SOLIDSOLUTIONS

RECOMMENDED
HARDWARE
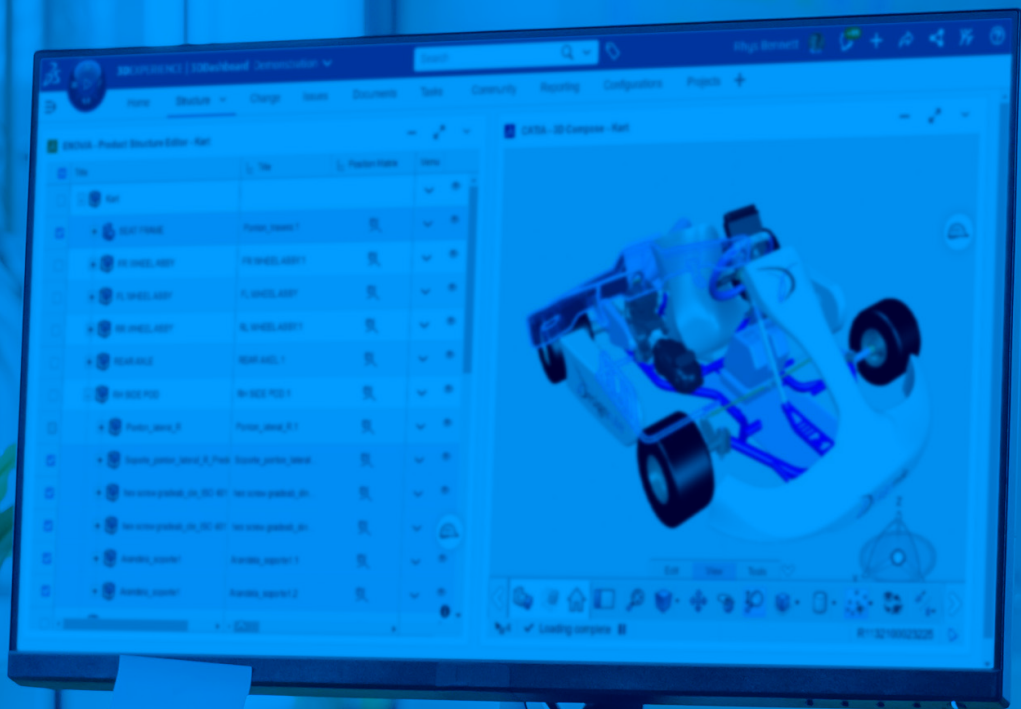
Perfect for
SOLIDWORKS

OCT
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23

P1070.1-V6

TRIMECH GROUP

CONTENTS

SOLIDWORKS HARDWARE RECOMMENDATIONS

The following is a summary of the key components of an ideal SOLIDWORKS PC. If you are unsure about more complex requirements such as Simulation and Visualization products see the appendix.

SOLID SOLUTIONS

PROCESSOR (CPU)

This carries out the majority of calculations within SOLIDWORKS; the most common limiting factor is the speed in GHz of the CPU, the faster (GHz) the better. Although note that on modern CPU's with higher core counts the base speed may be quite low especially for laptops.

Look for the maximum "Turbo Boost" speed as the best guide of performance for most SOLIDWORKS tasks. For SOLIDWORKS parts and assemblies typically 1-2 cores are fully utilized.

This is as many features need the previous one to be rebuilt before the next task can be carried out, they cannot be done in parallel. There are however some tasks that can take advantage of more cores such as drawings with many views many simulation types.

i5, i7,i9 VS Xeon - in the past the main advantage of Xeon CPUs was support for error correcting code (ECC) RAM which can correct for random hardware errors, helping to improve reliability in critical applications. Intel no longer offer these instead supporting ECC memory on select 12th generation and newer i5/i7/i9 CPU's.

Intel's 12th/13th generation core CPU's generation CPU's currently used in most workstations still have the lead in for CAD and CAE workloads with a blend of highest single threaded performance and up to 24 cores for multi-threaded workloads.

> We recommend: Intel 12th/13th Core CPU's

MEMORY (RAM)

When a document is opened in SOLIDWORKS it is loaded into RAM, you need enough so that Windows does not resort to using the hard disc (virtual memory). Adding More RAM will not improve performance unless you are running out.

We recommend 32GB for core most core CAD work and 64GB for complex designs and CAE workloads such as Simulation, Visualization.

Error Code Correcting (ECC) RAM is also recommended for these long running tasks where it reduces the chance of a crash or error due to random flipped bits and other environmental factors.

GRAPHICS CARD

The graphics card is fundamental to your productivity.

It assists the processor accelerated operations such as zooming and rotating. On-board Intel HD graphics, and cards such as GeForce and Radeon (non-Pro) are consumer level cards which are not supported. Using these can lead to

poor performance and stability. This is your productivity so you should not underestimate the potential hidden costs of having an unsupported setup.

For many years we have use and recommended the NVIDIA Quadro range as being the professional cards used in CAD workstations.

This branding was retired with the release of NVIDIAS Ampere generation cards e.g., RTX A2000, A3000, A4000 etc.

The latest Ada Lovelace generation released in 2023 lose a prefix but gain a suffix! Lookout for RTX XXXX "Ada Generation" cards, e.g. RTX 2000 Ada Generation, or abbreviated to RTX 3500 Ada Gen.

We recommend NVIDIA Professional graphics from NVIDIAS Ampere (2021) or Ada Lovelace (2023) generations

FIND OUT MORE

MONITOR

If buying a new monitor we recommend resolution of 1920x1080 at a minimum size of 15.6 inches for laptops or 24 inches for desktops. or 27 Inch and 32 inch at QHD resolutions (2560x1440).

4K+ screen resolutions are better supported by SOLIDWORKS 2020 onwards however we do not recommend on screens below 27 inches in size and certainly do not currently recommend these in laptops and would advise checking all applications compatibility with these screens before purchasing.

SOLID SOLUTIONS

STORAGE (HARD DRIVE)

Solid State Drives (SSD) offer a significant performance upgrade and are recommended to at least be used for your operating system and programs if budget allows. Try to allow for 25-50% free for best performance.

We recommend:
Fast solid state drives
(512GB +)

OPERATING SYSTEM (OS)

SOLIDWORKS supports Windows 10 Professional or above.

Note: Windows Pro for Workstations is only required for new PC's with Xeon CPUs.

Windows 11 is supported by SOLIDWORKS 2022 SP2 and above only. We still recommend windows 10 as a tried and tested platform, so this remains supported as of the 2024 release in November 2023

OLDER OPERATING SYSTEMS

SOLIDWORKS 2020 SP5 is the last release which will install and support Windows 7 64bit. SOLIDWORKS 2021 will not install on Windows 7.

Windows 8/8.1 are not supported for versions 2018 or newer.

We recommend:
Windows 10 Pro, or
Enterprise 64bit

DELL PROSUPPORT

All systems supplied by Solid Solutions come with Dell ProSupport, with a team of highly trained technicians local engineers during business hours with worldwide coverage out of hours. In the event an issue cannot be solved over the phone they will typically dispatch an engineer to fix the system the following working day.

Our support are of course also happy to help rule out software issue and work with Dell Pro Support if required.

FIND OUT MORE

Below is a guide of what we recommend for most users. These are only guidelines for the majority of users, if you have a question please contact your account manager or hardware@solidsolutions.co.uk

for advice. Specifications are correct as of January 2022 although our website always has the most up to date specifications, see solidsolutions.co.uk/hardware

With such a range of products we have added a new performance guideline for the most commonly used products provided by Solid Solutions.

|			
![icon]	SOLIDWORKS	![icon]	SOLIDWORKS COMPOSER
![icon]	SOLIDWORKS SIMULATION	![icon]	SOLIDWORKS ELECTRICAL
![icon]	SOLIDWORKS FLOW SIMULATION	![icon]	CAM
![icon]	SOLIDWORKS PLASTICS	![icon]	SOLIDWORKS VISUALIZE

With the vast range of SOLIDWORKS solutions now available what is required to improve performance varies. For instance adding more fast cores may benefit Simulation products whereas SOLIDWORKS Visualize would benefit from a higher spec NVIDIA graphics cards.

You can start to see why it may not be as simple as just spending more, what you invest in is key and we aim to help you get the most for your money.

E.g. on the left is the lowest performance for SOLIDWORKS and on the right denotes best performance.
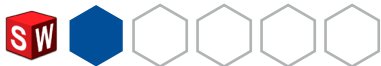
We have partnered with Dell for many years for both our own internal use and to provide systems to our customers so that they can benefit from the discounts we receive and the reassurance that it will be ideally specified for SOLIDWORKS.

If you aren't sure what is most suitable please get in contact with your account manager or email:
hardware@solidsolutions.co.uk

Dell Precision™ 3660 - Design 2023

- Intel i5-13600k 14 Core (6P +8E) Turbo Boost up to 5.1GHz
- Windows 10 Professional 64bit (Windows 11 License included)
- 32GB (2x16GB) DDR5 Ram
- NVIDIA A2000 6GB Graphics Card
- 512GB PCIe NVMe Solid State Drive
- 500W Chassis
- Intel Wi-Fi 6E AX211 & Bluetooth 5.2 Wireless Card
- Dell Wired Keyboard & Mouse
- *No Display Included*
- 3Yr Dell ProSupport and Next Business Day On-Site Service

Performance guidelines
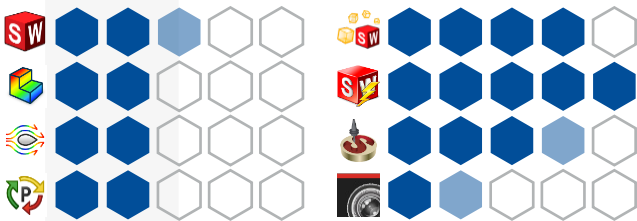
Dell Precision™ 3660 - Design Plus 2023

- Intel i7-13700k 16 Core (8P +8E) Turbo Boost up to 5.4GHz
- Windows 10 Professional 64bit (Windows 11 License included)
- 32GB (2x16GB) DDR5 Ram
- NVIDIA RTX A2000 12GB Graphics Card
- 1TB PCIe NVMe Solid State Drive
- 500W Chassis
- Intel Wi-Fi 6E AX211 & Bluetooth 5.2 Wireless Card
- Dell Wired Keyboard & Mouse
- *No Display Included*
- 3Yr Dell ProSupport and Next Business Day On-Site Service
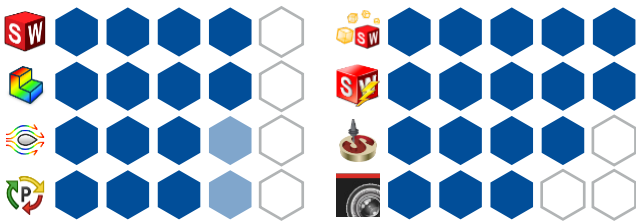
Performance guidelines

Dell Precision™ 3660 - High End 2023

- Intel i9-13900k 24 Core (8P +16E) Turbo Boost up to 5.8GHz
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB (2x32GB) DDR5 ECC Ram
- NVIDIA RTX A4000 16GB Graphics Card
- 1TB PCIe NVMe Solid State Drive
- 500W Chassis
- Intel Wi-Fi 6E AX211 & Bluetooth 5.2 Wireless Card
- Dell Wired Keyboard & Mouse
- *No Display Included*
- 3Yr Dell ProSupport and Next Business Day On-Site Service

Performance guidelines

Dell Precision™ 3660 - Ultimate 2023

- Intel i9-13900k 24 Core (8P +16E) Turbo Boost up to 5.8GHz
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB (2x32GB) DDR5 ECC Ram
- NVIDIA RTX A5000 16GB Graphics Card
- 1TB PCIe NVMe Solid State Drive
- Additional 1TB PCIe NVMe Solid State Drive
- 1000W Chassis
- Intel Wi-Fi 6E AX211 & Bluetooth 5.2 Wireless Card
- Dell Wired Keyboard & Mouse
- *No Display Included*
- 3Yr Dell ProSupport and Next Business Day On-Site Service
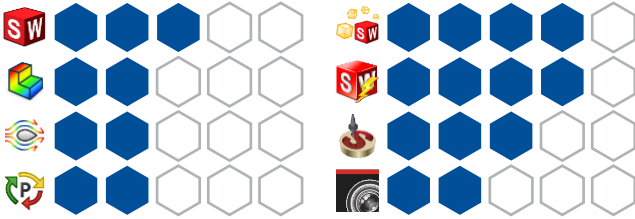
Performance guidelines

Dell Precision 3581 15" Laptop Design

- Intel Core i7-13800H 45W 14 Core (6P +8E) up to 5.20 GHz
- 15.6 Inch FHD, 1920x1080,with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 32GB (2x16GB) DDR5 RAM
- NVIDIA RTX A1000 6GB Graphics Card
- 512GB M.2 PCIe NVMe Solid State Drive
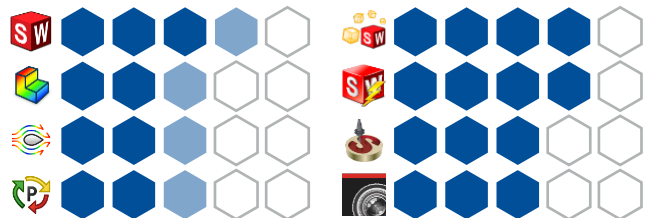- 3Yr ProSupport and Next Business Day On-Site Service

Performance guidelines

Dell Precision 7680 16" Laptop Design Plus

- Intel Core i7-13850HX 55W 20 Core (8P+12E) up to 5.3GHz
- 16.0 Inch FHD, 1920x1200, with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 32GB DDR5 RAM
- 8GB NVIDIA RTX 2000 Ada generation Graphics Card
- 1TB M.2 PCIe NVMe Solid State Drive
- 3Yr ProSupport and Next Business Day On-Site Service

Performance guidelines

Dell Precision 7680 16" Laptop - High End

- Intel Core i7-13850HX 16 Core (8P+12E) up to 5.3GHz
- 16.0 Inch FHD+, 1920x1200,with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB DDR5 RAM
- 12GB NVIDIA RTX 3500 Ada Generation Graphics Card
- 1TB M.2 PCIe NVMe Solid State Drive
- 3Yr ProSupport and Next Business Day On-Site Service
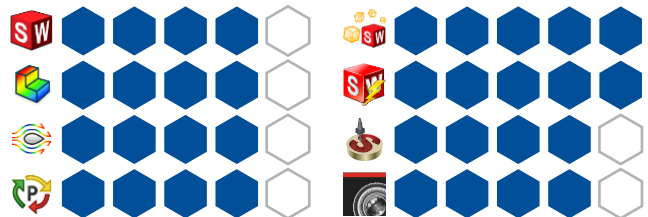
Performance guidelines

Dell Precision 7780 17" Laptop - High End

- Intel Core i7-13850HX 20 Core (8P+12E) upto 5.3GHz
- 17.3 Inch FHD, 1920x1200,with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB DDR5 RAM
- 12GB NVIDIA RTX 3500 Ada Generation graphics card
- 1TB M.2 PCIe NVMe Solid State Drive
- 3Yr ProSupport and Next Business Day On-Site Service

**Performance guidelines**

SOLID SOLUTIONS

Dell Precision 5680 16" Laptop - Ultraportable

- Intel Core i7-13800H 14 Core (6P +8E) upto 5.20 GHz
- 16.0 Inch FHD+, 1920x1200,with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB DDR5 RAM
- 12GB NVIDIA RTX 3500 Ada Generation Graphics Card
- 1TB M.2 PCIe NVMe Solid State Drive
- 3Yr ProSupport and Next Business Day On-Site Service

Performance guidelines
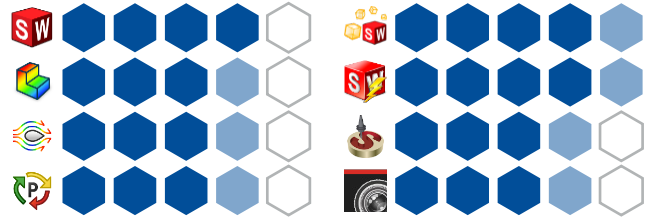
Dell Precision 7780 17" Laptop - Ultimate

- Intel Core i9-13950HX 24 Core (8P+16E) up to 5.5GHz
- 17.3 Inch FHD, 1920x1200,with Cam and Mic
- Windows 10 Professional 64bit (Windows 11 License included)
- 64GB DDR5 RAM
- 12GB NVIDIA RTX 4000 Ada Generation graphics card
- 2TB M.2 PCIe NVMe Solid State Drive
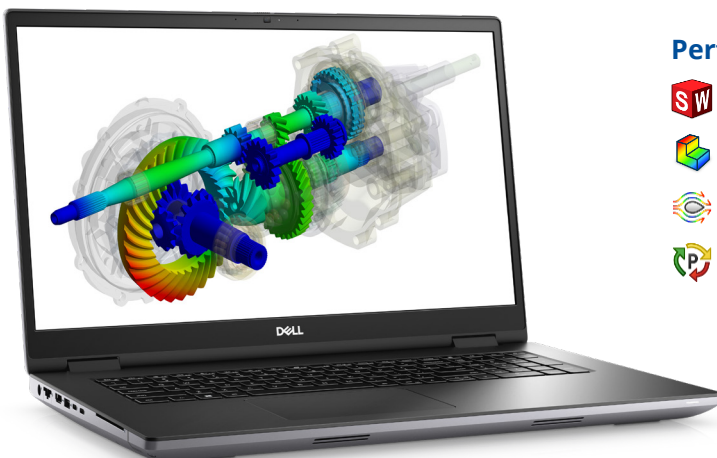- 3Yr ProSupport and Next Business Day On-Site Service

Performance guidelines

APPENDIX- FAQ AND PERFORMANCE DATA

IS SOLIDWORKS SUPPORTED ON MAC?

SOLIDWORKS will not install natively on Apple computers. However, some

customers run successfully on Intel based Mac OSX based systems, using emulation (parallels) or Boot Camp (installing windows on mac to dual boot). Compatibility is further complicated by newer Apple systems switching to Arm CPU's as used in mobile phones which cannot run the same code as Intel chips natively.

Please note that SOLIDWORKS may suffer from the lack of graphics acceleration on Apple Mac based machines, as pro level graphics along with certified graphics drivers are not available this is particularly noticeable on more complex data sets such as assemblies with many components.

WHAT ABOUT VIRTUALISATION?

SOLIDWORKS have tested to confirm that the software will install on certain virtualization platforms, however support in terms of performance and stability is down to the virtualization provider and graphics card manufacturer. The latest NVIDIA Quadro Virtual Data Center Workstation based setups support everything including accelerating SOLIDWORKS Visualize when using Pascal or Turing generation cards under VMware or Citrix environments.

RECOMMENDATIONS FOR DATA MANAGEMENT (PDM)

Ideally a dedicated Windows server/s should be used for either a or SOLIDWORKS PDM Standard and Professional vaults. Besides giving maximum performance for the CAD users, using a dedicated server provides a location to store company standards and templates.

For minimum requirements, please visit:

solidworks.com/support/system-requirements

We now also offer full supported private cloud hosted PDM environments a hassle free way to switch away from an on premise server.

For more information visit

solidsolutions.co.uk/PDM-Virtual-Servers

please contact your account manager or call **01926 333777** for further advice.

FIND OUT MORE   **FIND OUT MORE**

SLOWDOWNS - SHOULD I ADD MORE RAM?

Adding more RAM will not solve performance issues unless you are running out, tools such as the windows performance monitor or even at a basic level the task manager. Run your normal tasks and see if you are running low (the SOLIDWORKS performance Monitor should also alert you) you only need enough so that you don't run out this would start using virtual memory on your hard disc which is many times slower. Often using best practices in the software can speed things up otherwise you have to identify where the bottlenecks are before upgrading hardware.

DOES SOLIDWORKS USE MORE THAN ONE CORE?

It is a common misconception that nothing in SOLIDWORKS will use more than 1 core. The developers are always looking for opportunities to use multiple cores where possible. However, the solving process (rebuilding) used for parametric modeling is by nature very linear i.e. one feature must be rebuilt before the next therefore SOLIDWORKS will not always use all the available cores the full use of 1-2 cores is more typical during a rebuild.

This is why we advise to look for the latest generation CPU's with the highest "Turbo Boost" speed as a better indication of the speed of lightly threaded workloads for SOLIDWORKS modeling.

Many of the activities such as dialogue box interaction; drawings with multiple views and simulation tasks also benefit significantly from multiple cores to varying degrees as see on the following pages.

However, drawings with multiple views, most simulation and photoview 360 rendering tasks also benefit significantly from multiple cores to varying degrees more detail on this follows below.

SOLIDWORKS VISUALISE - HOW CAN I SPEED UP MY RENDERS?

SOLIDWORKS Visualize Standard is a new standalone product for which a complimentary license is provided with each SOLIDWORKS Professional and Premium subscription. SOLIDWORKS Visualize Professional available at extra cost including animation and many other functions to leverage your 3d data. Both options and can be installed either on the SOLIDWORKS users system or on another users system.

Speed in Visualize is primarily down to using NVIDIA GPU (graphics card) CUDA cores to achieve massive speed ups vs traditional CPUs. AMD graphics cards will not accelerate this process however the software will still run in CPU only mode on such setups.

Also note that the new Visualize AI denoiser included in versions 2018 SP3 and above is only supported on NVIDIA graphics cards with 4GB or more of dedicated video memory. This can be used to reduce the number of passes required to eliminate noose/artefacts in the render by up to 10 times. I.e. if you need 1000 passes in a traditional rendering tool you may be able to use as little as 100 using the denoiser.

When working in Visualize a mid-high end NVIDIA card (Quadro A2000/A3000 6GB+) will show significant acceleration with 6GB will be enough in most cases. More complex datasets may require 8GB or more dedicated memory otherwise the Visualize render process will revert to CPU mode which is considerably slower.

If possible adding a second card of the same specification will also reduce render times almost in half however it does not add to the total memory available.

Each new generation of cards increases performance so you cannot directly compare specifications between them.

Below results using the SOLIDWORKS Visualize Benchmarks to render a 10 second turntable animation. We have picked desktop cards from 2017 and 2021 to show the difference just 4 years can make in hardware.

MODEL	Quadro P4000 8GB (2017)	Quadro P5000 16GB (2017)	RTX A4000 16GB (2021)	RTX A5000 24GB (2021)
CUDA Cores	1792	2560	6144	8192
Ray Trace Cores	N/A	N/A	48	64
10 Sec Turntable Render time	28.25	25.29	13.49	10.51

NOTE: Dual graphics cards do not increase the available memory for SOLIDWORKS Visualize, you are still limited to the amount of memory in the smaller card.

APPENDIX- FAQ AND PERFORMANCE DATA

WHICH SIMULATION TYPES BENEFIT MOST FROM MULTI CORE PROCESSORS?

Most simulation types see some benefit from multiple cores; simulations using the direct sparse and FFEPlus Iterative solver see the most benefit.

Solvers in SOLIDWORKS Premium and Simulation Standard are limited to 8 cores. Some solvers in SOLIDWORKS Simulation Professional and Premium 2021 and newer can take advantage of more than 8 cores for certain studies.

Keep in mind that if you have capacity to spare in terms of available cores and RAM you should be able to continue working productively in other applications while carrying out simulations. For that reason, 8-16 cores is currently the sweet point

as you should have a good balance of speed and number of cores + some spare resources for other tasks.

Below you can find data based on some testing by SOLIDWORKS and Solid Solutions which is an indication only, there is no guarantee of how well a particular simulation study will take advantage of multiple cores.

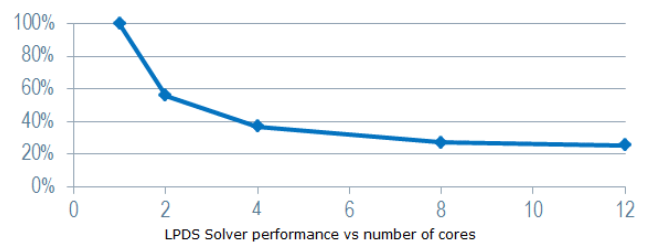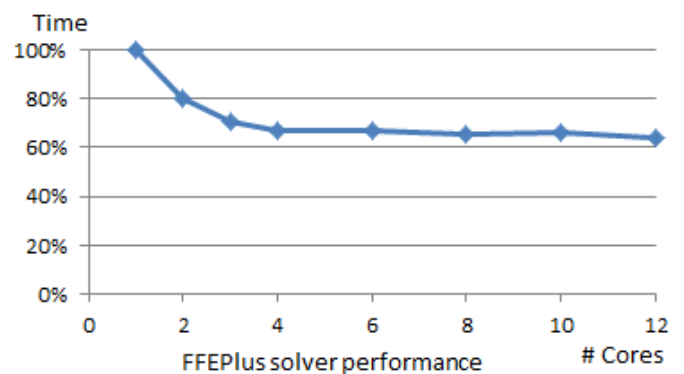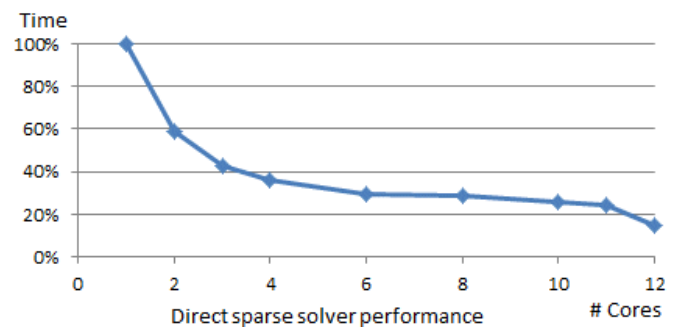## SOLIDWORKS SIMULATION

MESHING

From SOLIDWORKS 2011 the curvature based mesher can take advantage of multiple cores where as the standard mesher is mostly single threaded..

STATIC SIMULATION - ASSEMBLIES AND PARTS

A static simulation of an assembly with bolt connectors sees a 75% improvement in solve time using the direct sparse solver when going from 1 to 4 cores. Using the FFEPlus Solver this benefit may only be 15%.

Across is a table produced by SOLIDWORKS showing the performance increase for static simulation of more cores on the various solvers; Direct Sparse, FFEPlus and Large Problem Direct Spare Solvers.

The most computationally intensive stages of the analysis using a sparse solver are generally decomposition of stiffness matrix and solving contact constraints. These are the stages which support multi-core, hence making them less time consuming.

Direct sparse solver performance

FFEPlus solver performance

LPDS Solver performance vs number of cores

OTHER SOLIDWORKS SIMULATION TYPES

NON LINEAR SIMULATION

A similar setup as a non-linear simulation on a single part yields a 58% improvement using the direct spare solver but no improvement when using the FFEplus.

THERMAL SIMULATION

Thermal simulation sees an 82% improvement using the direct sparse solver, again no improvement when using FFEPlus.

OTHER SIMULATION TYPES

Simulation types which are mostly single threaded are:

FATIGUE

The fatigue solver itself uses only one core in testing but preparing to run a fatigue study involves running one or more static studies which do benefit from multiple cores, overall there is an improvement.

FREQUENCY

Frequency saw less improvement in testing than most simulation types, contrary to the other simulation types direct sparse solver saw 0% improvement whereas the FFEPlus Solver saw a 25% improvement.

OPTIMIZATION

Most of the time spent solving an optimization analysis is taken up by running loops of design iterations of the studies defined for constraints. The benefit would depend on the type of study optimised.

LINEAR DYNAMIC

The actual post dynamic analysis and stress calculations use special solvers which used only one core in testing. However, performing a linear dynamic analysis involves first finding resonant frequencies, which did show usage of more than one core when using the FFEPlus solver.

PRESSURE VESSEL DESIGN

The majority of the time taken to complete a pressure vessel analysis is running static studies that you wish to combine. The actual calculations for combination of results used only one core during testing but as this made up a small percentage of the total time to perform the analysis there was a significant performance improvement.

DROP TEST

Only one solver type available, the test model used only one core.
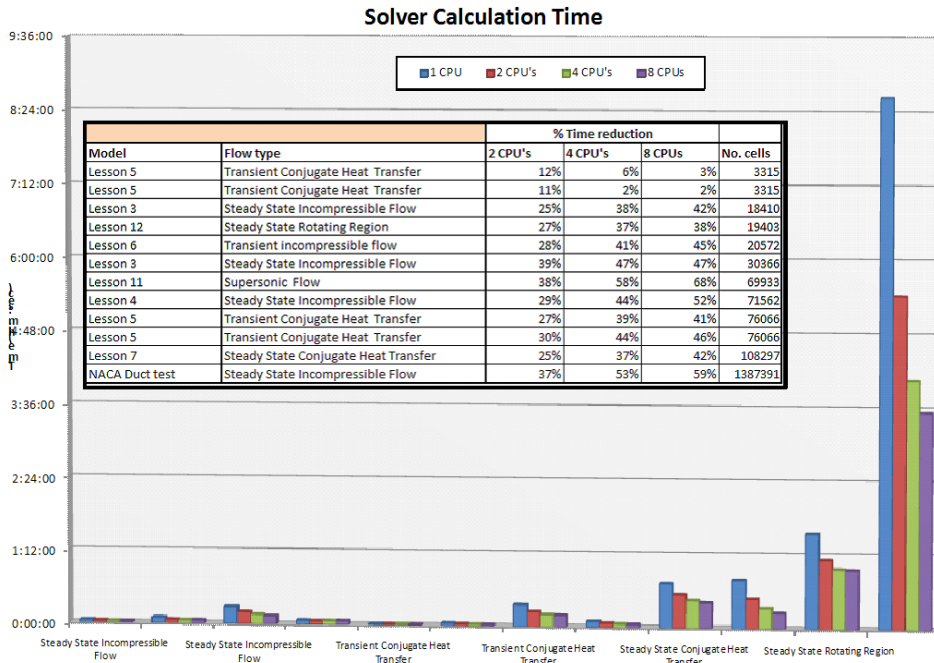
SOLIDWORKS PLASTICS

SOLDIWORKS Plastics shows good gains for all parts of the process. Note the jump here this is thought to be as when using 12 cores in our testing we were using all 10 cores from 1 CPU and 2 from the second, the data communication between the two likely being the cause of the anomalous results.

Dell 7910 Dual 10 Core 3.1GHz- Plastics
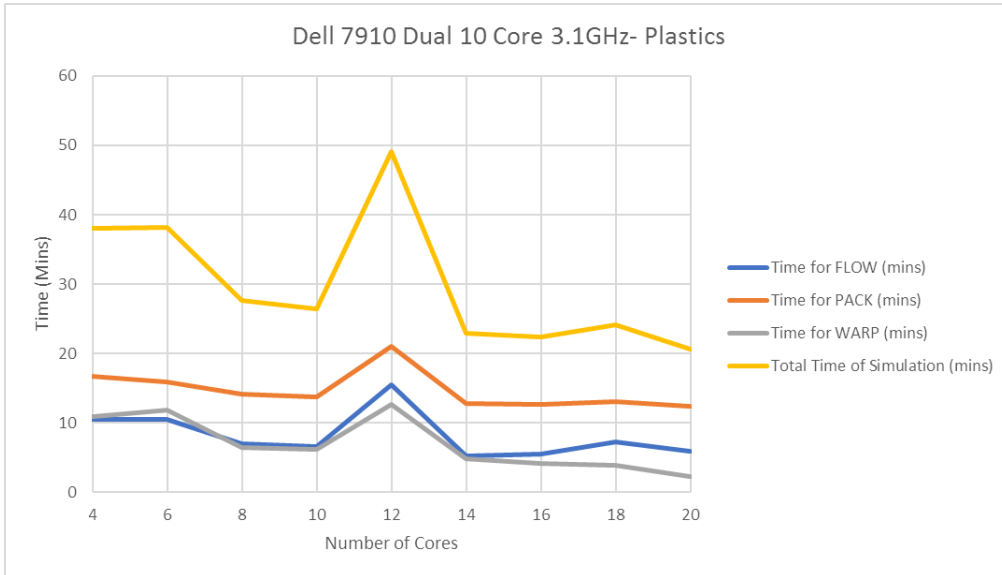
FLOW SIMULATION

In SOLIDWORKS Flow Simulation, great improvements were made in SOLIDWORKS 2012 and above to take advantage of more than 4 cores, larger cell count models see the most benefit.

FLOW SIMULATION SPEED VS NUMBER OF CORES

Solver Calculation Time

| Model	Flow type	2 CPU's	4 CPU's	8 CPUs	No. cells
		%\ Time reduction			
Lesson 5	Transient Conjugate Heat Transfer	12%	6%	3%	3315
Lesson 5	Transient Conjugate Heat Transfer	11%	2%	2%	3315
Lesson 3	Steady State Incompressible Flow	25%	38%	42%	18410
Lesson 12	Steady State Rotating Region	27%	37%	38%	19403
Lesson 6	Transient incompressible flow	28%	41%	45%	20572
Lesson 3	Steady State Incompressible Flow	39%	47%	47%	30366
Lesson 11	Supersonic Flow	38%	58%	68%	69933
Lesson 4	Steady State Incompressible Flow	29%	44%	52%	71562
Lesson 5	Transient Conjugate Heat Transfer	27%	39%	41%	76066
Lesson 5	Transient Conjugate Heat Transfer	30%	44%	46%	76066
Lesson 7	Steady State Conjugate Heat Transfer	25%	37%	42%	108297
NACA Duct test	Steady State Incompressible Flow	37%	53%	59%	1387391

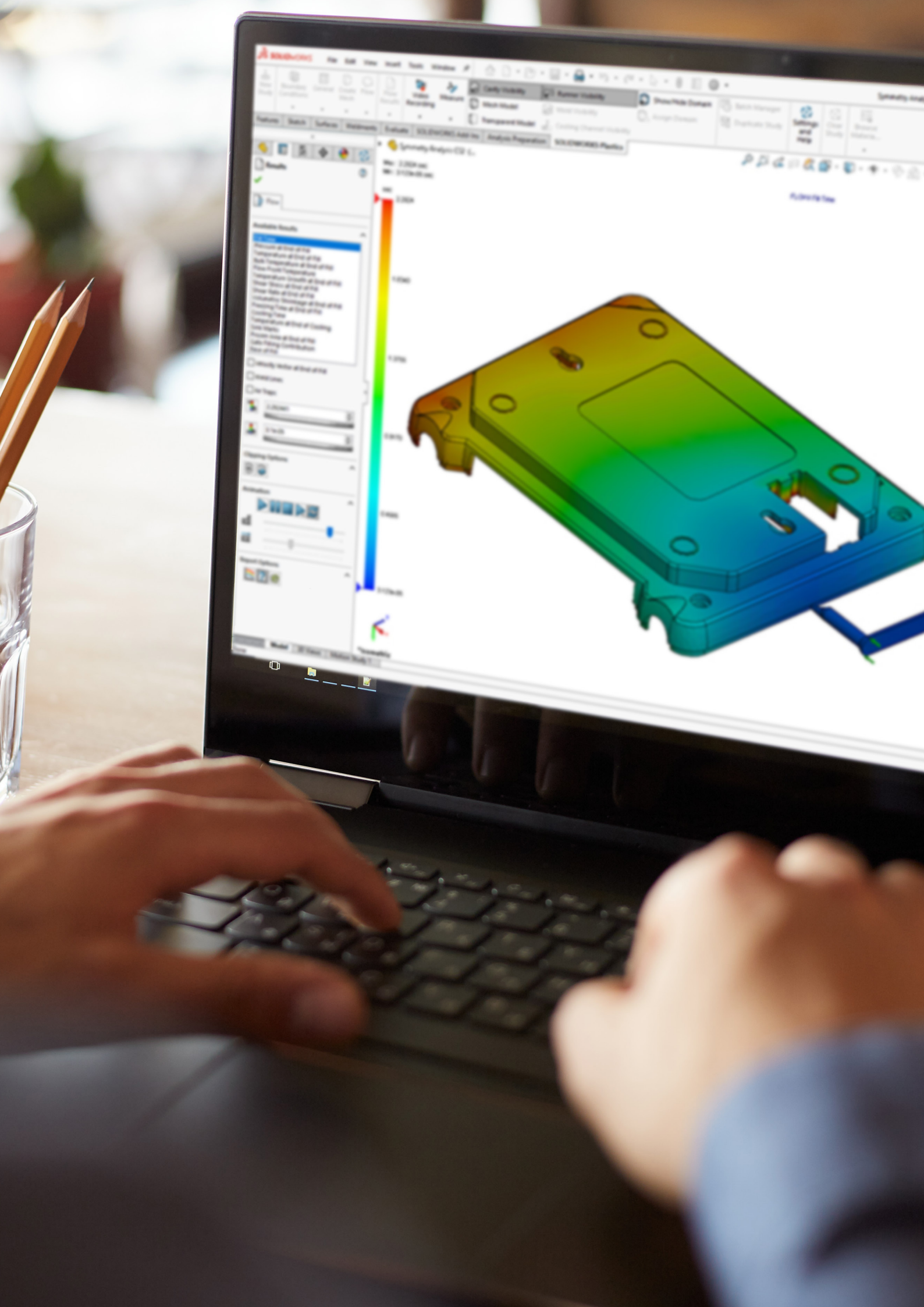From SOLIDWORKS 2014 onwards meshing is multithreaded, with the largest gains being for large meshes.

▶ Larger meshes see the highest gain

▶ For a single core, meshing is 30% faster on average compared to 2013

Complex Flow Simulation problems with a large cell count also typically show more benefit from core counts over 8 cores than smaller problems.

Dell 7910 Dual 10 Core 3.1GHz- Flow High Cell
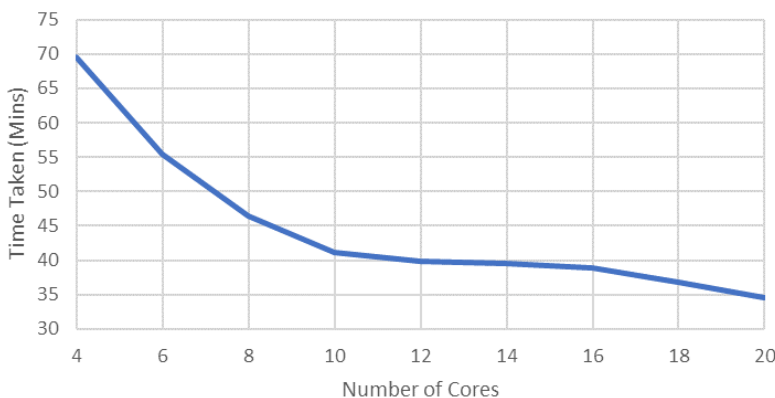
If you require a quote or if you are unsure about your requirements please contact your account manager or **hardware@solidsolutions.co.uk**

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