Technical white paper

Creating a System Recovery USB Flash Drive for HP Workstations

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This guide describes how to transfer HP Workstation optical recovery media to a USB flash drive for Windows 7 and Windows 10 recovery media. The optical recovery media includes an Operating System DVD and a Driver Recovery DVD. The USB flash drive can be used to restore the operating system and drivers on HP Workstations.

Pre-requisites

The following is required to create a bootable USB recovery flash drive from optical recovery media:

• Operating System DVD and Driver Recovery DVD: This is the recovery media that was either shipped with the system or obtained from HP Support.

• USB flash drive: Recommended minimum size is 8 GB, which is large enough to hold the Operating System DVD or the Driver Recovery DVD, but may not be large enough to hold both. The USB flash drive can be any connector or speed available on your system.

• Computer running Windows 7 or greater with both a USB port and an optical drive connected (either internal to the system or a USB attached optical drive). The optical drive only needs to be capable of reading media; it will not need to write media. This computer will be referred to as the development PC in this document.

• Consider what type of installation you plan to do. This document will cover the following types of installations:

  – UEFI installation of Windows 10 64-bit Operating System DVD

  – UEFI installation of Windows 7 64-bit Operating System DVD (Note: This installation requires the extra step 14 below.)

  – Legacy installation of Windows 7 64-bit Operating System DVD

• (Optional) Determine if your HP Workstation has an NTFS driver for UEFI available in the BIOS.

  – This is not typical. If you are not sure whether your system has an NTFS driver for UEFI available in the BIOS, then assume it does not.

  – See Appendix C for how to determine if an NTFS driver for UEFI is available in your BIOS and why you might want to know.

• It is recommended to read the Summary of Steps in its entirety before beginning to determine if steps 13 or 14 apply.

Summary of steps

Creating a bootable USB flash drive with the operating system DVD contents

The operating system media was originally created from an .iso file. An .iso cannot simply be copied to a USB flash drive and then booted. The USB flash drive must be prepared as a bootable device and then the contents of the Operating System DVD may be copied to it.

1. Insert the USB flash drive into a USB port on the development PC.

2. Open a command prompt with administrator privileges.

3. Run the DISKPART utility in the command window by executing the following command:
   ```
   C:\Windows\system32>diskpart
   ```

4. Locate the USB flash drive using the list disk command at the diskpart prompt. This will list all the disks connected to the development PC. Identify the USB flash drive in the list and note the disk number.
   ```
   DISKPART> list disk
   ```

5. Select the disk number of the USB flash drive within diskpart using the following command, where [#] is replaced by the drive number of your USB flash drive determined in step 4. For example, select disk 4
   ```
   DISKPART> select disk [#]
   ```

Caution: Continuing this process with the wrong drive selected will result in losing all data on that drive. Verify that you have selected the correct disk number. Examining the drive size will help identify the correct disk number. If you run the 'list disk' command again, you should see an asterisk to the left of the selected disk.

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6. Continue to prepare the USB flash drive with the following diskpart commands:
   ```
   DISKPART> clean
   DISKPART> create partition primary
   DISKPART> select partition 1
   ```

7. In this step, the USB flash drive partition needs to be formatted. The format choice will depend on the operating system, desired type of installation, and if the system has an NTFS driver for UEFI as part of the BIOS. For a UEFI installation (Windows 10 or Windows 7), typically the flash drive must be formatted as FAT32. The exception is if the system has an NTFS drive for UEFI as part of the BIOS. In that situation, the USB flash drive may be formatted as NTFS. The advantage of an NTFS format is that you will not need to split the install.wim. For a Legacy installation (Windows 7 only), the flash drive must be formatted as NTFS. Examples for each situation are below—select only one. Format the USB flash drive based on the operating system and the type of installation desired. The format will take longer if the 'quick' option is not included.

  a. UEFI installation of Windows 10 or Windows 7: This works whether NTFS driver for UEFI is available in the BIOS or not. This may require that install.wim is split as described in step 13 if install.wim is greater than 4 GB.
```
DISKPART> format fs=fat32 quick
```

  b. NTFS for UEFI installation of Windows 10: This works only if NTFS driver for UEFI is available in the BIOS; it is not necessary to split install.wim as described in step 13 because NTFS can accept file sizes greater than 4 GB.
```
DISKPART> format fs=ntfs quick
```

  c. Legacy installation of Windows 7:
```
DISKPART> format fs=ntfs quick
```

8. Mark the partition active.
```
DISKPART> active
```

9. Assign an available volume letter to the USB flash drive, then exit diskpart. In this example, the letter 'm' is chosen.
```
DISKPART> assign letter=m
DISKPART> exit
```

10. Insert the Operating System Recovery DVD into the optical drive connected to the development PC.

11. Using Windows Explorer or a comparable utility, open the DVD so that all contents are visible.

12. Select all of the folder and files.

13. Copy everything to the root of the bootable USB flash drive you created in steps 1-9.

  a. An extra step applies for a UEFI installation of Windows 10 if the [DVD root]\sources\install.wim file displays larger than 4.2 GB in Windows File Explorer. All files can be copied in step 13 in this situation except the install.wim, because the USB flash drive is formatted FAT32 for UEFI boot but FAT32 has a file size limitation of 4 GB. If the install.wim is greater than 4 GB, it must be split into two files. Appendix A describes this step.

Note: The file size seen in Windows Explorer is larger than the 'Size on disk' as seen in the Properties window for the install.wim. In Windows Explorer, the file size needs to be 4.2 GB or less. In the Properties window for the install.wim, the 'Size on disk' must be less than 4.00 GB.

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  b. At the time of this writing, it is known that the install.wim is greater than 4 GB for HP Operating System DVD Media:

    i. 836298-372

    ii. 836298-DW2

    iii. 836298-DY2

    iv. 836298-K22

14. This extra step only applies for a UEFI installation of Windows 7. The file bootmgfw.efi must be copied from the sources\install.wim file to the efi\boot folder on the USB flash drive. The file must also be renamed to bootx64.efi. See Appendix B for detailed steps.

The creation of a bootable USB flash drive as the Operating System Recovery DVD is complete. The flash drive should be inserted into the HP Workstation before it is powered on to be recognized as a boot device in the boot menu. Follow the instructions for reinstalling the operating system that were included with the Operating System DVD, but select the USB flash drive from the boot menu.

Note: For Windows 10, only UEFI mode installation of the operating system is supported. For Windows 7, Legacy mode and UEFI mode installation is supported.

Creating a USB flash drive with the Driver Recovery DVD contents

The Driver Recovery DVD contains the applications and data needed to re-install the drivers on the HP Workstation after the operating system has been completely installed. All that is necessary is for the contents of the Driver Recovery DVD to be copied to a USB flash drive. The contents can be copied to the flash drive with the Operating System DVD if there is enough space, or to a different USB flash drive, or the Operating System flash drive may be erased and re-used for the Driver Recovery DVD contents after the operating system has been installed.

1. Insert a USB flash drive into a USB port on the development PC.
2. Insert the Driver Recovery DVD into the optical drive connected to the development PC.
3. Using Windows Explorer or a comparable utility, open the DVD so that all contents are visible.
4. Select all of the folder and files.
5. Copy everything to the root of the USB flash drive.

You now have a USB flash drive with the contents of the Driver Recovery DVD. The flash drive should be inserted into the HP Workstation after the operating system has been completely installed. Follow the instructions for reinstalling the drivers that were included with the Driver Recovery DVD, but note that the HP Software Setup.exe application to start the driver installation is on the root of the USB flash drive.

Appendix A

Detailed steps to split the install.wim for Windows 10 UEFI installation

The Windows ADK tools are needed to split the install.wim into two files: install.swm and install2.swm. Once you have these two files, they can be copied to the USB Flash Drive under the sources directory. This is the same directory where you found the install.wim on the DVD media.

1. Install the Windows ADK on a development PC of your choice. The development PC must be running Windows 10. The latest Windows ADK can be downloaded from Microsoft.com. The default program options are all that is required.
2. Run the "Deployment and Imaging Tools" command prompt as administrator. You can find this in your applications from the start menu after the ADK is installed.

In this example, the J: drive is the location of the Operating System DVD media. The H: drive is the location of the USB Flash Drive and the E: drive will be used as the location to manipulate the install.wim into two files smaller than 4 GB.

3. Copy the install.wim from the Operating System DVD media to the E: drive on the development PC.

```
E:\>copy J:\sources\install.wim E:\install.wim
```

4. Use the Windows ADK dism command with the /split-image option to split the install.wim into two files.

```
E:\>dism /Split-Image /ImageFile:e:\install.wim /SWMFile:e:\install.swm /FileSize:4000
```

5. After the /split-image command completes, the directory will contain the two split files as shown by the dir command below.

```
E:\>dir
 Volume in drive E is ADK
 Volume Serial Number is 0675-C88A

 Directory of E:\

05/19/2016  01:46 PM     4,194,303,897 install.swm
11/19/2015  11:22 AM     4,337,926,030 install.wim
05/19/2016  01:46 PM       143,624,809 install2.swm
               3 File(s)  8,675,854,736 bytes
               0 Dir(s)   238,466,887,680 bytes free
```

6. Finally, copy the install.swm and install2.swm to the sources directory on the USB Flash Drive. Remember, the install.wim is not on the USB Flash Drive because the file size was too large to copy to a FAT32 formatted partition. If you tried to copy the install.wim to the flash drive, the copy would have failed. Note also that over 4 GB of files are still being copied. The copy will take a few minutes.

```
E:\>copy E:\install.swm H:\sources\install.swm
        1 file(s) copied.

E:\>copy E:\install2.swm H:\sources\install2.swm
        1 file(s) copied.
```

7. The USB flash drive with the Operating System DVD is ready to install Windows 10 in UEFI mode using the directions that came with the Operating System DVD but remembering to select the USB flash drive from the boot menu.

Appendix B

Detailed steps to retrieve bootmgfw.efi for Windows 7 UEFI installation

The bootmgfw.efi file is part of the install.wim. The Windows ADK tools are needed to open the install.wim and retrieve the bootmgfw.efi file. This file can be saved and used for any Windows 7 UEFI installation. It does not need to be retrieved again.

1. Install the Windows ADK on a development PC of your choice. The development PC must be running Windows 7 or greater. The latest Windows ADK can be downloaded from Microsoft.com. The default program options are all that is required.
2. Run the "Deployment and Imaging Tools" command prompt as administrator. This can be found in your applications from the start menu after the ADK is installed.

In this example, the E: drive will be used as the location to manipulate the install.wim and retrieve the bootmgfw.efi file. The J: drive is the USB flash drive that was created in this document.

3. From the USB flash drive created as the Operating System DVD, copy the sources\install.wim file to a location on the development PC.

```
Administrator: Deployment and Imaging Tools Environment - copy  j:\sources\install.wim e:\install.wim

E:\>copy j:\sources\install.wim e:\install.wim
```

4. Create a directory named e:\mount. This directory will hold the contents of the install.wim after it is mounted.

```
E:\>mkdir mount
```

5. Use the Windows ADK dism command to mount the install.wim so the files can be accessed.

```
E:\>dism /mount-wim /wimfile:e:\install.wim /index:1 /mountdir:e:\mount

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Mounting image
[==========================100.0%==========================]
The operation completed successfully.
```

6. Before retrieving the bootmgfw.efi file and renaming it, prepare the location on the USB flash drive.

```
E:\>mkdir j:\efi\boot
```

7. Copy the bootmgfw.efi file to the USB drive efi\boot location and rename it bootx64.efi.

```
E:\>copy e:\mount\Windows\Boot\EFI\bootmgfw.efi j:\efi\boot\bootx64.efi
        1 file(s) copied.
```

8. The USB flash drive with the Operating System DVD is ready to install Windows 7 in UEFI mode using the directions that came with the Operating System DVD, but remembering to select the USB flash drive from the boot menu. The next steps in this appendix will cover cleaning up the mount drive on the development PC.

It is recommended that the mount directory on the development PC be cleaned up properly to avoid an orphaned folder, as it may be difficult to remove later (short of reformatting the drive).

9. Use the Windows ADK dism command to unmount the install.wim. After the unmount is complete, the mount directory and install.wim may be deleted from the development PC.

```
E:\>dism /unmount-wim /mountdir:e:\mount /commit

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Image File : e:\install.wim
Image Index : 1
Saving image
[=========================100.0%=========================]
Unmounting image
[=========================100.0%=========================]
The operation completed successfully.

E:\>rmdir mount

E:\>del install.wim
```

Appendix C

NTFS driver for UEFI in BIOS

On some HP Workstations, an NTFS driver for UEFI has been added to the BIOS. This driver has been added to allow an NTFS formatted USB flash drive to boot for UEFI installation of Windows 7 or Windows 10. Typically, UEFI installation of the operating system requires the USB flash drive to be formatted FAT32, unless an NTFS driver is included in the BIOS.

If an NTFS driver or UEFI is included in the BIOS, then files over 4 GB can be included on the flash drive. FAT32 has a 4 GB file size limit. The install.wim is larger than 4 GB on some operating system DVDs and must be split into multiple files to use with a FAT32 formatted flash drive. In summary, the ability to format a USB flash drive as NTFS for UEFI installation guarantees that install.wim will not have to split, as described in Appendix A. If the system includes an NTFS driver for UEFI in the BIOS, it is not required that it be used. A UEFI installation from a FAT32 formatted USB flash drive will also be successful.

How do you know if your HP Workstation has an NTFS driver available in the BIOS? The easiest way to check is to look at the boot menu for NTFS formatted bootable media. One way to accomplish this is to take the USB flash drive that will be used for this installation and build the flash drive through step 8 in the instructions, formatting it as NTFS. Insert the flash drive in the system and power it on. Select F9 to see the boot options. If the USB Flash Drive appears under UEFI boot options, then the system has an NTFS driver for UEFI in the BIOS.

Appendix D

Troubleshooting and helpful hints

- Boot order issues: During Windows operating system installations, the system being imaged will reboot. If after a reboot, the system is back at the start of the installation, as if the system is ready to be imaged again, check the default boot order in the BIOS. This issue implies that USB boot was higher in the boot order than the disk being imaged. Because the USB flash drive is bootable, it will be the first thing to boot, returning to the start of the installation. Note that the system installation is actually complete, and the USB flash drive can be removed and the system rebooted without the flash drive; the system should continue to boot other boot options, which would include the imaged disk.

- File copy issues: When copying all files from the Operating System DVD to the USB flash drive, remember that the flash drive is formatted FAT32. FAT32 has a file size limitation of 4 GB. The install.wim may be larger than 4 GB, and you will not be able to copy the install.wim file to the USB flash drive. In this situation, use the Microsoft ADK tools to split the install.wim into smaller files as detailed in Appendix A.

- If the USB flash Drive is FAT32—does that mean the C: drive will be FAT32? No, the C: drive will be NTFS. The USB flash Drive must be formatted FAT32 for UEFI boot to install the operating system. UEFI is based on FAT32 partitioning, not NTFS.

- Why is NTFS driver for UEFI in BIOS mentioned? UEFI boot typically requires a FAT32 formatted boot partition. On select HP Workstations, an NTFS driver for UEFI has been added to the BIOS. If this driver is in the BIOS, then you can UEFI boot an NTFS partition. The advantage this offers when making a UEFI bootable flash drive is that files larger than 4 GB can reside on the NTFS partition. In the case of creating bootable media for operating system installation, the install.wim does not need to be split if it is greater than 4 GB.

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