FS2004 Performance Tuning Ideas

(by Scenery Solutions LLC, for Ultimate Terrain users)

Overview

Flight simulator applications are, without a doubt, one of the most complex and sophisticated software applications available today. Not only does the simulator have to model the actual aircraft operations, but it also has to manage how the visual terrain scenery outside of the cockpit is presented to the user. Adding to the complexity is the fact that simulators, like Microsoft's Flight Simulator, also provide the ability to fly the entire globe.

The popularity of Microsoft's Flight Simulator has created an opportunity for a large number of add-on products, which enhance the simulator even more for things like aircraft and terrain scenery.

Because these add-on products add more details and complexity to an already complex simulator, improving system performance is always worth considering.

Because our Ultimate Terrain product is a terrain enhancement product, this document will focus on improving system performance related to terrain scenery products.

Some of these ideas will be quoted from others (with credit). Some ideas have been discovered through our own test processes. Other ideas are mostly a compilation of suggestions that have been floating around the internet for some time.

These performance tips are geared towards users running the Windows XP operating system.

Scenery Solutions is not responsible for any results, good or bad, that you might get from applying these suggestions to your system. We are also not responsible for the correctness of any statements made in this document. The statements made here are based on our own technical expertise, in addition to general observations made by others.

Types Of Performance Issues In FS2004

In our opinion, there are three major categories that should be discussed when dealing with terrain scenery performance issues.

Frame Rate Reductions

A frame rate can be defined as the number of "frames" that can be displayed per time unit (usually described as frames-per-second or FPS). The term is very common in the gaming industry, and is also used in the motion picture industry. The higher the number of frames playing per second, the smoother the video playback appears to the user.

Frame rates normally go up or down in flight simulators as the scenery becomes more or less complex. As frame rates drop, an aircraft might lose it's responsiveness, or 3D objects might not display fast enough.

There is a lot of debate as to what the targeted minimum frame rate should be in MSFS. The professional frame rate for motion pictures is 24 frames per second.

The number and complexity of 3D objects that are displayed have a definite impact on the measurable frame rate in M SFS. Autogen objects are a significant contributer to frame rate reductions. Fortunately, you can easily adjust the number of autogen objects using sliders from within FS2004.

Ultimate Terrain does not seem to have a measurable effect on frame rates, with the exception of the night lighting system, which has a minimal to moderate impact.

Stutters/Hitching

Stutters are sudden drops in frame rates that can cause flight simulator to pause for a brief period of time. When this occurs, everything appears to freeze up (including aircraft control). The stutters occur when the flight simulator application has to pause, while waiting for a critical internal activity to complete.

Blurries

Blurries are the inability of flight simulator to keep up with requests to repaint the terrain (for various reasons).   As a result, the terrain can appear blurry, instead of the crisp terrain textures that are normally displayed.   This occurs because the process(es) that draw the terrain scenery are unable to complete the task in the allotted time frame.

Steve Lacey, one of the MSFS developers, maintains an internet blogging site.   On this site, he talks about the blurries and the stutters.   It is a fantastic explanation, that is greatly appreciated (thanks Steve).

For more information about blurries, here is the link to Steve's blog:

http://www.steve-lacey.com/blogarchives/2005/11/the_blurries.shtml

For more information about stutters, here is the link:

http://www.steve-lacey.com/blogarchives/2005/11/the_stutters.shtml

Although frame rates are not generally impacted by Ultimate Terrain., some users have reported an increase in stuttering or blurries.   In addition to better hardware, most of the performance tweaking issues in this document are targeted towards those particular users.

Performance Tuning Ideas For FS2004

Windows XP Tuning

Exit Background Applications

You will want to have as much CPU time available as possible to MSFS.   As a result, make sure you don't have any CPU hogging applications running in the background (i.e. chat client, email client, virus scan, etc).

Disk Defragmentation

File Fragmentation is a major cause of degraded hard disk performance and can affect the overall performance of Flight Simulator.   It can be a major cause of slow loading times, and can also result in the previously discussed blurries and/or stutters.

You should defragment your disk as much as possible.   It is especially important when you install add-ons with a large number of files, like Ultimate Terrain.

Windows XP comes with a built in disk defragmentation tool.   However, there are much better commercial alternatives available, including:

- ❖ Raxco Perfectdisk - http://www.raxco.com/products/perfectdisk2k/

- ❖ Diskeeper - http://www.diskeeper.com/

- ❖ O&O Defrag - http://www.oo-software.com/en/index.html

There are several advantages to using commercial defraggers.   One of the advantages is that the commercial defraggers will defrag your windows swap file and MFT (master file table).   The defrag tool that comes with windows XP will not do this.

The O&O defrag tool has an additional feature that has been reported to improve disk access performance in FS2004.   This is done through the "Complete name" defragmentation method.   This defrag method will sort all of your files and folders by folder/filename.   Since similar types of files loaded by flight simulator have similar filenames (and are located in the same folder), putting these files together physically on the disk should result in less disk head travel (and faster access times).

Our own tests at Scenery Solutions have shown the O&O Defragger does improve FS2004 loading times and performance.   The other commercial defragmentation tools might also help, but have not been tested by us.

Disable Last File Access Stamping

Every time flight simulator reads from a file (and it does this a lot), the windows XP file system will write a few bytes to the file which sets the file access time.   Unless you have a reason for knowing when your files were last accessed (read), you should disable this feature.

To disable "last file access stamping", you will need to go to the system prompt.   To get a system prompt, go to Start -> Programs -> Accessories -> Command Prompt.   This will open up an old-style DOS window.

At the command prompt (blinking cursor), type:

```
fsutil behavior set disablelastaccess 1
```

Press the Enter key to execute the command above.   Type exit (followed by enter) to exit the command prompt window.

Disable Windows File Indexing

The windows file indexing service will speed up disk searches accomplished by the Windows XP "Search" feature.   However, this feature can really slow down gaming and simulation applications.

To disable the file indexing:

- ❖ Open Control Panel
- ❖ Select Add/Remove Programs
- ❖ Press "Add/Remove Windows Components" button.
- ❖ Make sure "Indexing Service" box is unchecked.

* information provided by pcstats.com.

Increase CPU Priority To The Foreground Process

Because this next suggestion requires a registry edit, you should back up your registry first.   To increase the CPU priority to the foreground process, start Regedit and navigate to the following key:

```
[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Control\PriorityControl]
```

Change the dword value of Win32PrioritySeparation to 26. Make sure the hexadecimal button is clicked for the base.   You should then see the following value attached to the Win32PrioritySeparation keyword.

```
"Win32PrioritySeparation"=dword:00000026
```

Save your changes and reboot the system to run with the new setting. By default, the factory setting is usually 2.

FS2004 Settings (inside and outside of FS2004)

Target Frame Rate

If you have a problem with the blurrries, do not set the target frame rate to "Unlimited". Set the target frame rate to something else (maybe in the range of 18 to 22 ?). The lower you can go with the target frame rate, the more time FS will have to deal with issues like the blurries.

Sight Distance

From within FS2004, reduce your sight distance to something like 60 miles. Anything over this setting is overkill for most users, and can only reduce frame rates.

To change your site distance from within FS2004,

* ❖ From the main menu go to "Settings-Display".
* ❖ Click the "Weather" tab.
* ❖ Reduce your site distance if necessary.

Changing FS9.CFG Parameters

A large number of tweaks can be applied by editing the FS9.CFG file. In previous versions of MSFS, this file could be found in the same folder as the FS9.EXE application. In FS2004, this file has been moved and hidden.

The FS9.CFG file can be found at the following location:

        C:\Documents And Settings\<username>\Application Data\Microsoft\FS9\FS9.CFG

Where <username> is the name of the user logged into XP. We are also assuming that that OS is installed on the C: drive.

For example, if the logged in user was named FRED, then the complete path to the FS9.CFG file would be:

        C:\Documents And Settings\FRED\Application Data\Microsoft\FS9\FS9.CFG

You should also be aware that the "Application Data" folder is hidden.

In order to view the "Application Data" folder in windows….

- ❖ Start Windows Explore.
- ❖ Go to the "C:\Documents And Settings\FRED" folder (where FRED is your username).
- ❖ Select "Folder Options" from the "Tools" menu.
- ❖ Click on the "View" tab.
- ❖ Select the button that says "Show Hidden Files And Folders"

You can now work your way down to the FS9 folder using Windows Explore.   You can load and edit the FS9.CFG file using the windows notepad.

The TERRAIN portion of the FS9.CFG file contains a lot of settings that have been reported to improve performance.   Different settings seem to work better for different people.   Here is one that has been reported to work for quite a few people (thanks to users in the Ultimate Terrain and FSGenesis support forums).

```
TERRAIN_ERROR_FACTOR=50.000000
TERRAIN_MIN_DEM_AREA=10.000000
TERRAIN_MAX_DEM_AREA=100.000000
TERRAIN_MAX_VERTEX_LEVEL=21
TERRAIN_TEXTURE_SIZE_EXP=8
TERRAIN_AUTOGEN_DENSITY=2
TERRAIN_USE_GRADIENT_MAP=1
TERRAIN_EXTENDED_TEXTURES=1
TERRAIN_DEFAULT_RADIUS=9.500000
TERRAIN_EXTENDED_RADIUS=4.500000
TERRAIN_EXTENDED_LEVELS=3
```

General Hardware And Driver Improvements

As you probably already know, buying a better video card and a faster CPU will most likely have the biggest overall improvements with flight simulator.   This is obvious to most people.   However, there are some other hardware improvement areas that you should not ignore.

Hard Disk Performance

A faster hard drive will improve load-times.   It may also help with blurries and stutters if flight simulator is having to wait on disk access events.

You can really improve disk performance if you have at least 2 disk drives and RAID support with your system.   Running with RAID 0 (disk striping) can effectively double your disk transfer rate.

Video Drivers

New video card dependant drivers are constantly being released and installed by users.   There can be dramatic differences between different versions of video card drivers for the same video card.

Try and find out which video card drivers work well with your card in FS2004 (public forums are a good start).   If you find a good combination, stick with it.

Adding RAM

Flight Simulator itself is not much of a memory hog.   In fact, the minimum requirement is only 256mb.

Memory usage only becomes an issue when lots of 3rd party add-ons are purchased.   Detailed aircraft can eat up a good portion of the RAM.   Scenery packages like Ultimate Terrain can also take their share of the available RAM.

If you purchase a lot of add-ons, you should probably consider a RAM upgrade.   A common configuration these days seems to be 1 GB of RAM.

Having too little RAM will cause excessive page file usage, which will degrade system performance.

Comment About Ultimate Terrain Minimum Requirements

On occasion, a user will wonder why are not more specific with our hardware requirements for Ultimate Terrain.

While it is true that better hardware will generally result in better performance, there are other factors involved that can invalidate this statement.

So, while the hardware between two systems might be identical, performance differences can often be seen due to differing software installations and settings.   Different versions and configurations of video card device drivers are often a major culprit.

In addition, Ultimate Terrain is a feature rich but highly configurable product.   Most features can be toggled on and off as necessary, to find a good balance between visual effects and system performance.

Ultimate Terrain Settings

As a last resort, you can begin removing some Ultimate Terrain functionality to achieve your target performance.

We have made our Ultimate Terrain products highly configurable, so that just about any FS2004 user can benefit from some or all of the Ultimate Terrain features.

Here are some Ultimate Terrain features that you might consider disabling, using the Ultimate Terrain Setup And Configuration utilty.

Residential Roads

Many Ultimate Terrain users prefer to disable residential roads in the urban areas (cities).   This is because the FS2004 landclass textures have faux roads imbedded in them.   These embedded roads are positioned at random (not an accurate representation of true roads).   However, because the landclass texture have these faux roads in them, they tend to clash with the actual roads that are drawn on top of the landclass textures.

Disabling this feature may also improve performance around the large cities.   Ultimate Terrain often contains very dense groupings of residential roads in large urban areas.

To turn off the display of residential roads, click off the "Add Residential Roads" item in the Ultimate Terrain Setup And Configuration tool.

Road Flattening

If Ultimate Terrain road flattening is activated, then the area under the road textures is flattened. This can provide a more realistic look in very hilly or mountainous areas.   Some users love the road flattening.   Other users can take it or leave it.

If you are one of those that can live without the road flattening, you might consider disabling this Ultimate Terrain feature.

Add Residential Lights

The night lighting effects provided in Ultimate Terrain are applied to all urban roads (both major roads and residential roads).   You have the option of turning off the lights for the residential roads (leaving the lights on the major roads).   By doing this, you can improve frame rates and also improve the number of autogen buildings that are displayed.

Removing Coastlines For Smaller Water Features

At the time of this writing, this feature is only available in Ultimate Terrain Europe.

With UT Europe, you can have coastlines drawn for all water features.   This includes ocean shorelines, lakes, and even rivers of any size.

Many, if not most people, do not like shorelines drawn for very small or thin water features.   Not only do the shorelines overwhelm the visual impact of the water feature, it also exposes an anomaly in FS2004 that sometimes causes small pockets of water to be displayed between the shoreline texture and the shore itself.

UT Europe allows you to disable the shorelines for very small lakes and very thin rivers, while keeping them for ocean and lake features