

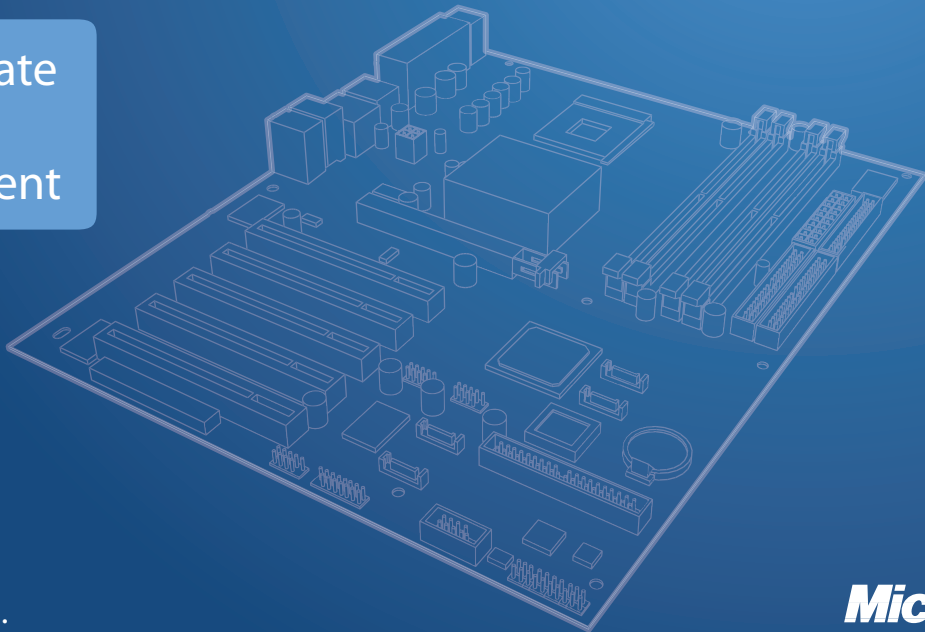


Windows® Embedded CE 6.0

Preparation Kit

Certification Exam Preparation

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Not for resale.

Microsoft

Foreword

It seems like yesterday that we released Windows CE 1.0 to the market, although 12 successful years have passed and many things have changed. New technologies have emerged, while others have vanished; and we continue to push forward with our partners to take full advantage of new hardware and software innovations. Windows Embedded CE continues to evolve, yet remains a small-footprint, real-time, embedded operating system that runs on multiple processor architectures and an amazing array of devices, including robots, portable ultrasound imaging systems, industrial controllers, remote sensor and alarm systems, point-of-sale front-ends, media streamers, game consoles, thin clients, and even devices most of us would never associate with a Microsoft operating system. Perhaps one day Windows Embedded CE will run on devices on the moon. It would not come as a surprise. Windows Embedded CE can be everywhere that computer devices help to make life easier and fun.

Right from the start, we have focused on the needs of professional embedded developers by creating a comprehensive suite of development tools and by supporting Windows programming interfaces and frameworks. We have integrated the Windows Embedded CE development tools with Visual Studio 2005 to provide developers with the freedom to customize the operating system and build the applications for the operating system. Today, Windows Embedded CE 6.0 supports x86, ARM, MIPS and SH4 processors out of the box, and includes approximately 700 selectable operating system components. CE provides the tools needed to configure, build, download, debug, and test operating system images and applications, ships with source code for the kernel, device drivers, and other features, and gives application developers the flexibility to create Win32, MFC, or ATL native code applications or managed applications based on the .NET Compact Framework. As part of the Microsoft Shared Source Initiative, we ship more than 2.5 million lines of CE source code, which gives developers the ability to view, modify, rebuild, and release the modified source. And recently we launched a "Spark your Imagination" program to give hobbyist developers access to hardware and CE software development tools at low costs.

You can find plenty of information about the CE operating system, development tools, and concepts in this preparation kit for Microsoft Certified Technology Specialist (MCTS) Exam 70-571 "Microsoft Windows Embedded CE 6.0, Developing" released in May 2008. We are very excited about Exam 70-571. It signifies another important milestone in the Windows Embedded CE success story. Now, for the first

time, embedded developers have the ability to assess and demonstrate their skills regarding the development of embedded solutions based on Windows Embedded technologies, and they can gain recognition for their knowledge and proficiency. Anybody with a passion for CE 6.0 should consider taking the exam. We hope that this book accelerates your preparation just as Windows Embedded CE 6.0 accelerates your development processes. Best wishes from all of us here at the Microsoft development team!

Mike Hall

Windows Embedded Architect
Microsoft Corporation

Introduction

Welcome to the Microsoft Windows Embedded CE 6.0 Exam Preparation Kit. The purpose of this preparation kit is to help Windows Embedded CE developers prepare for the Microsoft Certified Technology Specialist (MCTS) Windows Embedded CE 6.0 Application Development certification exam.

By using this preparation kit, you can maximize your performance on the following exam objectives:

- Customize the operating system design.
- Clone Windows Embedded CE components and manage catalog items.
- Generate a Software Development Kit (SDK).
- Build a run-time image and analyze build results.
- Deploy, monitor, and optimize a run-time image.
- Develop multi-threaded system applications.
- Implement exception handling.
- Support power management in applications, device drivers, and in the OEM adaptation layer (OAL).
- Configure a Board Support Package (BSP), including customizations to boot loader and memory mappings.
- Develop full-featured stream interface drivers.
- Implement Interrupt Service Routines (ISRs) and Interrupt Service Threads (ISTs) and marshal data between kernel-mode and user-mode components.
- Debug kernel-mode and user-mode components to eliminate software-related errors.
- Use the Windows Embedded CE Test Kit (CETK) to perform standard and user-defined tests on a development workstation and on a target device.
- Develop Tux extension components to include custom device drivers in CETK-based tests.

Intended Audience

This Exam Preparation Kit is for system developers with a basic level of knowledge about operating system design, programming system components, and debugging on the Windows Embedded CE platform.

Specifically, this Preparation Kit is designed for readers with the following skills:

- Basic knowledge of Windows and Windows Embedded CE development and development
- At least two years of experience with C/C++ programming and the Win32 Application Programming Interface (API).
- Familiarity with Microsoft Visual Studio 2005 and Platform Builder for Windows Embedded CE 6.0.
- Basic debugging skills using standard Windows debugging tools.



MORE INFO Audience profile for Exam 70-571

For information about prerequisites to pass the certification exam, see the Audience Profile section in the Preparation Guide for Exam 70-571 at <http://www.microsoft.com/learning/exams/70-571.aspx>.

Features of This Book

Each chapter opens with a list of exam objectives covered in the chapter and a “Before You Begin” section, which prepares you for completing the chapter. The chapters are then divided into lessons. Each lesson begins with a list of objectives and states an estimated lesson time. The lesson content is subdivided further according to topics and lesson objectives.

Each chapter ends with hands-on procedures and a short summary of all chapter lessons. This is followed by a brief check of key terms and suggested practices which test your knowledge of the chapter material and help you successfully master the exam objectives presented in the chapter.

- ▶ The hands-on examples give you an opportunity to demonstrate a particular concept or skill and test what you have learned in the chapter lessons. All hands-on examples include step-by-step procedures that are identified with a bullet symbol like the one to the left of this paragraph. To help you successfully master the presented procedures,

worksheets with detailed step-by-step instructions for each lab are also included in the companion material for this book.

To complete the hands-on procedures, you must have a development computer with Microsoft Windows XP or Microsoft Windows Vista, Visual Studio 2005 Service Pack 1, and Platform Builder for Windows Embedded CE 6.0 installed.

Hardware Requirements

The development computer must have the following minimum configuration, with all hardware on the Windows XP or Windows Vista Hardware Compatibility List:

- 1 GHz 32-bit (x86) or 64-bit (x64) processor or faster.
- 1 gigabyte (GB) of RAM.
- 40 GB hard drive with at least 20 GB of available disk space for Visual Studio 2005 and Platform Builder.
- DVD-ROM drive.
- Microsoft Mouse or compatible pointing device.
- Paging file set to twice the amount of RAM or larger.
- VGA-compatible display.

Software Requirements

The following software is required to complete the procedures in this course:

- Microsoft Windows XP SP2 or Windows Vista.
- Microsoft Visual Studio 2005 Professional Edition.
- Microsoft Windows Embedded CE 6.0.
- Microsoft Visual Studio 2005 Professional Edition SP1.
- Microsoft Windows Embedded CE 6.0 SP1.
- Microsoft Windows Embedded CE 6.0 R2.



NOTE Trial versions of Visual Studio 2005 and Windows Embedded CE 6.0

Installation guidelines and evaluation versions of Visual Studio 2005 and Windows Embedded CE 6.0 are available on the Microsoft Website, at <http://www.microsoft.com/windows/embedded/products/windowsce/getting-started.mspx>.

Notational Conventions

- Characters or commands that you type appear in **bold lowercase** type.
- <Angle brackets> in syntax statements indicate placeholders for variable information.
- *Italic* is used for book titles and Web addresses.
- Names of files and folders appear in Title Caps, except when you are to type them directly. Unless otherwise indicated, you can use all lowercase letters when you type a file name in a dialog box or at a command prompt.
- File name extensions appear in all lowercase.
- Acronyms appear in all uppercase.
- Monospace type represents code samples, examples of screen text, or entries that you might type at a command prompt or in initialization files.
- Square brackets [] are used in syntax statements to enclose optional items. For example, [*filename*] in command syntax indicates that you can choose to type a file name with the command. Type only the information within the brackets, not the brackets themselves.
- Braces { } are used in syntax statements to enclose required items. Type only the information within the braces, not the braces themselves.

Keyboard Conventions

- A plus sign (+) between two key names means that you must press those keys at the same time. For example, “Press ALT+TAB” means that you hold down ALT while you press TAB.
- A comma (,) between two or more key names means that you must press each of the keys consecutively, not together. For example, “Press ALT, F, X” means that you press and release each key in sequence. “Press ALT+W, L” means that you first press ALT and W together, and then release them and press L.
- You can choose menu commands with the keyboard. Press the ALT key to activate the menu bar, and then sequentially press the keys that correspond to the highlighted or underlined letter of the menu name and the command name. For some commands, you can also press a key combination listed in the menu.

- You can select or clear check boxes or option buttons in dialog boxes with the keyboard. Press the ALT key, and then press the key that corresponds to the underlined letter of the option name. Or you can press TAB until the option is highlighted, and then press the spacebar to select or clear the check box or option button.
- You can cancel the display of a dialog box by pressing the ESC key.

Notes

Several types of Notes appear throughout the lessons.

- Notes marked **Tip** contain explanations of possible results or alternative methods.
- Notes marked **Important** contain information that is essential to completing a task.
- Notes marked **Note** contain supplemental information.
- Notes marked **Caution** contain warnings about possible loss of data.
- Notes marked **Exam Tip** contain helpful hints about exam specifics and objectives.

About the Companion CD-ROM

The Companion CD contains a variety of informational aids that may be used throughout this book. This includes worksheets with detailed step-by-step instructions and source code used in hands-on exercises, as well as complimentary technical information and articles from the Microsoft developers.

An electronic version (eBook) of this book is included with a variety of viewing options available. The Companion CD also contains a complete set of post-press files for this official self-paced study guide to produce a printed book. The post-press files are in Portable Document Format (PDF) and have the required crop marks for professional printing and binding.

Microsoft Certified Professional Program

The Microsoft Certified Professional (MCP) program provides the best method to prove your command of current Microsoft products and technologies. The exams and corresponding certifications are developed to validate your mastery of critical competencies as you design and develop, or implement and support, solutions with Microsoft products and technologies. Computer professionals who become Microsoft certified are recognized as experts and are sought after industry-wide. Certification brings a variety of benefits to the individual, employers, and organizations.



MORE INFO All the Microsoft certifications

For a full list of Microsoft certifications, go to <http://www.microsoft.com/learning/mcp/default.asp>.

Technical Support

Every effort has been made to ensure the accuracy of this book and the contents of the companion CD. If you have comments, questions, or ideas regarding Windows Embedded CE development, contact a Windows Embedded CE specialist through Microsoft Product Support Services (PSS), Microsoft Developer Network (MSDN), or the following blog sites:

- **Nicolas BESSON's Weblog** Contact the principal author of the Windows Embedded CE 6.0 Exam Preparation Kit with feedback and subject suggestions for new articles related to those subjects at <http://nicolasbesson.blogspot.com>.
- **Windows Embedded Blog** Read about Mike Halls tricks, tips, and random thoughts on Windows Embedded at <http://blogs.msdn.com/mikehall/default.aspx>.
- **Windows CE Base Team Blog** Get background information about Windows Embedded CE kernel and storage technologies and system tools directly from the Microsoft developers at http://blogs.msdn.com/ce_base/default.aspx.



MORE INFO Windows Embedded CE product support

For detailed information about all available Windows Embedded CE product support options, go to <http://www.microsoft.com/windows/embedded/support/products/default.mspx>.