Solutions for Virtualizing Internet Explorer

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Abstract

The Windows® 7 operating system and its default browser, Windows® Internet Explorer® 8, offer many exciting new features and benefits. However, organizations may find that some of the older applications they rely on are not yet functional or supported in the new Windows 7 operating system. These applications may require a previous version of the Windows® operating environment—one running Windows® Internet Explorer® 7 or Microsoft® Internet Explorer® 6.

Microsoft provides several alternate ways to create a virtual operating environment on which you can run earlier versions of Internet Explorer. These virtualization options include Microsoft® Enterprise Desktop Virtualization (MED-V), Windows® XP Mode, and Terminal Services. These solutions can deliver a seamless and cost-effective way for organizations to continue to run their older applications.
This white paper provides information to help you select the virtualization alternative that is appropriate for your organization. This paper provides the benefits, costs, and limitations of each virtualization option; it also describes step-by-step guidance and best practices for setting up the virtual environments and for running them securely.
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INTRODUCTION

With new features and benefits, the Windows® 7 operating system drives lower total cost of ownership by helping users stay productive anywhere, enhancing security and control, and simplifying computer management across an organization. Windows® Internet Explorer® 8, the default browser for Windows 7, provides improved security and new features. These new versions of Windows® and Internet Explorer can increase efficiency and enhance an organization’s productivity and security.

However, migrating to a new operating system can be a challenge, and it brings with it the need to support older software. For example, your organization may be required by a regulatory agency to use the same software to obtain business data that was originally obtained using an older version of the operating system. You may also rely on an application that was built for previous versions of Internet Explorer, such as Windows® Internet Explorer® 7 or Microsoft® Internet Explorer® 6, and cannot easily run in Internet Explorer 8.

Your organization may not currently have the time or resources needed to rebuild, refit, or upgrade such applications within the timeframe required to roll out a new operating system. You may find that you are already maintaining older hardware that you need to support your older applications—this requires the effort of IT staff and can be very costly.

Microsoft provides solutions that let you run previous versions of Windows (and Internet Explorer) by using virtualization on your current hardware and software. By using these solutions, you can continue to run Internet Explorer 7 or Internet Explorer 6 in a virtual environment; you can then continue to run your older applications seamlessly, while you benefit from the newer technologies in Windows 7 and Internet Explorer 8.

This white paper looks at several Microsoft virtualization options that let you run Internet Explorer 7 and Internet Explorer 6—Microsoft® Enterprise Desktop Virtualization (MED-V), Windows® XP Mode, and Terminal Services. This paper details these options, including benefits, costs, limitations, and licensing considerations, and helps you decide which option is best for your organization.

Additionally, this white paper provides a series of appendices with prescriptive guidance and best practices—including step-by-step instructions—for setting up each virtualization solution and for running it securely.

Questions to Consider

To determine which virtualization option is most appropriate for your organization, consider the following questions:

- How big is your organization? How many users will need the Internet Explorer 7 or Internet Explorer 6 browser?
- Which of your existing servers and licenses can you use?
- Is your network centrally managed (for example, with Microsoft® System Center or Active Directory®)?
- Do you have a dedicated system administration staff?
- What are the connectivity requirements for your chosen Internet Explorer 7 or Internet Explorer 6 environment?
- What is your budget?
**Virtualizing Internet Explorer**

Application compatibility is one of the main reasons why organizations may be reluctant to upgrade to the latest version of the Windows® operating system. Organizations may rely on an important line-of-business (LOB) application that must run in the Windows® XP operating system, for example, or they may have a critical intranet site that was built to run in Internet Explorer 6. Additionally, they may not have the time or the resources they need to rebuild, refit, or upgrade these applications.

If your organization is considering an upgrade to Windows 7 but is concerned about the expense, time, and IT staff effort needed to maintain your older (or legacy) LOB applications, using a virtualization option might be an effective solution until you can run your applications natively.

The three Microsoft virtualization options most appropriate for virtualizing Internet Explorer 7 and Internet Explorer 6 are MED-V, Windows XP Mode, and Terminal Services. The following table summarizes these options.
Table 1. Virtualization options.

<table>
<thead>
<tr>
<th>Virtualization option</th>
<th>Benefits</th>
<th>Limitations</th>
<th>Basic Infrastructure requirements</th>
<th>Recommendation for size</th>
</tr>
</thead>
</table>
| MED-V                  | Most robust option  
Seamless Web solution with automatic URL redirection for applications that run on only Internet Explorer 6 (no user training necessary)  
Centrally managed, patched, and secured  
Flexible—can have different virtual machines for different users if other applications are required | Requires purchase  
Initial download of virtual machine can be time consuming, depending on bandwidth  
Does not work on a virtualized operating system | Requires both a server and client computer  
Requires 256 megabytes (MB) of extra RAM on workstation and sufficient space on drive | Enterprise—5,000 users or more |
| Windows XP Mode        | User can start Internet Explorer directly from desktop or Start menu  
Windows XP Mode and Windows® Virtual PC are free downloads for Windows® 7 Professional, Windows® 7 Enterprise, or Windows® 7 Ultimate | Not as centrally managed as other options  
Older hardware might not support Windows XP Mode  
Needs to be installed individually on each computer  
Requires some user training | Requires only client computer  
Requires 256 MB of extra RAM on workstation and sufficient space on drive | Small to medium-sized implementations—50 users or fewer |
| Terminal Services      | Easy to configure  
Centrally managed  
Some enterprises already have Terminal Services deployed  
All resources to run Internet Explorer on server side  
Clients need network access to the server resources  
Requires user training  
Requires purchase of Windows Server® 2003 Client Access Licenses to expand Terminal Services option | Requires both a server (Windows Server 2003 for this solution) and client computer | Medium-sized to large-sized implementations |
What About Other Virtualization Options?

Because Internet Explorer is integrated into the operating system, application virtualization options are not appropriate for virtualizing Internet Explorer 7 and Internet Explorer 6. (For more information, see the Knowledge Base article Running Multiple Versions of Internet Explorer on Single Operating System Is Unsupported. Also see the white paper Microsoft Guidance for Internet Explorer 6 to Internet Explorer 8 Application Compatibility Remediation.)

It is necessary to virtualize the entire operating system to obtain a previous version of Internet Explorer. By doing so, you prevent system conflicts that can occur if Internet Explorer is treated as an application. To reduce the cost of ownership of those operating systems, you can use Software Restriction Policies in Windows XP and Group Policy Settings in Internet Explorer 6 to lock down the virtualized environment. For more information about how to lock down Internet Explorer 6, see Appendix 4: How to Lock Down Virtualized Internet Explorer Content Access.

The following table provides a comparison of desktop virtualization and compatibility issues. In the table, machine virtualization (or full virtualization) includes Windows Virtual PC, Windows XP Mode, and MED-V. Session virtualization includes Terminal Services.

Table 2. Comparison of desktop virtualization options.

<table>
<thead>
<tr>
<th>Description</th>
<th>Machine virtualization</th>
<th>Session virtualization</th>
<th>Application virtualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runs earlier version of Internet Explorer</td>
<td>Yes</td>
<td>Yes, with earlier (legacy) server</td>
<td>No</td>
</tr>
<tr>
<td>Application-to-operating system incompatibilities</td>
<td>Yes</td>
<td>Yes, with earlier server</td>
<td>No</td>
</tr>
<tr>
<td>Application-to-application conflicts</td>
<td>No</td>
<td>Yes, using one server per application</td>
<td>Yes</td>
</tr>
<tr>
<td>16-bit applications on 64-bit hosts</td>
<td>Yes, with 32-bit virtual machine</td>
<td>Yes, with 32-bit virtual machine</td>
<td>No</td>
</tr>
<tr>
<td>Enterprise manageability</td>
<td>Only with MED-V</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
## VIRTUALIZE WITH MED-V

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limitations</th>
<th>Basic Infrastructure Requirements</th>
<th>Recommendation for Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most robust option</td>
<td>Requires purchase</td>
<td>Requires both a server and client computer</td>
<td>Enterprise—5,000 users or more</td>
</tr>
<tr>
<td>Seamless Web solution with automatic URL redirection for applications that run on only Internet Explorer 6 (no user training necessary)</td>
<td>Initial download of virtual machine can be time consuming, depending on bandwidth</td>
<td>Requires 256 megabytes (MB) of extra RAM on workstation and sufficient space on drive</td>
<td></td>
</tr>
<tr>
<td>Centrally managed, patched, and secured</td>
<td>Does not work on a virtualized operating system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible—can have different virtual machines for different users if other applications are required</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Microsoft Enterprise Desktop Virtualization (MED-V), a core component of the Microsoft® Desktop Optimization Pack (MDOP) for Microsoft® Software Assurance, is the most robust and scalable solution for virtualizing Internet Explorer 7 and Internet Explorer 6. It provides a centrally managed, patched, and secured solution that is intended for enterprise customers—those with 5,000 or more users. Be aware that if you are using MED-V only for virtualizing Internet Explorer 7 or Internet Explorer 6, you may be able to scale to 50,000 or more users.

If you use MED-V for virtualization, you can run Windows 7 and still run older applications seamlessly, directly from a Windows 7 desktop. By using MED-V, you retain the productivity benefits of the newest operating system, yet you can use older applications that might be best suited for your work.

You can learn more about MED-V with the [MED-V Overview](#) video, the [How Do I: Using Microsoft Enterprise Desktop Virtualization (MED-V)](#) video, and the [MED-V Quick Start Guide](#). For more information about MED-V, see the [MED-V home page](#).
What Is MED-V?
MED-V delivers applications in a virtual machine instance that runs an earlier version of the operating system, such as Windows XP or Microsoft Windows® 2000. (See Figure 1.)

MED-V builds on top of Windows Virtual PC so that you can run two operating systems on one physical device, adding virtual image delivery, policy-based provisioning, and centralized management. From the user’s perspective, these applications are accessible from the standard desktop Start menu and appear side by side with native applications, so there is minimal change to the user experience.

MED-V is the most complex of the virtualization options because it requires both a server and client computer. Resources for the Internet Explorer instance are required on the client computer side, but the server side still requires resources to host virtual machines and policies. While complex, MED-V is also the most robust of the virtualization options.

You can learn about MED-V in the Solution Accelerators Infrastructure Planning and Design documentation.

Benefits of Using MED-V
As previously stated, you can use MED-V to run Internet Explorer 7 or Internet Explorer 6 in a virtual environment with a previous operating system version, seamlessly integrated into the Windows 7 desktop. The following list addresses some of the benefits of using MED-V:

- **MED-V is easy to provision and deploy.** MED-V provides a way to automate the first-time setup of virtual machines at the endpoint, including assignment of a unique computer name, performing initial network...
setup, and joining the virtual machine to a corporate domain.

With MED-V, you can customize images in heterogeneous desktop environments, and you can adjust the Virtual PC memory allocation based on available RAM on the host computer.

Application provisioning is based on Active Directory users/groups. You can assign a virtual image and define which applications are available to the user.

- **MED-V is centrally managed, patched, and secured.** You can centrally define usage permissions and virtual machine settings and centrally monitor endpoint clients. There are also helpdesk tools to diagnose and troubleshoot virtual machines.

- **With MED-V, you can maintain a minimal inventory.** While you do have additional operating systems, you are generally not burdened with many extra images to manage. While language packs or Internet Explorer 7 may require more images, many customers find that they need only a single additional image.

MED-V provides an administrator console for virtual image creation and testing and a central image repository for image storage, versioning, and delivery based on Internet Information Services (IIS) web servers. Integration with Active Directory Domain Services makes it possible to provision virtual images based on group membership or user identity.

- **MED-V adds little additional overhead.** You need to add only 256 MB of RAM (be aware that the default for Internet Explorer 6 is 512 MB, but only 256 MB is essential) to the RAM you have to run Internet Explorer 7 or Internet Explorer 6.

- **You can use standard image maintenance.** With MED-V, you can continue using Windows Server® Update Services (WSUS) to deploy the latest Microsoft product updates.

For more information, see the [Microsoft Enterprise Desktop Virtualization Evaluation Guide](#). Also, see the [Links for Further Information](#) later in this document.

**Limitations of MED-V**

While MED-V is the most robust and scalable of the Microsoft virtualization options, it is also the most expensive. Additionally, you must first load a virtual machine. It can take some time to load Internet Explorer 6 if the MED-V virtual machine is not running when Internet Explorer 6 is initialized.

MED-V requires significant infrastructure to be a viable solution. It requires that you manage an extra operating system, which means extra inventory, patching, antivirus software, and so on. However, MED-V includes management tools that help handle the increased inventory, and you can also patch your older operating systems with Windows Server Update Services (WSUS), as described in Appendix 6: Updating with Windows Server Update Services.
MED-V does not work on a virtualized operating system through virtualized desktop infrastructure (VDI). VDI clients are already virtual, so they cannot host a virtual instance. This means that if you are using VDI for user desktops, you cannot host MED-V.

**MED-V Solution Components**

Figure 2 shows the components of a MED-V solution.

![Figure 2: MED-V architecture.](image)

The MED-V includes the following components:

1. **Administrator-defined virtual machine.**
   This virtual machine encapsulates a full desktop environment, including an operating system, applications, and optional management and security tools.

2. **Image repository.**
   The image repository stores all virtual images on a standard IIS server and enables virtual images version management, client-authenticated image retrieval, and efficient download (of a new image or updates).

3. **Management Server.**
   The Management Server associates virtual images from the image repository along with administrator usage policies to Active Directory users or groups. The Management Server also aggregates clients’ events and stores them in an external database (Microsoft® SQL Server®) for monitoring and reporting purposes.
4. **Management Console.**
The Management Console makes it possible for administrators to control the Management Server and the image repository.

5. **User.**
Applications installed in the virtual machine are seamlessly available through the standard desktop Start menu and are integrated with other applications on the user desktop.

**How Does MED-V Work?**

Figure 3 shows how the virtual image is delivered over a network. After the MED-V client is installed, the image can be retrieved using a standard HTTP or HTTPS tunnel. You can choose to deliver packaged Windows Virtual PC images (created by the MED-V Management Console) by using existing systems. The MED-V client computer looks for the package in a predefined path and extracts the image.

![Image](image.png)

**Figure 3. Delivering the virtual image with MED-V.**

Step-by-step guidance for using MED-V to virtualize Internet Explorer 7 or Internet Explorer 6 is provided in [Appendix 1: How to Use MED-V](#).

Be aware that once MED-V is deployed, the user experience is completely seamless—Internet Explorer 7 or Internet Explorer 6 is accessible from the standard desktop Start menu.

**Licensing Considerations**

MED-V software is part of MDOP 2009 volume licensing; MED-V is a Software Assurance (SA) benefit, available for enterprise customers.

MDOP customers can download the software at the [Microsoft® Volume Licensing Site (MVLS)](https://mvls.microsoft.com).

MDOP is available for test and evaluation for Microsoft® Developer Network (MSDN®) and TechNet subscribers in accordance with MSDN and TechNet agreements.
System Requirements

For the MED-V Management Server, you need the Windows Server® 2008 Standard or Windows Server® 2008 Enterprise operating system. For the client computers, you need the Windows 7, Windows Vista® with Service Pack 1 (SP1), Windows XP SP3, or Windows XP SP2 operating system. You also need Microsoft® Virtual PC 2007 SP1. Following are the detailed system requirements for MED-V version 1 (V1).

Be aware that while hardware-assisted virtualization is not required, it can significantly improve performance.

Management Server.

- **Operating system**: Windows Server® 2008 R2, Windows Server 2008 Standard, or Windows Server 2008 Enterprise (x86 and 64-bit) editions
- **Recommended hardware**: Dual processor (2.8 gigahertz [GHz]), 4 GB RAM
- **Active Directory®**: Management server should be joined to a domain

Additional Server Components.

- **Image repository**: web server(s) based on IIS
- **Reporting database (optional)**: Microsoft® SQL Server® 2005 SP2 Enterprise Edition SP2 or Microsoft® SQL Server® 2008 Express, Microsoft® SQL Server® 2008 Standard, or Microsoft® SQL Server® 2008 Enterprise editions

Client.

- **Operating system**:
  - Windows 7
  - Windows Vista SP1 (Enterprise, Home Basic, Home Premium, Business, Ultimate) — 32-bit (2 GB RAM recommended)
  - Windows XP SP2 or SP3 (Professional, Home) — 32-bit (256 MB RAM recommended)
- **Virtual PC**: Microsoft Virtual PC 2007 SP1 with KB958162 (or newer) is required

Guest Operating System.

- Windows XP SP2 or SP3 — 32-bit
- Microsoft Windows 2000 SP4 — 32-bit
VIRTUALIZE WITH WINDOWS XP MODE

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limitations</th>
<th>Basic infrastructure requirements</th>
<th>Recommendation for size</th>
</tr>
</thead>
<tbody>
<tr>
<td>User can start Internet Explorer directly from desktop or Start menu</td>
<td>Not as centrally managed as other options</td>
<td>Requires only client computer</td>
<td>Small to medium-sized implementations—50 users or fewer</td>
</tr>
<tr>
<td>Windows XP Mode and Windows® Virtual PC are free downloads for Windows 7 Professional, Enterprise, or Ultimate</td>
<td>Existing hardware might not support Windows XP Mode</td>
<td>Requires 256 MB of extra RAM on workstation and sufficient space on drive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Needs to be installed individually on each computer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Requires some user training</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Windows XP Mode is suitable for small to medium-sized organizations that have limited server infrastructure. Windows XP Mode uses a new version of Virtual PC to provide seamless access to Internet Explorer 7 or Internet Explorer 6, either through a virtual Windows XP desktop or directly through the Windows 7 desktop.

To learn more about Windows XP Mode, see Windows 7 Features: Windows XP Mode. Also, see the Links for Further Information later in this document.

What Is Windows XP Mode?

Windows XP Mode is a virtual machine package for Windows Virtual PC that contains a pre-installed, licensed copy of Windows® XP Professional SP3 as its guest operating system. Pre-installed integration components let applications running within the virtualized environment appear in the operating system Start menu as if they were running directly on the host computer.

Be aware that Windows XP Mode applications run in a Terminal Services session in the virtualized Windows XP instance. The applications are accessed via Remote Desktop Protocol by a client running on the Windows 7 host computer.

For step-by-step guidance for using Windows XP Mode, see Appendix 2: How to Use Windows XP Mode.

Benefits of Using Windows XP Mode

Windows XP Mode is a free option that requires only the Windows XP Mode download and Windows Virtual PC. Both are available as free downloads at Windows XP Mode. Windows XP Mode runs in a separate window on the Windows 7 desktop, much like a program, except it is a fully functional version of the Windows XP operating system. In Windows XP Mode, you can run Internet Explorer 7 or Internet Explorer 6, access your physical computer’s CD/DVD drive, install programs, save files, and perform other tasks as if you were using a computer running Windows XP.
When you install a program in Windows XP Mode, Internet Explorer 7 or Internet Explorer 6 appear in both the Windows XP Mode list of programs and in the Windows 7 list of programs.

Be aware that Windows Virtual PC includes some new improvements, such as the ability to access the computer’s physical hard disk drives (including the host operating system’s volumes) through a virtual machine and USB support.

You can learn more at [Windows 7 Features: Windows XP Mode](#). Also, see the [Links for Further Information](#) later in this document.

**Limitations**

Depending on the state of the virtual machine, it may take some time to load Internet Explorer 6. The Windows XP Mode option is not as centrally managed as other options; therefore, managing and patching Windows XP Mode can be more cumbersome.

**Licensing Considerations**

There are no special licensing requirements for using Windows XP Mode; it is free if you have Windows 7 Premium, Enterprise, or Ultimate editions. For more information, see [Install and use Windows XP Mode in Windows 7](#).

**System Requirements for Windows XP Mode**

Following are the system requirements for Windows XP Mode.

- Windows 7 (Premium, Professional, Enterprise, or Ultimate)
- Windows Virtual PC
- **Windows XP Mode** (a Windows XP virtual machine supplied by Microsoft)

Microsoft also recommends a minimum of 2 GB of RAM on the host computer and 15 GB of disk space for each Windows XP Mode instance. However, if the only workload that the Windows XP Mode virtual machine will be providing is Internet Explorer, the virtual machine may require less RAM than the base recommendation. A reasonable estimation is enough RAM for the host, plus an extra 256 MB for the guest. Be aware that if your computer does not meet the requirements, Windows Virtual PC and Windows XP Mode will not work correctly, even though you might be able to download and install them.

To find out which edition of Windows 7 you are running, click the Start button, right-click Computer, and then click Properties. The edition of Windows 7 you are running is displayed under Windows edition near the top of the window. If you are not running Windows 7 Professional, Enterprise, or Ultimate, you might consider using the Windows® Anytime Upgrade to upgrade your edition of Windows 7 to Windows 7 Professional or Ultimate. (Windows 7 Enterprise is not available in Windows Anytime Upgrade.)
Be aware that while hardware-assisted virtualization is not required, it can significantly improve performance.
VIRTUALIZE WITH TERMINAL SERVICES

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Limitations</th>
<th>Basic infrastructure requirements</th>
<th>Recommendation for size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy to configure</td>
<td>All resources to run Internet Explorer on server side</td>
<td>Requires both a server (Windows Server 2003 for this solution) and client computer</td>
<td>Medium-sized to large-sized implementations</td>
</tr>
<tr>
<td>Centrally managed</td>
<td>Clients need network access to the server resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some enterprises already have Terminal Services deployed</td>
<td>Requires user training</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Requires purchase of Windows Server 2003 Client Access Licenses to expand Terminal Services option</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Terminal Services (known as Remote Desktop Services in the Windows Server 2008 and Windows Server 2008 R2 operating systems), is a centralized application deployment and remote access solution that uses presentation virtualization, which separates where the application is used from where it is run. Terminal Services is best suited to a medium-sized to large-sized organization with a light server infrastructure, where the client computers have access to the server resources.

You must run Terminal Services in Windows Server 2003, because Internet Explorer 6 is the default version of Internet Explorer included in Windows Server 2003 (Windows Server 2008 includes Internet Explorer 7 and Windows Server 2008 R2 includes Internet Explorer 8).

For step-by-step guidance and best practices for using Terminal Services, see Appendix 3: How to Use Terminal Services.

**Benefits of Using Terminal Services**

When you use Terminal Services to virtualize Internet Explorer 6, all the activities on the networks and all the development and management issues related to the network are handled by the central computer or server. This central server makes it easy to configure and centrally manage. After Terminal Services are applied to the computer, clients can connect on the local area network (LAN) connection, virtual private network (VPN) connection, or through a wide area network (WAN) connection. The benefits of using Terminal Services include:

- **Rapid, Centralized Deployment.** When you use Terminal Services, all resources necessary to run the instance of Internet Explorer are located on the server side. Centrally deployed applications are easy to patch and upgrade.

- **Low-Bandwidth Access to Data.** Terminal Services reduce the amount of network bandwidth that is required for data access.
Limitations

Using Terminal Services to virtualize Internet Explorer 6 is not as seamless as the other virtualization options. You must connect to a new desktop to access Internet Explorer 6, and you must minimize the remote desktop session to access the local desktop. Be aware, however, that you can run the Remote Desktop Protocol (RDP) session with the optimal resolution for your applications or sites. Additionally, you can configure this RDP session to run only Internet Explorer and no other applications (including the Start menu and desktop), and you do not have to open the RDP session in full screen mode.

Because most Microsoft operating systems ship with versions of Internet Explorer, the Windows Server® 2003 operating system must be used to virtualize Internet Explorer 6. This means you cannot take advantage of the Terminal Services RemoteApp™ capabilities in the Windows Server 2008 and Windows Server 2008 R2 operating systems. You must use a traditional Terminal Services RDP session. (To virtualize Internet Explorer 7, you can use Windows Server 2008 or Windows Server 2008 R2 and a TSweb/RemoteApp RDP session, though this document does not cover these technologies.)

Licensing Considerations

Terminal Services is licensed on a per-device or per-user basis and is not available on a per-server or concurrent basis. Each device or user, whether the device or user connects directly to the terminal server or indirectly via another server, requires appropriate licenses to be assigned to it. In this scenario, the required licenses include Terminal Services for Windows Server 2003.

For more information, see Licensing Terminal Sever in Windows Server 2003 R2.

System Requirements for Terminal Services

The system requirements for Terminal Services are the requirements for the Windows Server 2003 operating system. These can be found at System Requirements.

Be aware that Terminal Services can be virtualized. While hardware-assisted virtualization is not required, it can improve performance.
SUMMARY

Your business may rely on applications that were built for Internet Explorer 7 or Internet Explorer 6, and the applications cannot easily run in the current version of Internet Explorer 8. If this is the case, but you still want to take advantage of the improved security, new features, and technologies included in Internet Explorer 8 and Windows 7, virtualization solutions might be the right choice for you.

With Microsoft virtualization solutions such as MED-V and Windows XP Mode, you can continue to use Internet Explorer 7 or Internet Explorer 6 on a virtual machine. You can also use Terminal Services to virtualize Internet Explorer 6. With these options, you can continue running your applications that run only on Internet Explorer 7 or Internet Explorer 6 while continuing to enjoy the new features and technologies included in Internet Explorer 8, or you can use operating systems that come with Internet Explorer 8 as the default browser.
APPENDIX 1: HOW TO USE MED-V

The following section provides high level information about how to set up and use MED-V to virtualize Internet Explorer 7 and Internet Explorer 6 and provides best practices for running and securing your implementation. The configuration described in the sections that follow all assume that an Active Directory domain is already deployed.

How to Deploy and Configure MED-V

Instructions for deploying and configuring MED-V can be found at MED-V Deployment and Configuration on TechNet. Following is a summary of the high-level steps:

1. Install and configure the MED-V Server component.
2. Configure the Image Web Distribution Server.
3. Install MED-V Client and MED-V Management Console.
4. Create Virtual PC Image for MED-V.
5. Create MED-V Workspace.
6. Test, pack, and upload Virtual PC Image.
7. Create and configure MED-V policy.
8. Test Internet Explorer access from client workstation.

Also see the MED-V Quick Start Guide and the Microsoft Enterprise Desktop Virtualization (MED-V) Administration Video Series.

How to Secure Application Access with MED-V

MED-V has the native capability to secure access from a published Internet Explorer instance. By configuring a policy in the MED-V Management console, an administrator can centrally manage a virtual machine. The applications policy dictates which applications are presented to the host operating system. The web policy can be used to define which URLs are allowed to be accessed through the MED-V published application, and the remaining URLs can be accessed through the host operating system browser instance. The user experience is seamless, because MED-V automatically directs URL requests to the proper instance.
The following screen shot shows a sample policy configuration, which can be used to publish Internet Explorer 6 to the host operating system. You configure sample policies in the Applications tab.

Figure 4. Applications tab.
The following screen shot shows a sample policy configuration, which allows access only to http://site1 from the MED-V Internet Explorer instance. You configure this information in the Web tab.

Figure 5. Web tab.
APPENDIX 2: HOW TO USE WINDOWS XP MODE

The following section provides steps for setting up and using Windows XP Mode to virtualize Internet Explorer 6 and Internet Explorer 7 and provides best practices for running and securing your implementation. The configuration described in the sections that follow all assume that an Active Directory domain is already deployed. Be aware that if you follow the instructions in the Configure Windows XP Mode section to add a Windows XP Mode virtual machine to the domain, the virtual machine can then be managed in a separate organizational unit (OU) for configuration and updates.

How to Use Windows XP Mode to Virtualize Internet Explorer 6

The following procedures show the general steps for using Windows XP Mode to virtualize Internet Explorer 6.

Install Windows XP Mode

1. From the Windows Virtual PC Website, download the appropriate version of Windows Virtual PC and download Windows XP Mode.
2. Install Windows Virtual PC.
3. Install WindowsXPMode_en-us.exe.

Configure Windows XP Mode

1. Click Start, All Programs, Windows Virtual PC, and then Windows XP Mode.
2. Accept the licensing terms, and then type and confirm a password for XPMUser.
3. Select Help protect my computer by turning on Automatic Updates now. (recommended), and then click Start Setup.
4. Wait for Windows XP Mode to configure and boot to the desktop.
5. Click Start, right-click My Computer, and then click Properties.
6. Click the Computer Name tab, and click Change.
7. Select Domain. In the Domain field, type your domain name.
8. When prompted for credentials, type the name and password of an account that has permission to join the domain.
9. When prompted to restart your computer, click Yes, and wait for the virtual machine to reboot.
10. Right-click Start, and then click Open All Users.
11. Double-click Programs.
12. Drag and drop the Internet Explorer icon from the desktop to the Programs folder, and close the Programs window.
13. Click Start, and then click Log Off. Click the X button in the upper-right corner to put the virtual machine in hibernation.

Test Internet Explorer 6

1. On the Windows 7 workstation, click Start, All Programs, Windows Virtual PC, Windows XP Mode Applications, and then click Internet Explorer (Windows XP Mode).
2. Type the password that was defined during the setup of Windows XP Mode.
3. Select the Remember my credentials check box.
4. In the menu bar, click Help, and then click About Internet Explorer.
5. Verify that the desired version of Internet Explorer is running.

**Customize Internet Explorer 6**
1. From the Tools menu, select Internet Options.
2. In the Home page address field, enter the URL address for your desired home page. Close the Internet Explorer window.
3. Click Start, All Programs, Windows Virtual PC, and then Windows XP Mode Applications.
4. Right-click Internet Explorer (Windows XP Mode), and then drag to the desktop.
5. Select Copy here.
6. Double-click the new Internet Explorer (Windows XP Mode) icon to test.

**How to Secure Windows XP Mode**
Windows XP Mode is an actual instance of Windows XP running in a virtual machine, and it must be treated as such for security purposes. Use the following guidance to secure your applications:

- Ensure that the appropriate antivirus/anti-malware software is installed on the operating system in the virtual machine. Be aware that the local security software on the host machine does not protect it.
- Ensure that the virtual machine gets all the Windows XP security updates through automatic updates or WSUS.
- Ensure that any applications installed in the virtual machine get vendor updates when needed.
- Disable unneeded services on the operating system running in the virtual machine.

Additionally, be sure to follow all the security guidelines in the Windows XP Security Compliance Management Toolkit.
APPENDIX 3: HOW TO USE TERMINAL SERVICES

The following section provides steps for setting up and using Terminal Services to virtualize Internet Explorer 7 and Internet Explorer 6 and provides best practices for running and securing your implementation. The configuration described in the sections that follow all assume that an Active Directory domain is already deployed.

How to Use Terminal Services to Virtualize Internet Explorer 6

For the detailed steps for installing and configuring Terminal Services, see Guidelines for Deploying Terminal Server. The following list includes the high-level steps:

1. Install Terminal Services.
2. Install the Terminal Services Licensing Server.
3. Configure Terminal Services licensing.
4. Configure the access group.

Secure Terminal Services

Requirements for securing Terminal Services may vary due to the needs of every company. The following guidelines can be used to limit functionality of a Terminal Services session for connected users.

1. Create an Active Directory group for users that will use Internet Explorer in Terminal Services.
2. In Terminal Services Configuration, click Connections to modify the properties for the RDP-TCP connection.
3. On the Permissions tab, add the group and grant Guest Access permissions. Remove any other groups that do not require remote desktop access.
4. Secure the RDP-TCP connection by configuring the following to fit your requirements:
   a. Restrict the number of client sessions that can remain active on the server.
   b. Set session time limits.
   c. Configure encryption levels.
   d. Set additional permissions for users and groups on the terminal server.
5. Right-click My Computer, and then click Properties.
6. On the Remote tab, clear the Enable Remote Desktop on this Computer check box.

Create .RDP File and Test Access

1. From any computer on the network, click Start, and then click Run.
2. Type MSTSC, and then press ENTER.
3. In the Computer field, type the name of your Terminal Services server.
4. Click the Options button.
5. Select the Allow me to save credentials check box.
6. Click the Display tab, and configure as desired.
7. Click the Local Resources tab, and configure as desired.
NOTE: It is recommended that you allow access to local drives so that you can download to local workstation from the Terminal Services Internet Explorer session.

8. Click the Programs tab.
9. In the program path and file name field, type `c:\program files\internet explorer\iexplore.exe`
   
   Note: You can also include a URL after the above path to define a default website.
   
   For example: `c:\program files\internet explorer\iexplore.exe” http://intranet/

10. Click the Experience tab, and then select the appropriate setting for your network speed.
11. Click the General tab.
12. Click Save As, and save the RDP file.
13. Double-click the RDP file, and then click Connect.
14. Log on and test connectivity. Internet Explorer should start upon log on.
15. Close the RDP session.
16. Copy the RDP file and distribute via your preferred method (e-mail, network share, and so on.).
17. After distributing the RDP file, users can right-click the file, click Edit, type credentials, and then click Save.
APPENDIX 4: HOW TO LOCK DOWN VIRTUALIZED INTERNET EXPLORER CONTENT ACCESS

By using Content Advisor configuration, you can limit access to content from the virtualized instances of Internet Explorer when using Windows XP Mode or Terminal Services on a per-computer basis. This process includes the following steps:

1. Create a content rating system that limits access to all sites.
2. Configure the Content Advisor on a master installation.
3. Export the configuration.
4. Apply and import on the target computers.

Create and Import a Content Rating System Limiting Access to All Sites

Create a file that includes the following information and save as noaccess.rat.

```plaintext
((PICS-version 1.0)
(rating-system "http://www.microsoft.com")
(rating-service "http://www.microsoft.com")
(name "Noaccess")
(description "This will block all sites.")
(category
(transmit-as "m")
(name "Yes")
(label
(name "Level 0: No Setting")
(description "No Setting")
(value 0) )
(label
(name "Level 1: No Setting")
(description "No Setting")
(value 1) ) )
```

Configure Content Advisor on the Master Installation

You need a master installation to lock down content. The master installation is either a source Windows XP Mode virtual machine or a Terminal Services server that matches the configuration of your target Internet Explorer virtualization platform.

After the Terminal Server or Windows XP Mode instance is created, perform the following tasks to configure the Content Advisor:

1. Log on as a user with administrative access.
2. Copy the noaccess.rat file to c:\windows\system32\.
3. From Internet Explorer, go to Tools, Internet Options.
4. Click the Content tab.
5. Click Enable.
6. Click the General tab.
7. Click Rating Systems.
8. Click Add.
9. Locate the noaccess.rat file, and then click Open.
10. Select Noaccess, and then click OK.
11. Click the Approved Sites tab.
12. In the Allow this web site field, enter the sites that are to be allowed access from the virtualized instance of Internet Explorer, and then click Always.
13. Repeat the process in Step 12 for any other allowed sites. Click OK.
14. Set a password to protect Content Advisor settings. Confirm the password.
15. If desired, type a password hint. Click OK until all settings windows are closed out.
16. Test the URL access.

Export Configuration

The configurations performed in the previous section are now stored in the registry and are applied globally to the operating system instance. The next task is to export this registry information to be distributed to target operating system instances. Perform these tasks as an administrator on the master installation.

1. Click Start, Run.
2. Type regedit, and then press ENTER.
3. Navigate to the following registry location:
   \[HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Policies\]
4. Right-click the Ratings container, and then click Export.
5. Save the exported registry file.
6. Copy the exported registry file to a network location or removable media.

Apply Content Advisor Settings to Target Computers and Test

Now that the configuration is complete, the exported registry file needs to be distributed to the target computers. This can be done by several methods; these tasks explain the manual registry import process.

1. From the target computer, log on as a user with local administrator privileges.
2. Copy the noaccess.rat file to the c:\windows\system32\ folder.
3. Locate and double-click the exported registry file.
4. Click Yes to confirm import. Click OK.
5. Open Internet Explorer.
6. Navigate to an allowed URL.
7. The designated site should load.
8. Navigate to another URL that is not allowed. You should receive a prompt stating that Content Advisor will not let you see this site.
APPENDIX 5: SECURING INTERNET EXPLORER

Make sure that you have a secure browsing experience that is in line with your company policies. For example, you can disable any Internet Explorer features that are not required, use security zones, and prohibit downloads.

For more information about security settings, see Working with Internet Explorer 6 Security Settings. For more information about setting policies, see Internet Explorer Policy Settings.
Solutions for Virtualizing Internet Explorer

With Windows Server Update Services (WSUS), IT administrators can deploy the latest Microsoft product updates to computers that are running the Windows operating system. By using WSUS, you can fully manage the distribution of updates that are released through Microsoft Update to computers in your network.

To keep WSUS from automatically updating Internet Explorer 7 or Internet Explorer 6 to Internet Explorer 8, you need create a separate update group for your computers running Internet Explorer 7 and Internet Explorer 6 to make sure that Internet Explorer version updates are not applied to them.

The high-level steps are:

1. Create a custom Organizational Unit (OU).
2. Add all computers running Terminal Services or Windows XP Mode to the OU. If you are using MED-V, add the MED-V images to the OU.
3. Right-click the custom OU and Group Policy object (GPO) configuration.
4. Create group in WSUS and limit IE version update approval to this group.

For more information, see Managing Windows Server Update Services.
LINKS FOR FURTHER INFORMATION

The following links can provide you with more information about using virtualization solutions.

For an engineering overview and customer best practices for addressing web application compatibility in a migration from Internet Explorer 6, see Microsoft Guidance for Internet Explorer 6 to Internet Explorer 8 Application Compatibility Remediation.

MED-V Information

For general information about MED-V, see the Microsoft Desktop Optimization Pack tab on the Windows Enterprise site.

For the latest content and expert advice, see Microsoft Desktop Optimization Pack (MDOP) on TechCenter.

The Official MDOP Blog provides information on a variety of topics.

For information about MED-V on TechNet, see Microsoft Enterprise Desktop Virtualization.

For a list of the benefits of MED-V, see Enhancing deployment and management for virtual PCs in enterprise environments.

To create a test environment and explore the basic MED-V product features, see Quick Start Guide (Quick start policy XML file).

To evaluate product deployment and management options, see the Evaluation Guide.

For additional technical resources, refer to the MED-V Team Blog.

For a screencast series, see Mad About MED-V. This screencast series covers four topics: concept and architecture, user experience, configuring workspace policy, and creating the deployment package.

For more about MED-V on TechNet, see MED-V Planning, Deployment, and Operations Guide.

For an overview, watch the MED-V Overview video. Also watch the Microsoft Enterprise Desktop Virtualization (MED-V) Administration Video Series.

To see MED-V in action, watch the video Microsoft Enterprise Desktop Virtualization (MED-V) Overview.

For case studies, see TUV NORD Group: Global Firm Reduces Hardware and IT Costs with Desktop Virtualization and the Microsoft IT Showcase article.

For an analyst’s view, see the paper Introduction to the Benefits of Local Desktop Virtualization.
**Windows XP Mode Information**
For general information, see [Windows XP Mode](#).

To download Windows XP Mode, see [Download Windows XP Mode](#).

For installation information, see [Install and Use Windows XP Mode in Windows 7](#). See also [Windows Virtual PC](#).

For an overview video, see [How Do I: Windows XP Mode? onTechCenter](#).

**Terminal Services Information**
For general information, see [Windows Server 2003 Terminal Services](#).

For papers, downloads, and news, see [Terminal Services on TechNet](#).

For an overview, see [Terminal Services Overview](#).

For licensing information, see [Windows Server 2003 Terminal Server Licensing](#).