

# Computers that are running Windows XP Service Pack 2 and that are equipped with multiple processors that support processor power management features may experience decreased performance

**Important** This article contains information about how to modify the registry. Make sure that you back up the registry before you modify it. Make sure that you know how to restore the registry if a problem occurs. For more information about how to back up, restore, and modify the registry, click the following article number to view the article in the Microsoft Knowledge Base:

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[256986](http://support.microsoft.com/kb/256986/) (<http://support.microsoft.com/kb/256986/>) Description of the Microsoft Windows registry

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## SYMPTOMS

Computers that are equipped with multiple processors that support processor power management features, such as Advanced Configuration and Power Interface (ACPI) processor performance states, require Microsoft Windows XP Service Pack 2 (SP2). Additional updates are available to optimize performance and behavior on computers that are running Windows XP SP2. Without these updates, computers that are equipped with these power management-capable, mobile, dual-core processors may experience decreased performance or unexpected behavior.

**Note** This problem also applies to x64-based versions of Microsoft Windows Server 2003. However, this article and its associated private hotfix are not intended to resolve timing problems in games and other applications that run on AMD dual-core computers. For more information about performance issues on dual-core computers, click the following article number to view the article in the Microsoft Knowledge Base:

[909944](http://support.microsoft.com/kb/909944/) (<http://support.microsoft.com/kb/909944/>) Game performance may be poor on a Windows XP-based computer that is using a dual-core processor

## RESOLUTION

### Update information

The following file is available for download from the Microsoft Download Center:



[Download the WindowsXP-KB896256-v4-x86-ENU.exe package now.](http://www.microsoft.com/downloads/details.aspx?FamilyId=C2AB5A48-8240-4934-BBD8-34FB8A0FCE3B)

(<http://www.microsoft.com/downloads/details.aspx?FamilyId=C2AB5A48-8240-4934-BBD8-34FB8A0FCE3B>)

Release Date: December 19, 2006

For more information about how to download Microsoft support files, click the following article number to view the article in the Microsoft Knowledge Base:

[119591](http://support.microsoft.com/kb/119591/) (<http://support.microsoft.com/kb/119591/>) How to obtain Microsoft support files from online services

Microsoft scanned this file for viruses. Microsoft used the most current virus-detection software that was available on the date that the file was posted. The file is stored on security-enhanced servers that help prevent any unauthorized changes to the file.

### Prerequisites

No prerequisites are required.

### Restart requirement

You must restart the computer after you apply this update.

### Update replacement information

This update does not replace any other updates.

### File information

The English version of this update has the file attributes (or later file attributes) that are listed in the following table. The dates and times for these files are listed in Coordinated Universal Time (UTC). When you view the file information, it is converted to local time. To find the difference between UTC and local time, use the **Time Zone** tab in the Date and Time item in Control Panel.

File name	File version	File size	Date	Time	Platform	SP requirement
Halmacpi.dll	5.1.2600.3023	134,400	30-Oct-2006	11:27	x86	SP2
NtkrnImp.exe	5.1.2600.3023	2,137,600	30-Oct-2006	12:11	x86	SP2
NtkrnIpa.exe	5.1.2600.3023	2,059,264	29-Oct-2006	19:27	x86	SP2
Ntkrpamp.exe	5.1.2600.3023	2,017,280	30-Oct-2006	11:27	x86	SP2
Ntoskrnl.exe	5.1.2600.3023	2,182,016	30-Oct-2006	12:13	x86	SP2

### STATUS

Microsoft has confirmed that this is a problem in the Microsoft products that are listed in the "Applies to" section.

### MORE INFORMATION

Windows XP SP2 is required on computers that have multiple CPUs that support ACPI processor performance states. This requirement includes computers that support the following items:

- Multiple physical sockets
- Multiple-core designs
- Multiple logical threads, such as Intel hyper-threading technology

Because Windows XP was not originally designed to support performance states on multiprocessor configurations, changes are required to correctly realize this support on multiprocessor systems. Windows XP Service Pack 2 includes the required changes to the kernel power manager. These changes make sure that Windows XP correctly functions on multiprocessor systems with processor performance states.

This hotfix also addresses the following issues on computers that have multiple processors that support processor performance states:

- A possible decrease in performance on single-threaded workloads when processor performance states are using demand-based switching.
- The synchronization of the processor Time Stamp Counter (TSC) registers across processors when you use the ACPI Power Management timer on multiprocessor systems.
- ACPI C-state promotion and demotion issues in the kernel power manager.

### Update details

#### Possible decrease in performance during demand-based switching

Demand-Based Switching (DBS) is the use of ACPI processor performance states (dynamic voltage and frequency scaling) in response to system workloads. Windows XP processor power management implements DBS by using the adaptive processor throttling policy. This policy dynamically and automatically adjusts the processor's current performance state in response to system CPU use without user intervention.

When single-threaded workloads run on multiprocessor systems that include dual-core configurations, the workloads may migrate across available CPU cores. This behavior is a natural artifact of how Windows schedules work across available CPU resources. However, on systems that have processor performance states that run with the adaptive processor throttling policy, this thread migration may cause the Windows kernel power manager to incorrectly calculate the optimal target performance state for the processor. This behavior occurs because an individual processor core, logical or physical, may appear to be less busy than the whole processor package actually is. On performance benchmarks that use single-threaded workloads, you may see this artifact in decreased performance results or in a high degree of variance between successive runs of identical benchmark tests.

This hotfix includes changes to the kernel power manager to track CPU use across the processor package. These changes enable visibility into the true activity level of a CPU complex and therefore help correctly calculate an increased target performance state.

**Note** This solution favors performance gains over power savings. Although benchmark performance scores may improve, battery life could be negatively affected. Accordingly, this kernel policy change may be disabled by a registry key to allow for maximum flexibility.

#### How to disable the new performance state policy behavior

**Warning** Serious problems might occur if you modify the registry incorrectly by using Registry Editor or by using another method. These problems might require that you reinstall the operating system. Microsoft cannot guarantee that these problems can be solved. Modify the registry at your own risk.

After you install the hotfix that is described in this article, you may use registry settings to disable the new performance state policy behavior. To do this, follow these steps:

1. Click **Start**, click **Run**, type **regedit**, and then click **OK**.
2. Right-click **HKEY\_LOCAL\_MACHINE\SYSTEM\CurrentControlSet\Control\Session Manager**, point to **New**, and then click **Key**.
3. Type **Throttle** for the new key name.
4. Right-click **Throttle**, point to **New**, and then click **DWORD Value**.
5. Type **PerfEnablePackageIdle** for the value name.
6. Right-click **PerfEnablePackageIdle**, and then click **Modify**.
7. In the **Value data** box, type **0**. Make sure that **Hexadecimal** is selected in the **Edit DWORD Value** dialog box, and then click **OK**.

**Note** You can type **1** in the **Value data** box to enable the new performance state policy behavior.

8. Quit Registry Editor.

### Correct TSC synchronization

On some operating systems, the processor TSC may change the rate at which it counts. Additionally, the processor TSC may stop counting when specific processor power management features are used. On computers that have multiple processors, the TSC is typically the operating system hardware timer that supports calls to the kernel **KeQueryPerformanceCounter** function. When TSC does not increment monotonically, system components that use the kernel **KeQueryPerformanceCounter** function may not work correctly. To address this problem, Microsoft makes it possible for the ACPI Power Management Timer to be used as the operating system timer that supports the kernel **KeQueryPerformanceCounter** function. However, some programs may directly access the TSC by bypassing the Windows timer APIs. The multiple-processor Hardware Abstraction Layer (HAL) makes sure that the TSC registers on all processors on a multiple-processor computer remain closely synchronized. Therefore, access by system software that may be directed to different processors does not return different results. This change makes sure that the multiple-processor HAL continues to correctly synchronize the TSCs across all processors on a computer, even if the ACPI power management timer is used as the operating system hardware timer.

### Correct C-state promotion and demotion

This change corrects issues in the kernel power manager to correctly handle processor ACPI C-state promotion and demotion on multiprocessor systems.

## MORE INFORMATION

For more information about a related topic, click the following article number to view the article in the Microsoft Knowledge Base:

[835730](http://support.microsoft.com/kb/835730/) (<http://support.microsoft.com/kb/835730/>) Sound may play slowly or music may not play continuously in Windows XP or Windows 2000

For more information about the standard terminology that is used to describe Microsoft software updates, click the following article number to view the article in the Microsoft Knowledge Base:

[824684](http://support.microsoft.com/kb/824684/) (<http://support.microsoft.com/kb/824684/>) Description of the standard terminology that is used to describe Microsoft software updates

The third-party products that this article discusses are manufactured by companies that are independent of Microsoft. Microsoft makes no warranty, implied or otherwise, about the performance or reliability of these products.

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## APPLIES TO

- Microsoft Windows Server 2003, Standard x64 Edition
- Microsoft Windows Server 2003, Enterprise x64 Edition
- Microsoft Windows XP Service Pack 2, when used with:
  - Microsoft Windows XP Home Edition
  - Microsoft Windows XP Professional
- Microsoft Windows XP Tablet PC Edition 2005

**Keywords:** kbwinserv2003sp2fix kbqfe kbhotfixserver kbfix kbbug kbpubtypekc KB896256

