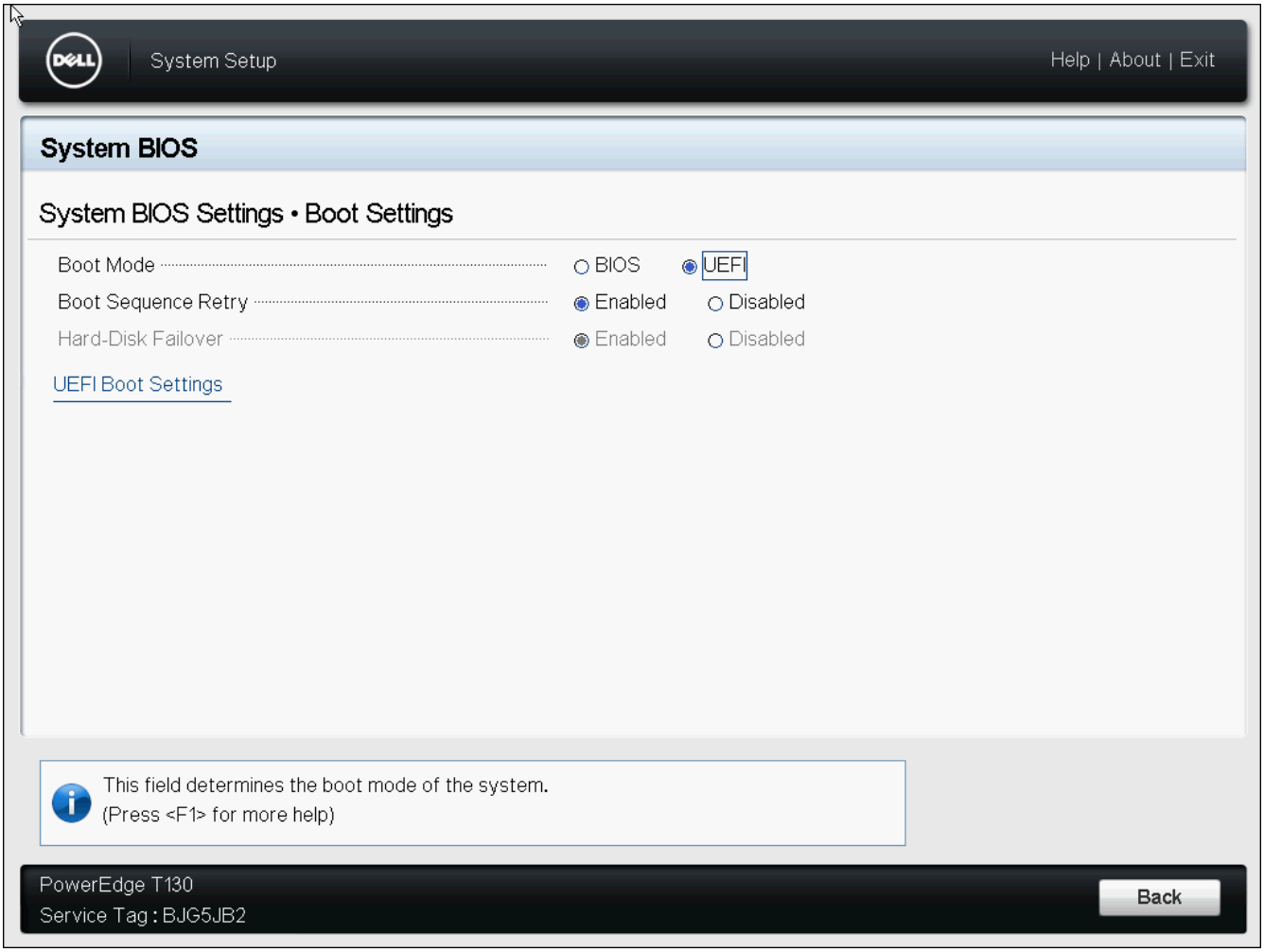
System Imaging via Windows PE and USB Flash Drive

This document describes how to *Capture* and *Apply* a WIM image using a modified version of Windows PE 10 64-bit and a bootable USB flash drive. UEFI boot mode is described here, not BIOS boot mode. Many computer manufacturers now use UEFI boot mode instead of BIOS boot mode (also known as legacy boot). If you have an old computer that uses BIOS boot mode, then these instructions would not apply to you. Some computers can be configured (in system setup) to use BIOS or UEFI boot mode. Dell servers have this option as shown below.



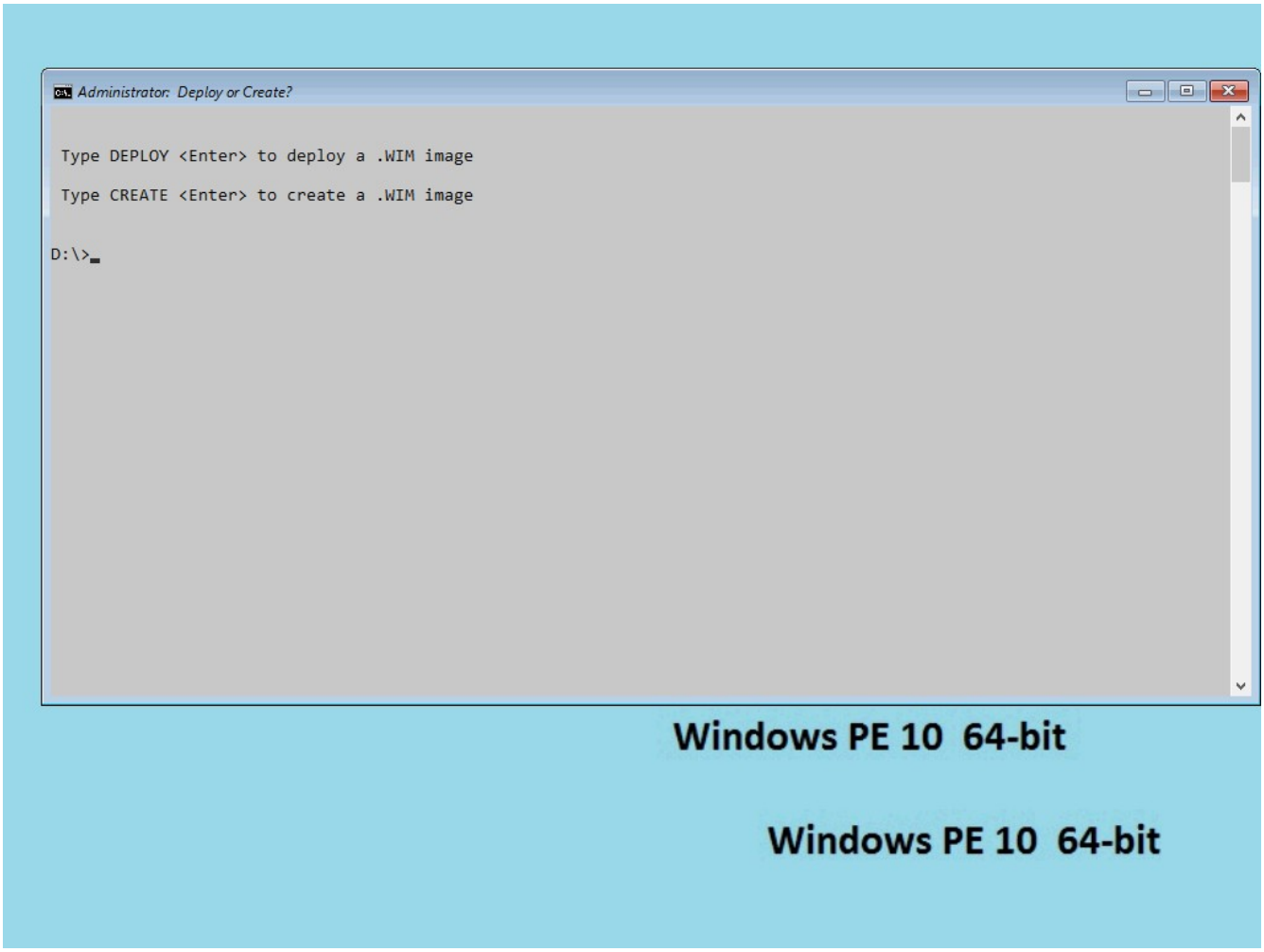
Background

A common task in the IT industry is system imaging of laptop, desktop and server-class computers. System imaging consists of two basic procedures: *capture* an image from a reference computer to a file, then *apply* the image to target computers. The reference and target computers should be the same make & model, and have identical specifications.

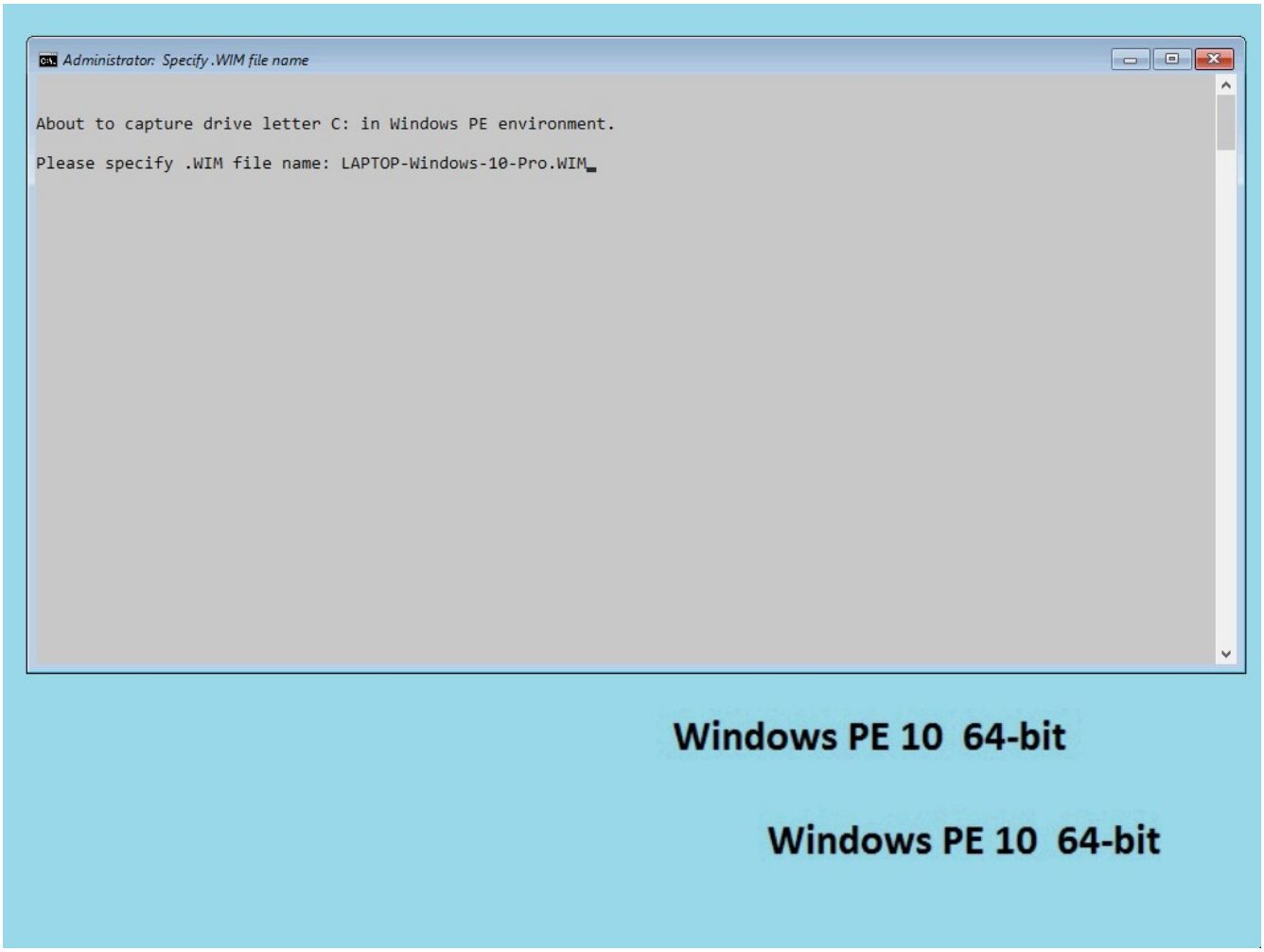
Typically, the Windows operating system is installed manually on the reference computer. Then it's customized and tested according to requirements. Once the administrator is satisfied with the quality of the reference computer, sysprep.exe is run to prepare it for image capture, and then the image is captured. Image files have a .wim file extension and are quite large. WIM file sizes can range from a few gigabytes to 20-30 GB depending on the role of the computer.

Create and Deploy operations

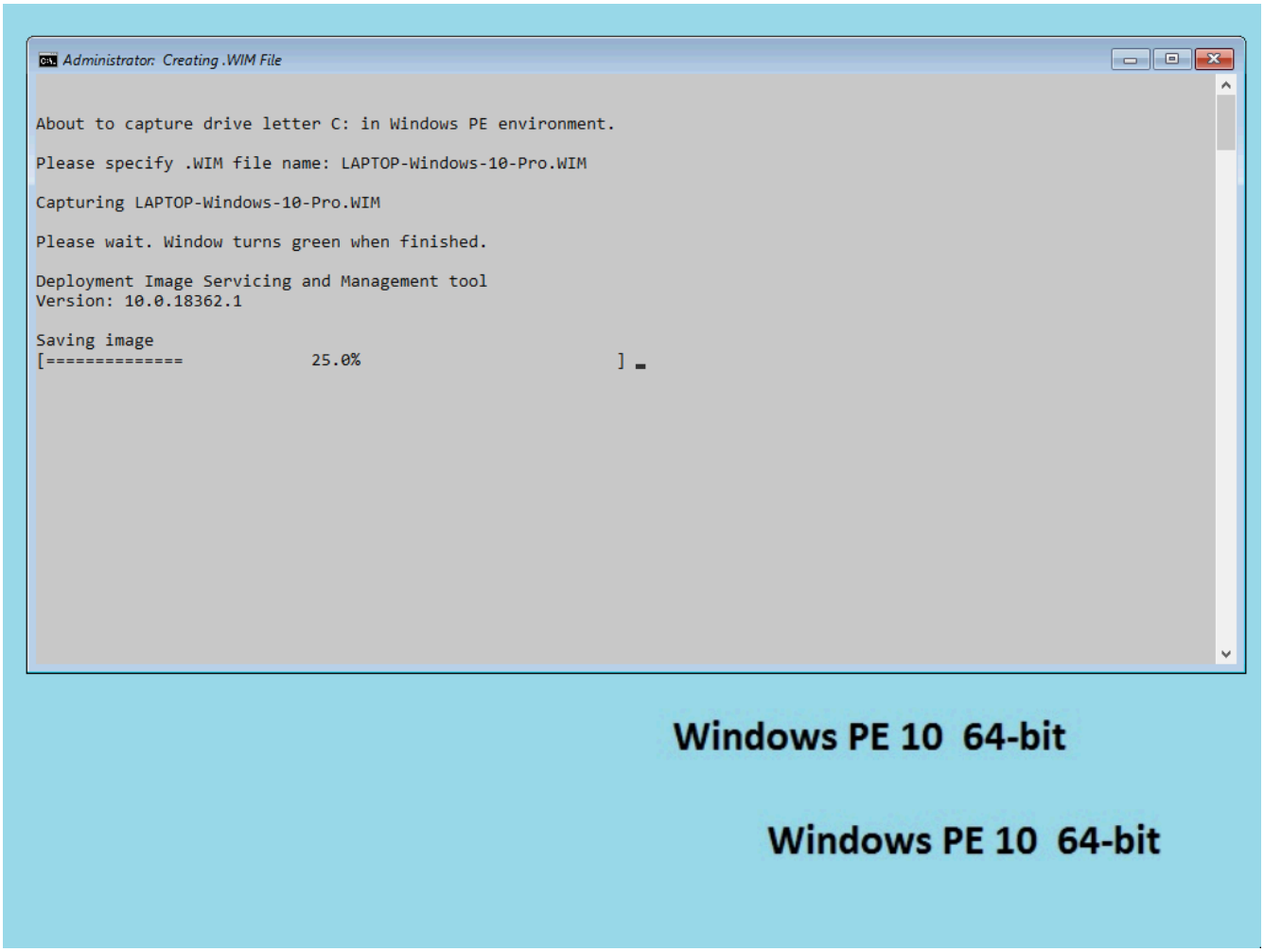
A WIM file is created automatically by typing CREATE at the Windows PE main menu. The WIM file is stored in the root of the USB drive. See picture below.



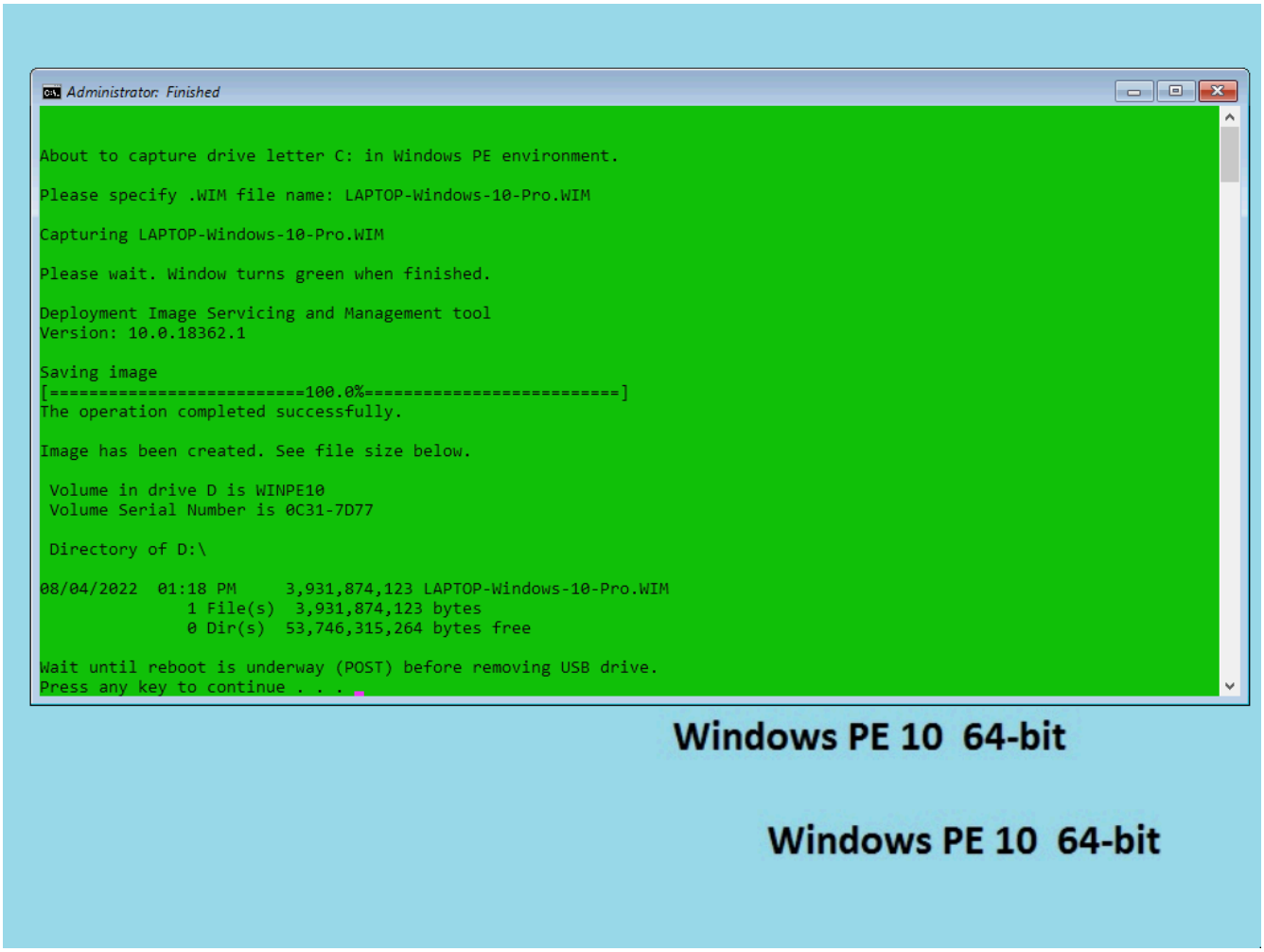
The user is prompted to specify a WIM file name. Type the desired file name and include the ".WIM" file extension. See example below.



A progress bar is shown as the image is being created/ captured. See example below.

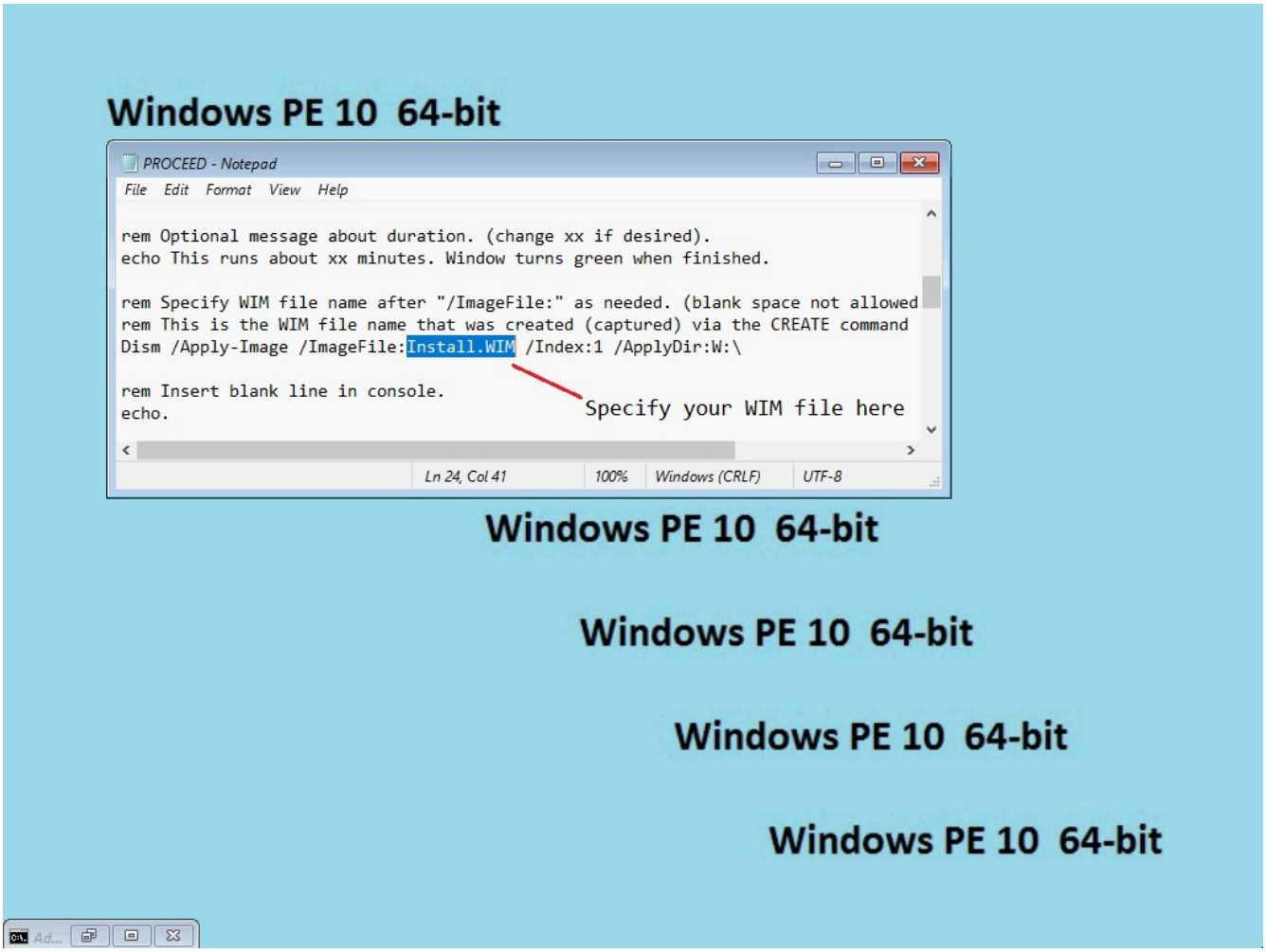


A summary report is displayed when finished. Window turns green to indicate the process is complete. See example below.



After the image is captured successfully, press the keyboard space bar then disconnect the USB drive.

The captured WIM image is now available to deploy onto another computer. But another step must be done first. Start notepad and open a file named PROCEED.CMD in the root of the USB drive. In notepad, change the file name filter to *All Files (*.*)* so you can see PROCEED.CMD in the file list. Specify the file name (highlighted in blue) to match your recently captured image file. Then save PROCEED.CMD and close notepad.



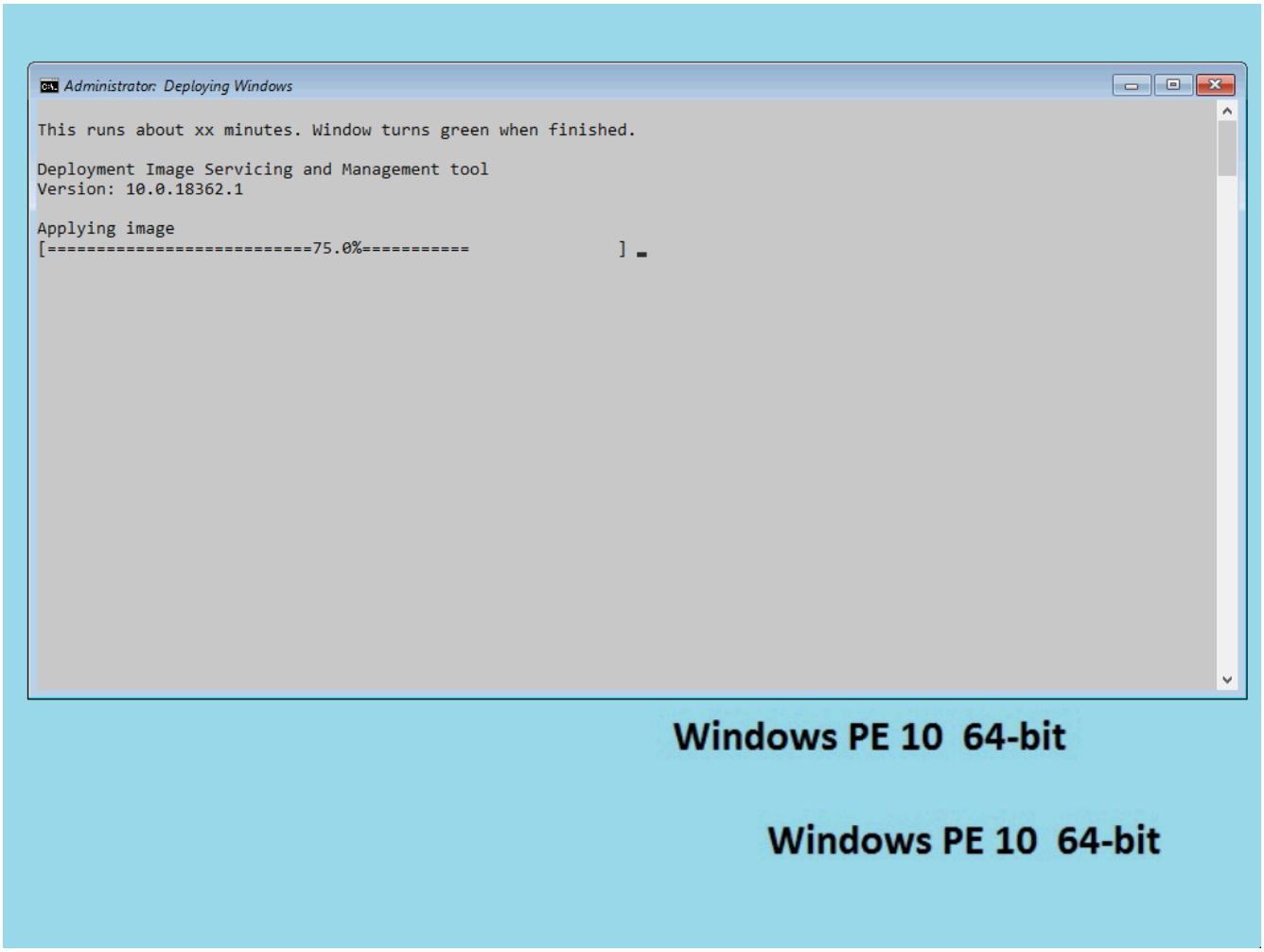
You are now ready to deploy the WIM image on another computer, the *target* computer. Connect the USB drive to the target computer and start or restart the computer. Ensure the target computer uses UEFI boot mode, then follow these steps.

- As the computer starts, press the appropriate key for the Boot Menu/ Boot Manager

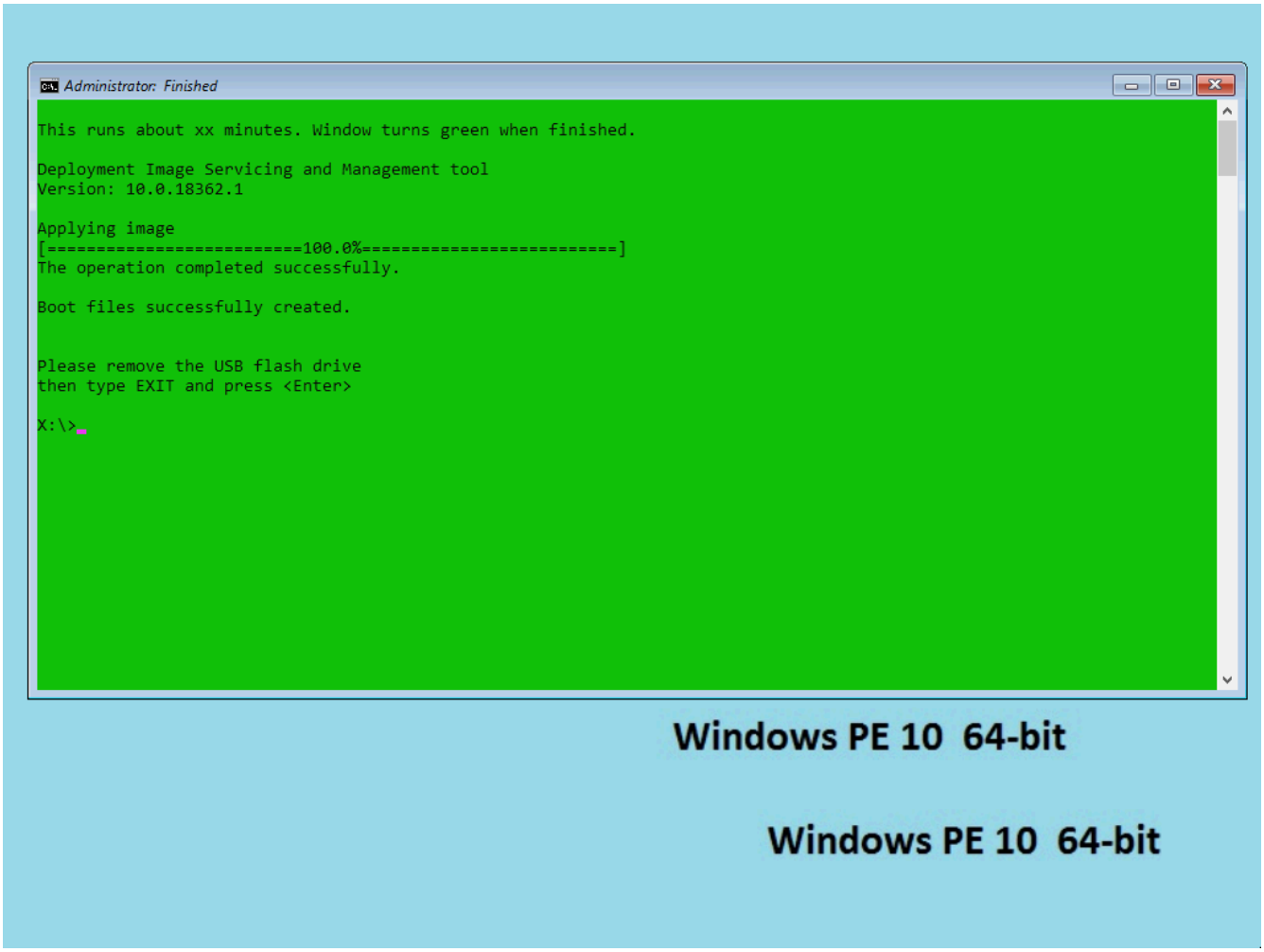
  (F12 key for Dell laptops and desktops)
  (F11 key for Dell servers)

- When the boot menu appears, select the USB drive as your boot device
- Windows PE 10 64-bit loads
- Type DEPLOY at the main menu
- Read the warning message
- Type PROCEED

The image starts to deploy on the target computer. See example below.



The window turns green when the deployment process is finished. See example below. The target computer is now ready to boot from the internal storage device. Remove the USB drive and set it aside.



The main benefits of system imaging vs installing Windows manually are:

- Faster operating system deployment
- Consistent results on all target computers
- Reduced labor costs

Windows PE has been around for many years. This paper describes the 64-bit version of Windows PE 10. The standard (unmodified) version of Windows PE works well but is tedious. Numerous commands are required to properly capture and apply an image.

The Windows PE 10 ISO file discussed here was modified for ease-of-use via shell scripts. The *create* and *deploy* operations are automated. See “ReadMe.txt” in the root of this ISO file for instructions on how to create a bootable USB flash drive.

Troubleshooting

1. My computer will not boot from the USB drive I just created from the ISO file.

a. Your computer may not support UEFI booting or is not configured for UEFI booting if that option is available. Power-up your computer and press the appropriate key (F2 for Dell systems) to enter the system setup. Browse the setup menu to find the boot mode. If it uses BIOS boot mode then this imaging method would not work because this ISO was designed only for UEFI boot mode.

b. If your computer uses UEFI boot mode and the USB drive does not work, it could be a defective USB drive. Or the USB drive was not selected as the boot device from the boot menu. Or the Rufus software malfunctioned. Try building another USB drive with Rufus.

c. Ensure that Secure Boot is disabled (the correct setting for Windows PE) in the system setup.

2. I am unable to create a WIM image; an error appears in Windows PE.

a. Ensure that BitLocker drive encryption is disabled on the drive you wish to capture. System imaging will fail when attempting to capture an image from an encrypted drive.

Notes

1. Notepad can be used in Windows PE by typing *notepad* at the command line
2. To return to the main menu in Windows PE, type *startnet*
3. To quit Windows PE and reboot, type *exit*
4. Deployment logs are stored in the *Logs* folder in the root of the USB drive

5. This USB drive can be used on computers with RAID controllers if the proper RAID drivers exist in Windows PE. This Windows PE build is known to work on some Dell PowerEdge server models with RAID controllers. To validate whether Windows PE can see the drives attached to a RAID controller, follow these steps.

a. Boot the server from the USB drive (do not type *create* or *deploy* at main menu)
b. Type *diskpart* at the command prompt
c. At the diskpart prompt, type *list disk*
d. If your internal drives appear in the list, drivers exist and system imaging will be successful
e. If your drives do not appear in the list, it indicates drivers do not exist in this Windows PE build

6. Rufus is one executable file; it does not install additional files in the file system.

Use cases

- For small business owners without an IT department
- For home users who want to create and retain pristine images for disaster recovery
- When system imaging tasks cannot be done over a network
- For large scale deployment projects at field sites

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