Windows 8.1 Administration Essentials & Configuration

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Windows 8.1 Administration: Essentials & Configuration: Pocket Consultant

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Acknowledgments

To my readers—thank you for being there with me through many books and many years. It has been an honor and a privilege to be your pocket consultant.

To my wife—for many years, through many books, many millions of words, and many thousands of pages she's been there, providing support and encouragement and making every place we've lived a home.

To my kids—for helping me see the world in new ways, for having exceptional patience and boundless love, and for making every day an adventure.

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Special thanks to my son Will for not only installing and managing my extensive dev lab for all my books since *Windows 8 Pocket Consultant* but also for performing check reads of all those books as well.

—William R. Stanek

Introduction

Writing *Windows 8.1 Administration Pocket Consultant: Essentials & Configuration* was a lot of fun —and a lot of work. As I set out to write this book, my initial goals were to determine how Windows 8.1 was different from its predecessors and what new features and options were available. As with any new operating system, I had to do a great deal of research and a lot of digging into the internals of the operating system to determine exactly how things work.

Anyone transitioning to Windows 8.1 from Windows 8 might be surprised at just how much has been updated, because changes both subtle and substantial have been made throughout the operating system. For anyone transitioning from Windows 7 or earlier, the extensive UI changes will be among the most substantial revisions to the operating system. Like Windows 8, Windows 8.1 supports a touch-based UI, as well as the traditional mouse and keyboard. When you are working with touch UI-enabled computers, you can manipulate on-screen elements in ways that weren't possible previously. You can do any of the following:

- **Tap**. Tap an item by touching it with your finger. A tap or double-tap of elements on the screen is generally the equivalent of a mouse click or double-click.

- **Press and hold**. Press your finger down and leave it there for a few seconds. Pressing and holding elements on the screen is generally the equivalent of a right-click.

- **Swipe to select**. Slide an item a short distance in the opposite direction compared to how the page scrolls. This selects the items and also might bring up related commands. If press and hold doesn't display commands and options for an item, try using swipe to select instead.

- **Swipe from edge (slide in from edge)**. Starting from the edge of the screen, swipe or slide in. Sliding in from the right edge opens the Charms panel. Sliding in from the left edge shows open apps and allows you to switch between them easily. Sliding in from the top or bottom edge shows commands for the active element.

- **Pinch**. Touch an item with two or more fingers, and then move the fingers toward each other. Pinching zooms in or shows less information.

- **Stretch**. Touch an item with two or more fingers, and then move the fingers away from each other. Stretching zooms out or shows more information.

You also are able to enter text by using the on-screen keyboard. Although the UI changes are substantial, they aren't the most significant changes to the operating system. The most significant changes are below the surface, affecting the underlying architecture and providing many new features. Some of these features are revolutionary in that they forever change the way we use Windows.

Because Pocket Consultants are meant to be portable and readable—the kind of book you use to solve problems and get the job done wherever you might be—I had to carefully review my research to make sure that I focused on the core essentials and configuration of Windows 8.1. The result is the book you hold in your hands, which I hope you'll agree is one of the best practical, portable guides available.

Because my focus is on giving you maximum value in a pocket-size guide, you don't have to wade through hundreds of pages of extraneous information to find what you're looking for. Instead, you'll find exactly what you need to address a specific issue or perform a particular task. In short, the book is designed to be the one resource that you turn to whenever you have questions regarding Windows 8.1 essentials and configuration. It zeroes in on daily procedures, frequently used tasks, documented examples, and options that are representative, although not necessarily inclusive.

One of the goals for this book is to keep its content concise so that it remains compact and easy to navigate, while at the same time packing it with as much information as possible to make it a valuable resource. Instead of a hefty 1,000-page tome or a lightweight, 100-page quick reference, you get a valuable resource guide that can help you quickly and easily perform common tasks, solve problems, and implement everyday solutions.

Who is this book for?

The focus of *Windows 8.1 Administration Pocket Consultant: Essentials & Configuration* is on the Standard, Professional, and Enterprise editions of Windows 8.1. The book is designed for the following readers:

- Accomplished users who want to configure and maintain Windows 8.1

- Current Windows system administrators and support staff

- Administrators upgrading to Windows 8.1 from earlier releases of Windows

- Administrators transferring from other platforms

To pack in as much information as possible, I had to assume that you have basic networking skills and a basic understanding of Windows operating systems. As a result, I don't devote entire chapters to understanding Windows basics, Windows architecture, or Windows networks. I do, however, cover desktop customization, system optimization, automation, maintenance, and much more. The book also goes into depth on troubleshooting, and I've tried to ensure that each chapter, where appropriate, has troubleshooting guidelines and discussions to accompany the main text. From the start, troubleshooting advice is integrated into the book, instead of being captured in a single, catchall troubleshooting chapter inserted as an afterthought. I hope that after you read these chapters and dig into the details, you'll be able to improve the overall experience of your users and reduce downtime.

How is this book organized?

Rome wasn't built in a day, nor was this book intended to be read in a day, or in a week, or even in a month for that matter. Ideally, you'll read this book at your own pace, a little each day as you work your way through each of the ten chapters. The chapters are arranged in a logical order, taking you from deployment and installation to configuration, optimization, and maintenance.

Ease of reference is an essential part of this hands-on guide. This book has an expanded table of contents and an extensive index for finding answers to problems quickly. Many other quick-reference features have been added to the book as well, including quick step-by-step procedures, lists, tables with fast facts, and extensive cross references.

As with all Pocket Consultants, *Windows 8.1 Administration Pocket Consultant: Essentials & Configuration* is designed to be a concise and easy-to-use resource. This is the readable resource guide that you'll want on your desktop at all times. The book covers everything you need to perform the essential tasks for deployment, installation, configuration, optimization, maintenance, and much more.

Although designed and written to stand on its own, this book can also be used with *Windows 8.1 Administration Pocket Consultant: Storage, Networking, & Security*. The latter book focuses on boot configuration and startup, drive configuration and encryption, advanced storage, file sharing and security, TCP/IP networking and remote accesses, advanced networking solutions, and much more.

Conventions used in this book

I've used a variety of elements to help keep the text clear and easy to follow. You'll find code listing in `monospace` type, except when I tell you to actually enter a command. In that case, the command appears in **bold** type, as does any text that the user is supposed to enter. When I introduce and define new term, I put it in *italics*.

Other conventions include the following:

- **Best Practices**. To examine the best technique to use when working with advanced configuration and maintenance concepts

- **Caution**. To warn you about potential problems

- **Important**. To highlight important concepts and issues

- **More Info**. To provide more information on a subject

- **Note**. To provide additional details on a particular point that needs emphasis

- **Real World**. To provide real-world advice when discussing advanced topics

- **Security Alert**. To point out important security issues

- **Tip**. To offer helpful hints or additional information

I truly hope you find that *Windows 8.1 Administration Pocket Consultant: Essentials & Configuration* provides everything that you need to perform essential tasks on Windows 8.1 systems as quickly and efficiently as possible. You are welcome to send your thoughts to me at williamstanek@aol.com. Follow me on Twitter at WilliamStanek and on Facebook at *www.facebook.com/William.Stanek.Author*. Thank you.

Other resources

No single magic bullet for learning everything you'll ever need to know about Windows 8.1 exists. Although some books are offered as all-in-one guides, there's simply no way one book can do it all. With this in mind, I hope you use this book as it is intended to be used—as a concise and easy-to-use resource. It covers everything you need to perform essential tasks, but it is by no means exhaustive.

Your current knowledge will largely determine your success with this or any other Windows resource or book. As you encounter new topics, take the time to practice what you've learned. Seek out further information as necessary to get the practical hands-on know-how and knowledge you need.

For topics this book doesn't cover, you may want to look to *Windows 8.1 Administration Pocket Consultant: Storage, Networking, & Security*. I also recommend that you regularly visit the Microsoft website for Windows (*microsoft.com/windows/*) and *support.microsoft.com* to stay current with the latest changes. To help you get the most out of this book, you can visit my corresponding website at *pocket-consultant.com*. This site contains information about Windows 8.1 and updates to the book.

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Every effort has been made to ensure the accuracy of this book and its companion content. Any error that have been reported since this book was published are listed at:

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Chapter 1. Introduction to Windows 8.1 administration

- Getting started with Windows 8.1: the quick tour

- Understanding 32-bit and 64-bit computing options

- Deploying Windows 8.1

- Installing Windows 8.1

- Running Windows 8.1

- Windows 8.1 architecture

Windows 8.1 is designed primarily as an operating system for client devices. This chapter covers getting started with Windows 8.1 and the fundamental tasks you need for Windows 8.1 administration. Throughout this and the other chapters in this book, you'll find detailed discussions of changes that enhance all aspects of computer management and security. Although this book focuses on Windows 8.1 administration, the tips and techniques discussed throughout the text can help anyone who develops for, works with, or supports Windows 8.1.

This book zeroes in on user and system administration tasks. You'll find detailed coverage of the following topics:

- Customizing the operating system

- Optimizing the Windows environment

- Configuring hardware devices

- Installing and maintaining programs

- Managing user access and global settings

- Troubleshooting system problems

Also, it is important to note that just about every configuration option in the Windows operating system can be controlled through Group Policy. Rather than add caveats to every discussion that feature A or B can be configured only if allowed in Group Policy, I'm going to assume that you understand the global impact of Group Policy on system configuration and management. I'm also going to assume that you are familiar with the command line and Windows PowerShell. This will

allow me to focus on essential tasks for administration.

Getting started with Windows 8.1: the quick tour

Windows 8.1 is the latest release of the Windows operating system for client computers. Windows 8.1 natively supports image-based installation and deployment. Windows 8.1, Windows 8.1 Pro, and Windows 8.1 Enterprise support 32-bit x86 and 64-bit x64 processors for PCs and tablets. Windows 8.1 RT supports ARM processors. For many advanced features, including BitLocker, Encrypting File System, Domain Join, Group Policy, and the Remote Desktop host, computers will need Windows 8.1 Pro or Windows 8.1 Enterprise.

Windows 8.1 has many enhancements to improve security, including memory randomization and other improvements to prevent malware from inserting itself into startup and running processes. Windows 8.1 uses address space layout randomization (ASLR) to randomly determine how and where important data is stored in memory, which makes it much more difficult for malware to find the specific locations in memory to attack.

Windows 8.1 has enhanced support for devices that use Trusted Platform Module (TPM). Although always-on devices require TPM 2.0, all other devices require at least TPM 1.2. Firmware can use TPM to store hashes, which verify that important operating system files haven't been changed, and keys, which verify that digital signatures are valid.

Windows 8.1 requires a processor that includes hardware-based Data Execution Prevention (DEP) support. DEP uses the Never eXecute (NX) bit to mark blocks of memory as data that should never be run as code. DEP has two specific benefits. It reduces the range of memory that malicious code can use and prevents malware from running any code in memory addresses marked as Never eXecute.

If your organization doesn't use an enterprise malware solution, you'll also be interested to know that Windows Defender for Windows 8.1 has been upgraded to a more fully featured program. Windows Defender now protects against viruses, spyware, rootkit, and other types of malware. Rootkit detection helps to safeguard PCs and tablets from malware that inserts itself into non-Microsoft drivers. If Windows Defender detects that a non-Microsoft driver has been infected, it prevents the driver from starting. It's important to point out that other features, such as Secure Boot, Trusted Boot, and Measured Boot, protect Microsoft drivers and other critical operating system files.

REAL WORLD

Firmware runs internal integrity checks to verify the firmware's digital signature as part of initialization. With Secure Boot, firmware also verifies the digital signature on the Windows bootloader as part of initialization. If a rootkit is installed and the firmware or the Windows bootloader has been modified, the computer will be prevented from starting. After the Secure Boot, the bootloader verifies the digital signature of the operating system kernel as part of Trusted Boot. Also as part of Trusted Boot, the kernel in turn verifies all remaining boot components, including boot drivers and startup files. Finally, Measured Boot allows third-party software running on a remove server to verify the security of every startup component as well.

Separate distribution media is provided for 32-bit and 64-bit editions of Windows 8.1. To install the

32-bit edition of Windows 8.1 on an x86-based computer, you need to use the 32-bit distribution media. To install the 64-bit edition of Windows 8.1 on an x64-based computer, you need to use the 64-bit distribution media. Generally, if you are running a 32-bit operating system and want to install a 64-bit operating system (on hardware that supports both), you need to restart the computer and boot from the installation media. The same is generally true if you want to install a 32-bit operating system on a computer running a 64-bit operating system.

NOTE

Windows 8.1 RT normally is preinstalled on devices with ARM processors, and it is very different from other editions of Windows 8.1.

Windows 8.1 uses modularization for language independence and disk imaging for hardware independence. Each component of the operating system is designed as an independent module that you can easily add or remove. This functionality provides the basis for the configuration architecture in Windows 8.1. Microsoft distributes Windows 8.1 on media with disk images that use compression and single-instance storage to dramatically reduce the size of image files. The format for disk images is the Windows Imaging (WIM) format.

The Windows Preinstallation Environment (Windows PE) replaces MS-DOS as the preinstallation environment and provides a bootable startup environment for installation, deployment, recovery, and troubleshooting. The Windows Preboot Environment provides a startup environment with a boot manager that lets you choose which boot application to run to load the operating system. On systems with multiple operating systems, you access operating systems prior to Windows 7 in the boot environment by using the legacy operating system entry.

User Account Control (UAC) enhances computer security by ensuring true separation of standard user and administrator user accounts. Through UAC, all applications are run by using either standard user or administrator user privileges, and you get a security prompt by default whenever you run an application that requires administrator privileges. The way the security prompt works depends on Group Policy settings. Additionally, if you log on by using the built-in Administrator account, you typically do not get elevation prompts.

Windows 8.1 has several key UI elements, including the following:

- Start screen
- Charm bar
- Search panel
- Settings panel
- PC Settings screen
- Apps screen (also referred to as All Apps)

The Start screen replaces the traditional Start menu. Start is a window, not a menu. Programs can have tiles on the Start window. Tapping or clicking a tile runs the program. When you press and hold or right-click a tile, an options panel rather than a shortcut menu normally is displayed.

From Start, one way to quickly open a program is by simply typing the file name of the program and then pressing Enter. This shortcut works as long as the Everywhere Search box is in focus (which it typically is by default).

Pressing the Windows key switches between the Start screen and the desktop or the current app you are working with (or, if you are working with PC Settings, between Start and PC Settings). On the Start screen, there's a Desktop tile that you can tap or click to display the desktop. You also can display the desktop by pressing Windows key + D or, to peek at the desktop, press and hold Windows key + , (that's the Windows key plus the comma key).

The Charm bar is an options panel for Start, Desktop, and PC Settings. With touch UI, you can display the Charm bar by sliding in from the right side of the screen. With a mouse and keyboard, you can display the Charm bar by moving the pointer over the hidden button in the upper-right or lower-right corner of the Start, Desktop, or PC Settings screen; or by pressing Windows key + C.

The Charm bar has the following five charms:

- **Search**. Tap or click the Search charm to display the Search panel. Any text typed while on the Start screen is entered into the Search box on the Search panel. Areas the Search box can be focused on include Everywhere, Settings, or Files. When it is focused on Everywhere, you can use Search to quickly find installed programs, files, settings, and more. When it is focused on Settings, you can use Search to quickly find settings and options in Control Panel. When it is focused on Files, you can use Search to quickly find files.

- **Share**. Tap or click the Share charm to share from a desktop app. For example, when working with the Maps app, you'll typically get options for sharing the map with which you are working.

- **Start**. Tap or click the Start charm to switch between Desktop and Start (or, if you are working with PC Settings, between Start and PC Settings).

- **Devices**. Tap or click the Devices charm to work quickly with attached devices, such as a second screen.

- **Settings**. Tap or click the Settings charm to access the Settings panel, which provides access to important options, including the power options for sleep, shutdown, and restart.

> **TIP**
>
> Normally, Everywhere Search is the default. Thus, from Start, you can quickly open a program by typing the program name and pressing Enter.

You also can display the Settings panel by pressing Windows key + I. From the settings panels, you can:

- View connected networks and network status.

- View and change audio output levels.

- Change brightness levels of the display (portable devices only).

- Hide notifications temporarily.

- Access power options.

- Display the touch keyboard (touch UI devices only).

- Access the PC Settings screen (by clicking Change PC Settings).

Start Settings, Desktop Settings, and PC Settings have nearly—but not exactly—identical Settings panels. The Start Settings panel has a Tiles option that you can tap or click to display an option for adding or removing tiles for the administrative tools to the Start screen and an option for clearing personal information from tiles. The Desktop Settings panel has several quick links, including:

- **Control Panel**. For opening Control Panel

- **Personalization**. For opening personalization settings in Control Panel

- **PC Info**. For opening the System page in Control Panel

- **Help**. For opening Windows Help and Support

Thus, when you are working with the desktop, one way to quickly open Control Panel is by pressing Windows key + I, and then clicking Control Panel on the Settings panel.

File Explorer is pinned to the desktop taskbar by default, which means you can also access Control Panel by following these steps:

1. Open File Explorer by tapping or clicking the taskbar icon.

2. Tap or click the leftmost option button in the address list.

3. Tap or click Control Panel.

Another technique you'll want to quickly master is getting to the Apps screen, which lists installed apps alphabetically within app categories. Apps are listed first in the results whenever you perform a Everywhere search. On the Start screen, you'll find a button with an arrow pointing down; tapping or clicking this button displays the Apps screen. On the Apps screen, you'll find lists of all installed programs, organized by category. Apps listed in the Windows System category are ones you'll often use for administration, including Command Prompt, Control Panel, Task Manager, File Explorer, Th PC, and Windows PowerShell. Administrative tools are only displayed on the Apps screen if you previously selected the Tiles option on the Start Settings panel and then selected Show Administrativ Tools.

With Windows 8.1, you might want to use Windows PowerShell as your go-to prompt for entering both standard Windows commands and Windows PowerShell commands. Although anything you can enter at a command prompt can be entered at the Windows PowerShell prompt, it's important to remember that this is possible because Windows PowerShell looks for external commands and utilities as part of its normal processing. As long as the external command or utility is found in a directory specified by the *PATH* environment variable, the command or utility is run as appropriate. However, keep in mind that Windows PowerShell execution order could affect whether a command runs as expected. For Windows PowerShell, the execution order is (1) alternate built-in or profile-defined aliases; (2) built-in or profile-defined functions; (3) cmdlets or language keywords; (4) scripts with the .ps1 extension; and (5) external commands, utilities, and files. Thus, if any element in 1 to 4 of the execution order has the same name as a command, that element will run instead of the expected command.

Windows 8.1 ships with Windows PowerShell. When you've configured Windows PowerShell for remote access, you can execute commands on remote computers in a variety of ways. One technique to establish a remote session with the computers with which you want to work. The following example and partial output shows how you can check the Windows edition on remote computers:

```
$s = new-pssession -computername engpc15, hrpc32, cserpc28 invoke-command
-session $s {dism.exe /online /get-currentedition}
```

The following is the resulting partial output:

```
Deployment Image Servicing and Management tool Version: 6.1.7600.16385

Image Version: 6.1.7600.16385

Current Edition : Ultimate
The operation completed successfully.
```

The internal version number for Windows 7 is 6.1, whereas the internal versions for Windows 8 and Windows 8.1 are 6.2 and 6.3 respectively. Thus, based on this output, you know the computer is running Windows 7 Ultimate edition (and hasn't been upgraded to Windows 8.1 yet).

Understanding 32-bit and 64-bit computing options

Since it was introduced for Windows operating systems, 64-bit computing has changed substantially. Not only do computers running 64-bit versions of Windows perform better and run faster than their 32-bit counterparts, they are also more scalable because they can process more data per clock cycle, address more memory, and perform numeric calculations faster.

Windows 8.1 PCs and tablets support x64 architecture. This architecture is based on 64-bit extensions to the x86 instruction set, which is implemented in AMD Opteron (AMD64) processors, Intel Xeon processors with 64-bit extension technology, and other processors. This architecture offers native 32-bit processing and 64-bit extension processing, allowing simultaneous 32-bit and 64-bit computing.

In general, 64-bit computing is designed for performing operations that are memory intensive and that require extensive numeric calculations. With 64-bit processing, applications can load large data sets entirely into physical memory (that is, RAM), which reduces the need to page to disk and increases performance substantially.

Currently, the prevalent firmware interfaces are:

- Basic input/output system (BIOS).

- Extensible Firmware Interface (EFI).

- Unified Extensible Firmware Interface (UEFI).

Computers based on x86 use BIOS and the master boot record (MBR) disk type for boot and system volumes. Computers based on x64 use UEFI wrapped around BIOS or EFI. UEFI and EFI support the GUID partition table (GPT) disk type for boot and system volumes. This means that there can be differences in the way you manage computers with these architectures, particularly when it comes to setup and disk configuration. However, with the increasing acceptance and use of UEFI and the ability of Windows 8.1 to use both MBR and GPT disks regardless of firmware type, the underlying chip architecture won't necessarily determine what firmware type and disk type a computer uses. This decision is in the hands of the hardware manufacturer.

In most cases, 64-bit hardware is compatible with 32-bit applications; however, 32-bit applications perform better on 32-bit hardware. Windows 64-bit editions support both 64-bit and 32-bit applications by using the Windows on Windows 64 (WOW64) x86 emulation layer. The WOW64 subsystem isolates 32-bit applications from 64-bit applications. This prevents file system and registry problems. The operating system provides interoperability across the 32-bit/64-bit boundary for the Component Object Model (COM) and for basic operations such as cutting, copying, and pasting using the Clipboard. However, 32-bit processes cannot load 64-bit dynamic-link libraries (DLLs), and 64-bit processes cannot load 32-bit DLLs.

In the shift to 64-bit computing, you might want to track which computers in the enterprise support 64-bit operating systems, which computers are already running 64-bit operating systems, or both.

With Windows PowerShell, you can:

- Determine whether a computer has a 64-bit operating system installed by using the OSArchitecture property of the Win32_OperatingSystem object. An example is

    ```
    get-wmiobject -class win32_operatingsystem | fl osarchitecture
    ```

    And the resulting output is

    ```
    osarchitecture : 32-bit
    ```

- Determine whether a computer supports a 64-bit operating system by using the Name and Description properties of the Win32_Processor object:

    ```
    get-wmiobject -class win32_processor | fl name, description

    name        : Intel(R) Core(TM)2 Quad CPU            @ 2.66GHz
    description : x64 Family 6 Model 15 Stepping 7
    ```

Here, the first sample output tells you the computer is running a 32-bit version of Windows. The second sample output tells you the computer has an x64 processor. As a result, you know the computer can be upgraded to a 64-bit version of Windows 8.1. Rather than check each computer individually, you could create a script to do the work for you.

Although Windows 8.1 continues to support 16-bit applications, it's important to point out that Windows 8.1 might restrict access to the 16-bit MS-DOS subsystem (ntvdm.exe). If so, the MS-DOS subsystem is prevented from running, and this in turn prevents 16-bit applications from running.

In Group Policy for Active Directory Domain Services or local policy for the computer, the Prevent Access To 16-bit Applications setting under Computer Configuration\Windows Components\Application Compatibility controls whether 16-bit applications can run. As with previous versions of Windows, when this setting is enabled, Windows 8.1 blocks access to 16-bit applications and prevents them from running.

In an important change, if the setting is not configured in policy, Windows 8.1 runs the 16-bit application control panel, which might require elevated administrator privileges to run the 16-bit application. Therefore, if you want to allow 16-bit applications to run without requiring elevated

administrator privileges, you must set Prevent Access To 16-bit Applications to Disabled.

Deploying Windows 8.1

With Windows 8.1, you can deploy custom builds to computers through manual and automated processes. To deploy Windows by using manual processes, you need to create the required boot and installation images and optionally create recovery images. To automate the deployment process, you need to install Windows Deployment Services. Whether you use a completely manual process, a completely automated process, or some combination of the two, you'll perform similar administrative tasks. These tasks require you to understand and use the Windows Assessment and Deployment Kit (Windows ADK) for Windows 8.1 and Windows Deployment Services.

The Windows Assessment and Deployment Kit for Windows 8.1 is available from the Microsoft Download Center (*download.microsoft.com*) and contains the tools for deploying Windows images, including the following:

- Application Compatibility Toolkit (ACT)

- The standard deployment and imaging tools

- User State Migration Tool (USMT)

- Volume Activation Management Tool (VAMT)

- Windows Assessment Services

- Windows Assessment Toolkit

- Windows Performance Toolkit (WPT)

- Windows Preinstallation Environment (Windows PE)

You can use Windows Deployment Services to deploy Windows 8.1 over a network. You can add the Windows Deployment Services role to any server running Windows Server 2012 RTM or R2.

Windows 8.1 and Windows Server 2012 RTM or R2 use Windows PE. Windows PE is a bootable startup environment that provides operating system features for the following:

- **Installation**. When you install Windows 8.1, the graphical tools that collect system information during the setup phase are running within Windows PE.

- **Deployment**. When a new computer performs a network boot, the built-in Preboot Execution Environment (PXE) client can connect to a Windows Deployment Services server, download a Windows PE image across the network, and then run deployment scripts within this environment.

- **Recovery**. Windows PE enables you to access and run the Startup Repair tool if Windows 8.1 fails to start because of a corrupted system file.

- **Troubleshooting**. You can manually start Windows PE to perform troubleshooting or diagnostics testing if Windows 8.1 is experiencing problems that can't otherwise be diagnosed.

Windows PE is modular and extensible, and it provides full access to partitions formatted by using the FAT or NTFS file system. Because Windows PE is built from a subset of Windows components, you can run many Windows applications, work with hardware devices, and communicate across IP networks. Several command-line tools are available in Windows PE, including:

- **BCDBoot**. A tool that initializes the boot configuration data (BCD) store and allows you to copy boot environment files to the system partition.

- **Bootsect**. A tool for creating and working with boot sectors on hard disks and flash drives.

- **Copype**. A tool for creating a directory structure for Windows PE files and then copying the Windows PE media files. Running this tool is a prerequisite for creating bootable Windows PE media.

- **DiskPart**. A tool for creating and working with disks, partitions, and volumes.

- **DISM**. An advanced tool for servicing and maintaining images.

- **Drvload**. A support tool for adding device drivers and dynamically loading a driver after Windows PE has started.

- **ImageX**. A tool for capturing and applying Windows images.

- **Lpksetup**. A tool for adding and removing a language pack.

- **Makewinpemedia**. A tool for creating bootable Windows PE media.

- **Net**. A set of support commands that enables you to manage local users, start and stop services, and connect to shared folders.

- **Netcfg**. A tool that configures network access.

- **Oscdimg**. A tool for creating CD and DVD ISO image files.

- **Wpeinit**. A tool that initializes Windows PE every time it boots.

Copype and Makewinpemedia are new tools that allow you to more easily create bootable Windows PE media. You use Copype to set up the Windows PE build environment. After you optimize the build as necessary, you can use Makewinpemedia to create the bootable media, which can be a CD, DVD, USB flash drive, or external USB hard drive.

Using DISM

Deployment Image Servicing and Management (DISM) is one of the most important deployment

tools. DISM is included with Windows 8.1 Pro and Windows 8.1 Enterprise.

By using DISM, you can manage online and offline images of the Windows operating system, including images for deployment and those for virtual machines. Windows Image (.wim) files are used to deploy Windows 8.1. Virtual hard disk (.vhd) files are used with virtual machines. The same commands work on WIM and VHD files.

You can use DISM to:

- Add and remove packages. Packages can include language packs, updates, and utilities.

- Enable and disable Windows features.

- Add and remove third-party device drivers.

You can run DISM at an elevated administrator command prompt by following these steps:

1. On the Apps screen, Command Prompt is listed in the Windows System category. Or, if you are working with Start, enter **cmd**.

2. Press and hold or right-click the Command Prompt shortcut on the Apps screen, and then tap or click Run As Administrator.

3. If the User Account Control prompt appears, proceed as you normally would to allow the application to run with administrator privileges.

4. In the Command Prompt window, enter **dism /?** to view available options for DISM.

5. To view commands available for working with online images, enter **dism /online /?**.

Although DISM is designed to work primarily with offline images and images you've mounted, you can use some DISM commands to get important information about the live operating system running on a computer. Table 1-1 provides an overview of DISM Online subcommands you can use with live operating systems. For example, if you want to display a list of Windows editions to which a comput can be upgraded, you can enter the following command.

```
dism /online /get-targeteditions
```

Table 1-1. DISM Online commands for live operating systems

Subcommand	Description
/Disable-Feature/featurename:FeatureName	Disables a specified feature. Feature names are case sensitive.
/Enable-Feature/featurename:FeatureName	Enables a specified feature. Feature names are case sensitive.
/Get-CurrentEdition	Displays the currently installed edition of Windows.
/Get-DriverInfo/driver:DriverName.inf	Displays information about a specified third-party driver that is installed in the driver store. Driver names are not case sensitive.
/Get-Drivers	Displays information about all third-party drivers that are installed in the driver store.
/Get-FeatureInfo/featurename:FeatureName	Displays information about a specified feature. Feature names are case sensitive.
/Get-Features	Displays the name and state of all features that are available in the online image.
/Get-Intl	Displays information about the default system user interface language, system locale, default time zone, keyboard language, and installed languages.
/Get-PackageInfo/packagename:PackageName	Displays information about a specified package. Package names are case sensitive.
/Get-Packages	Displays information about Windows packages that are installed.
/Get-TargetEditions2	Lists the Windows editions to which the operating system can be upgraded.

DISM Online also is handy when you want to list all available features by their name and status, such as might be needed for PC inventory or to add or remove features. To list available features, enter the following command at an elevated prompt.

```
dism /online /get-features
```

To add a feature, use the /Enable-Feature parameter and then set the name of the feature to enable with the /FeatureName parameter. If a feature has related subfeatures, add the /All parameter to enable all the subfeatures. This example enables Hyper-V and all related features.

```
dism /online /enable-feature /featurename:Microsoft-hyper-v /all
```

Understanding Windows imaging

When you update Windows 8.1 by adding or removing features, applying hotfixes, or installing service packs, you are simply modifying the set of modules available. And because these modules are independent, you can make these changes without affecting the system as a whole. Because language packs are separate modules as well, you can easily implement different language configurations

without needing separate installations for each language.

Microsoft distributes Windows 8.1 on media with WIM disk images. Because WIM is hardware independent, Microsoft can ship one binary file for 32-bit architectures and one binary file for 64-bit architectures. A separate binary file is available for Windows 8.1 RT.

Windows 8.1 can be installed through either automated or interactive setup. You can automate the installation of Windows 8.1 in several ways, including the following:

- **Create an unattended installation answer file.** Windows 8.1 uses a standards-based, single-format answer file. This file, called Unattend.xml, is written in XML, making it easier to process by using standard tools. By creating a custom answer file and then running Setup using this answer file, you can perform unattended installations of Windows 8.1. The Setup program can then install the operating system from a distribution share or from media.

- **Use Sysprep image-based installation.** This approach requires running the System Preparation command-line tool (Sysprep.exe) on a computer that you want to use as the master deployment computer, and then creating a disk image of this computer's configuration. Sysprep is stored in the %SystemRoot%\System32\Sysprep folder. The Windows Automated Installation Kit (Windows AIK) includes Windows System Image Manager and ImageX to help you use Sysprep for deployments. You use Windows System Image Manager to create answer files for unattended installations. You use ImageX to create and manage disk images.

By using WIM as its disk-imaging format and taking advantage of the modular design of Windows 8.1, ImageX significantly reduces the number of disk images that must be maintained. You don't need to maintain multiple hardware-dependent disk images or multiple language-dependent disk images. Instead, you typically need only a single disk image for each chip architecture used in your organization. You can then use different installation scripts to customize the operating system installation as necessary.

WIM has other advantages over earlier disk image formats as well. WIM enables you to modify and maintain disk images offline, which means you can add or remove optional components and drivers or perform updates without having to create a new disk image. To do this, you mount the disk image as a folder, and then use File Explorer or other tools to update, manage, or remove files as necessary.

Windows System Image Manager, ImageX, and Sysprep provide several different ways to automate deployment. Here are the basic steps:

1. Set up and configure Windows 8.1 on a computer not being used for normal operations, and then install and configure any necessary components and applications.

2. Run Sysprep to prepare the computer for capture. Sysprep removes unique identifiers from the computer and designates it as a master deployment computer. At the end of this process, the computer no longer has identifying information that allows it to be logged on to and used within a domain or workgroup.

3. Use the ImageX /Capture option to capture the disk image and store this image on media or in a distribution share. The image can be maintained offline by using the ImageX /Mountrw option to

mount the image in read/write mode so that you can make any necessary changes. Use the ImageX /Unmount command to unmount the image when you are finished making changes.

You also can mount images by using DISM /Mount-WIM and unmount images by using DISM /Unmount-WIM. DISM provides functionality for manipulating images. You can set product keys, perform upgrades, add or remove drivers, set language and locale information, add or remove packages and features, and clean up images.

4. Use Windows System Image Manager to create your unattended installation answer files. You can then create deployment scripts that configure the computer, run Setup by using the answer file, and apply the disk image you've previously created.

5. Run your deployment script to configure the computer and install the operating system.

Managing access and prestaging computers

You can manage images by using DISM. To prevent unauthorized users from installing images, you can:

- Prestage computers and allow only known computers to be deployed.

- Modify the security settings of image files so that only appropriate personnel can access them.

- Enable administrator approval for client installation.

Prestaging computers

Prestaging computers involves creating computer accounts in Active Directory Domain Services prior to their use. By prestaging a computer, you control exactly which clients and servers can communicate with each other. Before you prestage computers, you should be sure that Windows Deployment Services is configured to accept requests only from known computers by following these steps:

1. In the Windows Deployment Services console, expand the Servers node. Press and hold or right-click the server with which you want to work, and then select Properties.

2. On the PXE Response Settings tab, tap or click Respond Only To Known Client Computers, and then tap or click OK.

To prestage a computer, you need to know the computer's GUID. A computer's GUID comes from the active network adapter on the computer and must be entered in the format {*dddddddd-dddd-dddd-dddd-dddddddddddd*}, where *d* is a hexadecimal digit, such as {AEFED345-BC13-22CD-ABCD-11BB11342112}.

You can obtain the required identifier in several ways. In some cases, manufacturers print a label with the GUID and attach the label to the computer. However, don't forget that the GUID is valid only for the network adapter that shipped with the computer. If you replace the adapter, the new adapter will have a new GUID.

To obtain the GUID for the installed network adapter, you can check the computer's firmware. If a

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