Windows ACPI Emulated Devices Table

Version 1.0 - April 6, 2009

Abstract

This specification contains details of an Advanced Configuration and Power Interface (ACPI) table that was created for use with Windows® operating systems when they are running in guest partitions in a virtual machine environment.

This information applies for the following operating systems:  
 Windows 7  
 Windows Server® 2008  
 Windows Vista®  
 Windows Server 2003

For the latest information, see:   
 <http://www.microsoft.com/whdc/system/platform/virtual/WAET.mspx>

**WINDOWS ACPI EMULATED DEVICES TABLE (WAET) ACPI TABLE SPECIFICATION LICENSE**

**IMPORTANT—READ CAREFULLY: This Microsoft License Agreement ("Agreement") is a legal agreement between you (either an individual or a single entity) and Microsoft Corporation for the version of the Microsoft specification identified above which you are about to download ("Specification"). BY DOWNLOADING, COPYING OR OTHERWISE USING THE SPECIFICATION, YOU AGREE TO BE BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THE TERMS OF THIS AGREEMENT, DO NOT DOWNLOAD, COPY, OR USE THE SPECIFICATION.**

The Specification is owned by Microsoft or its suppliers and is protected by copyright laws and international copyright treaties, as well as other intellectual property laws and treaties. **THE SPECIFICATION IS LICENSED, NOT SOLD.**

1.         **GRANT OF LICENSE**.

(a)   Provided that you comply with all terms and conditions of this Agreement, Microsoft grants to you the following non-exclusive, worldwide, royalty-free, perpetual, non-transferable, non-sublicensable, limited license under any copyrights or patents that cover the table values described in the Specification and that are owned or licensable by Microsoft without payment of consideration to third parties,

(i)     to reproduce copies of the Specification for your and your contractor’s internal use for the sole purpose of (1) modifying your firmware and/or BIOS for computing devices (**"Firmware"**) so that it writes to memory the appropriate table values in the Specification or (2) modifying your software so that it may read from memory the appropriate table values (the **"Purpose"**),

(ii)    to implement the table values in your firmware and/or BIOS,

(iii)   to license to third parties directly and indirectly the table values as part of your Firmware (and any related documentation),

The foregoing license is granted only to the extent necessary to accomplish the Purpose and to license and/or distribute your Firmware containing the table values to third parties. The foregoing license shall not extend to any features of your Firmware that (i) are not required to comply with the Specification or (ii) to which there was a practicable alternative to infringing a patent.

(b)    Microsoft reserves all other rights it may have in the Specification, its implementation and any intellectual property therein.  The furnishing of this document does not give you or any other entity any license to any other Microsoft patents, trademarks, copyrights or other intellectual property rights.  Microsoft does not grant to you or any other entity any implied licenses or rights whatsoever under this Agreement.  Specifically, this Agreement does not grant any express or implied licenses or rights to any enabling technologies that may be necessary to fully utilize the tables or the table values described in the Specification.

2.    **ADDITIONAL LIMITATIONS AND OBLIGATIONS**.

(a)    You may use all or some of the tables provided, however for each table that you use, You must implement such table in its entirety (i.e. all fields) and without modification (e.g., byte length, offset, and permissible values as described in the Specification).

(b)    Your license rights to the Specification are conditioned upon you not creating, modify, or distributing your Firmware in a way that such creation, modification, or distribution may (a) create, or purport to create, obligations for Microsoft with respect to the Specification (or intellectual property therein) or (b) grant, or purport to grant, to any third party any rights or immunities to Microsoft’s intellectual property or proprietary rights in the Specification.

(c)    The foregoing license is applicable only to the version of the Specification which you are about to download. It does not apply to any additional versions of or extensions to the Specification.

(d)    Without prejudice to any other rights, Microsoft may terminate this Agreement if you fail to comply with the terms and conditions of this Agreement. In such event you must destroy all copies of the Specification and must not further distribute the table values.

3.     **INTELLECTUAL PROPERTY RIGHTS**. All ownership, title and intellectual property rights in and to the Specification, and any copies you are permitted to make herein, are owned by Microsoft or its suppliers

4.**DISCLAIMER OF WARRANTIES. To the maximum extent permitted by applicable law, Microsoft and its suppliers provide the Specification (and all intellectual property therein) and any (if any) support services related to the Specification ("Support Services") *AS IS AND WITH ALL FAULTS*, and hereby disclaim all warranties and conditions, either express, implied or statutory, including, but not limited to, any (if any) implied warranties or conditions of merchantability, of fitness for a particular purpose, of lack of viruses, of accuracy or completeness of responses, of results, and of lack of negligence or lack of workmanlike effort, all with regard to the Specification, any intellectual property therein and the provision of or failure to provide Support Services. ALSO, THERE IS NO WARRANTY OR CONDITION OF TITLE, QUIET ENJOYMENT, QUIET POSSESSION, CORRESPONDENCE TO DESCRIPTION OR NON-INFRINGEMENT, WITH REGARD TO THE SPECIFICATION AND ANY INTELLECTUAL PROPERTY THEREIN. THE ENTIRE RISK AS TO THE QUALITY OF OR ARISING OUT OF USE OR PERFORMANCE OF THE SPECIFICATION, ANY INTELLECTUAL PROPERTY THEREIN, AND SUPPORT SERVICES, IF ANY, REMAINS WITH YOU.**

5.    **EXCLUSION OF INCIDENTAL, CONSEQUENTIAL AND CERTAIN OTHER DAMAGES. To the maximum extent permitted by applicable law, in no event shall Microsoft or its suppliers be liable for any special, incidental, indirect, or consequential damages whatsoever (including, but not limited to, damages for loss of profits or confidential or other information, for business interruption, for personal injury, for loss of privacy, for failure to meet any duty including of good faith or of reasonable care, for negligence, and for any other pecuniary or other loss whatsoever) arising out of or in any way related to the use of or inability to use the SPECIFICATION, ANY INTELLECTUAL PROPERTY THEREIN, the provision of or failure to provide Support Services, or otherwise under or in connection with any provision of this AGREEMENT, even in the event of the fault, tort (including negligence), strict liability, breach of contract or breach of warranty of Microsoft or any supplier, and even if Microsoft or any supplier has been advised of the possibility of such damages.**

6.    **LIMITATION OF LIABILITY AND REMEDIES. Notwithstanding any damages that you might incur for any reason whatsoever (including, without limitation, all damages referenced above and all direct or general damages), the entire liability of Microsoft and any of its suppliers under any provision of this Agreement and your exclusive remedy for all of the foregoing shall be limited to the greater of the amount actually paid by you for the Specification or U.S.$5.00. The foregoing limitations, exclusions and disclaimers shall apply to the maximum extent permitted by applicable law, even if any remedy fails its essential purpose.**

7.    **APPLICABLE LAW**. If you acquired this Specification in the United States, this Agreement is governed by the laws of the State of Washington. In respect of any dispute which may arise hereunder, you consent to the jurisdiction of the state and federal courts sitting in King County, Washington.

8. **ENTIRE AGREEMENT. This Agreement is the entire agreement between you and Microsoft relating to the Specification supersedes all prior or contemporaneous oral or written communications, proposals and representations with respect to the Specification or any other subject matter covered by this Agreement. To the extent the terms of any Microsoft policies or programs for Support Services conflict with the terms of this Agreement, the terms of this Agreement shall control.**

Document History

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Change |  |  |  |
| April 6, 2009 | First publication, Version 1.0 | | | |

Contents

[Introduction 3](#_Toc226263326)

[Windows ACPI Emulated Devices Table 3](#_Toc226263327)

[Windows ACPI Emulated Devices Table Format 4](#_Toc226263328)

[Emulated Device Flags 4](#_Toc226263329)

# Introduction

Modern PC platforms often use devices that have known errata. In this case, the Windows® family of operating systems may include mechanisms to work around these known errata whenever possible. Two example devices are the real-time clock (RTC) and the ACPI power management (PM) timer, as implemented in some chipsets.

When an operating system runs as a guest in a virtualized environment, a device may be emulated by an underlying virtual machine monitor (VMM) or hypervisor. Unlike the actual device, the emulated device might not contain the errata. In this situation, special-case handling by the operating system software is unnecessary. Applying a needless work‑around to an emulated device can introduce unnecessary software overhead or lead to incorrect behavior when the operating system accesses the device.

To prevent the needless work-around, a Windows operating system that is running as a guest in a virtualized environment must be informed of the presence of a correctly functioning emulated RTC or ACPI PM timer. To accomplish this, Microsoft has defined the Windows ACPI enlightenment table (WAET).

Support for the WAET is included in the following versions of Windows:

* Windows 7
* Windows Server® 2003 Service Pack 2 (SP2)
* Windows Vista®
* Windows Server 2008

This document describes the layout of the WAET table, together with a more detailed description of the layout and contents of the Emulated Device Flags field.

# Windows ACPI Emulated Devices Table

To use the WAET in a virtualized environment, the virtual BIOS must create a static WAET table in the ACPI namespace of the guest partition. Supported versions of Windows operating systems read the WAET early during initialization. The Emulated Device Flags field describes the characteristics of any emulated device that is present in the partition.

## Windows ACPI Emulated Devices Table Format

Table details the layout of the WAET, which a virtual BIOS is responsible for building.

Table 1. Windows ACPI Emulated Devices Table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Field | | Byte length | | Byte offset | | Description |
| ***ACPI Standard Header*** | | | | | | |
| Signature | 4 | | 0x0 | | Signature for the WAET | |
| Length | 4 | | 0x4 | | Length, in bytes, of the WAET | |
| Revision | 1 | | 0x8 | | 1 | |
| Checksum | 1 | | 0x9 | | Entire table, which must sum to zero | |
| OEMID | 6 | | 0x10 | | Original equipment manufacturer (OEM) identifier (ID) | |
| OEM Table ID | 8 | | 0x16 | | Manufacturer model ID | |
| OEM Revision | 4 | | 0x24 | | OEM revision for supplied OEM table ID | |
| Creator ID | 4 | | 0x28 | | Vendor ID of the ASL compiler utility that created the table | |
| Creator Revision | 4 | | 0x32 | | Revision of the ASL compiler utility that created the table | |
| Emulated Device Flags | 4 | | 0x36 | | Container of a bitmask of Windows behavior that this system requires | |

## Emulated Device Flags

Table describes the bit definitions for the Emulated Device Flags field of the WAET.

Table 2. Emulated Device Flags Field

|  |  |
| --- | --- |
| Bit offset | Description |
| 0 | RTC good  Indicates whether the RTC has been enhanced not to require acknowledgment after it asserts an interrupt. With this bit set, an interrupt handler can bypass reading the RTC register C to unlatch the pending interrupt. |
| 1 | ACPI PM timer good  Indicates whether the ACPI PM timer has been enhanced not to require multiple reads. With this bit set, only one read of the ACPI PM timer is necessary to obtain a reliable value. |
| 31:2 | Reserved; must return 0 when read. |