

Why Windows Embedded Standard 2009?

Abstract

Windows Embedded Standard 2009 is the next generation of Windows XP Embedded. This white paper describes current trends in the global computing and embedded markets; the challenges facing OEMs; and the benefits and improvements this new Windows operating system offers to device manufacturers building smart, connected, service-oriented embedded devices.

Global Driving Factors

Living in the Cloud

Networking is one of the most important trends driving change in the embedded market. In recent years, the ability to communicate with embedded devices over a network or even the Internet has changed the way we view these devices significantly. Many embedded devices now are connected using the Internet Protocol (IP), either within an enterprise LAN or globally using a WAN or the Internet. Previously, these systems were more or less limited to being clients fulfilling the dedicated tasks for which they were created. Examples of this type of devices include point-of-service terminals in an enterprise scenario or consumer set-top boxes in a global scenario.

In the past, making changes to these systems after they left the factory was challenging, particularly in light of regulatory requirements. Today, however, embedded devices need to be updated, even while in the field. In the near future, it is also likely that embedded devices will transform from clients to a server into being nodes in an application mesh. In this role, devices are required to act as clients or servers, depending on the functionality requested by the usage scenario.

Pervasive Computing

Today, we find embedded devices in many real-life situations, where they would have been unexpected not too long ago. For example, we can carry around an MP3 player that holds our entire music collection with thousands of songs and videos, and also lets us listen to radio stations and buy the music we like over the air. We can have in our pocket a digital camera capable of taking hundreds of pictures that we can instantly upload to a web photo album to share with our family and friends around the world, whether for online viewing or down streaming to a digital picture frame in their living room. This is only the beginning of an evolution of embedded devices that will create new usage scenarios, form factors, and business opportunities.

Ease of Use

As embedded computing devices become more integrated in our daily life, it is very important that these devices are intuitive and easy to use. Consumers are unlikely to read and remember instruction manuals. Therefore, we can expect many user interface innovations in the near future that will serve as enablers for pervasive computing.

Environmental Awareness

Embedded devices consume resources through both the manufacturing process and end-user operation. The growing number of devices means additional demand for environmental resources.

In support of the global conservation effort to “go green,” embedded devices must be designed to consumer fewer resources, whether in manufacturing or in usage. For example, power consumption can be reduced significantly by making devices smarter about when and how they enter sleep mode and then resume normal operations.

Global Embedded Market Trends

Processing Power Is Still Increasing

Embedded processor manufacturers have kept up the pace of increasing processing power, while at the same time reducing the costs of manufacturing processes. Moore’s Law, stating that processing power doubles every 18 months, is still in effect, and it is complemented by efforts to make processor less power hungry and heat emitting.

This is a positive development for embedded device manufacturers. Now they offer more powerful processors at the same price as less advanced silicon designs in the past. This trend is accelerating the migration of embedded devices from 8- and 16-bit controllers to 32- or even 64-bit processors.

Increasing Complexity

Devices must do more and more, as pervasive computing become a reality and new usage scenarios develop. Look at networking, for example. In the past, only a sophisticated device would have IP connectivity. Now, a typical device is generally expected to have IP connectivity, USB connectivity, Bluetooth, and even IR in some cases. This means a significant increase in the complexity of designing and building these devices, as well as more complex software and hardware.

Shorter Device Life Cycles

Traditionally embedded devices have had a longer lifecycle than that of desktop and laptop computers. Embedded devices were designed to be in the field for at least a decade. This is changing, however, as devices become more connected and pervasive. Now devices have a shorter lifecycle so they can leverage the latest software and hardware technologies and infrastructure to do more and enable new usage scenarios.

Standards

Envisioning a connected ecosystem of smart embedded devices, it becomes clear that the best user experience and interoperability can only be achieved if all devices use interoperable means for detection of presence, authentication, and communication. To satisfy this requirement, standards such Plug and Play or Device Profile Web Services are evolving into the connected device area to provide a common substrate for building heterogeneous solutions.

OEM Challenges

Build or Buy?

The fact that connected smart devices are much more complex to build means that an OEM today must decide if they want to create a new device from scratch, or use a platform to help them get started. Frequently, it does not make as much commercial sense to develop for example, a custom OS or a network stack, as it did in the past. Devices also have a shorter lifecycle. In-house development of the latest software and hardware technologies and infrastructure (i.e., “the

plumbing”) for devices that will be in the field for only a few years is not a good investment of time or resources.

In most cases, the OEM is better off leveraging a standard platform with all the device technologies and infrastructure readily available. The platform abstracts away the complexity, brings the latest software and hardware technologies and infrastructure, and supports industry standards and interoperability. Then the OEM can focus its effort on creating value add features to differentiate its devices in the market. This “best practice” enables an OEM to achieve a shorter time to market.

Choosing a Reliable Platform

When deciding on an embedded platform, developers should choose one that is future-proof and reliable, because they are partly betting the future of the product or even the company on it. A good platform provides dedicated professional support, combined with long lasting market availability matching the requirements of the embedded market. Additionally, it should provide a clear roadmap of upcoming development plans and a strong commitment from the platform vendor.

Security

One of the larger pain points of pervasive networking is security. It is critical that devices support the latest security standards and mechanisms to enable them to participate in more global security concepts. An example would be a directory service or PKI infrastructure provided by the network management.

Device Management

For connected environments, it is important that remote change management requirements of devices are not treated as an afterthought. Devices should have the update functionality already onboard, ideally supplied as part of the device platform.

Windows Embedded Standard 2009 Offerings

Windows Embedded Standard 2009 is the platform for embedded devices based on the x86 processor architecture. Windows Embedded Standard 2009 as an overall operating system development platform can satisfy the challenges and requirements demanded by the driving factors, trends, and challenges, previously described.

Supplied to OEMs as a componentized version of Windows XP Professional, Windows Embedded Standard 2009 provides the same outstanding functionality together with flexible development tools and ease of use.

Broad Range of Configurable Functionality

Not only functionality components available in Windows XP Professional can be included in a Windows Embedded Standard 2009 image but also developers have the power and flexibility to choose only the required components and exclude unnecessary components of the platform from their embedded image, thus customizing the system to their specific product needs. This transforms the desktop system into an embedded operating system platform. Additionally, running less code leads to a leaner and faster image with fewer background processes. At the same time, the image is more robust and secure because less code is running and there is less surface area for malicious code to attack.

Embedded Enabling Features

Windows Embedded Standard 2009 offers Embedded Enabling Features (EEFs) in addition to the Windows XP Professional components. EEFs satisfy the requirements of special embedded use cases such as disk protection, the ability to startup from compact flash or read-only devices, device management for simple scenarios, and tools for configuring and cloning the Windows Embedded Standard 2009 system.

A couple of EEFs called Enhanced Write Filter (EWF) and File Based Write Filter (FBWF) allow storage partitions to be protected against write-access to guarantee that systems stay configured in the field as they were leaving the factory. Another EEF called El Torito CD enables kiosk systems to operate completely diskless, starting up from CD. To maintain embedded systems in smaller deployments, a third EEF called Device Update Agent (DUA) allows updates to be scripted and then transported by an update agent.

There is a fast startup EEF called Hibernate Once Resume Many (HORM) that enables systems to startup very quickly from a one-time created hibernation file. This scenario is very helpful, for example, in industrial automation, when automation controllers need to be up and running as quickly as possible, even after a power outage.

Security

In Windows Embedded Standard 2009, security is included as part of the platform, just as it is with Windows XP Professional. Additionally, the security functionality is based on well known and open security standards such as Kerberos and NTLM authentication; it supports Public Key Infrastructure; and it has state-of-the-art security mechanisms built into the network and Wi-Fi stack.

Fast Time to Market

Windows Embedded Standard 2009 enables OEMs to save time by reusing existing applications and building blocks of code. The Windows Embedded Studio toolkit provides automated functionalities that detect hardware components on the device and check dependencies among the functionality blocks to build a running system in just a few simple steps. Building an embedded image typically takes a few days to a few weeks, depending on its complexity.

This stands in sharp contrast to development efforts on other embedded platforms, which can take months or even years on average.

From the application development perspective, developers can take advantage of the Visual Studio IDE and all existing development technologies on the Microsoft platform, including Win32, COM, MFC, and all versions of the .NET Framework as well as Silverlight. The .NET Framework support includes the newest innovations such as Windows Presentation Foundation, Windows Communication Foundation, and Windows Workflow Foundation. With these new technologies, developers have the means to create stunning new UIs that make embedded devices easier and more intuitive to use.

Simple Enterprise Integration

In a corporate network it is very important that all connected systems follow standards and regulations.

Devices built on Windows Embedded Standard 2009 can be easily integrated in all enterprise infrastructure technologies, from Active Directory, to PKI, to security solutions, because these components are already part of the platform. Windows Embedded Standard 2009 even supports Network Access Protection (NAP), a technology freshly introduced with Windows Server 2008. It guarantees that only systems conforming to specific standards have access to the internal network. All other systems only have access to an update server to obtain required updates and fixes until they are in a desired state.

The same approach can be chosen for enterprise-class change management. Windows Embedded Standard 2009 provides clients, and also the required infrastructure, to satisfy Windows Server Update Services (WSUS), System Center Configuration Manager (SCCM), and System Center Operation Manager (SCOM) requirements. Therefore, Windows Embedded Standard 2009 devices can be managed seamlessly with the same tools and infrastructure as all other desktops and servers. Additionally, Windows Embedded Standard 2009 now includes the Sysprep utility to enable SCCM Operating System Deployment (OSD), providing OEMs another method for deploying custom embedded operating system images.

Synergies with the Windows Ecosystem

One of the most valuable benefits of Windows Embedded Standard 2009 is the ability to participate directly in all the innovations and developments related to the Win32 platform.

In a typical embedded device project, for example, developing drivers or other parts of the infrastructure is a very costly and time-consuming process. In comparison, the drivers for standard devices are either provided in the Windows Embedded Standard 2009 development toolkit, Windows Embedded Studio, or are available through the corresponding device manufacturer's support site. OEMs need to develop drivers on the Windows Embedded Standard 2009 platform only if the project requires custom hardware peripherals as part of the device.

Windows Embedded Standard 2009 can be leveraged as a powerful application platform. Any application that works on Windows XP Professional runs on a Windows Embedded Standard 2009 image, as long as the required OS functionality is part of this image. This appears to be a simple fact, but looking closer, it means open access to the wealth of applications, tools, and utilities available for the Win32 platform.

Over time, OEMs can participate in any innovation that is brought into the platform, either by Microsoft or any other software vendor in the world. On the Microsoft side, the Windows Embedded Standard product team drives all efforts to integrate innovations into the toolkit as soon as possible.

Saving Power and Resources

To save power and/or reduce heat emission, Windows Embedded Standard 2009 offers the full range of ACPI power management, whereby disk drives, monitors, or the complete system can be suspended or hibernated if certain services are not required. These APIs can be accessed by using tools or development frameworks so that power management can be customized to meet the requirements of the embedded device. Because Windows Embedded Standard 2009 is built for the x86 hardware platform, it will benefit from the "green" innovations of processor manufacturers.

Shared Success Based Licensing Model

Because the development toolkit is free to try, anyone can easily start using Windows Embedded Standard 2009. Royalty fees apply only after the OEM starts to create and ship devices to their customers. This reduces the risk for the OEM customer and therefore provides a shared success model.

Professional Documentation, Support and a Vivid Partner Ecosystem

Microsoft is committed to provide [comprehensive documentation and technical resources](#) for Windows Embedded Standard 2009. This comprehensive material is a valuable source of how-to articles and troubleshooting tips that serves both beginning users and experts.

[Microsoft Customer Support Services](#) offer a single point of contact if a device manufacturer needs help solving a specific problem or troubleshooting support.

To complete the picture, Windows Embedded Standard 2009 is supported by many Microsoft [partners](#), who offer all kinds of services, including training, system integration, implementation help, and much more.

Summary

Embedded computing devices are undergoing significant changes, as they evolve from specialized, isolated niche systems into smart, connected devices that play a major role in a global business and consumer trend called pervasive computing.

Windows Embedded Standard 2009 enables OEMs to benefit from these trends in a very efficient and powerful way. It enables device manufacturers to participate in all the innovations occurring on the Windows platform by using prefabricated building blocks to focus on adding custom value to the product. It is all supported by state-of-the-art OS and applications development tools for all available Microsoft development technologies.

Overall, the sophisticated toolkit in combination with professional support and documentation leads to significantly shortened product cycles and therefore, a faster time-to-market for device manufacturers.

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