Windows 7 Application Compatibility Overview

Windows Application Quality Team
Microsoft Corporation

Windows 7

Windows 7 Builds on Windows Vista

Deployment, Testing, and Pilots Today Will Continue to Pay Off

Windows 7

Few Changes: *Most software that runs on Windows Vista will run on Windows 7 - exceptions will be low level code (AV, Firewall, Imaging, etc). Hardware that runs Windows Vista well will run Windows 7 well.*

Windows Vista
Service Pack 1

Few Changes: *Focus on quality and reliability improvements*

Windows Vista

Deep Changes: *New models for security, drivers, deployment, and networking*

Lessons Learned

- We understand that the changes we made in Windows Vista have made it difficult to adopt Windows Vista
- How are we going to make it better for you in Windows 7?

Windows 7 Goals

- Applications that worked on Windows Vista and Windows Server 2008 continue to work on Windows 7 / Windows Server 2008 R2
- Broad ISV outreach for critical applications

Proactive Strategies

- **Scale** our compatibility efforts
  - Automation (AAF), Telemetry
- **Prevent** using education, tools, engagement
  - Internal resources for compatibility & impact
- **Detect** compatibility issues upstream
  - Quality Gates for application / public API removal
- **Mitigate** compatibility issues
  - Shim infrastructure, switchback, telemetry
- **Partner** and engage with ISVs
  - Tools, services and labs – release + 90

Reactive Strategies

- Testing of Highly Sensitive and Visible (HSV) applications and middle tier technology (Java, .NET Framework, etc)

The Net Result

- There is no new "special sauce" that makes software start working on Windows 7 if it didn't work on Windows Vista
- If you work on Windows Vista, you probably work on Windows 7, unless…

What we broke

Sorry.

Operating System Version

- Windows 7 is … Windows 6.1?
  - dwMajorVersion stays the same
  - dwMinorVersion changes
- Remediation
  - Check for features, not versions
  - Use the > key
  - Version lies

xxxVersionLie

Symptoms

“Unsupported operating system”

Fix description

Lies

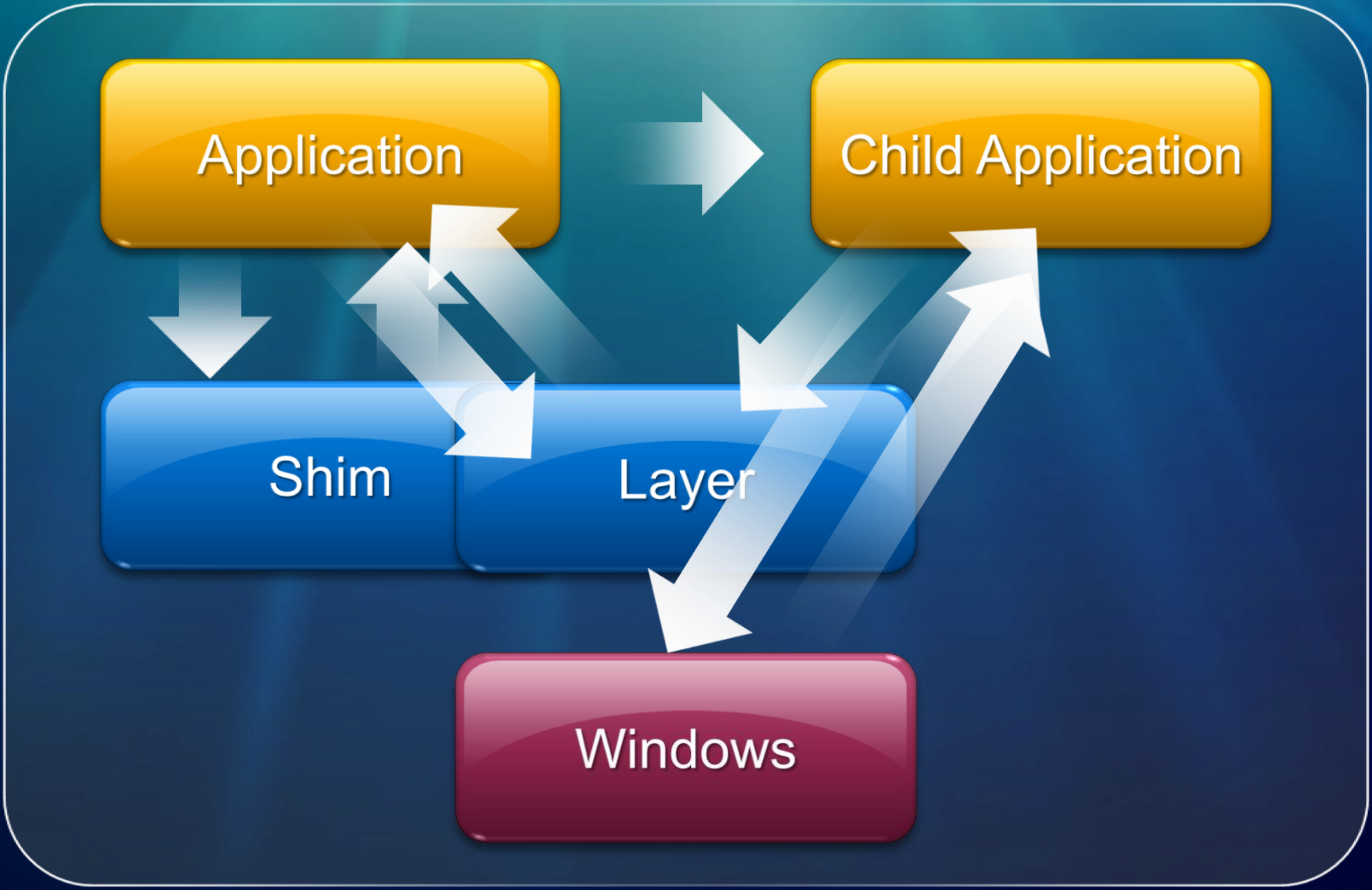
Version Lie Shims

- Win95VersionLie
- WinNT4SP5VersionLie
- Win98VersionLie
- Win2000VersionLie
- Win2000SP1VersionLie
- Win2000SP2VersionLie
- Win2000SP3VersionLie
- WinXPVersionLie
- WinXPSP1VersionLie
- WinXPSP2VersionLie
- Win2K3RTMVersionLie
- Win2K3SP1VersionLie
- VistaRTMVersionLie

Version Lie Layers

- Win95
- NT4SP5
- Win98
- Win2000
- Win2000SP2
- Win2000SP3
- WinXP
- WinXPSP1
- WinXPSP2
- WinXPSP2VersionLie
- WinSrv03
- WinSrv03SP1
- VistaRTM

Shims and Layers



Layers: More Than Version Lies

VistaRTM Layer:

- DelayAppDllMain
- ElevateCreateProcess
- FailObsoleteShellAPIs
- FaultTolerantHeap
- GlobalMemoryStatus2GB
- HandleBadPtr
- NoGhost
- RedirectMP3Codec
- VirtualRegistry
- VistaRTMVersionLie
- WRPDllRegister
- WRPMitigation

IE Version

- Without compatibility mode:
  - Mozilla/4.0 (compatible; **MSIE 8.0**; Windows NT 6.1; WOW64; Trident/4.0; SLCC2; .NET CLR 2.0.50727; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media Center PC 6.0)
- With compatibility mode:
  - Mozilla/4.0 (compatible; **MSIE 7.0**; Windows NT 6.1; WOW64; Trident/4.0; SLCC2; .NET CLR 2.0.50727; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media Center PC 6.0)

Detecting IE More Effectively

- http://msdn.microsoft.com/en-us/library/ms537509.aspx
- Detect Features
- Define compatibility modes

Specifying Compatibility Mode

```
<html>
<head>
  <!-- Mimic Internet Explorer 7 -->
  <meta http-equiv="X-UA-Compatible"
content="IE=EmulateIE7" />
  <title>My Web Page</title>
</head>
<body>
  <p>Content goes here.</p>
</body>
</html>
```

IIS Compatibility Mode

```
<?xml version="1.0" encoding="utf-8"?>
<configuration>
  <system.webServer>
    <httpProtocol>
      <customHeaders>
        <clear />
        <add name="X-UA-Compatible"
value="IE=EmulateIE7" />
      </customHeaders>
    </httpProtocol>
  </system.webServer>
</configuration>
```

Detecting Compat Mode

```
engine = null;
if (window.navigator.appName == "Microsoft Internet Explorer")
{
   // This is an IE browser. What mode is the engine in?
   if (document.documentMode) // IE8
      engine = document.documentMode;
   else // IE 5-7
   {
      engine = 5; // Assume quirks mode unless proven otherwise
      if (document.compatMode)
      {
         if (document.compatMode == "CSS1Compat")
            engine = 7; // standards mode
      }
   }
   // the engine variable now contains the document compatibility mode.
}
```

File Libraries

- Default location of common file dialogs: Documents Library
- File libraries are files (not folders)
- IFileDialog->GetFolder() + IFileDialog->GetFilename() breaks for library
  - GetFolder() returns a file
- Remediation
  - Use IFileDialog->GetResult()

Windows Mail Deprecated

- Replaced with **Windows Live Mail** – or the mail client of your choice
- Publicly documented APIs work
  - APIs that display UI break (silently fail)
- Protocol handlers and file extensions not registered
- Remediation
  - Remove calls to deprecated APIs
  - Install a mail application

CoStartOutlookExpress

```
msoert2.dll Section .text (0x43D01000)
CALL        DWORD PTR [KERNEL32.DLL!GetModuleFileNameW]
TEST        EAX,EAX
JZ          0x43D0A613
LEA         EAX,[EBP-0x20C]
PUSH        EAX
CALL        DWORD PTR [SHLWAPI.DLL!PathFindFileNameW]
TEST        EAX,EAX
JZ          0x43D0A60C
PUSH        'WinMail.exe'
PUSH        EAX
CALL        DWORD PTR [MSVCRT.DLL!_wcsicmp]
```

How to Write Apps that Break

- Ignore published APIs
- Reverse engineer Windows
- Write code depending on what you reversed, assuming that we'll never change Windows
- Wait for us to change Windows

Windows Portable Devices

- wpdusb.sys replaced by winusb.sys
- Consumers of WPD API are fine
- Consumers of (private) IOCTL codes will break
- Remediation
  - Rewrite to leverage WPD APIs

New Low-Level Binaries

- To improve the foundations of Windows, we have reorganized
- Example: functionality from kernel32.dll and advapi32.dll moved to kernelbase.dll
- Exported functions are forwarded
- Applications depending on offsets and undocumented APIs can break
- Remediation:
  - Rewrite to use documented APIs
- See Mark Russinovich's Kernel Changes

IE DEP Enabled by Default

- Data Execution Prevention (NX) now enabled by default
  - Vista – you had to elevate IE to enable
- Plug-ins that have an issue with DEP may cause the browser to crash
- Remediation:
  - Use DEP-compatible versions of frameworks (such as ATL)
    - http://support.microsoft.com/kb/948468
  - Use the /NXCOMPAT linker option

MSMQ Defaults to SHA-2

- SHA-2 default for sending messages
  - Not accepted by Windows Server 2003 and earlier
- SHA-2 required for incoming messages
  - Will not accepted messages from Windows Server 2008 and earlier
- Remediation:
  - Modify registry key to change policy

MSMQ Win2K Client Support

- Optional component for Windows Server 2003 and Windows Server 2008
- Windows 2000 MSMQ servers unable to run in Client Integrated Mode on a Windows 7 domain
- Remediation:
  - Install a Windows Server 2003 or Windows Server 2008 domain controller with the Windows 2000 Client Support Service

Windows Server 64-Bit Only

- Drivers
  - Port and sign 64-bit drivers
- 32-bit binaries
  - Should run well under WOW64
  - IsWow64Process
- 32-bit plug-ins
  - Port to 64-bit to plug into 64-bit processes, such as Explorer
- 16-bit binaries
  - Port to 32- or 64-bit

WOW64 Optional on Core

- 32-bit binaries will not run by default
  - Active Directory
  - Active Directory Lightweight Directory Services
  - Web server
  - 3rd party apps
- Remediation:
  - Port to 64-bit
  - Install WOW64 optional feature

How we help you express your intentions more clearly

Talk to us.

Switchback

- CompatibilityInfo section in the manifest – helps you communicate which OS you are designing for
  - We can make breaking changes to components as long as we keep the old one available for apps designed for a previous OS!
- No CompatibilityInfo == Vista Compatibility
- Components supporting in Windows 7:
  - APIs: GetOverlappedResult, ReadFileEx
  - RPC exception handling, thread pool mgmt.
  - DWM fail/lock bit blitting

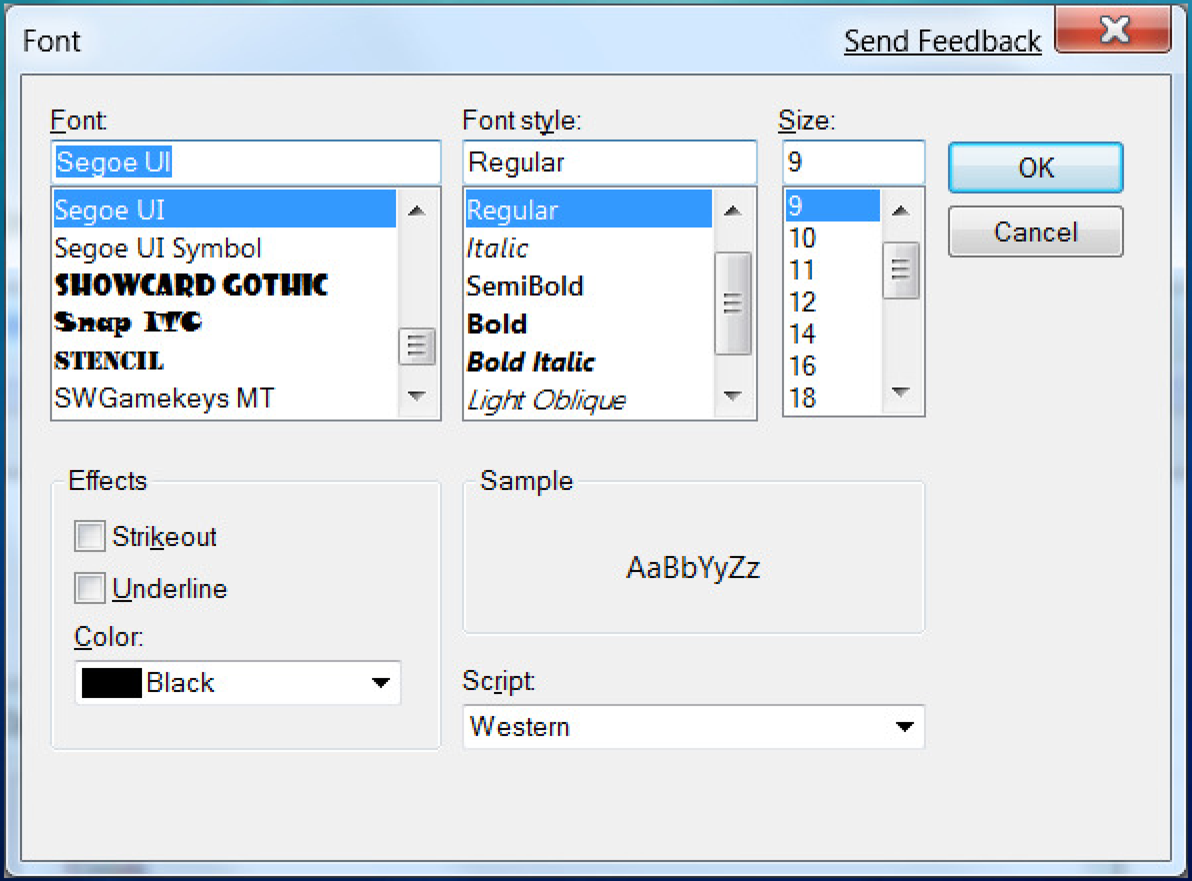
Switchback Manifest

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<assembly xmlns="urn:schemas-microsoft-com:asm.v1"
 manifestVersion="1.0">
  <compatibility
   xmlns="urn:schemas-microsoft-com:compatibility.v1">
    <application>
      <!-- Windows 7 supported -->
      <supportedOS Id="{35138b9a-5d96-4fbd-8e2d-a2440225f93a}"/>
    </application>
  </compatibility>
</assembly>
```

What we made look a little nicer

Enjoy.

ChooseFont() Dialog



Font

Font: Segoe UI

Font style: Regular

Size: 9

Effects

☐ Strikeout

☐ Underline

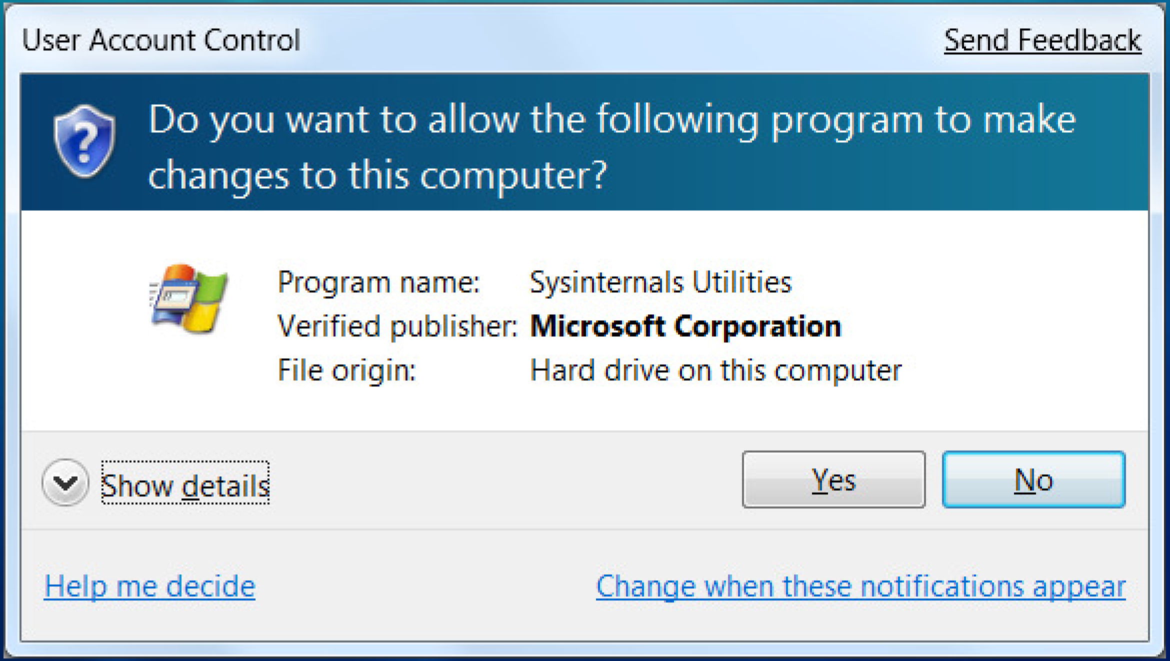
Color: ■ Black

Sample

AaBbYyZz

Script: Western

User Account Control



User Account Control

Send Feedback

Do you want to allow the following program to make changes to this computer?

Program name: Sysinternals Utilities

Verified publisher: **Microsoft Corporation**

File origin: Hard drive on this computer

Windows 7

Tools and Tips

Helpful?

Problem Step Recorder

- %windir%\system32\psr.exe
- Allows testers and users to track, step by step, exactly what an application is doing, creating an MHT file with screenshots illustrating the bug repro
- Creates a zip file containing an mht
- Integrated with Watson

Windows Troubleshooting

- Built-in troubleshooting for common problems
- Accessible from the Action Center
- Extensible
  - %sdkdir%\bin\tspbuilder\builder.exe
  - Implement using PowerShell scripts
  - http://www.withinwindows.com/2009/01/12/crash-course-on-authoring-windows-7-troubleshooting-packs/

Microsoft®

Your potential. Our passion.™

Windows 7