The Perils of Trying to Overcome the 2GB Memory Limit

By Ed Eaton

If you crash SolidWorks or PhotoWorks because of insufficient memory, purchasing more RAM for your computer is only part of the solution.

No matter how much memory you have, or how big your virtual memory, Windows will not allow you to use more than 2GB for a single application.

On top of that, the 2GB is theoretical. In practice, applications crash when memory usage reaches about 1.6-1.7 GB. This of course will stop you cold if you are working on large assemblies, or on PhotoWorks renderings.

Because of the 32-bit operating system, the mathematical limit for total memory+virtual memory is 4GB. By default, Windows reserves half of that total for itself!

On page 7-12 of the SW2004 "what's new manual," there is a mention that SolidWorks is written to take advantage of the /3GB switch. This switch allows Windows XP Pro and some server applications to override the 2GB limit and free up to 3GB of that expensive RAM you've been buying for your systems.

Unfortunately, when our company attempted to follow the instructions as presented, we permanently prevented our system from rebooting.

After a great deal of extra research, we found that enabling the 3GB switch requires that you know a poorly documented two-step process.

The first poorly documented problem is that the /3GB switch is not working in Windows XP Pro, Service pack 1 (that's why the system locked up)! To get a hotfix that corrects the issue, you have to call (800) 936-4900 and get to the "hotfix" people. Don't get spooked by Microsoft's statement that they will charge $245 for tech support - hotfixes are free.

Let the person on the phone know the problem has to do with the /3GB switch, referred to in article 328269. The link for that article is support.microsoft.com/default.aspx?scid=kb;en-us;328269&Product=winxp

Microsoft will email you a hotfix that carries no warranty and is not recommended for use in a production setting unless you thoroughly test it. But, for the record, it worked for us, and I have not experienced any problems in the three months I've had it on my machine.

After running the hotfix, enabling the /3GB switch is not as simple as checking a box in a dialogue. You have to dig into your boot.ini file and modify it.

The boot.ini file is on the top level of your C: drive, but to make it visible you have to go through Windows Explorer Options, Tools, Folder Options, View and select "Show hidden files and folders" and deselect "Hide protected operating system files."

The modification to the boot.ini file is explained in the following article:

www.microsoft.com/whdc/hwdev/platform/server/pae/PAEmem.mspx

The text of your boot.ini file may not match the sample shown. For reference, here is what I had to do to mine:

multi(0)disk(0)rdisk(0)partition(2)\WINDOWS="Microsoft Windows XP Professional" /3GB /fastdetect

A final warning: Yes, enabling the /3GB switch has worked for us, and allows us to use up to 2.7GB of RAM before locking up SolidWorks or PhotoWorks. We are now able to perform tasks that were simply not possible before the modification. But as with any time we hack our systems for performance, there are risks. Before starting on this process, I made a complete backup of my boot drive than I could plug in and use if things went south.

Ed Eaton is a member of the editorial board of this newsletter.

The Perils of Trying to Overcome the 2GB memory Limit – Part 2

By Wayne Tiffany

This article is a follow-up to Ed's article on utilizing the 3GB switch with Win XP, so reading it first is advised.

I had read a bit about the 3GB switch in the past, but never really pursued it. However, after reviewing Ed's article before publication, it occurred to me that maybe this would even help a machine with only 1GB of physical memory, and this information would be a valuable addition to the article. So I asked Ed - he didn't know.

The next logical step, then, was to figure out if there could be any benefit to a machine without gobs of RAM. The thought of a virtually free "upgrade" intrigued me, so I decided to find out.

The testing was all carried out by telling SolidWorks to load a huge file - certainly more than could be expected to fit, and was run on 3 different machines with various configurations. At the point that SolidWorks gave up due to lack of available memory, the amount utilized was recorded. Then the machine was rebooted and the next iteration was run.

One very important point to make - heed Ed's advice about applying the patch to WinXP SP1. If you turn on the 3GB switch without the patch, the machine will not boot! How do I know for sure? Embarrassingly, I must admit that in my exuberance to pursue more positive results, on one machine, I turned on the switch before the patch. Not so bad, I figured, just boot on a DOS floppy and modify the boot.ini file again. However with the SCSI drive in the machine, the drivers didn't load with the DOS boot, so the C drive was not accessible. The get-it-running-again solution was to install the hard drive on another machine as a second SCSI drive, and edit the boot.ini file from there to turn off the 3GB switch. Then back to its home, and this time, do it right. Note: you don't have to find & edit the Boot.ini file by itself with a text editor; you can do it through Windows by doing a right-click on My Computer, then selecting Advanced/Startup and Recovery Settings. There you will see a line that says, "To edit the startup options file manually, click Edit." Click on the button and it opens the file for you.

So, take a look at the results (the number recorded is the Total amount of RAM in the Commit Charge box), and decide if this is something you want to try. The bottom line of my testing was that making the changes did, in fact, give SolidWorks 2004 another GB of working space, even on a machine with only 1GB of physical RAM. Not as fast as having 4GB of physical RAM, but it may make the difference between actually getting something to load, or having it crash and burn. One final note – COSMOS will not recognize the extra memory yet, but hopefully will for the 2005 release.

Dell 360, 3.0Ghz, 2GB RAM, swap file set to 2046K min - 4092K max

SW2003	3GB switch off	1.98GB	
SW2003	3GB switch on	1.99GB	(As expected, 2003 can't use it)
SW2004	3GB switch off	2.00GB	
SW2004	3GB switch on	3.00GB	

Dell 350, 2.8Ghz, 1GB RAM, swap file set to 3072K min - 3072K max

SW2004	3GB switch off	1.71GB	
SW2004	3GB switch on	2.79GB	
SW2004	3GB switch on	2.81GB	(Set the max swap file limit to 4098 just to see)

Dell 350, 2.8Ghz, 1GB RAM, swap file set to 3072K min - 4098K max (a different 350 machine)

SW2004	3GB switch off	1.71GB	
SW2004	3GB switch on	2.80GB	
SW2004	3GB switch on	2.85GB	(Upped the physical RAM to 2GB)

The Perils of Trying to Overcome the 2GB Memory Limit – Part Three

By Wayne Tiffany

I've been investigating the 3GB switch some more and learned a few more valuable pieces of the puzzle. If you missed the first two installments, here are the links to them — it's worth reading them first to know what's going on. Then you can also search the newsgroup comp.cad.solidworks for "3GB" to read more discussion on the topic.

Probably the most important discovery is that while you can turn the switch either on or off, you can also set how much memory you want to allocate — it isn't all or none as I had thought. When I turned it on full bore, I experienced problems connecting to network drives. Huh, you ask? The error message reads "Z:\ is not accessible. Insufficient system resources exist to complete the requested service."

So what's this have to do with the switch? Keep in mind that turning on the 3GB switch "steals" memory away from the XP operating system and "gives" it the application side. I don't know if there's something peculiar about my particular computer/network/XP version, etc., but apparently something doesn't work properly when I steal the whole GB of memory.

So, what's the secret? In the Boot.ini file you can set another switch that controls the amount of memory allocated to the application. Here's my Boot.ini file as I am now running. (For more information on switch options for WinXP Boot.ini file, go to http://support.microsoft.com/default.aspx?scid=kb;en-us;833721&Product=winxp.)

```
[boot loader]
timeout=5
default=multi(0)disk(0)rdisk(0)partition(2)\WINDOWS
[operating systems]
multi(0)disk(0)rdisk(0)partition(2)\WINDOWS="Microsoft Windows XP Professional 3GB limited"
/fastdetect /3GB /userva=2900 /SOS
multi(0)disk(0)rdisk(0)partition(2)\WINDOWS="Microsoft Windows XP Professional" /fastdetect
/SOS
multi(0)disk(0)rdisk(0)partition(2)\WINDOWS="Microsoft Windows XP Professional 3GB "
/fastdetect /3GB /SOS
multi(0)disk(0)rdisk(0)partition(2)\WINDOWS="Microsoft Windows XP Professional 4\3GB "
/fastdetect 4\3GB /SOS
```

If you look at the [operating systems] section, you will notice that I have 4 entries — all different. This gives me four different boot choices if that option is turned on. (Check the box and set the time.) Take a look at the part in quotes right after the WINDOWS=. If you read the Microsoft info, you are led to believe that the only verbiage that can be there is from a set list of possible operating systems. Not true — when I did that, all the presented options looked the same, and I couldn't tell which one was which. So, customize the list. I haven't tried totally varying from the list, but what you see here does work.

The first option is the default that I am currently running. Notice the "/userva=2900" in addition to the "/3GB " at the end — the value is the amount of RAM that is allocated to the application side. I started at 2.5 GB by setting it to 2560. Here XP worked OK, but I hit the wall with SolidWorks, so I bumped it to 2816 — same story. So then I wondered if maybe the difference might be just the fact that I enabled the /userva switch; Nope, setting it to the full 3072 once again gave me the XP problems. I set it to 3000 and ran there for quite some time, but then did eventually get hit with the XP error message again; therefore the 2900 value. Where's the exact upper limit? I don't know — haven't had the time to tweak it closer. Your mileage may vary.

The second line is the "standard" line and is quite valuable to have there in case something goes wrong — like not installing the XP patch first. The third line, of course, is the full 3GB allocation. The fourth line is what Mike Eckstein was told to do with his machine, but I never could see any difference in the way the machine ran with "4\3GB" vs. "/3GB".

So, the bottom line is, if you are constantly working in the 2.0 - 2.5 Commit Charge range, as I currently am, and just turning on the 3GB switch causes other problems, this latest info will probably let you open up enough more memory to get the job done.

Wayne Tiffany is a Senior Design Engineer at Automatic Systems, Inc. in Kansas City. He is currently the CAD manager for SolidWorks there, and has more than three years of SolidWorks experience designing custom machinery for the conveyor and automotive industries. He is the current president of the newly formed Kansas City Area SolidWorks User Group, and is a Certified SolidWorks Professional. Wayne can be reached at wayne.tiffany@asi.com.