

A GUIDE TO IMPROVING YOUR WORKSTATION EXPERIENCE

SPECIAL
SOLIDWORKS
2012
EDITION



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Produced by
DEVELOP3D
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OPTIMIZE

Tune your workstation for free

Just like a kettle, workstations get furred up over time. Regular maintenance can help them perform to their true potential. Here are ten simple steps you can take to improve performance for free. Here's the disclaimer — proceed with caution and make sure all of your data is backed up before you start!

1 UNINSTALL UNNECESSARY APPLICATIONS

The simplest, most effective way to improve performance is to uninstall unnecessary applications as these take up memory and clog up startup sequences. Make sure you do this in the correct way, through Start > Settings > Control Panel > Add/Remove Programs.

the operating system is ready to be used. Here's the WARNING! Be very careful what you turn off. For example, if you take out ATI.dll, on restart your screen will not display! Search the web for details of what each process does. In Figure 1 the Adobe PDF update utility has been switched off, which will save resources every time the machine boots up.

2 TURN OFF UNWANTED STARTUP APPS

Some applications can't be uninstalled in the traditional way. To overcome this, click Start > Run and type MSCONFIG. Click the STARTUP tab and you will see all the processes that run at startup before

3 REBOOT REGULARLY

When applications and datasets load they can take up valuable memory resources. Over time this memory can become full, as resources are not always freed up when things are closed. This can slow down your workstation, as new applications

will then push some of their data to a swap file on the hard disk, which is a lot slower. Restarting your workstation periodically can clear up these minor memory leaks, helping ensure you have all of your memory available.

4 DEFRAG YOUR HARD DRIVE

Defragmentation can be a good way of increasing the performance of mechanical Serial ATA (SATA) hard drives. Hard disks are spinning platters with heads that read/write the data. The disks spin at a constant rate so the outside edge has more data read from / written to per revolution than the inside. This difference can be as much as 20%.

If you use your workstation a lot the files get spread over the disk with one part in the middle and one part at the end and this gets worse the more you delete and add files. This decreases performance because the head needs to physically move from one part of the disc to another and over a period of time your system starts to feel slower.

Defragmenting your hard drive on a regular basis can help with this as it moves all the files back together. N.B. defragmentation will not improve performance on modern Solid State Drives (SSDs) as there are no moving parts so they don't suffer from the same problems. Defragmenting a SSD could even damage the drive.

5 KEEP SPACE FREE ON YOUR HARD DISK

Keeping your hard disks half full can improve performance. There are many things you can do to achieve this. First of all archive old projects,

remove large files or duplicates and delete temporary internet and CAD files. Many software applications also install temp files in the root of the C drive. Once the application is installed it won't need them. A good way to check you've deleted the right folder is not to empty the recycle bin straight away. Run the application and if it all works OK you know it's safe to permanently delete.

6 INSTALL THE LATEST GRAPHICS DRIVER

Hardware drivers are always important. Windows operating systems come with a base set of drivers but you can still benefit from ones that are more up to date. For 3D applications, graphics drivers, then chipset drivers are the most important. The first place to visit is the certification page for SolidWorks (bit.ly/9jZmqu). This is updated periodically but the graphics card vendor might have a more recent one so you could visit their site as well.

Over the life of a professional graphics card, updating to the latest drivers can improve performance dramatically. A recent update to the AMD FirePro graphics driver, for example, boosted 3D SolidWorks performance by up to 70% when using RealView on certain models!

7 SET TO MAXIMUM PERFORMANCE

By default, the power profile in Windows is set to 'balanced', giving a combination of performance and reduced energy consumption. To set these to maximum performance click Start > Settings > Control Panel > Power Options. Then click 'show additional plans' and set to 'high performance'.

8 TURN OFF ENCRYPTION AND COMPRESSION

On NTFS disks, the standard file system used in Windows, you can save space and increase security by compressing and encrypting files. However, for maximum performance always turn these off.

9 SPECIALIST WINDOWS 7 TIPS

There are a number of specialist tips for boosting performance in Microsoft Windows 7. Here we provide the key concepts, but you'll need to do some research to find out exactly how to do them.

PREFETCHING is a Microsoft Windows 7 performance feature that spots trends in disk usage. Data that is accessed most frequently is automatically read into memory. The prefetcher can speed up booting, application launching, or both. It is configured by changing registry settings.

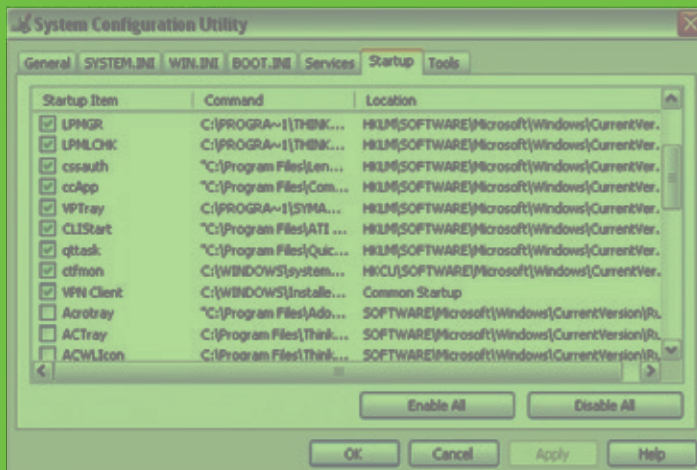
PROCESSOR SCHEDULING can tune Windows 7 so that it is optimised to run programs, as opposed to background operations.

THE LAST ACCESS TIMESTAMP tells you when a folder or file was last accessed. If you have folders that contain large numbers of files (such as SolidWorks parts) and you frequently access those files, writing the Last Access Time data can slow down disk access. You can turn this off in the registry.

10 SPRING CLEAN YOUR MACHINE

Over time, a build up of dust can clog up fans, which are used to cool CPUs and graphics cards. This makes them less effective, and in some cases causes processors to slow down to stop them overheating. Cleaning inside the machine can help this, but be very careful. Workstations are delicate and sensitive to static so this should be done by hand using an anti-static cloth or compressed air, not with a vacuum cleaner or cleaning products!

Fig. 1 AUTOMATIC PROGRAM UPDATES, SUCH AS ADOBE'S PDF UPDATE UTILITY, CAN BE REMOVED FROM STARTUP



UPGRADE

Invest in new components

Your workstation can be improved further by upgrading key components. As machines get older, compatible components come down in price, and there are some great second hand bargains, so upgrading can be a very cost effective way of getting a lot out of a small budget.

1 PROFESSIONAL GRAPHICS
Upgrading to a new graphics card can help improve 3D performance when models increase in size and complexity. For example, the new GeometryBoost feature in the AMD FirePro V5900 and V7900 can increase performance significantly by processing two primitives (triangles) per clock cycle compared to one in previous generations. This is particularly important when using features that improve image quality such as Full Scene Anti Aliasing. A new graphics card can also help maintain full support with new software. Older graphics cards can become out of date if they don't support the latest APIs, such as OpenGL 4.1 and DirectX 11, which are used by modern 3D applications.

Those that currently use a gaming card, such as AMD Radeon, may be missing out on features. For example, RealView, the real time visualisation engine in SolidWorks, is only supported on professional graphics cards, such as AMD FirePro. The amount of Graphics Processing Unit (GPU) memory is also an important factor when considering an upgrade. 128MB or 256MB is common in some older generation cards, but modern 3D applications, particularly those that have implemented Vertex Buffer Objects (VBOs), such as SolidWorks, need more to run to their full potential. VBOs allow 3D geometry to be directly stored and modified in the graphics card's dedicated frame buffer memory, rather than in system memory. This reduces latencies by essentially shortening

the data path to the GPU. It can also reduce CPU cycles allowing the workstation to stay more responsive. To find out how much memory your graphics card uses AMD offers a free memory viewer tool. Simply load up your key applications and datasets, then run the utility. Another free tool counts the number of triangles in a SolidWorks assembly. Understanding the size of the geometry in a SolidWorks part or assembly can be useful when choosing a graphics card. Both utilities are available here (bit.ly/wfpKAL).
PRACTICAL TIP #1 Make sure your new graphics card is compatible with your workstation. 'AGP' workstations will not support 'PCI Express' graphics cards and the latest PCI Express 2.1 cards will not work to their true potential in PCI Express 1.0 workstations.
PRACTICAL TIP #2 Make sure you have sufficient power (watts). Some PSUs simply don't output enough power for high-end cards.
PRACTICAL TIP #3 Make sure you have enough room. Some workstation chassis don't support full length or double height cards.

MEMORY (RAM) REQUIREMENTS FOR TYPICAL CAD MODELS

MODEL TYPE	ENGINE	CHASSIS	BOODY
# OF COMPONENTS IN ASSEMBLY	655	706	6625
TYPICAL RAM CONSUMED	7.5GB	10GB	23.5GB

Four CPU cores is a good amount for mainstream SolidWorks users. Investing in a faster CPU can also benefit 3D graphics. Increasing the GHz of the CPU will almost always improve 3D performance.
PRACTICAL TIP #1 Make sure the CPU is compatible with the socket on your motherboard.
PRACTICAL TIP #2 Make sure you have the correct heat sink and use a good quality thermal paste to 'bond' the CPU to the motherboard.

2 CPU (CENTRAL PROCESSING UNIT)
Those considering an upgrade to a new CPU should concentrate on two main areas - GHz and CPU cores. All applications will benefit from a CPU with a higher GHz so this is a good way to boost general performance. Increasing the amount of CPU cores will have a major benefit for multi-threaded processes such as rendering in PhotoView 360, but will also boost performance for certain CAD/CAM/CAE tasks and increase potential for multi-tasking.

3 MEMORY (RAM)
Multi-application workflows and increasingly complex datasets mean workstations need more RAM than ever before. When a workstation runs out of memory, the system can slow down completely due to hard drive caching. Here, adding more memory can be a very cost effective way of improving performance, but make sure you have a 64-bit operating

system if you have more than 3GB.
PRACTICAL TIP #1 To check how much memory you are using press CTRL, ALT, DELETE and click performance or, for a more detailed report, download a specialist memory viewing application.
PRACTICAL TIP #2 When you add more memory, make sure it is matched to existing RAM for best performance.

4 DISPLAYS
There are many benefits to upgrading a display. Modern TFT displays feature higher resolutions, more vivid colors, a smaller footprint and can help reduce eye strain. Modern graphics cards can support multiple displays, which can either be used for individual applications or positioned side by side for an extended desktop.
PRACTICAL TIP #1 Don't throw out your current display. Use it for a complementary process, such as email or document management.
PRACTICAL TIP #2 All graphics cards support two displays, but AMD Eyefinity technology can support three or more.

5 OPERATING SYSTEM
One of the most compelling arguments for upgrading your operating system (OS) is to get access to more memory. A 32-bit OS, such as Windows XP Professional, can't use more than 3GB, whereas a 64-bit OS, such as Windows 7 Professional 64-bit can. It is also important to maintain compatibility. SolidWorks 2013 will not run on Windows XP, for example. Windows 7 can also improve performance in some applications, by enabling them to make better use of multiple CPU cores.

6 STORAGE
There are two main reasons to upgrade a hard drive. 1) to increase performance 2) to increase capacity. For performance, a popular upgrade is to a modern Solid State Drive (SSD). These boast faster read/write access than standard mechanical platter drives, which means operating system, applications and datasets will load quicker. For increased capacity the latest mechanical SATA drives can hold terabytes of data and prices are comparatively low.
PRACTICAL TIP #1 Make sure your motherboard supports the relevant SATA standard (PCI cards can be added in to support newer standards).
PRACTICAL TIP #2 Buy a SSD for operating system, applications and current datasets and use your existing SATA drive for storage.

RENDERING TIME IN RELATION TO CPU CORES (SMALLER IS BETTER)

CAD SOFTWARE PERFORMANCE IN RELATION TO CPU SPEED (BIGGER IS BETTER)

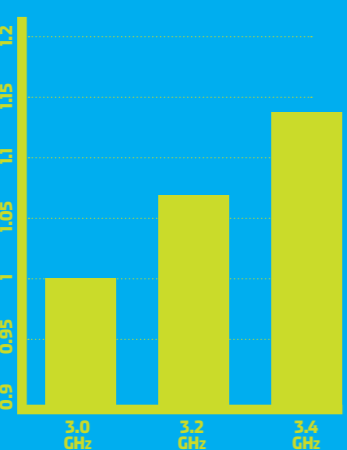
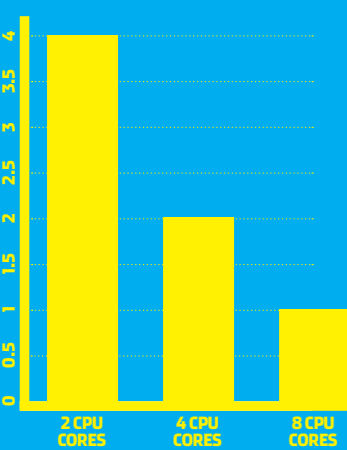


ILLUSTRATION: ROB BIDDULPH

INVEST

Buy a brand new workstation

Investing in a brand new workstation can deliver huge productivity benefits, enabling new workflows that are simply not possible with aging hardware. But where do you spend your money? We look at the key components and what they all mean.

1 GRAPHICS
Professional graphics cards, such as AMD FirePro, are a good choice for designers and engineers as they are tested, optimised and certified to work with all the leading CAD/CAM/CAE applications.

For SolidWorks, an entry-level or mid-range card with 1GB or more of memory is a good choice. However, when working with exceptionally large models a more powerful card with more memory can help ensure smooth model manipulation when using advanced visualisation features such as RealView.

When buying a workstation it is important to find a good balance between CPU and graphics card. A high-end graphics card will not be

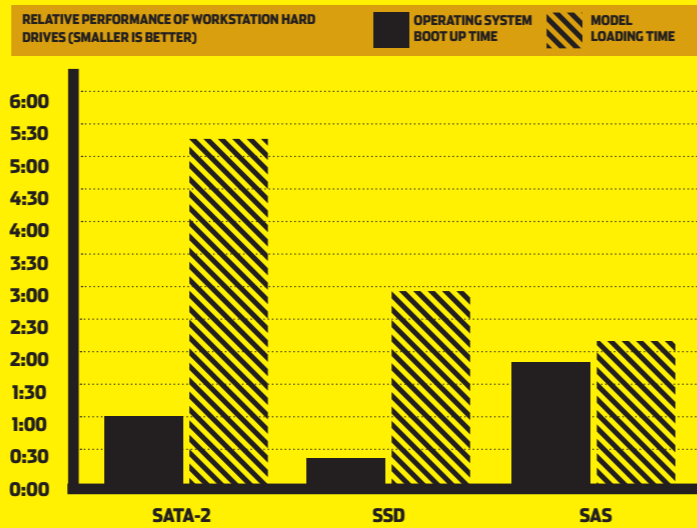
able to express its true performance if matched with an entry-level CPU.

Higher end graphics cards can also offer additional benefits. A single AMD FirePro V7900, for example, can span SolidWorks models across four displays for 'beyond HD' visualisation. This is a unique feature, which is made possible by AMD Eyefinity multi-display technology. Professional graphics cards from other manufacturers require two graphics cards to do the same task.

AMD Eyefinity multi-display technology is also available in other graphics cards. The AMD FirePro V4900 and V5900, for example, support three displays, while the AMD FirePro V9800 supports six.

GPUs can also be used to accelerate compute intensive operations such as Finite Element Analysis (FEA), Computational Fluid Dynamics (CFD) and rendering — tasks that are traditionally carried out by CPUs. The OpenCL-compliant version of Abaqus from Dassault Systèmes Simulia, for example, can take advantage of GPUs for structural and multiphysics analysis.

2 CENTRAL PROCESSING UNIT (CPU)
Modern CPUs comprise multiple processors (cores). When there was only one core per chip you had the choice of a single or dual processor workstation. Now things are measured in single or dual sockets and the number of cores per socket.



On a single socket workstation four cores are common, but two, six or even eight core processors are also available. On a dual socket workstation the amount of cores is doubled.

In general the speed of the CPU is more important for performance in 3D software than the number of cores. This is measured in GHz. For SolidWorks two cores should be a minimum, as one core looks after the memory allocation while the other takes care of interface/modelling. Certain elements of SolidWorks, such as assembly loading and boolean operations, can also take advantage of multiple CPU cores as can drivers for graphics cards.

Today, in order to benefit from a larger number of cores, you will need to use specialist software for rendering or simulation. While rendering software, such as PhotoView 360, works incredibly efficiently with eight or twelve cores, the benefits for simulation software often diminish above two

or four cores. However, multi core workstations can be put to good use when solving multiple simulations at the same time.

3 STORAGE
There are three main types of hard drives in workstations today. SATA (Serial ATA), SSD (Solid State Drive) and SAS (Serial Attached SCSI).

SATA drives are the most popular as they offer large capacities at a low cost. They feature read/write heads that move across rotating platters. A common rotation speed is 7,200RPM.

SSDs are becoming increasingly common. Read/write speeds are faster than SATA, which means datasets can be opened and saved quicker. Operating systems and applications will also load faster. The downside of SSDs is that the cost per MB is still high. As a result, a popular choice for workstations is to use an SSD for operating system,

applications and current datasets and a SATA drive for storage.

SAS drives offer excellent read/write performance. Like SATA drives they feature read/write heads that move across rotating platters, but rotation speeds are typically from 10,000RPM to 15,000RPM. As the cost per GB is also high, a combination of SAS (for performance) and SATA (for storage) is also typical.

Disks can also be combined in multiple ways with a hardware solution called RAID. This comes in many forms, but here are two of the most popular.

RAID 0 is where you take two disks and stripe the data across both. You get better performance than a single drive, the full capacity of both drives, but if one drive fails you lose all your data.

RAID 1 is where the drives are mirrored. If one drive fails your data is backed up on the other, but you only get the capacity of one drive.

4 OPERATING SYSTEM
Microsoft Windows 7 64-bit now comes as standard on all new CAD/CAM/CAE workstations. However firms that are on older operating systems, such as Windows XP, need to plan for the future.

Windows 7 is able to handle multi-tasking more efficiently, which better supports advanced engineering workflows. Reduced support for CAD/CAM/CAE software and workstation hardware on Windows XP make an even stronger case for standardising on a modern operating system. It is also important to note that some new hardware, including AMD Eyefinity multi-display graphics cards, is not supported on Windows XP.

5 MEMORY
Memory requirements are growing in CAD/CAM/CAE workstations and 8GB is now considered 'entry-level' with 16GB or more often needed to run multiple applications at the same time and load up complex datasets. Additional memory is required for compute intensive operations such as simulation, rendering, CAM and drawing production.

To address more than 3GB of memory a 64-bit operating system is mandatory. To improve system stability Error Code Checking (ECC) is often recommended and this is standard in high-end workstations. Non-ECC memory is more common in entry-level machines.

When buying a new workstation it is good practice to ensure there are spare DIMM slots reserved for future upgrades. However, don't break the bank doing this by having to buy expensive high capacity modules. The price of memory always comes down over time, so in the long run it could be more cost effective to replace the entire memory in the workstation.



ILLUSTRATION: ROB BIDDULPH

MODEL TYPE	ENGINE	CHASSIS	BODY
# OF COMPONENTS IN ASSEMBLY	655	706	6625
TYPICAL GPU MEMORY CONSUMED	370MB	1GB	1.2GB



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DESIGN AND SIMULATE

AMD FirePro graphics provides professional support for advanced SolidWorks workflows — including high-quality real time graphics, multi display environments and GPU-accelerated simulation

1

REAL-TIME PREVIEWS WITH REALVIEW



RealView brings models to life through advanced shading in real time. In SolidWorks 2012 it comes with Ambient Occlusion, which delivers outstanding depth and realism reducing

the need for ray-traced rendering. AMD FirePro is specifically optimised for this and provides new levels of real-time performance. N.B. RealView is not supported by consumer graphics cards.



2

ACCURATE DESIGNS WITH ANTI-ALIASING



The GeometryBoost feature in the AMD FirePro V5900 and V7900 means high-quality features like Full-Scene Anti-Aliasing (FSAA) can be turned on in SolidWorks permanently

without slowing down workflow. FSAA removes coarse edges from contours of geometries in real time. This results in higher-quality visuals and a more accurate representation of designs.



3

PRODUCTIVITY WITH THREE DISPLAYS



AMD Eyefinity enables three displays to be driven by a single AMD FirePro graphics card. This supports advanced design workflows, where SolidWorks users switch between applications

including SolidWorks Simulation and PhotoView 360. Other tasks, such as part and assembly modelling, data management, email and spreadsheets, are all available at the click of a button.



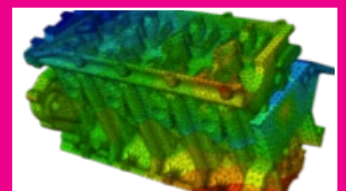
4

WORKFLOW PERFORMANCE FOR CAE



Enabled by OpenCL, AMD FirePro GPUs can be used to accelerate calculations in Computer Aided Engineering (CAE) software such as Finite Element Analysis (FEA) — tasks traditionally carried

out by CPUs. For example, the time taken to carry out structural and multiphysics analysis in the OpenCL version of Abaqus from DS Simulia can be cut using a high-end AMD FirePro GPU.



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