Windows 11 image creation using the image deployment framework

Article • 10/25/2021

This guide demonstrates how to create customized Windows 11 images, using a collection of scripts that are available for download from the Microsoft Download Center.

You can use the images you create to deploy to a line of devices, complete with customizations like apps, drivers, languages, and settings.

Prepare your environment

To follow the steps in this lab, you'll need:

- A technician PC where you'll be making offline customizations to your image
- A reference PC where you'll deploy your custom image
- A 16 Gb USB drive that you'll use to deploy your image. This is required for both USB- and network-based deployments.
- Windows installation ISO and supplemental media (collateral).

Technician PC

Ensure your technician PC meets the following requirements:

- Quad core CPU
- 8 Gb RAM
- 128 Gb SSD
- Windows 11 Professional
- The Windows ADK for Windows 11 and associated WinPE add-on installed. When you install the ADK, at minimum, install:

- Deployment Tools
- User State Migration Tool (USMT)
- Network connection if you're going to deploy your image over a network

Collateral

Download the following collateral onto your technician PC:

Expand table

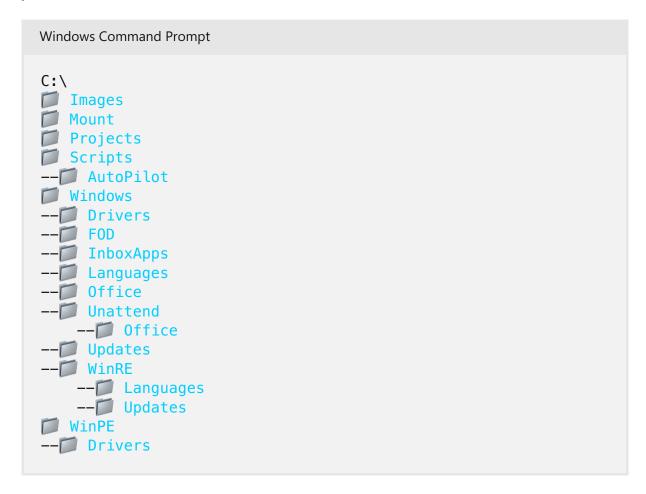
Collateral	Part number
Windows installation media	X22-77379
Languages and Optional Features ISO	X22-62160
RDX ISO	X22-62162
Inbox apps ISO	X22-79194
The latest LCU for Windows 11	X22-89545
Office 2106 OPK	X22-61138
Office C2R Scripts for OPK v 2106	X22-61128
The Images.zip download	No part number

Prepare the Images folder

Now that you've gathered your collateral, you can configure your technician PC to start creating images. The image creation process described in this lab is based on the Images.zip download, which you'll extract onto your PC and then populate it with contents from the other collateral.

Extract Images.zip

Extract the contents of Images.zip to the root of your hard drive. once extracted, you should have this folder structure:



Here's a description of what each folder is for. Many of these folders will be empty when you extract images.zip, and you'll copy packages into them:

Expand table

Folder	Description
Images	This is where custom project images are stored.
Mount	Used for mounting wim files during the customization process. This folder must be empty before starting a new custom image. Never store files here.
Projects	Projects are stored here and inherit the file system and

	files from \Windows folder when CreateProject.cmd is run
Scripts	contains scripts required for WinPE environment including WinPEMenu.cmd.
Windows\Drivers	Drivers placed here will be injected into the Windows and WinRE images.
Windows\FOD	Retail Demo Experience and Language Features on Demand packages.
Windows\InboxApps	Inbox UWP Apps Updates and other UWP apps. Apps in this folder are managed with UpdateInboxApps.cmd.
Windows\Language	Language files for multi-language Windows images.
Windows\Unattend	OEM customization files and other scripts required for automated processing.
Windows\Updates	.msu update packages, including the ZDP and LCUs.
Windows\WinRE\Languages	WinRE language files from the ADK for multi language Windows images.
Windows\WinRE\Updates	WinRE update packages.
WinPE\Drivers	Drivers required for WinPE.

Script usage

The scripts in Images.zip make it easy to build and deploy images. The steps in this lab use the scripts for each of the image creation and deployment phases.

When you run the scripts, you'll see the following colors, each with a different meaning:

Expand table

Color	Description
Green	Waiting for user input
Blue	The script is running
Red	Warning

Copy collateral

Now that you have the folder structure and scripts on your hard drive, add packages from your collateral into the Images folder.

Copy drivers

Add drivers to the Images\Windows\Drivers and Images\WinPE\Drivers folders.

- If you are preparing a system specific image you can place Windows drivers in this folder that will be added to the image
- If you are preparing a generic Windows image and do not want to include system specific driver then you'll have the opportunity to add drivers on the Reference PC during image customization.
- Only .inf based drivers can be added. Drivers than use an installer (Setup.exe) cannot be added using DISM
- Only install applicable driver architecture. Some IHVs may deliver the driver package that includes both x86 and x64 binaries, but only install the applicable architecture.

Copy RDX packages

Copy the packages from the RDX FOD ISO into the Images\Windows\FOD folder.

Copy at least the Microsoft-Windows-RetailDemo-OfflineContent-Content-

Package~31bf3856ad364e35~amd64~~.cab and Microsoft-Windows-RetailDemo-OfflineContent-Content-en-us-Package~31bf3856ad364e35~amd64~~.cab files

Also copy the Microsoft-Windows-RetailDemo-OfflineContent-Content-xx-yy-Package~31bf3856ad364e35~amd64~~.cab files of all the languages you are adding.

Copy Language packages

If you're planning to include additional languages into your image:

- 1. Copy language FOD packages from the Languages and Optional Features ISO into the Images\Windows\FOD folder. These files are:
 - Microsoft-Windows-LanguageFeatures-TextToSpeech-xx-yy-Package~31bf3856ad364e35~amd64~~.cab
 - Microsoft-Windows-LanguageFeatures-Basic-xx-yy-Package~31bf3856ad364e35~amd64~~.cab
 - Microsoft-Windows-LanguageFeatures-Handwriting-xx-yy-Package~31bf3856ad364e35~amd64~~.cab
 - Microsoft-Windows-LanguageFeatures-OCR-xx-yy-Package~31bf3856ad364e35~amd64~~.cab
 - Microsoft-Windows-LanguageFeatures-Speech-xx-yy-Package~31bf3856ad364e35~amd64~~.cab

① Note

Only some Languages have the Microsoft-WindowsLanguageFeatures-Speech package. Some Languages require the optional fonts package e.g. Japanese (Microsoft-Windows-LanguageFeatures-Fonts-Jpan-

Package \sim 31bf3856ad364e35 \sim amd64 $\sim\sim$.cab).

2. Copy the contents of the the LanguagesAndFeatures folder of Languages and Optional Features ISO into the Images\Windows\Languages folder.

After copying, delete the Microsoft-Windows-Client-LanguagePack_x64_xx-yy.cab main language files of the languages you do not want to add.

To save disk space, you can also delete the Microsoft-Windows-Client-Language-Pack_x64_en-us.cab file since it's already in the image.

(i) Important

Don't remove the rest 3,000+ files as they are needed for the correct configuration of satellite packages.

If you are building an English only image, you can leave the folder empty

Copy inbox apps

- 1. Copy the contents of the amd64fre folder of the Inbox Apps ISO into the Images\Windows\InboxApps folder.
- Copy the contents (4 files) of the x64\Microsoft.SecHealthUI_8wekyb3d8bbwe folder of the X22-79194 Win 11 21H2 x64 MltLng OPK Inbox Apps (Win Security AppX) JuneRTM\SW ELCTRNC Win 11 21H2 x64 MltLng InboxAppsOEM (WinSecurityAppX) JuneRTM\Layer\X22-79198.zip archive overwriting the two existing files: Microsoft.SecHealthUI_8wekyb3d8bbwe.appx and Microsoft.SecHealthUI_8wekyb3d8bbwe.xml.

Copy Office packages

- Copy the contents of the 2106ODT folder of the X22-61128 Office C2RScriptsConfigDeployment Tool for OEM OPK v2106 in the Windows\0ffice folder.
- 2. Copy the contents of the X22-61138 Office 2106 English OPK in the Images\Windows\Office folder.
- 3. **Optional**: Copy the contents of additional Office 2106 OPKs of the Office languages that you intend to preinstall

Notes:

- The top folder of each Office 2106 OPK is Office. This is the folder that must be copied in the Windows\Office folder so you'll end up with an Images\Windows\Office\Office\Data\.. folder structure.
- Office 2106 OPKs have different language resource files but the base files are the same. If you're copying multiple Office OPKs then you'll get a fileoverwrite prompt. It's OK to skip overwriting files to speed up the copying process.
- The Office languages you add will not all be preinstalled by default. You'll
 be prompted to select which Office languages will be preinstalled later in
 the project creation process.
- If you don't want to add multiple languages in a multilanguage Windows image, then you must preinstall Office in the default Windows language.

Unattend

The Images\Unattend folder contains the file Unattend.xml which is used to add OEM information to the Windows image. This file will be customized with the information you will be asked to provide during CreateImage.cmd process in the image creation process.

All the files and scripts in this folder are required for successful image creation.

Wallpaper

If you're using a custom desktop background (wallpaper) image, copy it into the Images\Unattend folder wallpaper.jpg overwriting the existing file. If you don't plan to use a custom wallpaper, then please delete the existing wallpaper.jpg file

Updates

Place all .msu update packages in the Images\WIndows\Updates and Images\Windows\WinRE\Updates folder. Updates in these folders will programmatically update the Install.wim file during the CreateImage.cmd process.

Place the following into the update folders:

- The Windows10.0-KB5005027-x64.msu package from he Windows installation media OPK.
- The Windows10.0-KB5005635-x64.msu from the LCU media.

Recovery

Place all the WinPE language packs you want to be applied to WinRE into the Images\Windows\WinRE\Languages folder. Copy the language packs from C:\Program Files (x86)\Windows Kits\10\Assessment and Deployment Kit\Windows Preinstallation Environment\amd64\WinPE_0cs\xx-yy.

You'll also need the following files for each language; if adding multiple languages you may preserve the folder structure from C:\Program Files (x86)\Windows Kits\10\Assessment and Deployment Kit\Windows Preinstallation Environment\amd64\WinPE_OCs

- lp.cab
- WinPE-Rejuv_xx-yy.cab

- WinPE-EnhancedStorage_xx-yy.cab
- WinPE-Scripting_xx-yy.cab
- WinPE-SecureStartup_xx-yy.cab
- WinPE-SRT_xx-yy.cab
- WinPE-WDS-Tools_xx-yy.cab
- WinPE-WMI_xx-yy.cab
- WinPE-StorageWMI_xx-yy.cab
- WinPE-HTA_xx-yy.cab

(i) Important

You must match the WinRE languages with the preinstalled Windows languages. If you're building an English only image, you can leave the folder empty. Some Languages require the optional fonts package e.g. Japanese.

For network based deployment - Share the Images folder

If you'll be deploying your image over a network, you'll need to make youe Images folder available over the network.

- 1. In File explorer on your technician PC, right-click on the C:\Images folder and select **Properties**.
- 2. Click on the Sharing tab.
- 3. Under **Advanced Sharing**, click the **Advanced Sharing...** button.
- 4. Check the box next to **Share this folder**.
- 5. Click on **Permissions**.
- 6. Configure permissions:

• Full control: Allow

• **Change**: Allow

Read: Allow

- 7. Click **OK** on the Permissions and Advanced Sharing windows.
- 8. Close the Image Properties window. Your Images folder is now available over the network.

① Note

Ensure that your network is set as Private, and your firewall rules allow for sharing a folder over a network.

Create a USB drive that can boot to WinPE

Now that you have your environment setup, you can start using the Images.zip scripts. We'll first use CreateWinPE.cmd to create a bootable USB drive with a customized version of WinPE that you'll use to boot the reference PC with WinPE and store Images, or create a network mapping back to the technician PC.

CreateWinPE.cmd uses the following syntax:

Expand table

Command	Description
Partition option (required)	
/DualPart	Dual partitioned bootable WinPE with NTFS partition for Images to be stored.

/OnePart	Single partitioned bootable WinPE drive, formatted as FAT32.
/Network	Single partitioned bootable WinPE with network mapping capabilities. You'll need to supply the Computer Name, User Account name and the Password for that account.

1. Open the **Deployment and Imaginging tools** as an administrator

2. Run CreateWinPE.cmd:

```
Windows Command Prompt

CreateWinPE.cmd /dualpart
```

to create a dual-partitioned USB drive, or:

```
Windows Command Prompt

CreateWinPE.cmd /network
```

to create WinPE media that will connect over a network to a share that contains your image.

```
📼 Administrator: Command Prompt - CreateWinPE.cmd /network ComputerName UserName Password - CreateWinPE.cmd /network ComputerName UserNam...
WARNING: This process will clean and format the selected Disk
Select the Disk number of your USB from the list above: 4
WARNING, ALL DATA ON NON-REMOVABLE DISK
DISK 4 WILL BE LOST
 roceed with Format or Ctrl-C to break
Waiting for 6 seconds, press a key to continue ...
Microsoft DiskPart version 10.0.22454.1000
Copyright (C) Microsoft Corporation.
On computer: MURPHYSRV
Disk 4 is now the selected disk.
DiskPart succeeded in cleaning the disk.
DiskPart succeeded in creating the specified partition.
 100 percent completed
DiskPart successfully formatted the volume.
DiskPart successfully assigned the drive letter or mount point.
DiskPart marked the current partition as active.
Leaving DiskPart...
Proceeding...
Deployment Image Servicing and Management tool
/ersion: 10.0.22454.1000
  ounting image
                                    18.0%
```

Start a new project

Before you can start creating a custom Windows image, create a new project. A project is a design for one image.

1. Mount the Windows installation ISO image. In Windows Explorer, double click on the ISO file and the ISO will appear as an optical drive and be assigned a drive letter. Notice the drive letter, e.g. D:\.



You can copy the \Sources\install.wim file from the Windows installation ISO into the C:\Images folder for easier access.

- 2. If it's not already open, run the **Deployment and Imaging Tools Environment** as an administrator.
- 3. Navigate to the C:\Images folder:

```
Windows Command Prompt

cd c:\Images
```

4. Run the CreateProject.cmd script to create a new project:

```
Windows Command Prompt

CreateProject.cmd <projectname> D:\Sources\install.wim
```

Where | s a name for your project, e.g. "testproj", and D:\Sources\install.wim is the path to the install.wim file on the mounted ISO file or your hard disk.

When this script runs, all files and folders from the Images\Windows folder will be copied to Images\Projects\<projectname>.

The Images\Projects\<projectname> folder is now presented for verification, additions and removals of files. The Images\Windows folder is left intact for future use with additional projects.

```
Administrator Deployment and Imaging Tools Environment - CreateProject.cmd testproj install.wim

ps\Microsoft.WebMediaExtensions_Bwekyb3d8bbwe.appxbundle
C:\Images\Windows\InboxApps\Microsoft.WebMediaExtensions_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WebPImageExtension_Bwekyb3d8bbwe.x64.appx -> C:\Images\Projects\testproj\InboxApps\Microsoft.WebpImageExtension_Bwekyb3d8bbwe.x64.appx -> C:\Images\Projects\testproj\InboxApps\Microsoft.WebpImageExtension_Bwekyb3d8bbwe.x64.appx -> C:\Images\Projects\testproj\InboxApps\Microsoft.WebpImageExtension_Bwekyb3d8bbwe.x64.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WebpImageExtension_Bwekyb3d8bbwe.x64.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Whiteboard_Bwekyb3d8bbwe.x64.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Whiteboard_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Whiteboard_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Whiteboard_Bwekyb3d8bbwe.xml
C:\Images\Windows\InboxApps\Microsoft.Windows.Photos_Bwekyb3d8bbwe.appxbundle -> C:\Images\Projects\testproj\InboxApps\Microsoft.Windows.Photos_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Windows.Photos_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Windows.Photos_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.Windows.Photos_Bwekyb3d8bbwe.xpd.xde.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsAlarms_Bwekyb3d8bbwe.appxbundle -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsAlarms_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsAlarms_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsAlarms_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsCalculator_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsCamera_Bwekyb3d8bbwe.xml -> C:\Images\Projects\testproj\InboxApps\Microsoft.WindowsC
```

Create a new image

Now that you've created a project, you can start creating a new image. We'll use CreateImage.cmd to create our image.

1. From the **Deployment and Imaging Tools** running as an administrator, run CreateImage.cmd:

```
Windows Command Prompt

CreateImage.cmd NewProject
```

Where NewImage is the name you're giving the image.

2. You'll be prompted to select a Windows 11 edition. The default OA 3.0 Manufacturing Key will be automatically applied to the image and the unattend.xml updated:

```
### Administrator Exployment and Imaging Tools Environment - Creating Age of the State of the St
```

Once you choose an edition, the image will be mounted and your drivers,

languages, FOD, and Updates will be applied programmatically.

All the drivers in your Images\Projects\<projectname>\Drivers folder will be applied to both Windows and WinRE.

The script pauses at the end of this process for your review of applied packages and drivers.

OEM Customizations

After you've reviewed the list of applied packages and drivers, NewImage.cmd will prompt for additional information.

1. Enter the date. This date will be used to create a csup.txt file that includes the date, in the MM-DD-YYYY format.

```
Administrator: Deployment and Imaging Tools Environment - CreateImage.cmd testproj

OEM Customizations

Enter the date for CSUP.txt

Enter today's date MM-DD-YYYY [e.g. 09-30-2021 Cannot be blank] 09-30-2021
```

2. Enter the default language of the image. This will also be applied as the default language for WinRE. Note that a corresponding Language Pack must be have been included in your \Images\Windows\Languages folder when you initially ran CreateImage.cmd.

The default value is en-US.

```
Administrator: Deployment and Imaging Tools Environment - CreateImage.cmd testproj

Enter the default language to set Windows and WinRE

Type the default language e.g. de-de [ENTER = en-us]
```

3. Type the name of your time zone.

The default value is **Pacific Standard Time**.

```
Administrator Deployment and Imaging Tools Environment - Createlmage.cmd testproj

Set default Time Zone settings
For more information please look at https://docs.microsoft.com/en-us/windows-hardware/manufacture/desktop/default-time-zones

Type the default time zone e.g. Singapore Standard Time [ENTER = Pacific Standard Time]
```

4. Enter whether you want to enable S Mode (Y/N).

```
Administrator: Deployment and Imaging Tools Environment - CreateImage.cmd testproj

Enable Windows S Mode

Enable Windows S Mode [Y/N]
```

5. Enter your OEM name and support URL. Entering this information is required and will be used in the Get Help app.

```
Administrator: Deployment and Imaging Tools Environment - CreateImage.cmd testproj

Enter OEM Information

Enter your OEM name and press ENTER [Cannot be blank] SuperHero OEM
Enter your Support URL and press ENTER [Cannot be blank] www.superhero.com\support
```

6. If you've included Office in your image you will prompted to select the Office languages, you want to include in your image from the file which is presented in Notepad. Completely remove the lines with languages you do not want to include, select **File** and **Save**, then close Notepad when done.

Save your image

Image customization is now complete, and the custom image is saved in the Images\Images\rojectname>.wim

- If you'll be deploying your image from a USB, copy the
 <projectname>.wim file to your USB drive.
- If you'll be deploying your image over a network, you can leave the image where it is.

Apply your image to a reference PC

Now that you have a customized image, you can deploy it to your reference PC. You can:

- Deploy it over a network, or
- Deploy it using a USB key

```
EVI 11 - Image Deployment Framework
Copyright (c) Nicrosoft Corporation. All rights reserved.

[1] - Apply .wim file
[2] - Apply Recovery
[3] - Capture .wim file
[4] - Open new CMD Window
[5] - Exit and Reboot

Select Option then press ENTER: 1
[1] - testproj.wim

Select Option: __
```

USB Deployment Method

Copy the C:\Images\Images and C:\Images\Scripts folders to the NTFS
 USB drive/partition

USB and Network Method

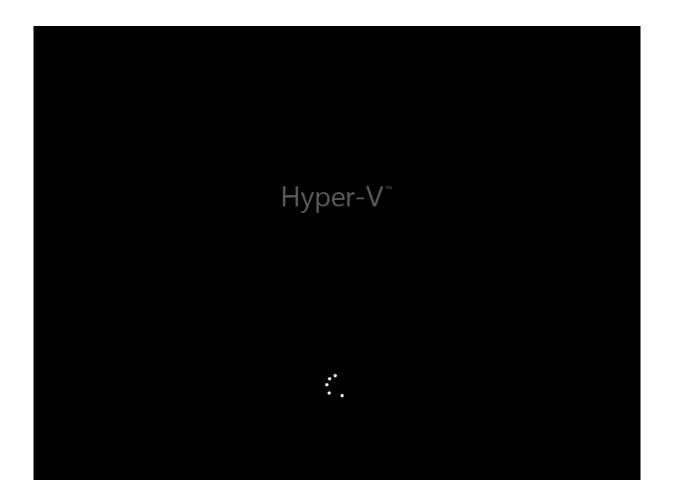
1. Boot the reference device from the WinPE USB drive.

- 2. After the device boots, you'll be prompted to choose an option. Select Enter 1 to Apply a .wim file. You'll be shown a list of available wim files.
- 3. Select the image you want to apply (but don't press Enter).
- 4. On the selection screen, enter 2 to Apply Recovery.
- 5. Once the image is applied, enter 5 to Exit and reboot the reference PC into Audit mode.

Audit mode customizations

The reference PC will bot Windows 11 in Audit mode and an automated process will start in a paused state, and the Sysprep window will be closed.

- 1. When you're ready to start Audit mode customizations, press any key in the script window to start Office configuration and installation.
- 2. When Office the installation finishes, close the Office window.
- 3. If you have additional drivers or applications to add to your image, add them.
- 4. Once you're finished installing additional apps and drivers, click any key in the paused script window to configure recovery, finalize the image, and shut down the PC.



Capture your image

Next you'll boot the reference PC from the WinPE USB drive to capture the customized image. Make sure that the USB with the Images and Scripts folder is in the reference PC when you turn it on.

(i) Important

Make sure you're booting to the USB drive, and not into Windows. If you boot into Windows, you may have to manually enter Audit mode and run Sysprep again.

USB Deployment Method

Once booted to the USB drive, you'll be prompted with a list of options:

- 1. Enter 3 to capture a .wim file. The Windows image will be captured on the USB drive in the \Images folder as ctname_Final>.wim
- 2. When the image capture is finished enter 5 to Exit and Reboot.

Network Deployment Method

Once booted to the USB drive, you'll be prompted with a list of options:

- 1. Enter 3 to capture a .wim file. The Windows image will be captured on the network share in the \Images folder as _Final.wim
- 2. When the image capture is finished enter 5 to Exit and Reboot.

Deploy your image

Boot the reference PC from the WinPE USB

USB Deployment Method

To deploy your image, you'll boot the reference PC from the WinPE USB drive and then choose the Apply wim optione. Make sure that the USB with the Images and Scripts folder is in the reference PC when you turn it on.

- 1. Once you've booted to the USB drive, you'll be shown a list of options. Enter 1 to Apply .wim file.
- 2. Select your finalized image (ctname>_Final.wim).
- 3. Once the image is finished being deployed, enter 5 to Exit and Reboot to reboot the destination PC to Audit mode
- 4. When the device reboots into Audit mode, you can run quality checks and OA 3.0 DPK injection, and then use the Sysprep pane to seal the PC to OOBE mode, shutdown and ship.
- 5. For images shipping with S Mode enabled: Run the Sysprep S Mode.cmd file on the desktop. This script configures the registry for final shipment and runs Sysprep /00BE /Shutdown.

(i) Important

Don't manually run Sysprep, use this script instead.

