Microsoft

Windows 8.1 deployment to PCs

A guide for education

January 2014

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Deploying the Windows 8.1 operating system in an educational environment can be an easy process when properly planned. Educational institutions have requirements (such as classroom and computer labs) that make them unique, but you can deploy Windows 8.1 in multiple ways, depending on the needs of the environment.

This guide provides an overview of Windows 8.1 deployment to PCs in an educational environment. The guide is written for IT pros and looks at the various means by which they can deploy Windows 8.1, including the processes and tools involved along with their benefits, requirements, and limitations.

Windows deployment overview

You can install Windows 8.1 onto devices within your institution in many ways. Although deployment strategies for enterprise typically apply to educational deployments, certain requirements make educational deployments unique. Many educational environments need to provide not only for administrative staff but also for faculty and students, each of whom has special requirements for their computing environment.

At a high level, you can deploy Windows by using a thick or thin image. A *thick imaging strategy* creates an image with the operating system, applications, drivers, and updates installed prior to deployment. A *thin imaging strategy* creates an image with the operating system, and then installs applications, drivers, and updates after deployment. A thin imaging strategy is easier to maintain and is the recommended strategy for Windows deployment.

This section examines three primary methods for deploying Windows:

- Manual installation

- Image-based deployment

- Automated installation

Manual Windows installation

Installing Windows manually typically involves the retail media, such as a DVD copy of Windows, and requires a technician to select options during installation, enter a product key, and perform post installation configuration, although an IT pro can also create an unattended installation file based on the expertise within the organization and the needs of the deployment. As such, this method of deployment is also called a *High Touch with Retail Media* deployment, because it requires a lot of interaction to complete the deployment.

You can use a manual installation of Windows when you are deploying only a few computers, such as reference computers, or when you want to create a test computer. However, when installing Windows onto more devices, it quickly becomes evident that a more automated means of deployment will be necessary.

Image-based Windows installation

Using the retail media to install Windows, and then installing applications and performing postinstallation configuration become less viable as you deploy more and more computers. With this in mind, you can create an image that contains Windows along with your applications and customizations. An image-based installation saves time for configuration and is appropriate even if you don't have previous deployment experience, as might be the case if you have students involved in the deployment process. This method of deployment is sometimes called *High Touch with Standard Image*.

Automated Windows installation

As you deploy more computers, automating the installation process becomes increasingly important. Behind the scenes, automated deployments use images and can involve little or no interaction by an IT pro. However, fully automated deployments have some prerequisites that make them less appropriate for low-volume deployments. For example, small institutions may not have Microsoft Volume Licensing (VL), which is necessary for an automated deployment.

> **NOTE**
>
> See the section "Choosing a Windows deployment strategy" on page 9 for more information on each of the automated deployment methods.

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Automated deployments, whether they require little interaction (Lite Touch, High Volume) or no interaction (Zero Touch, High Volume), are easier than ever thanks to a powerful set of tools available to assist across the entire deployment process. The infrastructure you will use with the two automated deployment types is the primary difference. For example, Microsoft System Center Configuration Manager and Active Directory Domain Services (AD DS) are required for a fully automated deployment.

Additional resources:

- *Basic Windows Deployment Step-by-Step Guide* at http://technet.microsoft.com/library/hh825212.aspx

Understanding Windows deployment tools

Microsoft provides numerous tools to assist in Windows deployment. Like the deployment strategies already discussed, the tools range in complexity, with certain tools being more appropriate for different deployment scenarios and environments. For example, using a tool like Deployment Image Servicing and Management (DISM) means learning its syntax and also being comfortable with Windows PowerShell scripting. By contrast, the Microsoft Deployment Toolkit (MDT) provides as easy method for automating deployments without requiring you to create scripts or learn cmdlet syntax. This section looks at some of the tools available for Windows deployment.

Windows Assessment and Deployment Kit

The Windows Assessment and Deployment Kit (Windows ADK) is a collection of tools that's new for Windows 8 and Windows 8.1. The Windows ADK includes the tools previously found in the Windows OEM Preinstallation Kit and the Windows Automated Installation Kit. The Windows ADK includes the following tools:

- Application Compatibility Toolkit (ACT)

- Windows System Image Manager

- Windows Preinstallation Environment (Windows PE)

- Windows User State Migration Tool (USMT)

- Volume Activation Management Tool (VAMT)

- Windows Performance Toolkit

- Windows Assessment Toolkit

- Windows Assessment Services

- Various other tools, such as the Oscdimg command-line tool

Using the Windows ADK requires using the right tools in the right order. For example, the first step when designing a deployment with the Windows ADK is to create and optionally customize a Windows PE image. You create an answer file to interact with Windows Setup, then generalize the image by using the System Preparation Tool (Sysprep) and capture it by using the DISM tool.

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Although the Windows ADK contains all of the tools you need for deployment, using it requires a certain level of expertise and prior experience creating and managing images. For this reason, Microsoft recommends a more automated means, such as MDT or Microsoft System Center 2012 R2 Configuration Manager for most deployments.

The Application Compatibility Toolkit

You use the ACT to verify that applications are compatible with the version of Windows you are deploying. Although this step is optional, it can help to reduce the number of problems you may encounter during later steps or after deployment. For example, some educational applications that work with the Windows XP operating system may not work with Windows 8.1. It will require less effort to correct any application compatibility problems now rather than after the image has been deployed throughout the school.

Using ACT has three steps:

1. **Collect inventory**   Create an inventory collector package, and deploy it to client computers. The package gathers system inventory, device inventory, and software inventory from the client computers on which you install the package. You can deploy the inventory collector package by using Group Policy Software Installation, a logon script, System Center Configuration Manager, or manually.

2. **Test and analyze**   Perform tests using a runtime analysis package, and then analyze the compatibility results through compatibility reports.

3. **Mitigate compatibility issues**   Decide how to resolve any compatibility issues, including whether to fix an application or deploy a workaround.

Windows Preinstallation Environment

Windows PE is an important tool in the imaging process. Using Windows PE, you can capture and deploy Windows images and start Windows Setup as well as perform other tasks, such as partitioning a hard disk and creating recovery images.

When preparing a computer for deployment, you create a Windows PE image by copying the Windows PE files into a folder on the technician's computer. If necessary, you can use DISM to add drivers and other packages to the Windows PE image. You then install the Windows PE image on a USB flash drive or other media. Finally, test the reference computer by using the Windows PE image.

The System Preparation Tool

Sysprep is a tool that generalizes an image so that it can be used for deployment on other computers. Sysprep configures the computer to request a new security identifier (SID) and removes other customizations, causing the operating system to start the Out of Box Experience the next time it starts.

Sysprep prepares an image, after which you use DISM to capture the image appropriate for deployment. However, using Sysprep and DISM requires IT pro–level expertise and therefore isn't appropriate for all environments.

Deployment Image Servicing and Management

DISM is a program that runs from the command line. Using DISM, you can capture an image of a hard disk partition, then customize the image in various ways, including adding or removing drivers and software packages and enabling or disabling Windows features.

Using DISM requires some experience in creating and managing images. If your organization doesn't have prior deployment or image management experience, a tool like MDT will be more appropriate.

User State Migration Tool

The USMT helps with the migration of user accounts, data, and settings during an operating system upgrade. Using the USMT, an administrator migrates user state to an intermediary migration store. After the new operating system has been deployed, the administrator migrates the user state to the new operating system. The USMT migrates application settings, user documents, and the user profile and data by using XML-based rules that can be customized.

The Microsoft Deployment Toolkit

MDT is the recommended tool for automating Windows deployments. MDT provides a wizard-driven interface and requires little previous deployment experience. MDT also has low infrastructure-related requirements. A file server, typically already present in most organizations, is the only requirement for an MDT-based deployment. The file server can even be the same as the IT pro's computer.

By itself, MDT can help you with Lite Touch Installation (LTI), discussed above. When combined with System Center Configuration Manager, MDT can also facilitate Zero Touch Installation (ZTI)

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deployments and User-Driven Installation (UDI). IT pros with little prior deployment experience can use MDT.

Behind the scenes, MDT uses command-line tools like DISM and Sysprep, which you learned about earlier. The obvious advantage to MDT is that it provides a graphical interface into those processes. Beyond the obvious, however, MDT places the extensive deployment experience built over years into a framework that IT can leverage for their projects.

System Center Configuration Manager

System Center 2012 R2 Configuration Manager is a powerful software package that helps IT deliver advanced management of infrastructure. When used with MDT, System Center 2012 R2 Configuration Manager provides a fully automated deployment environment (ZTI), including not only Windows but other software, as well. System Center 2012 R2 Configuration Manager enables Windows image capture and deployment onto computers through *task sequences*. Using task sequences, IT can fully customize the deployment process.

Using System Center 2012 R2 Configuration Manager and MDT together for deployments is appropriate for environments that have prior experience with deployments and need to perform ZTI or UDI deployments. Ideally, the environment would already have System Center Configuration Manager running within the infrastructure.

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Additional resources:

- Deploy Windows 8: Tools, Step-by-Step Guide, Help at http://technet.microsoft.com/windows/hh974336.aspx

- "Fundamentals of Configuration Manager" at http://technet.microsoft.com/library/gg682106.aspx

- "Operating System Deployment in Configuration Manager" at http://technet.microsoft.com/library/gg682018.aspx

- "Windows ADK Overview" at http://msdn.microsoft.com/en-us/library/hh825486

- "Windows ADK Quickstart" at http://msdn.microsoft.com/en-us/library/hh825343.aspx

- "Deployment Image Servicing and Management (DISM) Overview" at http://technet.microsoft.com/en-us/library/hh825236.aspx

- System Preparation (Sysprep) Technical Reference at http://technet.microsoft.com/en-us/library/hh825209.aspx

- "User State Migration Tool (USMT) Overview Topics" at http://technet.microsoft.com/en-us/library/hh825261.aspx

Choosing a Windows deployment strategy

The choice of which deployment strategy to use depends on several factors, including the level of expertise and prior deployment experience available, whether tools like System Center Configuration Manager are already deployed, and the number of computers being targeted. As discussed, there are four primary deployment strategies:

- High Touch with Retail Media

- Lite Touch with Standard Image

- Lite Touch, High Volume

- Zero Touch, High Volume

Table 1 discusses each option.

TABLE 1 Windows Deployment Strategies

	HIGH-TOUCH WITH RETAIL MEDIA	HIGH-TOUCH WITH STANDARD IMAGE	LITE TOUCH, HIGH VOLUME	ZERO TOUCH, HIGH VOLUME
Deployment size	Less than 100 computers	100 to 200	200 to 500	500+
Location/ infrastructure	Off-campus remote locations, reference computers, or small computer labs	Off-campus remote locations or computer labs	On-campus locations with Windows Server machines available; can be used for media-based deployments, if needed	On-campus location with Windows Server machines and System Center Configuration Manager available; can be used for media-based deployments, if needed
Skills available	Generalist or student	IT pro or student with mentor	IT pro with deployment experience or advanced student with mentor	IT pro with deployment and System Center Configuration Manager experience
Application deployment	Manual installation	Manual installation	Automatic installation	Automatic installation

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	High-Touch with Retail Media	High-Touch with Standard Image	Lite Touch, High Volume	Zero Touch, High Volume
Primary tool used	Retail media	Windows ADK	MDT System Center Configuration Manager (optional)	MDT and System Center Configuration Manager
Infrastructure requirements	None	Low	Low to medium, depending on strategy	High

Because all but the smallest deployments use a custom Windows image, this guide examines the High Touch with Standard Image and both of the High Volume strategies in more depth. In most cases, you can accomplish deployment by using MDT for the best combination of simplicity and flexibility. However, for large-scale deployments, System Center Configuration Manager with MDT is the recommended tool.

If you have a student mentoring program available, you'll be able to adapt the High Touch with Standard Image and the Lite-Touch, High-Volume deployments for the mentoring program. These methods require little deployment experience and offer an opportunity for learning in a hands-on environment.

Table 2 looks at the deployment tools and their respective strategies along with other considerations that will help you choose the right strategy and tool.

TABLE 2 Deployment Tools and Strategies

	LTI with MDT	UDI with MDT and System Center Configuration Manager	ZTI with MDT and System Center Configuration Manager
Automation	Allows for a customizable automation level, as needed	Allows for customizable automation	Fully automated
Process initiation	Manually or automatically	Manually	Manually or automatically
Media	Network or local media	Network	System Center Configuration Manager distribution or local media
Deployment process configuration	MDT	MDT with System Center Configuration Manager	System Center Configuration Manager

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	LTI WITH MDT	UDI WITH MDT AND SYSTEM CENTER CONFIGURATION MANAGER	ZTI WITH MDT AND SYSTEM CENTER CONFIGURATION MANAGER
Configuration settings	Configuration settings predetermined	Some configuration settings predetermined	Configuration settings don't need to be predetermined
Initial configuration	Low	Medium	High
Interaction	Some	Some	None
Permissions	IT pros need elevated permissions		No elevated permissions needed
Connectivity	Slow or none	High speed	High speed
Client requirements	None		The Configuration Manager client must manage the client computer
Network permissions	Clients can be behind a firewall		Requires Remote Procedure Call communication

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Additional resources:

- "Windows 8 Deployment Strategies" at http://technet.microsoft.com/en-us/windows/dn282135

- "Windows Deployment with the Windows ADK" at http://technet.microsoft.com/library/hh824947.aspx

- "Microsoft Deployment Toolkit" at http://technet.microsoft.com/en-us/windows/dn475741.aspx

- "System Center 2012" at http://technet.microsoft.com/en-us/systemcenter/hh880681

- "High Touch with Retail Media" at http://technet.microsoft.com/en-us/windows/dn282136

- "High Touch with Standard Image" at http://technet.microsoft.com/en-us/windows/dn282137

- "Lite Touch, High Volume Deployment" at http://technet.microsoft.com/en-us/windows/dn282138

- "Zero Touch, High Volume Deployment" at http://technet.microsoft.com/en-us/windows/dn282139

Using the High Touch with Standard Image strategy

The High Touch with Standard Image strategy is appropriate for small deployments in school systems that don't have prior deployment experience or a managed infrastructure (e.g., file servers). You would typically use this strategy when 100 to 200 client computers will be deployed. It uses a standardized image instead of retail media. A standard image ensures that all client computers have consistent configurations, which reduces support issues arising from inconsistent operating system configurations.

Requirements

Using the High Touch with Standard Image strategy requires the following elements:

- Retail or VL media

- Windows ADK

- A temporary reference computer for installing and customizing the initial image

- An IT pro computer on which the Windows ADK will be installed

- A test computer that matches the computers on which the image will be deployed

- Removable media on which to install Windows PE

- Removable media or a network share for the image

Deployment tools

A High Touch with Standard Image strategy uses the following tools:

- Windows ADK

- ACT (optional)

- Sysprep

- DISM

Limitations

The High Touch with Standard Image strategy has certain limitations, including:

- **Scale**   By requiring a lot of interaction, the High Touch with Standard Image strategy doesn't scale well to large deployments.

- **Image customization**   The High Touch with Standard Image strategy works best with a single image. Organizations that require several customized images for different types of deployments should examine one of the LTI deployment strategies.

- **Image maintenance**   Licensing restrictions limit the amount of maintenance you can do on an image to which Sysprep will be applied. Therefore, if the image you are deploying requires frequent updates, use another tool, such as MDT.

- **Upgrade**   Using a standard image implies that upgrade of an existing operating system is not a supported scenario for this strategy. However, you can use Windows Easy Transfer, which is included in Windows 8.1, to migrate user files and settings to the new computer. Also, you can use the USMT, which is part of the Windows ADK, to transfer files and settings to the newly deployed operating system.

Deployment process

The process of deploying Windows 8.1 with the High Touch with Standard Image strategy involves creation of the image on a reference computer, capturing and generalizing the image, and then deploying it. Table 3 describes the Lite Touch with Standard Image deployment process.

TABLE 3 Lite Touch with Standard Image Deployment

Step	Description	More information
Use ACT (optional)	Use the ACT to test and mitigate compatibility issues.	"Application Compatibility Toolkit (ACT) Technical Reference" at http://technet.microsoft.com/library/hh825181.aspx
Install Windows PE	Prior to installing Windows on the reference computer, install Windows PE on the IT pro's computer. Then, customize Windows PE to add drivers and application packages. With Windows PE customized, install it on a USB flash drive so that it can be booted with the reference computer. Finally, start the reference computer from the Windows PE USB flash drive.	"WinPE: Windows PE Overview" at http://technet.microsoft.com/library/hh825110.aspx

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Step	Description	More information
Create an answer file	Answer files provide configuration information for the Windows Setup process during a new installation of Windows. Using an answer file helps to automate the Setup process, which creates a consistent, repeatable installation of Windows: • Enter a product key. • Customize Windows Firewall rules. • Create local Windows accounts. • Run a logon script. • Join a domain. • Customize the Internet Explorer home page.	"Walkthrough: Build an Answer File for BIOS-based Computers" at http://technet.microsoft.com/library/dd744509.aspx
Install Windows on the reference computer	Install Windows by using retail or VL media. Optionally, use an answer file to ensure consistency.	"Methods for Running Windows Setup" at http://technet.microsoft.com/library/dd744269.aspx
Customize the reference computer	Install applications and device drivers, change settings, and make any other customizations on the reference computer.	
Capture the Windows image	Capture the image of the reference computer by using Sysprep and DISM. Sysprep removes computer-specific settings so that you can add specialized settings for the individual computer on which the image is deployed. For example, Sysprep removes information unique to the individual computer, such as its SID.	"System Preparation (Sysprep) Technical Reference" at http://technet.microsoft.com/en-US/library/hh825209.aspx
Deploy the image	Deploy the image to multiple computers. With a High Touch strategy, you typically install the image manually on each computer.	"Methods for Running Windows Setup" at http://technet.microsoft.com/library/dd744269.aspx

Although the scripted approach of a High Touch with Standard Image strategy is a big step forward in consistency along with the ability to install Windows on multiple computers, having to run scripts on each computer means that the strategy doesn't scale well to large deployments. For that reason, Microsoft recommends that you use a tool such as MDT (discussed in the next section).

Additional resources:

- High Touch with Standard Image at http://technet.microsoft.com/en-us/windows/dn282137

- *Basic Windows Deployment Step-by-Step Guide* at http://technet.microsoft.com/en-us/library/hh825212.aspx

- "Deployment and Imaging Tools Technical Reference" at http://technet.microsoft.com/en-us/library/hh825039.aspx

- "WinPE: Windows PE Overview" at http://technet.microsoft.com/en-us/library/hh825110.aspx

- "Unattended Windows Setup Reference" at http://technet.microsoft.com/en-us/library/ff699026.aspx

- "Application Compatibility Toolkit (ACT) Technical Reference" at http://technet.microsoft.com/en-us/library/hh825181.aspx

Using the Lite-Touch, High-Volume deployment strategy

As you perform more or larger deployments, it becomes necessary to reduce the amount of touch points that IT staff have with the computers being deployed. This means using a deployment tool to help automate the process as much as possible. MDT is an essential tool for performing deployment using this strategy. Leveraging MDT's database capabilities enables you to further abstract deployments, making many of the configuration settings dynamic. For example, you might use the MDT database to store settings customized for both classroom and administrative staff deployments.

This section looks at the LTI process, including requirements, the tools involved, and a high-level description of the process itself.

Requirements

To use an LTI deployment strategy, you need:

- An IT pro computer running Windows 8.1

- A reference computer matching those to be deployed

- MDT

- Windows ADK

- VL Windows media

- A file server from which to serve the files related to the deployment (This server can be the same machine as the IT pro's computer.)

- A USB or DVD flash drive from which to start client computers or the Windows Deployment Services role installed on a computer running the Windows Server operating system

Deployment tools

A Lite-Touch, High-Volume deployment strategy uses the following tools:

- MDT

- Windows ADK

- ACT

- Optionally, System Center 2012 R2 Configuration Manager

Limitations

The Lite-Touch, High-Volume deployment strategy has the following limitation:

- **Interaction** The LTI deployment strategy requires interaction during the deployment process.

Deployment process

The deployment process is described in Table 4.

TABLE 4 The Lite-Touch, High-Volume Deployment Process

STEP	DESCRIPTION	MORE INFORMATION
Use the Microsoft Assessment and Planning (MAP) Toolkit for the new version	If the deployment will be a new version of Windows, use the MAP Toolkit to assess readiness.	"Microsoft Assessment and Planning (MAP) Toolkit" at http://technet.microsoft.com/en-us/solutionaccelerators/dd537566.aspx
Use ACT (optional)	Use the ACT to test and mitigate compatibility issues.	"Application Compatibility Toolkit (ACT) Technical Reference" at http://technet.microsoft.com/library/hh825181.aspx
Install the file server	Install a file server that will be used as the distribution share.	
Install MDT and additional components	Install MDT and additional components, like Windows ADK and the USMT.	"Microsoft Deployment Toolkit" at http://technet.microsoft.com/en-us/windows/dn475741.aspx
Create a distribution share	Create a share on the file server that contains the operating system, applications, devices drivers, and other files needed for the deployment.	
Create a task sequence	Use MDT to create and customize a task sequence.	

Step	Description	More information
Create a deployment share	Use MDT to create and update a deployment share.	
Create a Windows PE start method	Create a device or prepare another method for Windows PE to start.	"Booting Windows PE" at http://technet.microsoft.com/library/cc709626.aspx

Additional resources:

- "Lite-Touch, High-Volume Deployment" at http://technet.microsoft.com/en-us/windows/dn282138

- "Microsoft Deployment Toolkit" at http://technet.microsoft.com/en-us/windows/dn475741.aspx

- "Application Compatibility Toolkit (ACT) Technical Reference" at http://technet.microsoft.com/library/hh825181.aspx

- "Windows Deployment with the Windows ADK" at http://technet.microsoft.com/library/hh824947.aspx

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Using the Zero-Touch, High-Volume deployment strategy

The best option for high-volume deployments with more than 500 computers, the Zero-Touch strategy involves MDT working in conjunction with System Center Configuration Manager to provide a powerful deployment solution that requires no interaction during deployment. A Zero-Touch, High-Volume strategy has several benefits, including:

- Ease of deployment, requiring no IT interaction

- Ease of maintenance, with System Center Configuration Manager handling updates

- Less support because of a standardized and consistent configuration across the deployment

This section examines requirements, tools, and limitations and provides a high-level description of the ZTI process.

Requirements

A Zero-Touch, High-Volume deployment has the following requirements:

- A server running the Windows Server 2012 or Windows Server 2012 R2 operating system with MDT and System Center Configuration Manager

- VL Windows media

- A file server from which to serve the files related to the deployment

Deployment tools

Performing a ZTI deployment requires System Center Configuration Manager, which organizations that require a high-volume deployment typically have available. System Center Configuration Manager helps to facilitate advanced management scenarios, including those found in high-volume deployments. With System Center Configuration Manager, you can create groupings of computers such that you can deploy different computer configurations based on the grouping. For instance, you might do this to have a separate configuration deployed to specific classrooms or devices.

Limitations

The need for a specialized IT skill set along with a System Center Configuration Manager infrastructure is a limitation of the Zero-Touch, High-Volume strategy. However, you can mitigate the infrastructure limitation if you already have System Center Configuration Manager deployed in the organization. Also, the cost savings of automated deployments along with other benefits of System Center Configuration Manager serve as mitigating factors.

Deployment process

The addition of System Center Configuration Manager to the deployment means that IT staff does not need to work with each client to start the Windows installation. Likewise, the installation and configuration of Windows will be completed automatically, requiring no interaction from IT in a ZTI strategy. Table 5 examines the process.

TABLE 5 The Zero-Touch, High-Volume Deployment Process

STEP	DESCRIPTION	MORE INFORMATION
Determine readiness (optional)	If you will be deploying a new operating system, use the MAP Toolkit to determine readiness for the deployment.	"Microsoft Assessment and Planning (MAP) Toolkit" at http://technet.microsoft.com/en-us/solutionaccelerators/dd537566.aspx
Use the ACT	Use the ACT to determine application compatibility.	"Application Compatibility Toolkit (ACT) Technical Reference" at http://technet.microsoft.com/library/hh825181.aspx
Install System Center Configuration Manager	Install and configure System Center Configuration Manager within the organization.	
Install MDT, and integrate it with System Center Configuration Manager	Install MDT, and configure System Center Configuration Manager with additional packages, such as the USMT and custom Settings, as needed.	"Microsoft Deployment Toolkit" at http://technet.microsoft.com/en-us/windows/dn475741.aspx
Create a custom master image (optional)	Create a custom master image by deploying Windows 8.1 to a master computer, and then capturing the image after customizations have been applied.	

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Additional resources:

- "Application Compatibility Toolkit" at http://technet.microsoft.com/library/hh825181.aspx

- "Microsoft Deployment Toolkit" at http://technet.microsoft.com/en-us/windows/dn475741.aspx

- "System Center 2012" at http://technet.microsoft.com/en-us/systemcenter/hh880681

- "Zero-Touch, High-Volume Deployment" at http://technet.microsoft.com/en-us/windows/dn282139

Managing device drivers, language packs, and applications

You can customize deployments by including additional device drivers, language packs, and software updates as part of the configuration. A thin imaging strategy reduces maintenance when adding these customizations, because the customizations are maintained independent of the deployment image.

- **Language packs**   Language packs are maintained as packages with System Center Configuration Manager. When deploying Windows by using a ZTI strategy, you can bundle language packs as needed for a deployment. See "Understanding Language Packs" at http://technet.microsoft.com/library/cc766472.aspx for more information.

- **Device drivers**   You can create a System Center Configuration Manager driver package that can install one or more device drivers onto target computers. Add this package to the operating system at deployment.

- **Software updates**   You can include updates with a deployment, which ensures that deployed computers are up to date at deployment time and also means less time is needed to maintain a thick image.

Once deployed, you can use System Center Configuration Manager to apply updates.

Additional resources:

- "Configuring Configuration Manager for Operating System Deployments" at http://technet.microsoft.com/en-us/library/gg682028.aspx

- "How to Manage the Driver Catalog in Configuration Manager" at http://technet.microsoft.com/library/hh301101.aspx

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Using Volume Activation

Client computers need a way to activate their Windows licenses. Many environments, including all environments employing Windows 8.1 Enterprise, use Microsoft Volume Activation to provide for this purpose. The primary technologies available for Volume Activation include:

- **Key Management Service (KMS)**   KMS is appropriate in mixed environments where Windows 7 computers are also being licensed, when AD DS isn't available, when the domain isn't running at the Windows Server 2012 level, or when there will be licensed computers that aren't part of the domain. In these instances, you cannot use Active Directory-Based Activation (ADBA). Also, your environment contains multiple versions of Windows, KMS will be the appropriate solution, because KMS is the default activation method for those clients.

- **ADBA**   ADBA is appropriate when AD DS is already operating at the Windows Server 2012 schema level and all the computers to be activated are running Windows 8 or Windows 8.1 and are part of the domain. ADBA can also activate Microsoft Office 2013.

- **Multiple Activation Key (MAK)**   MAK activation provides a non-domain method for Volume Activation. MAK activation takes place directly with Microsoft over the Internet or by telephone.

Table 6 on page 25 describes these activation methods.

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	ADBA	KMS	MAK
Domain joined	Yes	Optional	No
Devices must connect to the network at least once every 180 days	Yes	Yes	No
Supports Volume Activation of Windows 8 and Windows 8.1	Yes	Yes	Yes
Supports Volume Activation of Windows 7	No	Yes	Yes
Supports Volume Activation of Microsoft Office	Yes (Office 2013 only, not Microsoft Office 365 or previous versions of Office)	Yes	Yes
Can use Volume Activation services in Windows Server 2012 or Windows Server 2012 R2	Yes	Yes	N/A
Can use Volume Activation services in operating systems prior to Windows Server 2012	No	Yes	N/A
VL information is stored in AD DS	Yes	No	No
Requires Internet access	No	No	Yes
Can be activated by telephone	No	No	Yes
Infrastructure	AD DS	KMS server	Internet access or telephone

Key Management Service

Once activated with Microsoft, a KMS server provides local network–based activation services. Rather than connecting to Microsoft for activation, clients can connect to the KMS server within

the network. KMS is the means by which a newly deployed VL edition of Windows 8.1 attempts to obtain its activation.

At least 5 servers or 25 clients need to attempt activation to meet the KMS activation threshold. These computers can be physical or virtual, and many times, virtual machines will be deployed so that the threshold is met.

Active Directory-Based Activation

A new method for activation, ADBA, uses AD DS to store activation objects. When using ADBA, computers running Windows 8, Windows 8.1, Windows Server 2012, or Windows Server 2012 R2 with a Generic Volume License Key will remain activated as long as the computer remains in the domain. However, a limitation of ADBA is that the domain must operate at the Windows Server 2012 schema level and be activated with Microsoft to store activation objects. In addition, ADBA can only be used to activate Windows 8, Windows 8.1, Windows Server 2012, or Windows Server 2012 R2.

Additional resources:

- "Active Directory-Based Activation Overview" at http://technet.microsoft.com/library/hh852637.aspx

- "Volume Activation Overview" at http://technet.microsoft.com/en-us/library/hh831612.aspx

- "Volume Activation Management Tool Technical Reference" at http://technet.microsoft.com/en-us/library/hh824825.aspx

Storing user data and settings

Users can store their data and settings locally on the computer's internal hard disk or through a networked strategy such as User State Virtualization (USV). This section examines the various means of storing user data and settings:

- **Using the internal disk**   Using the local disk is the default and familiar means for storing data and settings on a computer. With this strategy, all data is stored locally on an internal disk.

- **Using a Microsoft account**   A Microsoft account can be used to synchronize many settings related to the Windows 8.1 experience and data to Microsoft SkyDrive.

- **Using USV**   You can use USV (i.e., Microsoft User Experience Virtualization [UE V] with Folder Redirection and Offline Files) or Roaming User Profiles to store settings.

Table 7 describes these strategies and considerations for their use.

TABLE 7 Choosing a Strategy for Storage of User Data and Settings

	INTERNAL DISK	MICROSOFT ACCOUNT	USV WITH ROAMING USER PROFILES	USV WITH UEV
Ease of IT configuration	No additional configuration required	No additional configuration required	IT pro–level configuration needed	IT pro–level configuration needed
Ease of use	Easy; users are familiar with this	Users need to change workflows to save data on SkyDrive	Easy; user experience is the same	Easy; user experience is the same
Limitations	Data is stored locally and can be lost; data is not portable	May not be appropriate for sensitive data or regulatory reasons		
Backup of data and settings	None	Backed up to SkyDrive	Backed up using in-place network backup strategies	Backed up using in-place network backup strategies
Use with domain	Can be used within an AD DS domain	Can be used with an AD DS domain	AD DS domain is required	AD DS domain is required

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	INTERNAL DISK	MICROSOFT ACCOUNT	USV WITH ROAMING USER PROFILES	USV WITH UEV
Ability to roam	None; this strategy wouldn't be appropriate for student computer labs	Can roam to any compatible computer with Internet connectivity as long as the user signs in with their Microsoft account or associates their Microsoft account with their AD DS domain account	Can roam to any compatible, domain-joined computer capable of connecting to the network	Can roam to any compatible, domain-joined computer

It's important to understand the different infrastructure requirements involved in each strategy. With local storage, no additional infrastructure is required, but user settings and data are not transferred between devices. Another limitation of local storage is that user data and settings are at risk of being lost if the computer becomes damaged or is stolen. Likewise, using a Microsoft account requires no additional infrastructure but does require that the computer be connected to the Internet to synchronize users' data and settings. USV requires additional infrastructure to store the data and settings but enables a complete and seamless experience for the user.

For large-scale school deployments, you will likely use a USV strategy. USV provides the best availability for settings and data within a domain environment. The strategy takes advantage of infrastructure and processes that are already in place in many schools while providing for backups and enabling users to access their data from virtually anywhere.

Additional resources:

- "User Experience Virtualization" at http://technet.microsoft.com/windows/hh943107.aspx

- "Windows User State Virtualization" at http://technet.microsoft.com/library/ff877478.aspx

- "Folder Redirection, Offline Files, and Roaming User Profiles overview" at http://technet.microsoft.com/library/hh848267.aspx

Managing institution-owned computers

Management of computers within a school is easier than ever. Tools like Windows Intune, System Center Configuration Manager, Windows PowerShell, and Group Policy provide the necessary granularity while at the same time enabling automation with low overhead. This section looks at some of the management tools available for Windows 8.1. Table 8 discusses the benefits, limitations, and requirements of several such management tools.

TABLE 8 Management Tools for Windows 8.1

	BENEFITS	LIMITATIONS	REQUIREMENTS
Group Policy	• Included with Windows • Little experience required • Powerful control over many aspects of Windows	• Limited advanced capabilities • No means for updating client software • Limited change management capabilities (can add by using Advanced Group Policy Management)	• Cannot manage non-Windows clients • Requires a domain environment to be most effective
System Center Configuration Manager	• Advanced control over infrastructure • Can create a hierarchy of client computers, mirroring the organization • Can manage Mac and Linux client computers	• Requires expert-level IT experience • Numerous components such as Microsoft SQL Server required • Requires ongoing maintenance	• Requires installation of client software • Several software-related requirements (see "System Requirements for System Center 2012 R2" at http://technet.microsoft.com/en-us/library/dn281925.aspx for more information)

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	BENEFITS	LIMITATIONS	REQUIREMENTS
Windows Intune	• Can manage and deploy updates • Can deploy applications, including Windows Store apps • Can configure Windows Firewall, Windows Intune Endpoint protection • Requires little experience • Self-service portal for users to install apps and get help • Available for multiple platforms	• Dependent on the cloud	• Access to the management console depends on the Internet • Client access to the Internet periodically required • Client software installation required
Windows PowerShell	• Ability to manage services, the registry, event logs, processes, and more • Ability to manage remotely • Can run tasks on multiple computers simultaneously • Highly customizable • Can integrate with System Center 2012 R2 Configuration Manager	• IT staff need to be comfortable with scripting and command-line tools	• Scripting-related IT skill set required

Which management solution is right for me?

The management solution you choose depends largely on the skill set of IT staff and the number of computers you'll be managing. For many environments, Group Policy provides all the management needed, while other, larger institutions require the power of System Center Configuration Manager.

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Windows Intune is becoming increasingly popular as a supplement to both Group Policy– and System Center Configuration Manager–managed environments, and Windows PowerShell is pervasive in some form throughout many institutions.

Additional resources:

- "Group Policy Overview" at http://technet.microsoft.com/library/hh831791.aspx

- "System Center 2012" at http://technet.microsoft.com/systemcenter/hh880681

- "Windows Intune" at http://technet.microsoft.com/windows/intune.aspx

- "Windows PowerShell" at http://technet.microsoft.com/library/bb978526.aspx

- *Windows PowerShell User's Guide* at http://technet.microsoft.com/library/cc196356.aspx

Conclusion

Deployment of PCs in a school setting uses many of the same tools and techniques found in most organizations. You can perform manual installations or fully automated and customized deployments depending on your need. To learn about other ways you can deploy Windows 8.1 in your school, see *Windows 8.1 deployment planning: A guide for education* at http://www.microsoft.com/download/details.aspx?id=39682.

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