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Chapter 1 -- Introduction

The HP Performance Tuning Framework (hereafter abbreviated as PTF) has been developed to assist workstation system administrators and technical users who would like to configure and tune their machines for optimal performance with certain third-party applications. Hewlett-Packard has a long history of close cooperation with engineering teams at the major independent software vendors in the technical markets. This utility is the framework through which the years of technical experience and knowledge can be shared with users of HP workstations.

Overview

When a new workstation gets delivered to an engineer’s desk, the process of configuring the software for productive work begins. The administrator must install the applications the engineer will need, and establish connection to shared data repositories. It is easy for the administrator to move on to the next challenge once the engineer has the applications and data needed to start working. However, the engineer’s productivity may suffer if some configuration steps are skipped. For example, 3D graphics rendering performance and image quality could be decreased by use of an unsupported graphics driver, or the engineer may not have full access to the capabilities of the new machine due to reduced default system settings.

The HP Performance Tuning Framework assists workstation system administrators by quickly guiding their configuration of workstations used to run certain technical applications. Several key features of PTF that provide this assistance are:

- a thorough configuration inventory displayed on the Configuration Page along with easy access to the Hewlett-Packard QuickSpecs document for the particular workstation model
- a listing of available drivers for the machine’s graphics card along with the application names that were certified using each one; this information is presented on the Graphics Driver Page, which also includes a button to easily download and install the desired driver
- an OS Tuning Page for Windows XP Professional customization
- a report of the plug-in and add-in application software, USB Plug-and-play device information and driver for the 3Dconnexion motion controller connected on the workstation; this information is presented on the 3Dconnexion Page, which also includes a button to start/stop the driver
- a collection of application-specific tuning pages that deliver knowledge and experience derived from Hewlett-Packard’s long history of intimate involvement with the application development teams
System Requirements

The following sections describe the specific network, software, and hardware requirements of the HP Performance Tuning Framework.

Network Requirements

An internet connection is crucial to the proper and successful operation of PTF. Each time it runs, the PTF server is queried for an updated certification database. If one is found, it is immediately downloaded for use by PTF. Similarly, the PTF utility itself may require an update, either to fix a defect or add support for a new third-party application; these updates are delivered over the internet. Finally, a major feature of PTF is its ability to download and install graphics drivers. This operation clearly requires access to the internet.

Both direct connection to the internet and connection through a firewall via an HTTP proxy server are supported by PTF. Upon the first attempted network connection, a direct request is made to the remote server using the system’s Internet Options proxy settings. If that request times out (after approximately ten seconds), the user is prompted to enter the address and port number of an HTTP proxy server, and, optionally, the user account information if it is required for the server. If a connection is made using the proxy server, the proxy's address, port, and account information are saved for use with all future network requests.

System Internet Options that utilize an Automatic Configuration Script are not supported by PTF. Running on such a configuration will time out when connecting to PTF’s server, and will then prompt the user for an explicit HTTP proxy server.

Software Requirements

PTF has been developed for 32-bit and 64-bit versions of the Microsoft Windows XP Professional and Windows Vista operating systems using version 2.0 of Microsoft's .NET Framework. The .NET Framework is loaded automatically during a web-downloaded installation of the HP Performance Tuning Framework if it is not found on the workstation.

Due to PTF's ability to install drivers and modify system settings, the user running PTF must have Administrator privileges.

Third-party applications are not required to run PTF. Their presence is represented through the content of some of PTF’s tabbed pages however. For example, when supported applications are found on a machine, PTF can report graphics driver certification information relative to only those installed applications. Also, on the
Applications Page, the installed, supported applications are listed first, before the supported applications that are not installed.

Supported Applications lists the applications recognized by PTF, and describes the available application-specific features in greater detail.

Hardware Requirements

PTF extracts its computer and graphics card certification information from a database that is updated frequently by the HP engineering team working with the software vendors. As Hewlett-Packard and the graphics card vendors release new hardware, the database will reflect up-to-date certification results to provide accurate configuration recommendations.

These workstation models are currently supported:

- HP xw3100 Workstation
- HP xw3400 Workstation
- HP xw4000 Workstation
- HP xw4100 Workstation
- HP xw4200 Workstation
- HP xw4300 Workstation
- HP xw4400 Workstation
- HP xw4550 Workstation
- HP xw4600 Workstation
- HP xw5000 Workstation
- HP xw6000 Workstation
- HP xw6200 Workstation
- HP xw6400 Workstation
- HP xw6600 Workstation
- HP xw8000 Workstation
- HP xw8200 Workstation
- HP xw8400 Workstation
- HP xw8600 Workstation
- HP xw9300 Workstation
- HP xw9400 Workstation
- HP Compaq nw8000 Mobile Workstation
- HP Compaq nw8240 Mobile Workstation
- HP Compaq nw8440 Mobile Workstation
- HP Compaq nw9440 Mobile Workstation
- HP Compaq 8510w Mobile Workstation
- HP Compaq 8710w Mobile Workstation
- HP ProLiant xw460c Blade Workstation
Attempting to run PTF on a non-HP workstation will fail.

PTF's graphics driver library contains drivers for these graphics cards:

ATI Technologies Inc.

- FireGL 8700
- FireGL 8800
- FireGL X1
- FireGL Z1
- FireGL T2-64s
- FireGL T2-128
- FireGL V3100
- FireGL V3300
- FireGL V3350
- FireGL V5100
- FireGL V5600
- FireGL V7200
- Mobility FireGL T2
- Mobility FireGL V5000
- Mobility FireGL V5200
- Mobility FireGL V5600

NVIDIA Corporation

- Quadro2 MXR
- Quadro2 EX
- Quadro2 Pro
- Quadro4 NVS
- Quadro4 380 XGL
- Quadro4 550 XGL
- Quadro4 580 XGL
- Quadro4 750 XGL
- Quadro4 900 XGL
- Quadro4 980 XGL
- Quadro FX 330
- Quadro FX 370
- Quadro FX 500
- Quadro FX 540
- Quadro FX 560
- Quadro FX 570
- Quadro FX 570M
- Quadro FX 1000
• Quadro FX 1100
• Quadro FX 1300
• Quadro FX 1400
• Quadro FX 1500
• Quadro FX 1500M
• Quadro FX 1600M
• Quadro FX 1700
• Quadro FX 2000
• Quadro FX 3000
• Quadro FX 3400
• Quadro FX 3450
• Quadro FX 3500
• Quadro FX 4500
• Quadro FX 4600
• Quadro FX 5500
• Quadro FX 5600
• Quadro NVS 290
• Quadro NVS 440

These 3Dconnexion motion controllers are currently supported:

• USB Spaceball 5000
• SpaceTraveler
• SpacePilot
• SpaceNavigator
• SpaceExplorer
Chapter 2 -- User Interface

The HP Performance Tuning Framework employs a simple user interface (see the Welcome Page image below). The main window contains only four different controls: a Help or User Guide button, which displays this document; an About button, which displays the current Framework version number, database timestamp, and other support information; an Exit button, which terminates the program; and a collection of tabbed pages, which contain the user-interface controls that perform the tuning operations of PTF. The individual tabs are labeled to indicate the area of configuration contained on the page. Click on each tab to display its corresponding page.

The Welcome Page

The Splash Screen

The Performance Tuning Framework uses a splash screen (shown below) to convey its progress during startup processing. The current area of system interrogation or interface construction is reported at the bottom of the window.
Occasionally while the splash screen is displayed, PTF will find an updated version of either its database, or PTF itself, that it will download and install. Minimal interaction is required to complete these updates; simply follow any prompts to complete the download and allow PTF to start. Chapter 4, Dynamic Updates, discusses these situations in greater detail.

The Welcome Page

The Welcome Page image above shows the initial Framework interface presented after the startup processing completes. The Welcome Page contains convenient hyperlinks that, when clicked, bring up relevant HP web sites in the system’s default browser. When PTF is run on a workstation with no active network connections, these links will be disabled (grayed-out) to indicate that their destinations are currently unreachable.

The Configuration Page

The workstation’s configuration is reported on the Configuration Page. The types of information reported include:

- the hardware inventory
- the environment variables and their values
• the list of applications PTF supports that it found installed on the workstation
• the list of graphics drivers available, and which applications have certified them

Many of the top-level categories can be expanded to disclose the lower levels of detail. The image below shows an example of the Configuration Page.

The information displayed on the Configuration Page can be printed or saved to a file using the print options context menu. To display this menu, simply click the right mouse button or depress the context menu key on the keyboard when the mouse cursor is over the configuration data, and the print options menu will be displayed, as shown here.
Beyond the configuration data collected from the system and displayed on this page, access to other types of information may also be presented along the right-hand side of the screen, as shown in the Configuration Page image above. If an internal chassis image is available for this model workstation, it can be displayed by clicking on the View button in the Look Inside box to the right of the configuration data. More in-depth information about the parts and options of this workstation model is contained in the QuickSpecs document, which is also viewable from this Framework page.

The box in the lower-right corner of the Configuration Page contains machine-specific links to the HP support web site. First, there is a link to the HP PartSurfer web site to help locate additional or replacement parts for the workstation. This is followed by a link which will display the available drivers and software for the current workstation model and operating system combination. This second link is helpful when the workstation’s system BIOS or component drivers need to be updated. Before downloading a new graphics driver from the HP site however, the application certification assistance provided on PTF’s Graphics Driver Page should be consulted; often the latest driver on the HP site is not the same version that was certified by the application providers.

The Graphics Driver Page

One of the primary features of the HP Performance Tuning Framework is its ability to organize graphics driver certification information. This organization allows a system administrator to compare potentially conflicting application requirements and make an informed decision about which driver to install. In addition to the application certification results presented, PTF can also provide driver release information direct from the HP workstation graphics lab that might help with the selection process. All graphics drivers listed on this page are maintained on PTF’s server, and can be downloaded over the network as needed.
The image below shows the Graphics Driver Page for a machine with several applications installed. By default, the certification data for only the installed applications are reported in the list on this page. By selecting the All Framework Apps radio button, the certification information for all Framework applications will be displayed, giving the user a more complete view of the certification status of the individual drivers.

Not all applications perform explicit certification of graphics drivers. For example, the image below shows Adobe Photoshop CS2 and Macromedia Flash in the two driver boxes; these applications do not certify 3D graphics drivers, however PTF does recognize them as installed applications. Hewlett-Packard recommends using one of the recently released graphics drivers that has passed the Microsoft Windows Hardware Quality Labs (WHQL) driver functionality testing, and HP’s own workstation graphics lab testing. These applications for which exact drivers are not crucial will be listed with the three most-recently WHQL and HP certified drivers that support the system’s graphics card.

Another feature of PTF is its recognition of more than one installed graphics card. When there are multiple cards present in the system, the card name field on the Graphics Driver Page becomes a selection list from which the different cards can be chosen. Driver selection data will be displayed for the card that is selected from the card list.
To determine the order in which the drivers should be presented, PTF counts how many applications have been certified with each driver version. The versions with the most certifications are listed first, and they are designated as such by the addition of the tag "Most Certifications" to their title. There may be more than one driver that have the same number of certifications, which means there will be more than one driver that claim to have the most. When confronted with this situation, administrators should compare the application lists of the drivers to decide which one to load based on the anticipated workload for the system.

The remaining drivers are then listed in decreasing order of the number of applications that have certified them. In addition to the "Most Certifications" designation, two other labels may appear in the driver list. "Latest Release" indicates that this driver is the latest one recognized by HP. The driver already installed on the machine will be tagged as "Currently Installed."

By scrolling through the list, a system administrator can select the driver that satisfies the most application certification requirements, or a different driver altogether. All drivers in the list can be downloaded and installed with the click of its corresponding button.

**The Applications Page**

PTF recognizes the presence of many different technical applications on a workstation. The installation status of these applications is represented on the Applications Page (see the image below). Installed applications are listed first, followed by the remaining applications supported by PTF.
The Applications Page

Clicking on the logo or button for an application will display a new form containing information and tuning controls specific to that application. The UGS NX4 form shown below is an example. Across the top of the form is a dashboard that shows important status information about the application.
First there is a button with a visual representation of this application’s certification status of the currently-installed graphics driver. The image shown on the button indicates the extent to which the selected application supports the driver. PTF will use the following status images:
<table>
<thead>
<tr>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No driver installed</td>
<td>There is no 3D driver installed; the system is using the default 2D VGA driver.</td>
</tr>
<tr>
<td>Unknown driver</td>
<td>The driver is not recognized by PTF, therefore there is no certification information for this driver in PTF's database.</td>
</tr>
<tr>
<td>Unsupported driver</td>
<td>This driver preceeds any driver versions tested with this application, or this is not one of the recent WHQL and HP certified drivers suitable for applications that do not certify explicit 3D drivers.</td>
</tr>
<tr>
<td>Supercedes supported driver</td>
<td>The installed driver is more recent than the version tested with this application.</td>
</tr>
<tr>
<td>Supported driver</td>
<td>The application vendor tested and certified the installed driver, or this is a recent WHQL and HP certified driver that is recommended for applications that do not test explicit 3D drivers.</td>
</tr>
</tbody>
</table>

To the right of the driver status button is a button that controls the Resource Collector. The button will either be labeled Configure, where it will launch the Resource Collector's configuration dialog, or Summarize, where it will produce a summary dialog showing the results from previous collections. Completing the top row of the dashboard is a hyperlink to the Hewlett-Packard web page containing information specific to the application, if one exists.

If the application is running while PTF’s application tuning form is visible on the Windows desktop, a panel showing parameters of the executing process is added to the application’s form. The information is updated every five seconds.

In addition to the dashboard, the application forms provide access to application-specific tuning functionality. For example, there are three application-specific tuning features shown on the UGS NX form shown above: Run HyperTune for UGS NX, Run NX Log Analyzer, and Enable Large Memory. As new tuning techniques arise for the supported applications, Hewlett-Packard will add new buttons to expose them. For specific information about the tuning features associated with each supported application, refer to the appropriate section in Supported Applications.
The Memory Usage Page

When a Windows workstation runs low on available memory, the operating system’s virtual memory mechanism can often free enough physical RAM to allow a workload to run to completion. It is convenient to rely on this safety net when temporarily working with uncharacteristically large datasets, however as the memory requirements of an engineer’s daily workload grows, this convenience comes at the price of lost productivity. The virtual memory components of an operating system must take over the computer to reorganize the data stored in physical RAM. During this time, a user application must wait until memory has been cleared before it can continue processing.

PTF can help users understand how both physical and virtual memory resources are being used by the applications running on their workstations. As shown in the image below, the Memory Usage Page contains a plot of memory usage over time. The currently-executing programs are listed on the left; clicking on a program name in the list will assign a color and begin plotting that program’s memory usage. Applications that are supported by PTF are automatically recognized and plotted, as was the case for Unigraphics (ugraf) and I-DEAS (geomod) below.
This image was taken on a machine with one gigabyte (1GB = 1,024MB) of system RAM. The dark gray area at the bottom of the plot represents the amount of physical RAM being used by the Windows operating system, and the lighter gray area corresponds to all the applications that are not being individually highlighted. The white space above the plotted processes shows how much RAM was available during the sampling periods.

A vertical time-division line is drawn for each fifth sample, and it is labeled with the minutes and seconds past the hour. If the plot is stopped and restarted, a thicker time-division line is drawn to call attention to the break in the sampling sequence. Each time-division line also corresponds to a refresh of the process list. It is during these refreshes that PTF will notice if any supported applications have been started since the previous refresh, as geomod was recognized to have started prior to the 51:42 sample. The Refresh button can be used to force PTF to recognize a newly-launched application; this could be desirable when using the longer sampling periods.

When the left mouse button is clicked within the plot, information describing the current memory region is displayed. In the image above, the user clicked in the blue area of the plot that corresponds to the ugraf process. Similar information is presented when the mouse cursor is stopped over a name (not clicked) in the process list on the left side of the page.

The plotted data can be switched to virtual memory using the Plot selection box above the process list. The virtual memory usage of the currently selected processes will automatically be plotted for the existing samples. The total virtual memory capacity shown is a combination of the system RAM and pagefile(s).

The current memory usage percentages are displayed below the process list, with a color-coded indication of the amount of free space. Green indicates that the levels are good, while yellow means that free memory is diminished, and red connotes extremely low availability where paging activity may decrease application performance. The Info button will display the current memory usage values, as well as advice on how to alleviate memory pressure if the system has exceeded PTF’s memory thresholds.

The HP Performance Tuning Framework provides a simple mechanism to implement processor affinity. The Processor Affinity setting controls which CPUs the process will be allowed to execute on. Using the Set Affinity command limits the execution of the program or process to the selected processors and might decrease overall performance. By default, the Windows task scheduler will allow processes to run on all available processors.

The currently-executing programs are listed on the left; right clicking on a program name in the list will allow the user to Set Affinity on that running program. In the case below,
Autodesk Revit was the program selected by right clicking. The dialog shows Revit running on a dual-processor workstation. The user could select a single processor for the program to run on. This state will stay in effect until changed by this Set Affinity action or the program is re-started.

![Processor Affinity - Revit](image)

The Set Affinity Dialog

**Resource Collector**

The Memory Usage plot is helpful for watching memory allocation while working interactively on the system. Often minute-by-minute information is not necessary, but rather simply knowing how the system's resources are utilized over a longer period can help diagnose reduced performance issues. To accomplish this analysis, Hewlett-Packard has added the Resource Collector to PTF.

The Resource Collector is a separate process that periodically checks for the user-selected applications on a workstation. If found, certain memory and system resource parameters of those applications are captured and logged. After collecting data for a longer period of time, for example a typical workday, the logged data can be summarized to see how often the limits of the system resources were approached. Based on this analysis, the fitness of the current hardware and software configuration for its dedicated tasks can be determined. Possible conclusions could be that far too often the important processes are utilizing more than the amount of physical RAM or CPU resource in the workstation, thereby relying upon the much slower virtual memory system and slower response time as multi-threaded and multi-task operation must wait to access the CPU resource.

There are individual versions of the Resource Collector for Windows XP and Windows XP x64 Edition, even though there is only one version of PTF. As described in the Software
**Requirements** section, the 64-bit version of the Resource Collector is necessary for observing processes that utilize more than 4GB of memory. The data collected by the 64-bit version of the Resource Collector is stored such that the 32-bit version of PTF can process and report values representing more than 4GB.

The Resource Collector *Configure* button at the bottom of the *Memory Usage page* will display the dialog shown below. The Collector options are set on the left-hand side, and there are buttons to control the Collector on the right. In the dialog shown here, the user has configured the Resource Collector to inspect any running Photoshop, XSI, and I-DEAS Design processes every thirty seconds. Between collection periods, the Resource Collector goes to sleep so it does not consume any of the workstation's processor cycles. The *Start* button will launch the Resource Collector, and then become a *Stop* button. The Resource Collector will run until the *Stop* button is clicked, or until Windows is shut down or restarted.

![The Resource Collector Configuration Dialog](image)

The *Summarize* button in the Resource Collector Configuration dialog will read through the current Collector log, and display a summary dialog like the one below. In this example, the log contained resource data for three applications (PTC Pro/ENGINEER, UGS NX, and Google Earth), and the user is using the mouse to select a different application to summarize. The summarized data shown is for 3,991 individual sessions of Pro/ENGINEER (xtop), where a session is one execution of the application binary. Out of those sessions, three were observed to have exceeded both of the first two metrics reported by the Resource Collector summary, and two sessions caused the system's
available physical memory to drop below ten percent of the total amount. The last field reports that 108 sessions exhibited high CPU usage. At the bottom of the summary dialog, the maximum and average readings of physical and virtual memory usage are reported for the observed sessions.

The Resource Collector Summary Dialog

The *Show Session Details* button will display a grid listing information for the sessions recorded by the Resource Collector. Seven Pro/ENGINEER sessions are shown in the example below. Each session is identified by its Program Start time. The columns in the grid contain maximum and percentage values accumulated over the duration of each session, and tool tips will provide a longer description of data in each column. The grid’s column width and row height can be adjusted, and the grid can be sorted by selecting one of the column labels. The grid displays elapsed and CPU time (in seconds), the maximum number of threads, the maximum CPU usage as a percentage across all processors, three memory metrics, and a Performance Impact for each session.
The Resource Collector Session Detail Window

The Windows Version Specific Pages

Each Windows operating system version offers different performance and functionality tuning capabilities, and the HP Performance Tuning Framework can help administrators understand these different capabilities. When run on Windows XP Professional (32-bit edition only), there will be an OS Tuning Page included in PTF, and on Windows Vista, there is a Performance Check-Up Page which is useful for comparing performance of different workstation configurations.

Windows XP OS Tuning Page

A complex, feature-rich operating system such as Windows XP offers many options for customizing its behavior and features. Not all relevant configuration parameters can be manipulated via the Control Panel however. Many print and on-line articles have been published describing little-documented system parameters and registry settings that can be modified to augment the performance, security, or user-interface features of the operating system.

The HP Performance Tuning Framework contains an OS Tuning Page that enables the system administrator to modify several of these configuration parameters. This page is only available on systems running Windows XP. An instance of this page is shown in the image below. There are checkboxes and other controls on the left-hand side of the screen, and a large description box on the right. To view the description of a parameter, simply position the mouse over the desired control on the left, and the description of the corresponding parameter will be displayed. The descriptions include:
• some background information about the tuning parameter
• several circumstances that may indicate when each possible setting of the parameter would be desired
• an indication of when the parameter change will take effect (for example, immediately, or after Windows Restart)

The Windows XP OS Tuning Page

The currently visible set of tuning parameters is selected with the control in the top-left corner of the page. The Restore Defaults button will return all settings in the currently visible set to their Windows XP default values.
As Hewlett-Packard investigates and tests other tuning parameters, and determines that they are both operationally safe and potentially beneficial, new options may be added in future releases.

**Windows Vista Performance Check-Up Page**

The Windows System Assessment Tool (WinSAT) is a core component of the Windows Vista operating system. It is used to evaluate the features, capabilities, and performance of a Windows Vista workstation, and it generates the Windows Experience Index (WEI), which represents the relative performance measured during the most-recent formal assessment run.

PTF contains an interface to the WinSAT utility that displays the WEI scores, and can be used to launch a large number of WinSAT assessments. It also exposes the raw performance data used to calculate the current WEI scores. WinSAT maintains up to 100 results files on the system, and PTF can be used to go back through earlier results to compare past and current performance levels.

The image below shows the Vista Performance Check-Up Page from a machine with a Base score of one. On the left side of the screen, the results from the initial assessment are shown with a Base score of 5.8. The first time Windows Vista ever boots on a machine, it runs a formal assessment to discover the system’s capabilities, and it retains that initial assessment for future comparison. The situation shown here was that a new graphics card was added to the system, but a Windows Display Driver Model-compliant driver has not been installed. Without the correct driver, the graphics scores are at the minimum value, causing the entire system to rate as a one.
The Performance Tuning Framework uses WinSAT during startup to acquire features and capability information on the current workstation configuration. For example, the primary graphics adapter memory in the Windows Display Driver Model (WDDM) are presented on the Configuration Tab. For more details on the WDDM graphics memory values, refer to the Graphics Memory Reporting through WDDM white paper.

The Remote Graphics Page

Technologies that improve human efficiency and productivity continue to be developed. The computer network is fertile ground for such technologies, and Hewlett-Packard's Remote Graphics Software is a perfect example. It uses the network to deliver flexibility and performance to technical computer professionals, by allowing users to view and control the operation of high-end 3D applications running on remote workstations across a standard network. The Performance Tuning Framework enhances the value of Remote Graphics Software by adding configuration and maintenance capabilities that expose basic and advanced features of the software.
There are two separate components to the Remote Graphics Software solution: the Sender runs on the workstation where the applications and data reside, and the Receiver is run by users wishing to connect to the Sender machine to operate the applications. If neither component is found on a machine, PTF's Remote Graphics page will simply show a diagram depicting how Remote Graphics Software works (see the image below). There is also a link to HP's Remote Graphics Software Site where users can read more about the product, and even download a free trial edition, good for thirty days.

The Remote Graphics Page, when neither component is installed

The Remote Graphics Sender

When PTF finds the Remote Graphics Sender installed, it will assemble the interface shown in the image below. There are fields for selecting settings to be used when the Sender service is launched at boot time, and controls to manage the insertion of the required OpenGL library into application folders.
The Sender startup options that can be modified are:

Connection Timeout
This is the number of seconds the Sender will wait before assuming a Receiver's connection has been broken. Valid values are integers in the range from 1 to 60 seconds, and the default is 5. This value could be increased when Receivers will be connecting over slow network links.

Authentication Timeout
This is the number of seconds the Sender will wait before assuming the user's account name could not be authenticated. Valid values are integers in the range from 1 to 60 seconds, and the default is 5. This value could be increased when the authentication process requires transmission over slow network links.

Sender Process Priority
All processes on a computer have a priority that is used by the operating systems' scheduler. This setting is the relative priority that should be assigned to the Sender process. The default priority is Normal, which is used by the majority of processes, but it may be raised or lowered by selecting one of the other settings, Below Normal, Above Normal, and High.
Limit Connection

This setting can be used to restrict connections to the Sender. When it is set to No Limit, any number of different, valid accounts may be used to connect. If the Single User option is selected, then multiple remote connections will still be allowed, however they must all use the same user account. The default setting is No Limit.

In order for the Remote Graphics Sender to recognize when an application updates the graphics display, it must watch the operations each application requests of the OpenGL graphics library. This requires that a small library be placed in the folder of each OpenGL application, where it can be loaded every time the program starts. Without this library, the user interface components of the application (for example, the menus and buttons) will be visible to remote Receivers, however the graphics portion of the window will be blank or incomplete.

PTF has knowledge of many 3D applications, and it will automatically add the installed applications it finds to the list of OpenGL Library Locations (see the image above). The checkboxes next to each application name can be used to copy or remove the library needed by the Remote Graphics Sender. Clicking on the checkbox at the top of the list, labeled All, will copy the library to (or remove it from) each folder below it in the list. This makes it very easy to prepare a workstation for remote display of all its applications.

The Add button will present a file selection dialog that can be used to navigate to a specific executable that should be included in the list. The Search button will display a folder selection dialog that can be used to designate a top level folder. PTF will then search all folders below the selected one for executables requiring the OpenGL library. As the search discovers files that depend upon OpenGL, their folders are added to the Library Locations list.

The Remote Graphics Receiver

PTF attempts to help users of the Remote Graphics Receiver by testing connections to workstations running the Remote Graphics Sender component (see the image below). Also, as exposed for the Sender, the Receiver's two timeout values can be adjusted through PTF's interface. This feature can only be applied to the Start menu shortcut created by the Receiver installation process.
The Remote Graphics Page - Receiver Configuration

The Remote Graphics Receiver maintains a list of recently connected Sender machines. PTF reads that list and then presents a Test button for each recent Sender workstation. This button performs the following operations for on the Sender:

Sender Socket Test
PTF will attempt to open the socket used by the Remote Graphics Sender on the remote machine. If there is no service watching that dedicated socket, the connection will fail. When the socket connection is successful, the Remote Graphics Software logo will be displayed next to the machine name.

Ping Test
PTF will attempt to gather Internet Control Message Protocol (ICMP) echo responses from the remote machine using the Windows ping utility. Upon a successful response, the average roundtrip time will be reported.

Note: The default Windows network configuration does not respond to echo (ping) requests, however it may be enabled through the advanced firewall settings for the network connection; this is documented in the Microsoft TechNet article How to Configure Windows Firewall on a Single Computer.

Route Trace
If `ping` was successful, the final step PTF performs uses the Windows `tracert` command to measure transmission rates between the sub networks connecting the Sender and Receiver workstations. The number of sub networks traversed is reported in the PTF window in the column labeled `Number of Hops`.

PTF can perform these tests on machines not already in the `Recent Senders` list by entering the workstation name or network address in the `Test New Sender` field. The transcript of the tests will be displayed in a new window, as shown in the image below. When the Sender socket test succeeds, an `Add` button on the output window can be used to insert this new machine into the list of recent Senders.

Note: The Remote Graphics Receiver rewrites its recent Senders list each time it terminates, so new Senders added by PTF will get lost if the Receiver is running at the time of the addition. For this reason, the `Add` button should not be used if the Receiver is running.
Common to both Sender and Receiver interfaces in PTF is the View Log button. Clicking this will display the contents of the respective log file in a window similar to the image below. The log can be presented as either a tree separated by entry date, or a plain text dump. The logging facility can be told to include extra information using the Capture Debug Information check box; this can be helpful when diagnosing connection problems.
Changing this setting will not take effect until the Sender or Receiver is restarted. There are also buttons to refresh the log display, and clear the log file.

The Remote Graphics Log Display Window

The Client Management Page

For more than a decade, HP has been a leader in driving industry standards and providing customers with innovative PC management solutions. HP Client Management Solutions continues that leadership tradition by providing a comprehensive portfolio of solutions that reduce the complexity of managing client systems throughout their lifecycle. PTF's Client Management Page provides information, status, and downloads for some of the HP-provided client management utilities.

HP System Software Manager (SSM)

SSM is a free utility that helps streamline the mass deployment of software updates to client workstations. Its capabilities include:
• deploying system software updates (HP’s SoftPaqs for drivers and BIOSes, for example) from a centralized file store to multiple client workstations - simultaneously and automatically
• deploying customer-created update packages
• enforcing BIOS configurations and passwords
• logging the changes made to each workstation

If SSM is not currently present on the workstation, its installation SoftPaq can be downloaded and launched from PTF. Once installed, SSM can be run from the Client Management Page, and its read-me file and User Guide can be viewed by clicking the appropriate Framework buttons, as show below.

![HP System Software Manager (SSM) 1.70 A6](image)

**HP Client Management Interface (HP CMI)**

HP CMI is an open architecture for gathering client computer inventory, monitoring health events, and managing BIOS configuration settings on HP business class client computers. This interface is included standard on new workstation models beginning with the HP xw4300 workstation. The HP CMI Software Provider is available for Windows XP.
workstations without the built-in hardware support. At this time, there is no HP CMI Software Provider available for Windows XP x64.

If HP CMI is available, the Run button will display the HP CMI classes exposed through the interface. The read-me file and HP CMI White Paper can each be viewed with one button click. If HP CMI is not present, the Software Provider may be downloaded and installed using the PTF interface.

![HP Performance Tuning Framework](image)

**HP Client Management Interface**

**HP BIOS Configuration for ProtectTools**

The HP BIOS Configuration for ProtectTools utility is used to locally set BIOS options (such as modifying the boot order, disabling serial ports, etc.) using the new Microsoft Windows Management Instrumentation (WMI) Specification for the Client Management Interface. This package also includes HP Protect Tools Security Manager which provides an interface for the HP BIOS Configuration.

If HP BIOS Configuration for ProtectTools utility is not installed, its SoftPaq can be downloaded and run from the PTF interface. When PTF recognizes that it is installed, the
utility can be launched from the Run button, and the User Guide can be displayed by clicking on its button.

The 3Dconnexion Motion Controller Page

The 3Dconnexion motion controller configuration is reported on the 3Dconnexion page. The types of information reported include:

- the motion controller installation detected in the Windows's Registry
- the USB Plug-and-Play motion controller currently connected on workstation
- the 3Dxware software driver version installed on the workstation
- the list of 3Dconnexion Add-in and Plug-in application software installed on the workstation
- hyperlinks to the motion controller product information
- hyperlinks to the motion controller software download site

There are buttons to Run/Stop the motion controller driver on this page. There is a View button to display the motion controller product specifications.
This screen image shows the 3Dconnexion Page for a machine with the USB SpacePilot installed.

The 3Dconnexion Motion Controller Page
Chapter 3 -- Supported Applications

The foundational support PTF provides for an application is the recognition of a valid installation (shown on the Applications Page), and the presentation of graphics driver certification information for the current platform configuration (shown on the Graphics Driver Page). Beyond that, the HP consultants working with the application providers may have implemented tuning utilities unique to the supported application versions. These tuning opportunities are presented to the user on tuning and information forms created for each installed application.

A common additional tuning feature PTF provides is the enablement of large memory usage, which is supported by several applications. However, the most exciting feature is the graphics performance enhancement capability of HP HyperTune technology for certain applications.

With HP HyperTune, users can really benefit from the deep technical knowledge HP has gained through long, cooperative relationships with the application providers. HP engineers have discovered ways to improve the graphics performance of Siemens PLM Software NX, and have written a HyperTune module to expose this capability to the workstation user. The HyperTune for NX module employs a rich user interface that allows fine control over the types of graphics operations it measures (see the HyperTune screen image).

This table lists the currently supported Framework applications for which installation recognition and graphics driver certification information are provided, and also identifies the applications for which additional tuning features are available:

<table>
<thead>
<tr>
<th>Application</th>
<th>Versions</th>
<th>Large Memory</th>
<th>HyperTune Module</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe Photoshop CS2</td>
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<td>Autodesk AliasStudio</td>
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<td>Autodesk AutoCAD Mechanical</td>
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<td>Autodesk Mechanical Desktop</td>
<td>2007, 2008</td>
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<td>Architecture</td>
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<td>3, 4, 2008</td>
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<td>Bentley MicroStation</td>
<td>V8, V8 XM</td>
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<td>Bentley ProjectWise</td>
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<td>Navigator</td>
<td>V8 XM</td>
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<td>CoCreate OneSpace</td>
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<td>SolidWorks Cosmos</td>
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<td>Siemens PLM Software</td>
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<td>IDEAS</td>
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</table>

Applications with Additional Tuning Features

Autodesk 3ds Max

3ds Max is capable of utilizing several different graphics technologies, including a custom display driver delivered by the graphics hardware vendors. To facilitate selection of a graphics driver, the 3D Studio Max application page contains a button to launch the application's Graphics Driver Setup dialog.
Autodesk AutoCAD

Starting with AutoCAD 2007, an AutoCAD Hardware Certification Database file contains the latest data that AutoCAD uses for optimizing the performance of graphics hardware. PTF offers the ability to download and install the latest hardware certification data from the Autodesk web site to keep workstations current. The button to initiate the download and installation of the updated AutoCAD Hardware Certification Database is shown here.
Autodesk Inventor

Autodesk Inventor 6.0 through 10.0 maintains data about supported graphics cards and drivers in the Windows registry. PTF offers the ability to download and install the latest support data from the Autodesk web site to keep workstations current. The button to initiate the download and installation of the updated registry contents is shown here.
The Inventor 10 Application Form

Starting with Inventor 11.0, data about supported graphics cards and drivers are maintained in the Inventor Graphics Database. PTF offers the ability to download and install the latest Graphics Database from the Autodesk web site to keep workstations current. The button to initiate the download and installation of the updated database is shown here.
Siemens PLM Software NX

PTF can launch the HyperTune for NX utility. This tool has the ability to measure the graphics performance of NX, and configure the graphics card and application settings for optimal performance. The screen image below shows the user interface of this utility. For more detailed information on HyperTune, read its Users Guide.
The HyperTune for NX User Interface
Chapter 4  --  Dynamic Updates

To get the most out of the HP Performance Tuning Framework, a network connection is required. Hewlett-Packard will update PTF periodically to add new configuration features and application support, and the certification data must be updated regularly as new workstations, graphics cards, and drivers are released and certified. These updates can only occur via the internet.

Certification Database

Each time PTF is started, it compares its local version of the database with the one on the PTF server. If it finds the local copy is not up to date, it will replace it with the latest.

Performance Tuning Framework

The database contains information about the latest available version of PTF, which is also checked each time PTF is run. If PTF finds that its version is not the latest, it will prompt for permission to update itself. If accepted, the newer version will be downloaded, installed, and launched.

As new features are added to PTF, or if critical issues have been found and corrected, it may become necessary to force an update. In these situations, a prompt will be displayed notifying that an update is required before PTF can run. If the update is declined, PTF will terminate, and will not run again until the update is accepted.
Appendix A  --  Large Memory Configuration

Microsoft Windows XP Professional includes the ability to give applications access to a larger virtual address space than was previously available. For example, if a CAD designer using UGS Unigraphics NX2 was running out of memory while loading a large assembly, this operating system feature could be enabled to give her the extra storage necessary to bring the entire assembly up on the screen. This document provides some background information about this new feature, and describes what the HP Performance Tuning Framework can do to help enable it.

The following Microsoft documents discuss various aspects of this feature, which Microsoft refers to as 4 Gigabyte Memory Tuning or 4GT:

- Memory Support and Windows Operating Systems
- Windows NT Server Enterprise Edition FAQ - 4 Gigabyte Memory Tuning
- Information on Application Use of 4GT RAM Tuning
- Troubleshooting the Startup Process
- Windows XP SP1 May Not Start with the /3GB or /USERVA Switch

Overview

The default configuration of the Windows XP Professional operating system reserves the upper 2 gigabytes (GB) of the 32-bit virtual address space for itself, and allows applications to use the remaining 2GB at the low end of the address range. This is far more space than most applications need. For the few technical workstation users who require more than 2GB, Windows XP can be set to reserve only 1GB for itself, thereby opening up an additional 1GB for applications to use. To enable an application to access this additional memory, both the operating system and the application must be configured appropriately.

Configuring the operating system

Windows must be started with a boot option that restricts its memory use to only the top 1GB of the 32-bit address range. Boot options are stored in the boot initialization (boot.ini) file, which is a hidden system file containing the boot entries that get presented when a system is turned on, as shown here:
This screen shot was taken on a machine that has three boot entries in its boot.ini file: two for a disk that contains Windows XP, and one for another disk with Windows 2000. Each selectable boot entry can pass different boot options to Windows. So, aside from the different labels for the Windows XP entries, what really differentiates them are the options they pass to the Windows boot loader. Here, "(3GB Enabled)" indicates that the first boot entry includes the options necessary to enable large memory usage.

Configuring the application

The application’s executable file must be set to notify Windows that it may request more than the typical maximum of 2GB. This can be done by the software vendor while the application is being developed, or it can be accomplished after release with a tool that knows how to modify the program’s header.

Enabling Large Memory with the Performance Tuning Framework

The HP Performance Tuning Framework simplifies the process of enabling large memory usage for several technical applications. Currently the list includes:

- ANSYS 9
- ANSYS 10
- ANSYS Workbench 9
- ANSYS Workbench 10
- CATIA V5
- Inventor 7
- Inventor 8
- Inventor 9
- Inventor 10
- Inventor 11
- MicroStation V8
- MicroStation V8 XM
When the *Enable Large Memory* button is clicked on one of the tunable application pages in PTF, several checks are made of the workstation to decide if it is safe to continue. The most important thing examined is the presence of a specific Microsoft Hotfix on systems running Service Pack 1 or 1a. Microsoft has granted HP permission to redistribute this hotfix, and PTF will download and install it if necessary. The process for requesting this HotFix from Microsoft is outlined in their Knowledge Base Article 328269.

The next thing PTF does is make a back-up copy of the system boot.ini file before making any edits. If there is only one boot entry in the file, it is duplicated and the large memory options are added to the new copy. If there is more than one boot entry that applies to the current OS image, then the user is given the chance to select which one should be used as the basis for the large memory entry. In either case, the new entry is made the default for the next time the system is rebooted.

Finally, PTF will make sure the application executable files are set to utilize the additional memory. The next time the system is rebooted, and the large memory boot entry is selected, the application will have access to the increased address space. Operating in large memory mode will have no effect on applications that are not enabled for large memory usage.

**Additional Notes**
The benefits of large memory mode come with some potential risk. The following bullets describe the issues that should be understood before enabling large memory mode.

- Reducing the amount of memory Windows retains for itself could have adverse effects on system or application performance. See the answer to the question “Can 4GT hurt an application?” in Microsoft’s FAQ. All the applications for which PTF will enable large memory mode have been proven to run correctly in this configuration by their respective companies.
- With diminished memory available, the Windows kernel might not be able to allocate a large enough block of memory to satisfy requests from the software drivers of system components, such as high-end graphics cards. The /USERVA option can be used in boot entries for greater control over the amounts of memory partitioned between applications and the Windows kernel.