



Business Desktops

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Technical  
White Paper

# Implementing Hyper-threading Technology on HP Business Desktops

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## Abstract

The intent of this White Paper is to explain how to implement Hyper-threading technology on HP business desktops.

## Introduction

Hyper-threading technology has been available in server and workstation systems using P4 Xeon processors since the early part of 2002. Hyper-threading has now become available on single physical processor IA-32 desktop systems using the latest Intel Pentium processor with certain chipsets. Certain considerations regarding BIOS and Operating System configurations need to be understood to ensure Hyper-threading is enabled and configured properly. This paper also covers the ability to enable or disable Hyper-threading through F10 Setup. Finally, known issues are presented in the Frequently Asked Questions section.

## Acronyms Used

**HT**—Hyper-thread(ing)

**P4**—Intel Pentium 4 Processor

**CMOS**—complementary metal oxide semiconductor that has the ability to store small amounts of memory for system time and configuration settings

**GHz**—Gigahertz: one billion cycles per second; a standard reference to the clock speed of a microprocessor

**OS**—Operating System: a generic term not referring to any specific vendor's application

**SP**—Service Pack

**HAL**—Hardware Abstraction Layer: a software layer that allows an operating system to communicate with the hardware layer; for example, devices on motherboard. For purposes of this paper, the HAL will be in reference to the Hardware Abstraction Layer in Microsoft Windows XP and Microsoft Windows 2000 Operating Systems.

**MP**—Multiprocessor; will be used in regard to the HAL as in MP\_HAL for the multiprocessor HAL

**UP**—Uniprocessor; used as in UP\_HAL for uniprocessor HAL

**POST**—Power-On Self Test

**BIOS**—Basic Input/Output System: The computer's firmware that primarily allows the various devices to turn on during startup so the OS will load properly

## What is Hyper-threading Technology?

Hyper-threading is the ability of a single processor to perform as if it were two distinct processors. Optimized single processor thread execution is accomplished by allocating two separate resources to execute threads in parallel. In essence, the two resources are seen as two virtual or logical processors by the operating system. The system with HT enabled will be seen by the operating system as a multiprocessor system. This technology is accomplished through an architectural enhancement available with HT-capable Intel Pentium processors and through the ability of the operating system to identify and employ this underlying hardware technology.

## System Considerations

Four main system requirements must be met to enable and run Hyper-threading:

- an HT-capable processor
- an HT-capable chipset
- a BIOS capable of detecting and enabling the processor and chipset to use Hyper-threading
- an operating system that takes advantage of Hyper-threading technology

The following are specifics for each of these requirements, which are featured on certain HP business desktops:

### 1. Processor

An HT-capable Intel Pentium processor is the first non-workstation Intel processor with Hyper-threading technology.

### 2. Chipset

Currently, the Intel 845G, 845GE, and 865G chipsets are fully Hyper-thread capable and available on certain HP business desktops. Future Intel chipset families may also employ Hyper-thread technology.



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**Note:** The 845G chipsets were not Hyper-thread-capable until revision B-2.

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### 3. BIOS

Out of the factory, Hyper-threading will be set to Enabled for all Windows XP configured systems except those based on 845G/GE chipsets. In all systems, the BIOS default value for Hyper-threading is Disabled. In other words, if the Hyper-threading had been previously set to Enabled and the BIOS settings are reset back to the default values, then Hyper-threading is set to Disabled.



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**Note:** With Hyper-thread set to Disabled in BIOS Setup, the system is not HT-capable until the setting are changed to Enabled and the proper HAL is loaded for the Operating System. See [Enabling Hyper-threading](#) for steps to enable HT in the BIOS.

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- During POST, the BIOS searches for the presence of a Hyper-thread-capable Pentium processor. If a non-capable HT processor is present in the system, then the F10 BIOS Setup section does not display a selection for enabling HT.

### 4. Operating Systems

- Windows XP Home or Professional is enhanced for Hyper-threading technology. The following section provides more details regarding HT support in other operating systems.

## OS Considerations

1. HP recommends either Windows XP Home or Professional with Service Pack 1 to take advantage of Hyper-threading technology.
2. The following OSs are not optimized for Hyper-threading:
  - Windows NT4
  - Windows ME
  - Windows 98, 98SE
  - Windows 2000 (Hyper-threading can run on Windows 2000, but it is not recommended.)
  - Linux (As of the beginning of 2003, Linux capability for Hyper-threading was under development.)
  - For more information regarding operating system support, refer to <http://www.intel.com/support/platform/ht/os.htm>.
3. Microsoft Windows 2000 Professional Edition recognizes up to two physical CPUs. The OS is not able to distinguish one physical CPU with Hyper-threading enabled from two physical CPUs, whether Hyper-threading is enabled or disabled.
4. Windows XP, on the other hand, recognizes logical processors and takes advantage of the virtual CPU resources efficiently.
5. Windows XP Home and Professional treat Hyper-threaded systems as multiprocessor systems. Refer to Microsoft Knowledge Base Article 810231, <http://support.microsoft.com/default.aspx?scid=kb%3ben-us%3b810231>.
6. For Microsoft information regarding support for Hyper-threading, refer to <http://www.microsoft.com/whdc/hwdev/platform/proc/HT-Windows.msp>.
7. Known Issue:  
Certain programs may not run correctly on Hyper-threaded computers and require an update to SP1 for Windows XP. For more information, refer to Microsoft Knowledge Base Article 327809, <http://support.microsoft.com/default.aspx?scid=kb;en-us;327809>.

## Enabling/ Disabling Hyper-threading

### Enabling Hyper-threading

If a system is Hyper-thread capable—the chipset, processor, and BIOS all support Hyper-threading—Windows XP loads the MP HAL dynamically once Hyper-threading is enabled in the BIOS F10 Setup. The computer must be restarted after Windows XP installs the MP HAL.

#### Verifying that the MP HAL is loaded

1. Checking the registry:
  - It should be HKLM/Hardware/ResourceMap/Hardware Abstraction Layer/ACPI 1.0—APIC platform MP.
2. Checking the hal.dll internal name:
  - Under //windows/system32/hal.dll, right-click the hal.dll file, click **Properties**, click **Version**, then click **Internal Filename**. The hal.dll internal filename should be halmacpi.dll.

## Disabling Hyper-threading

3. Checking Device Manager:
  - Click **Start>Control Panel>System**, click the **Hardware** tab, click **Device Manager**, then double-click **Computer**. The UP HAL should show as ACPI Multiprocessor PC.



If the uniprocessor HAL is installed, its nomenclature under Device Manager is ACPI Uniprocessor PC.

4. Task Manager:
  - Press **Ctrl+Alt+Del** to call up Task Manager.
  - Click the **Performance** Tab.
  - The CPU Usage History should display two usage graphs.


Windows XP does not dynamically install from the MP HAL to the UP HAL once the HT BIOS settings change from Enabled to Disabled. The following procedure forces the correct UP HAL to load.

### Steps for disabling Hyper-threading and forcing the UP\_HAL to load on Windows XP

1. Disabling Hyper-threading option under BIOS F10 Setup:
  1. Press the **F10** key as soon as the monitor light turns green.
  2. Use the up or down arrow key to select a language, then press **Enter**.
  3. Use the right or left arrow key to move to the **Advanced** tab, then use the up or down arrow key to move to **Device Options**. Press **Enter**.
  4. Use the left or right arrow key to change Hyper-threading from **Enabled** to **Disabled**.
  5. Press **F10** to accept the change.
  6. Use the left or right arrow key to move to **File**. Use the up or down arrow key to move to **Save Changes and Exit**. Press **Enter**, then press **F10** to confirm.
2. Restart the computer and allow Windows XP to open.
3. Download Microsoft DEVCON utility @: DEVCON Download.
  - DEVCON is a command line alternative to Device Manager that we'll use to force the UP HAL to install.
  - DEVCON.exe is a self-extracting file.
    - a. Extract into a temp directory.
    - b. Copy the devcon.exe file from the created i386 folder into the main C:\i386 folder.
4. Use the command line entries to update to the UP HAL:
  1. Go to the i386 directory, "C:\i386", and type the following command:  
C:\i386>devcon install c:\Windows\inf\hal.inf ACPIAPIC\_UP.
  2. A few seconds later, this message appears:  
"C:\i386>devcon install c:\Windows\inf\hal.inf ACPIAPIC\_UP".
  3. Then this message appears:  
"Updating drivers for acpiapic\_up from C:\windows\inf\hal.in".
  4. Finally, the command prompt appears: "C :>".
  5. Manually restart the system. After Windows XP opens, a "Found New Device" message is displayed.
  6. Restart again when the device is loaded.

7. This is the final restart back into Windows XP with the UP HAL properly loaded. An “unknown device” may show under Device Manager/Computers. Either:
  - Delete the unknown device.
  - Use the devcon utility to remove the unknown device with the following:  
"c:\i386> devcon remove @root\computer\0000".
5. Here are a few ways to determine whether or not the UP HAL installed correctly:
  1. Check Device Manager:
    - Click **Start>Control Panel>System**, click the **Hardware** tab, click **Device Manager**, then double-click **Computer**. The UP HAL should be displayed as ACPI Uniprocessor PC.

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 If the multiprocessor HAL is installed, its nomenclature under Device Manager is ACPI Multiprocessor PC.

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  2. Check the registry:
    - It should be HKLM/Hardware/ResourceMap/Hardware Abstraction Layer/ACPI 1.0—APIC platform UP.
  3. Check the hal.dll internal name:
    - Under //windows/system32/hal.dll, right-click the hal.dll file. Click **Properties**, click **Version**, then click **Internal Filename**. The HAL.dll internal filename should be halaacpi.dll.
  4. Check Task Manager:
    - Press **Ctrl+Alt+Del** to call up Task Manager.
    - Click the **Performance** Tab.
    - The CPU Usage History should display one usage graphs.

## Frequently Asked Questions

- Q** Can I disable Hyper-threading if it has already been enabled?
- A** Yes. Refer to the section above, [Enabling/Disabling Hyper-threading](#).
- Q** Will I have to reload Windows XP if I disable or enable Hyper-threading?
- A** No, it is not necessary to reinstall Windows XP if you either disable or enable HT. See [Enabling/Disabling Hyper-threading](#) for details on how to do this properly and what to check to ensure it was switched properly.
- Q** Which operating systems work with Hyper-threading?
- A** Microsoft Windows XP, Home or Professional. Hyper-threading will be available with Linux soon. For more details, see [System Considerations](#) above.
- Q** I have Hyper-threading enabled in BIOS Setup and I installed Windows XP—how do I know Hyper-threading is working?
- A** You can verify that Hyper-threading is correctly enabled in several ways. One is to confirm that the HT processor logo appears when the BIOS F10 Setup is opened. You can check that the multi-processing HAL has been loaded by checking the Device Manager. You should also verify the presence of two logical processors through the Performance tab under Task Manager. For more information, see [Verifying that the MP HAL is loaded](#).

- Q** My system is capable of Hyper-threading. I have Windows XP installed and I know how to check Hyper-threading, but Windows XP doesn't show that I have HT running. Now what?
- A** The most logical conclusion is that the BIOS setting for Hyper-threading is set to Disable. See [Enabling Hyper-threading](#) for how to enable Hyper-threading in the BIOS Setup.
- Q** Do I need a particular BIOS version to run Hyper-threading?
- A** Yes, but all HP business desktops that feature Hyper-threading have an HT-ready BIOS. This includes all HP d330 and d530 computers. The steps to enable HT are shown above in [Enabling/Disabling Hyper-threading](#).

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