Feature Comparison of Windows Embedded Standard 7 vs. Windows Embedded Standard 2009

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Overview

Microsoft Windows Embedded Standard 7 is the next-generation platform from the Microsoft Windows Embedded Standard product family that includes Windows XP Embedded and Windows Embedded Standard 2009. Windows Embedded Standard 7 delivers the power, familiarity and reliability of the Windows 7 operating system in a highly customizable and componentized form, enabling OEMs and developers to configure smart, connected, commercial and consumer devices that require rich applications, services and end-user experiences while easily connecting to common industry standards and Microsoft technologies.

This article will give a high-level summary of the benefits of Windows Embedded Standard 7 and the Windows 7 operating system on which it is built. It will also compare Windows Embedded Standard 7 to Windows Embedded Standard 2009, which is built on Windows XP, and focus on some of the feature differences between the platforms and their operating systems, tools and building models.

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General Comparison: Windows Embedded Standard 2009, Windows Embedded Standard 7 WS7E and Windows Embedded Standard 7 WS7P

	Windows Embedded Standard 2009	Windows Embedded Standard 7 WS7E	Windows Embedded Standard 7 WS7P
Key Windows 7 Components (in-the-box)	Internet Explorer 7 Windows Media Player 11 Remote Desktop Protocol 6.1 .NET Framework 3.0 *Later releases of IE, WMP, RDP and .NET available on Embedded Communications Extranet (ECE)/ Microsoft OEM Online (MOO)*	Internet Explorer 8 Windows Media Player 12 Remote Desktop Protocol 7.0 .NET Framework 3.5 SP1	Internet Explorer 8 Windows Media Player 12 Remote Desktop Protocol 7.0 .NET Framework 3.5 SP1
Processor and Hardware Support	32-bit (x86) Minimum 126MB storage and 256MB RAM	32-bit (x86) and 64-bit (x64) Minimum 1GB storage and 512MB RAM	32-bit (x86) and 64-bit (x64) Minimum 1GB storage and 512MB RAM
Image Build Tools	Embedded Studio Toolkit: Target Designer Component Designer DB Manager Target Analyzer SDI support	Windows Embedded Studio: Image Builder Wizard Image Configuration Editor Target Analyzer Windows 7 WIM support Search Better performance Easier third-party software and driver integration XML image configuration	Windows Embedded Studio: Image Builder Wizard Image Configuration Editor Target Analyzer Windows 7 WIM support Search Better performance Easier third-party software and driver integration XML image configuration
OS Building Blocks	OS components ~1000 Driver components ~9000	OS feature sets ~150 Driver packages ~500 Embedded Core	OS feature sets ~150 Driver packages ~500 Embedded Core
Image Build Model	Image is configured and assembled on developer machine	Image configured on device or on developer machine	Image configured on device or on developer machine

	Image is deployed to device	Image is assembled on the device	Image is assembled on the device
	Adding features requires an image refresh	Features can be added post-build directly to device	Features can be added post-build directly to device
	Component database and repository	Distribution share to hold files and packages	Distribution share to hold files and packages
OS Image Footprint	Minimum image size > 40 MB	Minimum image size ~500MB	Minimum image size ~500MB
Deployment Methods	PXE Boot, Remote installation	Windows Deployment Servicing (WDS)	Windows Deployment Servicing (WDS)
	Windows Pre-installation Environment (WinPE) 1.0	WinPE 3.1 or latest	WinPE 3.1 or latest
	CD/DVD boot & USB Boot	USB Boot	USB Boot
	Remote Boot		
Servicing	OEM Servicing	OEM Servicing	OEM Servicing
	Device Manual Servicing	Device Manual Servicing	Device Manual Servicing
		Device Automatic Servicing (Windows Update)	Device Automatic Servicing (Windows Update)
Embedded Enabling Features	Enhanced Write Filter, File-Based Write Filter, Registry Filter	Enhanced Write Filter, File-Based Write Filter, Registry Filter	Enhanced Write Filter, File-Based Write Filter, Registry Filter
	CD/DVD boot & USB Boot	USB Boot	USB Boot
	Custom shell support	Improved custom shell support	Improved custom shell support
		OEM branding experience	OEM branding experience
	Device Update Agent	Notification & Popup suppression	Notification & Popup suppression
Key Distinguishing Features		Advanced power management	Advanced power management
		Fast boot/Shutdown Location & other sensors	Fast boot/Shutdown Location & other sensors

		Aero glass & Aero background	Aero glass & Aero background
			Windows Touch (Multi-touch)
		Direct boot from VHD	Direct boot from VHD
Localization and Language Packs	OS image Documentation (localized into a subset of languages)	OS image (partial) Documentation Language-neutral design separates localized resources completely	OS image (partial) Documentation Language-neutral design separates localized resources completely
Activation	Not required	Not required	Note required
Enterprise Connectivity		Full certified IPv6 support	Full certified IPv6 support
Advanced Remote Connectivity			DirectAccess BranchCache
Advanced Data Security			Bitlocker & Bitlocker to Go Applocker
High-end device support		64-bit CPU support	64-bit CPU support
Consumer Features			HomeGroup Windows Media Center Windows Sideshow Remote Assistance Anti-Malware PhotoViewer Parental Control
Customer Connection to the Product Team	Links to team blogs and forums	Support for Software Quality Metrics (SQM) in developer tools Links to forums, MSDN and product team blogs	Support for Software Quality Metrics (SQM) in developer tools Links to forums, MSDN and product team blogs

Setup

The Setup experience in Windows Embedded Standard 7 is improved over Windows Embedded Standard 2009 because the installer process is simplified — SQL Express does not have to be installed as a prerequisite. Setup of Windows Embedded Standard 7 does require .NET Framework 3.5 SP1, but it is included in the installer and it will be installed automatically if it is not present on the developer workstation.

There are other important differences between Windows Embedded Standard 7 and Windows Embedded Standard 2009:

- Windows Embedded Standard 2009 has a component database. Windows Embedded Standard 7 has distribution shares (one for x86 and another for x64) that contain all of the resources for the building blocks.

- Windows Embedded Standard 2009 Multilingual User Interface (MUI) packs must be installed separately. Windows Embedded Standard 7 includes the language packs in the distribution shares.

- Windows Embedded Standard 2009 integrates Remote Boot Server Setup into the installer. Windows Embedded Standard 7 does not include Windows Deployment Server in its Setup.

Image Build Tools

The end-to-end developer experience is very similar in Windows Embedded Standard 2009 and Windows Embedded Standard 7: browse for components, instantiate components, resolve dependencies, tweak settings and build.

There are, however, there some important differences. In Windows Embedded Standard 2009, developers build runtimes. In Windows Embedded Standard 7, they build answer files.

Windows Embedded Standard 7 also has a new set of build tools for creating and maintaining OS Images: Image Builder Wizard (IBW), Image Configuration Editor (ICE) and Deployment Image Servicing and Management (DISM).

IBW

Building an image using IBW is a new interactive experience that was not offered in previous generations of Windows Embedded Standard. Windows Embedded Standard 2009 requires the image to be configured and built on a developer workstation in Target Designer and then deployed to the device. With Windows Embedded Standard 7, developers can deploy IBW to create images very quickly, simply by booting into IBW, customizing the composition of the image and installing directly to the device.

IBW also allows installations with answer files or Configuration Sets, and it can be run from a USB Flash Drive. Standardized answer files can also be used across deployment stages — from Setup through Sysprep and redeployment.

ICE

To customize an image, Windows Embedded Standard 2009 uses a suite of three tools — Target Designer, Component Designer and Component Database Manager. Windows Embedded Standard 7 uses ICE.

ICE runs on the developer machine and is used to build answer files to respond to the dialogs presented in IBW in order to streamline the image creation process. All of the options for customizing an image in IBW are available in ICE, which provides more powerful functionality and better integration with source control of images.

Developers can use ICE's Find feature to search for file names and registry keys, values and data. This new, improved functionality includes the ability to:

- o Import packages into the distribution share.
- o Encrypt passwords in Unattend files and hide sensitive data.
- o Create a Configuration Set.
- o Capitalize on easy deployment options through media creation in ICE.
- o Insert path of third-party drivers.
- o Specify OEM folder paths in order to install applications.
- o Include or omit Optional Dependencies during image configuration.

DISM

DISM is a command-line tool that enables developers to add features to an image while it is running or offline.

OS Building Blocks

Packages

Windows Embedded Standard 7 consists of Embedded Core, a bootable entity that contains the most common pieces of functionality that are required for any image to be bootable (such as the kernel or networking stack), and many packages that contain all the functionality available in the Windows 7 operating system. A package is a part of the operating system (OS) that contains the files, resources and settings required for specific functionality.

Driver Packages

In-box drivers are offered as driver packages in Windows Embedded Standard 7 and not as components, as is the case in Windows Embedded Standard 2009. There are currently around 500 driver packages in Windows Embedded Standard 7. In addition, Embedded Core includes basic, boot-critical drivers (except for SCSI drivers because of footprint consideration). The basic drivers are installed by default if the developer does not add specific driver packages.

Driver installation scenarios in Windows Embedded Standard 7 depend, as they do in Windows Embedded Standard 2009, on the correct devices being installed, as well as on the necessary dependencies, which must be satisfied. Some drivers work only on 32-bit or 64-bit platforms; Windows Embedded Standard 7 supports both, but Windows Embedded Standard 2009 supports x86 drivers only.

Drivers can be added to an image in various ways in Windows Embedded Standard 7 using IBW or the DISM.exe utility online or offline. Driver packages are serviceable in the same way that features are serviceable.

There are language resources for some drivers in Windows Embedded Standard 7 that are not available in Windows Embedded Standard 2009.

Target Analyzer (tap.exe) is available in Windows Embedded Standard 7, as it is in Windows Embedded Standard 2009, but in Windows Embedded Standard 7 it can be run as part of an IBW installation. Hardware files created by tap.exe (.pmq files) can be imported into IBW or ICE in Windows Embedded Standard 7, just as they can be imported to Target Designer in Windows Embedded Standard 2009.

Deployment Methods

Windows Embedded Standard 7 supports well-known utilities that are also used for Windows Client and Windows Server to facilitate mass deployment of images created on the factory floor:

- Windows Deployment Server (WDS) is the replacement for PXE installations that utilize Remote Boot Server in Windows Embedded Standard 2009.

- Windows Embedded Standard 7 fully supports Sysprep scenarios as defined for non-Embedded Windows versions so that developers can generalize master images to deploy to multiple machines. Windows Embedded Standard 2009 uses the System Cloning Tool and only partially supports Sysprep.

- With Windows Embedded Standard 7, Windows Imaging File Format (WIM) images can be captured with the ImageX utility provided in Windows PE 2.0.

Servicing

Upon the request of Windows Embedded users, the Microsoft Windows Embedded Standard team has designed Windows Embedded Standard 7 to enable a number of servicing scenarios, including the ability to service run-time images in the same way that Windows client is serviced. The servicing process for Windows Embedded Standard 7 is now completely different than it is for Windows Embedded Standard 2009:

Component-Based Servicing
File/Registry Key/INF file-based servicing for Windows Embedded Standard 2009 has been replaced by Component Based Servicing (CBS). In the CBS model, system inventory is maintained through the Component Servicing Infrastructure (CSI) layer in the OS. System integrity is better guaranteed by a servicing component that encompasses a set of dependent files and registry keys so that all dependencies are well enforced.

CBS resolves inconsistent system state when pending reboot by treating system changes as atomic transactions. All installations —not just servicing installations — are handled by CBS through the CBS and CSI servicing APIs, and applicability is determined by querying the CBS and CSI metadata. With CBS, updates do not overwrite existing files; if an update is uninstalled, the system will roll back to its previous version, thus avoiding an unstable system state.

Package Scanner

Windows Embedded Standard 7 has a new tool called Package Scanner that allows easy identification of updates that are applicable to a device. Package Scanner also allows the removal, or scavenging, of all previous versions of an update.

Service Packs

With Windows Embedded Standard 7, service packs can be applied directly to a runtime, either online or offline. With Windows Embedded Standard 2009, an image refresh is required.

Windows Update

Windows Embedded Standard 7 utilizes Windows Update for feature updates. Windows Update has a rich control panel applet and command-line tools for checking, downloading and installing update packages. This is not available in Windows Embedded Standard 2009.

Improvements to Existing Features

For Windows Embedded Standard 7, the Microsoft Windows Embedded team made a considerable amount of improvements to the features of Windows Embedded Standard 2009:

Language Packs and Localization

Because Windows Embedded Standard 7 is based on the Windows 7 OS, it benefits from an improved localization design compared to Windows Embedded Standard 2009, which is based on Windows XP.

One of the key differences in Windows 7, and therefore, in Windows Embedded Standard 7, is a language-neutral design that separates localized resources completely from non-localized, or neutral, binaries. This design enables the localization of many languages very quickly, fixing non-localized bugs without re-shipping localized resources, and it reduces the need for servicing security and feature updates significantly.

Windows Embedded Standard 7 features other important localization changes:

- Localization Packs do not include the speech recognition engines or video help files that are normally included in Windows 7 language packs — they contain only localized resources for feature sets. As a result, the language packs are significantly smaller.

- Via Windows 7, Windows Embedded Standard 7 features more than 50 new fonts. Its existing fonts are also improved, as is the font control panel, which now allows for better viewing and management.

- Windows Embedded Standard 7 fonts are grouped into a number of packages based on regions and countries, as well as on their associated scripts, so they can be easily associated with the appropriate languages. As a result, certain embedded images benefit from smaller footprints, as they do not need to include unnecessary fonts.

- With Windows Embedded Standard 7, developers have access to the desired language packs when configuring or building an embedded image using ICE or IBW. They can also install additional language packs on the runtime using the Language Pack Setup (LPKSetup) tool or DISM.

File-Based Write Filter

File-based Write Filter (FBWF) is a write filter that protects at the file level, meaning that it helps maintain a stateless disk by redirecting all disk writes on a protected file system to a memory cache in a transparent manner. Upon reboot, all file data is lost and the user is reverted back to the original disk. The scenario of protecting the disk from writes is the same in Windows Embedded Standard 7 and Windows Embedded Standard 2009, but in Windows Embedded Standard 7 there is:

- Limited Support for AMD64.

- Support for reparse points.

- Improved integration with removable devices and stability fixes.

Power Management

Windows Embedded Standard 7 includes updated and enhanced support for processor power management so that developers can build "green" solutions. The PowerCfg command-line tool can be used to view or change the processor power policy, and power meter Windows Management Instrumentation (WMI) provides better power management.

The new parameters enabled for PowerCfg are:

- Requires. Enumerates application and driver power requests.

- Requestsoverride. Sets a power request override for a particular process, service or driver.

- Energy. Evaluates the system energy efficiency. Adding an optional dependency when configuring the image enables this function.

- Powercfg.cpl. This function also requires an optional dependency to be satisfied.

Power Management works with FBWF enabled, and it also works on both x64 and x86 systems.

Directory Services

Directory Services manages the name and address relationship of objects within a networking system. It also provides security and access control, including integration with Access Control Lists. Domain Name System (DNS) snap-in, viewing property pages and searching for people or printers requires an optional dependency for Microsoft Management Console (MMC) to be included.

Shell

The Windows Embedded Standard 7 Shell has several improvements over the Windows Embedded Standard 2009 Shell:

- An improved taskbar.

- Full-screen previews.

- Jump Lists. To view the files used recently, users can just right-click on the application icon on the taskbar. By right-clicking on the Internet Explorer icon, they can see the most recently viewed Web sites. Additional files can be pinned to the Jump List so that they will always appear.

- Snaps. Snaps allow users to simply grab a window and pull it to either side of the screen to fill half of the screen. With Snaps, it's easier than ever to compare windows.

- Windows Aero. Windows Aero allows for rich, immersive user experiences. For example, moving the mouse to the lower-right corner of the desktop will make all open windows transparent so the desktop underneath is immediately visible. To get all but one window out of the way, users can grab the top of that window and shake it — the other windows will instantly minimize to the taskbar. And by shaking that same window again, the other windows will return.

Device Management

The Devices and Printers feature set in Windows Embedded Standard 7 offers one single place to connect, manage and use printers, phones and other devices.

Device Stage is a new technology that helps users interact with any compatible device connected to the computer. From Device Stage, developers can see device status and run common tasks from a single window. Device manufacturers can also customize Device Stage.

File System

Windows Embedded Standard 7 includes USB Boot, which is available in previous versions, but it will eventually offer VHD Boot as well. In addition, Windows Embedded Standard 7 features new functionality in disk management, such as the ability to shrink a volume to free up space. In Windows Embedded Standard 2009, the volume had to be deleted in order to make more space available.

.NET Framework

Windows Embedded Standard 7 includes .Net Framework 3.5 SP1, while Windows Embedded Standard 2009 includes .Net Framework 3.5 by default.

Multi Media and Windows Media Player

Windows Embedded Standard 7 is equipped with Windows Media Player to enable rich multi-media experiences. Windows Media Player allows end-users to right-click on what they would like to hear and select Play To in order to see a list of devices and systems, such as an Xbox 360 or a network-connected stereo, on which they can play music. In most cases, if the media receiver doesn't support a certain file format, Windows 7 will automatically convert that content into a format that the media receiver can play. Windows Media Player also offers controls such as play, stop and skip to manage the new device so that the machine becomes its remote control.

Windows Media Player can also be deployed on an OEM device to listen to music and to view pictures, videos or recorded TV in the media libraries of a PC.

Installers (Third-Party Application Support)

Windows Embedded Standard 7 features MSI Installer 5.0, while Windows Embedded Standard 2009 has version 3.5.

Remote Desktop

Both Windows Embedded Standard 7 and Windows Embedded Standard 2009 use Remote Desktop Protocol 6.1.

Microsoft Management Console (MMC)

Windows Embedded Standard 7 features MMC 6.1 while Microsoft Embedded Standard 2009 has MMC 5.1.

Control Panel

In Windows Embedded Standard 7, the Control Panel has an enhanced user interface.

New Runtime Features

Ease of Access Center

The new Ease of Access Center provides a centralized location in which developers can quickly adjust accessibility settings and manage assistive technology programs. The Ease of Access Center also features a new questionnaire that can be used to get suggestions for accessibility features that developers might find useful.

Graphics API

The Graphics API feature set is new in Windows Embedded Standard 7; it offers a hardware-accelerated API and Microsoft Windows Codecs Extended Library.

Dialog Filter

Dialog Filter is new in Windows Embedded Standard 7. It provides the ability to automatically send window messages such as "close," "cancel" or "continue" to most windows appearing on active desktops. The developer can configure the Dialog Filter through an editor tool to send any button message to a process message loop to control the messages sent to specific windows.

Windows Embedded Standard 7 has several new capabilities to complement Dialog Filter:

- Branding removal. The Embedded developer can remove branding from the logon and desktop backgrounds, including strings and brands found during power management transitions.

- Credential Provider interface. Windows Embedded Standard 7 exposes the same Credential Provider interface as Windows 7. Credential Provider Samples are provided in a separate MSDN download.

- Message Box Auto Reply. This feature is provided in both Windows Embedded Standard 7 and Windows Embedded Standard 2009, but the primary difference is that Windows Embedded Standard 7 runs on Windows 7, where Message Boxes are largely replaced by a new control, Task Dialogs. The Embedded developer should use the Dialog Filter described below to manage Windows on the active desktop.

- The Dialog Filter has a 64-bit service and a 32-bit service (WoW64) in Windows 7 64-bit edition, and it will process window messages from both 32-bit and 64-bit window processes without observed differences.

Windows PowerShell 2.0

Windows Embedded Standard 7 includes the Windows PowerShell 2.0 feature set, a new command-line shell and task-based scripting technology that provides administrators with comprehensive

control and automation of system administration tasks, which increases administrator productivity. Windows PowerShell 2.0 features numerous system administration utilities, consistent syntax and naming conventions and improved navigation of common management data such as system registry, certificate stores and WMI. Windows PowerShell 2.0 also includes an intuitive scripting language designed specifically for IT administration.

Internet Explorer 8
Internet Explorer 8 is included in Windows Embedded Standard 7, while Windows Embedded Standard 2009 ships Internet Explorer 6 or 7 — Internet Explorer 8 is available for download from ECE/MOO. Internet Explorer 8 provides new and enhanced features such as tabbed browsing, RSS feeds, anti-phishing, better viewing and printing experiences and improved securities.

Unified Background Process Manager
The Unified Background Process Manager (UBPM) feature set is a new infrastructure in Windows 7 (and therefore in Windows Embedded Standard 7) that manages both Tasks and Services. UBPM is an improvement over the previous Task Scheduler component that shipped in Windows Embedded Standard 2009, as it brings cohesive behavior for Tasks and Services and adds value in serviceability because both Task Scheduler and Services will automatically benefit from updates made to the UBPM engine.

BitLocker
BitLocker Drive Encryption is a data protection feature in Windows Embedded Standard 7. Having BitLocker integrated with the operating system addresses the threats of data theft or exposure from lost, stolen or inappropriately decommissioned computers. BitLocker can work with or without the Trusted Platform Module (TPM), which is a hardware component installed in many newer computers by the computer manufacturers.

Speech Recognition
In Windows Embedded Standard 7, the Speech Recognition feature is integrated into the Speech feature set. With Speech Recognition, the system can understand spoken word and natural language and also translate language in text format or perform the spoken commands.

Network and Sharing Center
The Network and Sharing Center in Windows Embedded Standard 7 puts developers in control of their network connectivity. It is a place where developers can check their connection status, view their network visually and troubleshoot connection problems. The Network and Sharing Center summarizes network information in the form of a Network Map and provides a graphical representation if a connection is down.

User Account Control (UAC)
UAC is a new feature in Windows Embedded Standard 7 that prompts a dialog box seeking users' permission to continue or stop whenever a system-level change is made. Options are provided for users to select various levels of UAC notifications. The default user account created during the installation is still a protected administrator.

Windows Touch
With Windows Embedded Standard 7, users with touch-screen monitors can scroll, resize windows, play media and pan and zoom with their fingers for a more direct and natural way to work. The Start menu, Windows Taskbar and Windows Explorer are all touch-friendly, with larger icons that are easier to select with fingers.

Windows Embedded Standard 7 also introduces support for new multi-touch technology, so users can control what happens on the screen with more than one finger. For example, users can zoom in on an image by moving two fingers closer together, as if they are pinching something, or zoom out by moving two fingers apart. They can rotate images on the screen just by rotating one finger around another, and they can right-click by holding one finger on the target and tapping the screen with a second finger.

Conclusion

Windows Embedded Standard 7, the next-generation platform in the Windows Embedded family, delivers the latest Windows 7 technologies to OEMs in a highly customizable and componentized form. Windows Embedded Standard 7 enables developers to quickly configure unique, high-performing, service-oriented commercial and consumer devices that require rich applications, services and end-user experiences while easily connecting to common industry standards and Microsoft technologies.

Additional Resources

Microsoft Windows Embedded Web site:
www.microsoft.com/windowsembedded