

Windows XP for embedded applications

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The embedded version of Windows XP is a componentized version of the well-known Windows XP Professional operating system. Instead of everything being wrapped tightly into a single package, XP Embedded breaks the OS down into more than 10,000 individual components, allowing developers to create systems that have the functionality and familiar features of XP. One of the most attractive features of XP Embedded is that it is much smaller than XP for desktop systems — so small, in fact, that it can fit on a 512 MB CompactFlash® card, and still leave room for system applications and data backup. The CompactFlash card resists vibration and shock for reliable storage and can be replaced easily for fast system upgrades.

Also of great interest for the embedded system developer are XP Embedded's choices of boot methods, its wide range of communications options, and the array of tools available for system configuration. XP Embedded uses the same application programming environment as XP, which makes application development quick and easy, and allows the same application to run on desktop and embedded machines. And it has improved code protection for critical kernel structures, file protection and more.

Suggested industrial applications for XP Embedded include human-machine interface (HMI) panels, process automation systems, industrial robots, inspection systems, Soft programmable logic controllers (Soft PLCs), remote control devices and factory monitoring systems. Accordingly, many Advantech systems are compatible with XP Embedded. A few of the many possible consumer and commercial applications of XP Embedded would include set top boxes and terminals such as kiosks and ATMs.

Boot options

Embedded XP supports a variety of boot methods. Remote boot service allows the system to automatically download the system image and boot from a network, which is useful for diskless systems and for systems in which there are frequent system updates. It also makes it possible to deploy systems with no persistent storage at all, either hard drive or Flash RAM.

The Enhanced Write Filter (EWF) feature allows the system to boot from a write-protected hard drive, Flash or other read-only media, or to use a protected area on a disk. Instead of writing to the boot drive (which, as in the case of Flash, may have a limited number of write cycles), the system will write to a local cache. By protecting a volume from write access it eliminates the threat of viruses, and running from RAM will eliminate corrupt files if the machine is shut down in the middle of an operation. EWF has password protection and can be turned on and off when installing new software.

EWF redirects all write operations to another storage location called an overlay, which can be in RAM or on another disk partition. In addition, an EWF volume is created on the media in unpartitioned disk space to store configuration information about all EWF-protected volumes on the device, including the number and sizes of protected volumes and overlay levels. XP Embedded makes it possible to configure a run-time image to boot from a hibernation file with EWF enabled. This allows for quicker boot time, makes it possible to define the state of a system by booting with specific applications and services running, and supports the hibernate once, resume many (HORM) utility. HORM allows the user to define a hibernated state that quickly wakes up the system without having to perform a full OS boot, which is useful for systems that spend much of their time in standby mode.

As another aid to the boot process, Advantech offers the Advantech WatchDog API, which works with a watchdog timer (WDT: a device or electronic card that performs a specific operation after a

certain period of time if something goes wrong with an electronic system and the system does not recover on its own). The watchdog timer can be programmed to perform a warm boot (restarting the system) after a certain number of seconds during which a program or computer fails to respond following the most recent user input.

Communications and networking

XP Embedded retains all of XP's communication features, but makes them available individually. Supported communications modes can include Ethernet, USB 2.0, IrDA (Infrared Data Association), IEEE 1394 (FireWire), Bluetooth and more. The Windows Firewall gives users and administrators more control over inbound connections.

Another communications feature, Remote Desktop Protocol Version 5.2, makes it possible to build Windows XP Embedded-based devices that can communicate with Windows Server 2003 via a Terminal Services session. It supports 24-bit color and high resolution (1600 x 1200). Other features include standard Web Services, which provides developers with a high-level interface for Web server and FTP server functionality; and Internet Connection Sharing, which allows multiple devices to share a single Internet connection.

Memory management

Windows XP improves on memory management in two ways. The first is better memory pooling, which allows for prioritization of memory tasks, thus creating shorter boot times. The second is input/output (I/O) throttling, which allows for optimal memory allocation and stability.

Protection from bad device drivers

Two features that Embedded XP shares with regular Windows XP help prevent problems with device drivers. Device Driver Rollback makes it possible to go back to the previous known good version of a device driver, while device driver signing indicates whether a driver has passed the Windows Hardware Quality Laboratory (WHQL). If a driver has not been approved, a dialog box indicates that the driver has not been approved for Windows XP/Windows XP Embedded.

Developing for the target system

The programming model for XP Embedded is the same as for XP for the desktop, and all application development skills — WIN32, MFC, ATL or .NET — are directly transferable. A good way to find out if an existing application can be migrated to Windows XP Embedded is to use Advantech Windows XP Embedded Ready Platform, a ready-to-run ePlatform pre-loaded with Windows XP Embedded. Advantech also offers inexpensive Design-to-Order Services (DTOS).

Platform development tools

Windows Embedded Studio, included in Windows XP Embedded, is built on the Win32 programming model and includes four major tools: Target Analyzer, Target Designer, Component Designer, and Component Database Manager. Since XP Embedded uses the same components as XP professional, it is easy to build and configure an XP Embedded operating system image.

- *Target Analyzer* analyzes the content of the target hardware and creates a file to import into Target Designer or Component Designer.
- *Target Designer* is used to create, customize, and build a bootable run-time image. It provides a hosted, high-performance build process that features advanced component browsing; multiple tree views and customizable filters for easy discovery of desired features. A drag and drop user interface makes for easy integration of selected features. It also provides automated dependency checking and an issues list. Target Designer also contains a set of design templates, each containing the basic functionality for a specific device. Included are templates for basic, advanced and digital set top boxes; a home gateway; a generalized information appliance; a kiosk/gaming console; a point of sale terminal; a network attached storage device; and Windows-Based Terminal Professional.
- *Component Designer* is used to create or modify components. It makes it possible to quickly convert unique drivers and applications into components that can be used in a custom operating system image.

- The *Component Database Manager* manages the component database and repositories. An additional feature, BootPrep, is a command-line tool that allows MS-DOS bootable media to boot to Windows XP Embedded. Another boot-related feature is Simple Boot Flag Support, a BIOS register that allows for faster boot times on subsequent reboots. Boot time is also reduced by parallel processing of drivers and registry data at boot.

Advantech supports embedded XP

Many Advantech systems are compatible with Windows XP Embedded, including UNO, TPC, IPPC and IPC. The UNO series is highly rugged and robust, and suitable for use in critical and harsh environments. It has a strong mechanical and fanless design, flexible mounting options, and offers excellent anti-vibration and anti-shock properties. It can endure high operating temperatures and almost anything an industrial environment can demand.

The TPC Series of ultra-slim, light, fanless and vibration-resistant Touch Panel Computers provides an ideal HMI platform for most automation applications. They are available in display sizes of from 5.7 to 15 inches and feature ARM and x86 processors that have low power consumption do not require a fan, which makes them ideal for industrial environments. In addition, the product housings are made from a magnesium alloy which results in light weight, corrosion resistance and excellent heat dissipation.

The IPPC (Industrial Panel PC) series feature robust design and compact size, making for a good fit for almost any industrial application. Constructed with a stainless steel chassis and heavy-duty aluminum front panel, the rugged design of IPPCs stands up to tough industrial environments. Equipped with powerful Intel Pentium III and 4 processors, the IPPC has high computing power, but also provides expansion slots for add-on cards.

Advantech IPC chassis provide customers with a more complete selection pool to assist their decision making. Most chassis can be equipped with a redundant power supply and feature alarm notification of system malfunctions. Each IPC chassis is CE and UL approved. All these advantages make Advantech IPC chassis the best choice for price, performance, and total cost of ownership.

For updates on EP Embedded compatible products, go to http://www.advantech.com/solutions/ess/CMScontent.asp?doc_id=%7BA923EEB4-AD3C-4CD8-B623-0A88B372AB6&category_id=1-EE5PM

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