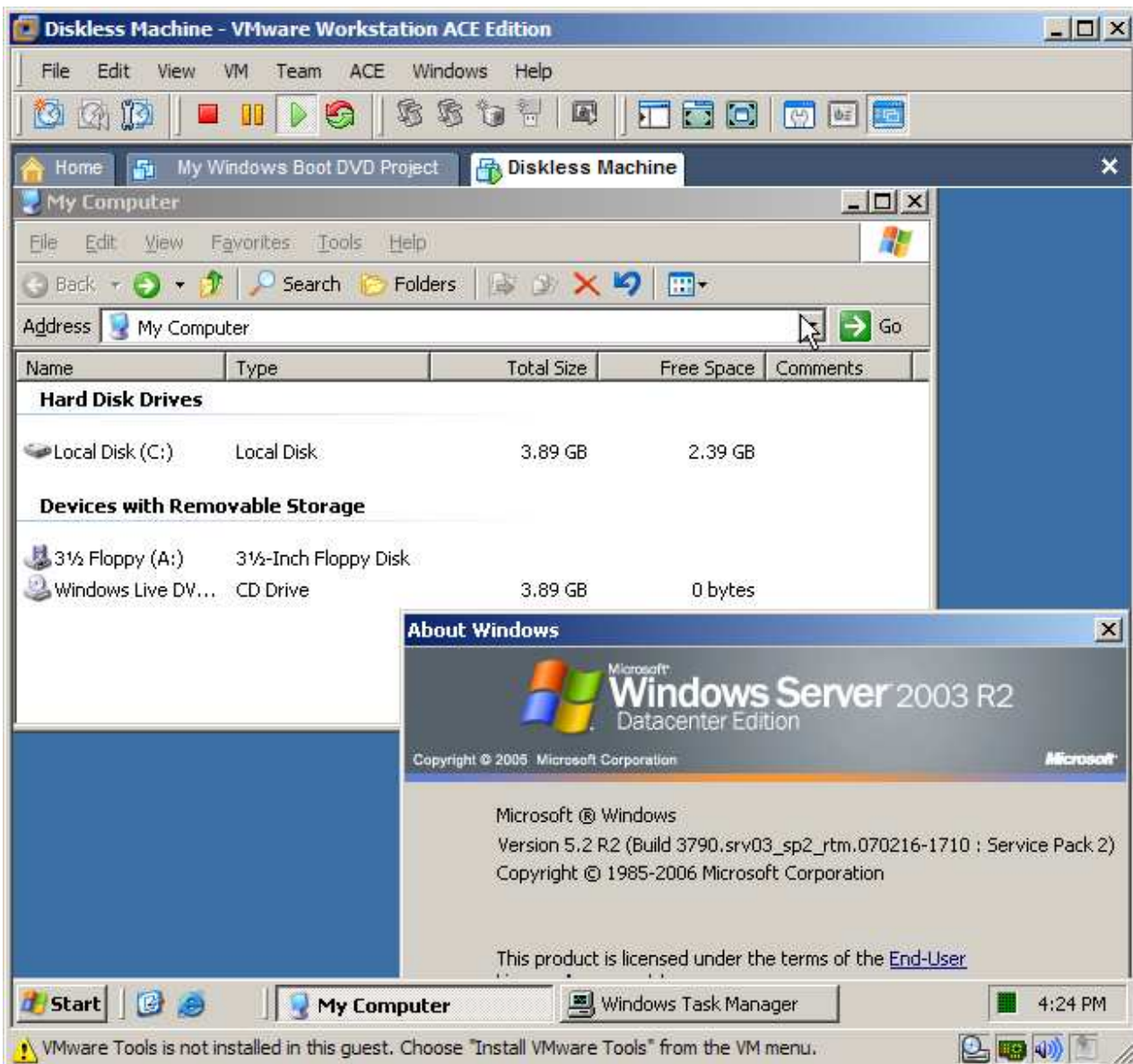
After the process completed without any problem, the ISO image is ready to use.

8. Testing the final bootable ISO image:

Insert the finally made bootable ISO image to the virtual machine, and remove the virtual hard disk that used for creating this bootable ISO image, because the hard disk and the CD-ROM contains same disk signature which will cause the Windows on CD/DVD-ROM failed to boot with BSOD (Blue Screen of Death) error.

The disk signature is unique for every disk, 4 bytes data located at offset $0x01B8$ on the hard disk. It is generated when the disk is partitioned.

This is the successful boot from the bootable ISO image:



9. Burning the final bootable ISO image to CD/DVD:

This is the optional final step to go if you wish to burn the image to the disc,

If you want to burn the bootable ISO image to the disc you'll need a blank disc, either CD or DVD, please use the blank disc fastest speed if possible, I recommend not to use *RW (Rewritable)* disc for this bootable image, because it may be failed to boot on some hardware due to the slow reading speed.

You must use the disc burning software that support image burning, for example: *Nero Burning ROM*, *EasyCD Creator*, or other software that can burn ISO image.

Below is the Nero burning software:



Choose **Burn Image to Disc** to burn the ISO image to the CD/DVD.

Well, this is the end of the tutorial.

Thank you for taking time to read this tutorial, hope you enjoy something from it.

Good luck!