



# ALTAIR

ONLY FORWARD

## Altair HyperWorks 2023

### Hardware Recommendations and Certifications

Updated: 09/08/2023

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**Altair® HyperLife®** ©1990-2023  
**Altair® HyperMesh®** ©1990-2023  
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**Altair® PSIM™** ©2022-2023  
**Altair® Pulse™** ©2020-2023  
**Altair® Radioss®** ©1986-2023  
**Altair® romAI™** ©2022-2023  
**Altair® RTLvision PRO™** ©2002-2023  
**Altair® S-CALC™** ©1995-2023  
**Altair® S-CONCRETE™** ©1995-2023  
**Altair® S-FRAME®** ©1995-2023  
**Altair® S-FOUNDATION™** ©1995-2023  
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**Altair® Accelerator™ Plus** ©1995-2023

**Altair® Breeze™** ©2022-2023

**Altair® Cassini™** ©2015-2023

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**Altair® Desktop Software Usage Analytics™ (DSUA)** ©2022-2023

**Altair® FlowTracer™** ©1995-2023

**Altair® Grid Engine®** ©2001, 2011-2023

**Altair® Hero™** ©1995-2023

**Altair® Mistral™** ©2022-2023

**Altair® Monitor™** ©1995-2023

**Altair® NavOps®** ©2022-2023

**Altair® PBS Professional®** ©1994-2023

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**Altair® Unlimited™** ©2022-2023

**Altair® Unlimited Data Analytics Appliance™** ©2022-2023

**Altair RapidMiner®, a Data Analytics & AI Platform**

**Altair® Analytics Workbench™** ©2002-2023

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**Altair® Knowledge Studio®** ©1994-2023

**Altair® Knowledge Studio® for Apache Spark** ©1994-2023

**Altair® Knowledge Seeker™** ©1994-2023

**Altair® Monarch® Classic** ©1996-2023

**Altair® Monarch® Data Prep Studio** ©2015-2023

**Altair® Monarch Server™** ©1996-2023

**Altair® Panopticon™** ©2004-2023

**Altair® Panopticon™ BI** ©2011-2023

**Altair® SLC™** ©2002-2023

**Altair® SLC Hub™** ©2002-2023

**Altair® SmartWorks™** ©2002-2023

**Altair® RapidMiner®** ©2001-2023

**Altair® RapidMiner® AI Hub** ©2001-2023

**Altair® RapidMiner® Cloud** ©2001-2023

**Altair® RapidMiner® Studio** ©2001-2023

**Altair One®** ©1994-2023

**Altair® License Utility™** © 2010-2023

2023

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# Technical Support

Altair provides comprehensive software support via web FAQs, tutorials, training classes, telephone, and e-mail.

## Altair One

Altair One (<https://altairone.com/>) is Altair's customer portal giving you access to the Marketplace, the Community, Managed Licenses, Altair Drive, My Apps, and the Learning Center. We recommend that all users create an Altair One account and use it as their primary portal for everything Altair.

## Altair Community

Visit the Altair Community (<https://community.altair.com/community>) where you can participate in forums, share insights, access knowledge base articles, and contact Support. Once you login to the Altair Community, subscribe to the forums and user groups to get up-to-date information about release updates, upcoming events, and questions asked by your fellow members.

These valuable resources help you discover, learn and grow, all while having the opportunity to network with fellow explorers like yourself.

Once your Altair One account is set up, use this link to access the Altair support page: [www.altair.com/customer-support/](http://www.altair.com/customer-support/)

## Altair Learning

Altair's in-person, online, and self-paced trainings provide hands-on introduction to our products, focusing on overall functionality. Trainings are conducted at our corporate and regional offices.

For more information visit: <https://learn.altair.com/>

If you are interested in training at your facility, contact your account manager or technical specialist for more details.

## Telephone and E-mail

If you are unable to contact Altair support via the customer portal, you may reach out to technical support via phone or e-mail. Use the following table as a reference to locate the support office for your region.

Altair support portals are available 24x7 and our global support engineers are available during normal Altair business hours in your region.

When contacting Altair support, specify the product and version number you are using along with a detailed description of the problem. It is beneficial for the support engineer to know what type of workstation, operating system, RAM, and graphics board you have, so include that in your communication.

Location	Telephone	E-mail
Australia	+61 3 9866 5557	<a href="mailto:anzsupport@altair.com">anzsupport@altair.com</a>
Brazil	+55 113 884 0414	<a href="mailto:br_support@altair.com">br_support@altair.com</a>



Location	Telephone	E-mail
Canada	+1 416 447 6463	<a href="mailto:support@altairengineering.ca">support@altairengineering.ca</a>
China	+86 400 619 6186	<a href="mailto:support@altair.com.cn">support@altair.com.cn</a>
France	+33 141 33 0992	<a href="mailto:francesupport@altair.com">francesupport@altair.com</a>
Germany	+49 703 162 0822	<a href="mailto:hwsupport@altair.de">hwsupport@altair.de</a>
Greece	+30 231 047 3311	<a href="mailto:eesupport@altair.com">eesupport@altair.com</a>
India	+91 806 629 4500	<a href="mailto:support@india.altair.com">support@india.altair.com</a>
Israel		<a href="mailto:israelsupport@altair.com">israelsupport@altair.com</a>
Italy	+39 800 905 595	<a href="mailto:support@altairengineering.it">support@altairengineering.it</a>
Japan	+81 3 6225 5830	<a href="mailto:jp-support@altair.com">jp-support@altair.com</a>
Malaysia	+60 32 742 7890	<a href="mailto:aseansupport@altair.com">aseansupport@altair.com</a>
Mexico	+52 55 5658 6808	<a href="mailto:mx-support@altair.com">mx-support@altair.com</a>
New Zealand	+64 9 413 7981	<a href="mailto:anzsupport@altair.com">anzsupport@altair.com</a>
South Africa	+27 21 831 1500	<a href="mailto:support@altair.co.za">support@altair.co.za</a>
South Korea	+82 704 050 9200	<a href="mailto:support@altair.co.kr">support@altair.co.kr</a>
Spain	+34 910 810 080	<a href="mailto:support-spain@altair.com">support-spain@altair.com</a>
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United Kingdom	+44 192 646 8600	<a href="mailto:support@uk.altair.com">support@uk.altair.com</a>
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United States	+1 248 614 2425	<a href="mailto:hwsupport@altair.com">hwsupport@altair.com</a>
United States/Data Analytics	+1-800-988-4739 +1 978.275.8350	<a href="mailto:dasupport@altair.com">dasupport@altair.com</a>

If your company is being serviced by an Altair partner, you can find that information on our web site at <https://www.altair.com/PartnerSearch/>.

See [www.altair.com](http://www.altair.com) for complete information on Altair, our team, and our products.

# Hardware Recommendations and Certifications

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View the most recent recommended graphic boards, laptops and desktop hardware configurations.

This chapter covers the following:


- [Recommended Graphics Boards](#) (p. 11)
- [Recommended Workstation Desktop and Laptop/Notebook Hardware](#) (p. 15)
- [Altair HyperWorks 2023 Solver Hardware Configuration Recommendations](#) (p. 29)
- [Recommended GPU Computing Processor List](#) (p. 35)
- [Additional Information on Driver Installations](#) (p. 36)

## Recommended Graphics Boards

Recommended CAE/CAD graphic boards to use with Altair HyperWorks applications.

The most recent vendor/manufacturer drivers should be used and all driver support for these cards should be addressed to the appropriate manufacturer of the graphic board.

Added Intel® Arc™ support.

 **Note:** AMD and Intel® Arc™ graphics cards are not supported on Linux x86\_64 operating systems in Altair HyperWorks 2022 and higher products.

### Intel Arc Graphics Cards

Products	GPU Model	Driver Version
Intel® Arc™	A40 A50	Windows 10/11 (64-bit) 31.0.101.4316  Linux (64-bit) Not Supported
Intel® Arc™ mobility	A30M A40M	Windows 10/11 (64-bit) 31.0.101.4316  Linux (64-bit) Not Supported

### AMD Graphics Cards

Products	GPU Model	Driver Version
Radeon™ Pro	W7900 W7800 W7600 W7500 W6800 W6600 VII WX 9100	Windows 10/11 (64-bit) 23.Q3  Linux (64-bit) Not Supported

Products	GPU Model	Driver Version
	W5700 WX 8200 W5500 WX 7100 WX 5100 WX 4100 WX 3200 WX 3100 WX 2100	
Radeon™ Pro Mobility	W6600M WX 7130 WX 7100 WX 4170 WX 4150 WX 4130 WX 3100 WX 2100	Windows 10/11 (64-bit) 23.Q1.1  Linux (64-bit) Not Supported

## NVIDIA Graphics Boards

Products	GPU Model					Driver Version
	P (Pascal)	V (Volta)	RTX (Turing)	A* (Ampere)	Ada Generation	
Quadro Series	P400	GV100	RTX 3000	RTX A2000	RTX 4000	Windows 10/11 (64-bit) R525 U5 (537.13)
	P420		RTX 4000	RTX A3000	Ada SFF	
	P600		RTX 5000	RTX A4000	RTX 4000	Linux (64-bit) ODE Long Live 535.104.05
	P620		RTX 6000	RTX A5000	Ada	
	P1000		RTX 8000	RTX A6000	RTX 4500	
	P2000		T400		Ada	
	P2200		T600		RTX 5000	
				Ada		

Products	GPU Model					Driver Version
	P (Pascal)	V (Volta)	RTX (Turing)	A* (Ampere)	Ada Generation	
	P4000 P5000 P5200 P6000 GP100		T1000		RTX 6000 Ada	
Quadro Mobility	P500 P520 P600 P620 P1000 P2000 P3000 P3200 P4000 P4200 P5000 P5200		T400 T550 T600 T1000 T1200 T2000 RTX 3000 RTX 4000 RTX 5000	RTX A500 RTX A1000 RTX A2000 RTX A3000 RTX A4000 RTX A4500 RTX A5000 RTX A5500	RTX 2000 Ada RTX 3000 Ada RTX 3500 Ada RTX 4000 Ada RTX 5000 Ada	<i>Windows 10/11 (64-bit) R535 U5 (537.13)</i>  <i>Linux (64-bit) ODE Long Live 535.104.05</i>



**Note:**

*Minimum OpenGL 3.2, Vulkan 1.2 and OpenCL 2.1 Requirement*

Virtual server/clients and VirtualGL setups may work, but are not officially tested or supported.

*NVIDIA Optimus or AMD Switchable Graphics*

In order to ensure best performance, these options should be set to use discrete NVIDIA or AMD GPU and not the Intel GPU.

*Power Options and Mobility Center*

In order to ensure best performance, these options should be maximum performance for both GPU and CPU.

*Graphics Driver Corruption or Installation Issues*

In order to ensure best driver compatibility, it is recommended to use "Custom" and "Clean" install options instead of the general "Express" driver installer options.

# Recommended Workstation Desktop and Laptop/ Notebook Hardware

## DELL Workstations - Desktops

Product	Precision Workstation	
Workstation Model	NVIDIA Quadro GPU	AMD Radeon™ Pro GPU
<b>3260</b>	T400 T1000 RTX A2000 RTX 3000 Ada	
<b>3460 (mini)</b>	RTX 3000	
<b>3460 SFF</b>	T400 T1000 RTX A2000	
<b>3650</b>	T400 T1000 RTX A2000 RTX A4000 RTX A5000 RTX A5500 RTX A6000	W5500 W5700 W6600 W6800 WX3200
<b>3660T</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000	

<b>Product</b>	<b>Precision Workstation</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>5860T</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000	W6300 W6400 W6600 W6800
<b>7865T</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000 GV100	
<b>7960T</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000	W6300 W6400 W6600 W6800
<b>7960 Rack</b>	T400 T1000 RTX A2000 RTX A4000	W6300 W6400 W6600 W6800



<b>Product</b>	<b>Precision Workstation</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
	RTX A4500 RTX A5000 RTX A5500 RTX A6000	

### DELL Workstations - Laptops

<b>Product</b>	<b>Precision Workstation</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>3470</b>	T550	
<b>3480</b>	RTX A500	
<b>3560</b>	T500	
<b>3561</b>	T600 T1200	
<b>3570</b>	T550 T600 RTX A500	
<b>3571</b>	T600 RTX A1000 RTX A2000	
<b>3580</b>	RTX A500	
<b>3581</b>	RTX A500 RTX A1000 RTX 2000 Ada	
<b>5470</b>	RTX A1000	
<b>5480</b>	RTX A1000	

<b>Product</b>	<b>Precision Workstation</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
	RTX 2000 Ada RTX 3000 Ada	
<b>5560</b>	T1200 RTX A2000	
<b>5570</b>	RTX A1000 RTX A2000	
<b>5680</b>	RTX A1000 RTX 2000 Ada RTX 3500 Ada RTX 4000 Ada RTX 5000 Ada	
<b>5760</b>	RTX A2000 RTX A3000	N/A
<b>5770</b>	RTX A2000 RTX A3000	
<b>7560</b>	T1200 RTX A2000 RTX A3000 RTX A4000 RTX A5000	
<b>7670</b>	RTX A1000 RTX A2000 RTX A3000 RTX A4500 RTX A5500	
7680	RTX A1000 RTX 2000 Ada	

Product	Precision Workstation	
Workstation Model	NVIDIA Quadro GPU	AMD Radeon™ Pro GPU
	RTX A3500 Ada RTX 4000 Ada RTX 5000 Ada	
<b>7760</b>	T1200 RTX A3000 RTX A4000 RTX A5000	
<b>7770</b>	RTX A1000 RTX A3000 RTX A4500 RTX A5500	N/A
<b>7780</b>	RTX A1000 RTX 2000 RTX 3500 Ada RTX 4000 Ada RTX 5000 Ada	

### Lenovo Workstations - Desktops

Product	Lenovo ThinkStation	
Workstation Model	NVIDIA Quadro GPU (442.92 or higher)	AMD Radeon™ Pro GPU
<b>P340 SFF / P340 TWR*</b>	RTX A2000* RTX 4000* RTX 5000* RTX A4000* RTX A5000* T400 T600	

Product	Lenovo ThinkStation	
Workstation Model	NVIDIA Quadro GPU (442.92 or higher)	AMD Radeon™ Pro GPU
	T1000	
<b>P340 Tiny</b>	T1000	
<b>P348</b>	T400 T600 T1000	
<b>P350 SFF / P350 TWR*</b>	RTX A2000 RTX A4000* RTX A5000* T400 T600 T1000	
<b>P350 Tiny</b>	T600 T1000	
<b>P358 TWR</b>	RTX A2000 T600 T1000	
<b>P360 Ultra* / P360 TWR</b>	RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5000m* T400 T600 T1000	
<b>P360 Tiny</b>	T400 T1000	

Product	Lenovo ThinkStation	
Workstation Model	NVIDIA Quadro GPU (442.92 or higher)	AMD Radeon™ Pro GPU
<b>P3 Tiny</b>	T400 T1000	
<b>P3 TWR</b>	T400 T1000 RTX A2000 RTX A4500 RTX A5500	
<b>P3 Ultra</b>	T400 T1000 RTX A2000 RTX A5500 mobility	
<b>P520* / P520c</b>	T4000 T1000 GV100 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000*	N/A
<b>P5</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5500 RTX A6000	

Product	Lenovo ThinkStation	
Workstation Model	NVIDIA Quadro GPU (442.92 or higher)	AMD Radeon™ Pro GPU
<b>P620 (AMD Ryzen PRO 3975X) /                      (AMD Ryzen Threadripper PRO 5955WX)</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000 RTX 6000 Ada	WX3200 W6400 W6600 W6800
<b>P720 / P920</b>	RTX 4000 RTX 5000 RTX 6000 RTX 8000 RTX A2000 RTX A4000 RTX A4500 RTX A5000 RTX A5500 RTX A6000 T400 T600 T1000	
<b>P7</b>	T400 T1000 RTX A2000 RTX A4000 RTX A4500 RTX A5500 RTX A6000	

Product	Lenovo ThinkStation	
Workstation Model	NVIDIA Quadro GPU (442.92 or higher)	AMD Radeon™ Pro GPU
	RTX 6000 Ada	
<b>PX</b>	T4000 T1000 RTX A2000 RTX A4500 RTX A5500 RTX A6000	

**Lenovo Workstations - Laptops (\*Windows 10 support only)**

Product	Workstation Model		
Lenovo ThinkPad	NVIDIA Quadro GPU	AMD Radeon™ Pro GPU	Intel Arc GPU
<b>P1 Gen4</b>	T1200 RTX A2000 RTX A3000 RTX A4000 RTX A5000		
<b>P1 Gen5</b>	RTX A1000 RTX A2000 RTX A3000 RTX A4500 RTX A5500		
<b>P1 Gen6</b>	RTX A1000 RTX 2000 Ada RTX 3500 Ada RTX 4000 Ada RTX 5000 Ada		

Product	Workstation Model		
	NVIDIA Quadro GPU	AMD Radeon™ Pro GPU	Intel Arc GPU
<b>P14s Gen1</b>	P520	AMD Ryzen 7 PRO 4750U with Radeon Graphics (2 GB) AMD APU 4400	
<b>P14s Gen2</b>	T500	AMD APU 5500	
<b>P14s Gen3a</b>	N/A	Radeon PRO Graphics	
<b>P14s Gen3i</b>	T550		
<b>P14s Gen4</b>	RTX A500		
<b>P15 Gen1</b>	T1000 T2000 RTX 3000 RTX 4000		
<b>P15 Gen2</b>	T1200 RTX A2000 RTX A3000 RTX A4000 RTX A5000		
<b>P15s Gen2</b>	T500		
<b>P15v Gen2</b>	T600 T1200 RTX A2000		



Product	Workstation Model		
	NVIDIA Quadro GPU	AMD Radeon™ Pro GPU	Intel Arc GPU
<b>P15v Gen3a/Gen3i</b>	T600 T1200 RTX A2000		
<b>P16 Gen1</b>	RTX A1000 RTX A2000 RTX A3000 RTX A4500 RTX A5500		
<b>P16 Gen2</b>	RTX A1000 RTX 2000 Ada RTX 3500 Ada RTX 4000 Ada RTX 5000 Ada		A30M
<b>P16s Gen1a</b>		Radeon PRO Graphics	
<b>P16s Gen1i</b>	T550		
<b>P16s Gen2</b>	RTX A500		
<b>P16v Gen1</b>	RTX A500 RTX A1000 RTX 2000 Ada		
<b>P17 Gen1</b>	T1000 T2000 RTX 3000 RTX 4000		

<b>Product</b>	<b>Workstation Model</b>		
<b>Lenovo ThinkPad</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>	<b>Intel Arc GPU</b>
	RTX 5000		
<b>P17 Gen2</b>	RTX A4000 RTX A5000		
<b>P73*</b>	T2000 RTX 3000 RTX 4000 RTX 5000		

**Acer Workstations and Laptops (\*Windows 10 support only)**

<b>Product</b>	<b>Acer</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>ConceptD 500*</b>	RTX 4000	
<b>ConceptD 700*</b>	RTX 4000	
<b>Veriton K8</b>	RTX 4000	
<b>Veriton K8690G</b>	RTX A4000	

<b>Product</b>	<b>Acer</b>	
<b>Mobile Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>ConceptD 3</b>	T1000	

<b>Product</b>	<b>Acer</b>	
<b>Mobile Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>Pro*</b>		
<b>ConceptD 3 Ezel Pro*</b>	T1000	
<b>ConceptD 5 Pro*</b>	RTX 3000	
<b>ConceptD 7 Pro*</b>	RTX 3000	
<b>ConceptD 7 Ezel Pro*</b>	RTX 5000	

**Altos Workstations and Laptops (\*Windows 10 support only)**

<b>Product</b>	<b>Altos Computing</b>	
<b>Workstation Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>BrainSphere™ P130 F5</b>	RTX 2000	
<b>BrainSphere™ P530 F4</b>	RTX 2000 RTX 4000 RTX 5000	

## SuperMicro Workstations

<b>Product</b>	<b>SuperMicro</b>	
<b>System Model</b>	<b>NVIDIA Quadro GPU</b>	<b>AMD Radeon™ Pro GPU</b>
<b>AS- 5014A-TT</b>		
<b>Mainstream Ryzen Threadripper Pro 3955WX</b>	RTX A4500	W6800
<b>Performance Ryzen Threadripper Pro 3975WX</b>	RTX A4500	W6800
<b>Expert Ryzen Threadripper Pro 3995WX</b>	RTX A4500	W6800
	(visit SuperMicro for a complete GPU support list)	

### Comments

For NVIDIA GPU based laptops/notebooks the Optimus power saving option in the BIOS should be disabled and the NVIDIA drivers properly installed for optimal performance in Altair HyperWorks products.

For AMD GPU based laptops/notebooks; the Enduro/Switchable Graphics power saving option should be disabled and the AMD drivers properly installed for optimal performance in Altair HyperWorks products.

Optimus (Intel/NVIDIA) enabled drivers may create performance issues with notebooks/laptops compared to a dedicated non-shared GPU driver. Disabling the Optimus feature in BIOS, if available, will help give the best overall graphics performance.

Disable nView Window manager under NVIDIA drivers if you experience random crashes and/or issues.

All power saving modes, settings and governors for CPU frequencies and GPU performance should be set to maximum settings in order to get the optimal performance out of Altair HyperWorks products. This includes smooth graphics and high frame rates (FPS) on Windows and Linux platforms.

# Altair HyperWorks 2023 Solver Hardware Configuration Recommendations

Recommended hardware configurations for Altair Solvers.

## AcuSolve Solver

Table 1:

Problem Size	Small	Medium	Large
Typical Workload Steady State or Transient	Steady state: Up to 1M nodes  Transient: Up to 100K nodes	Steady state: Up to 10M nodes  Transient: Up to 1M nodes	Steady state: Greater than 10M nodes  Transient: Greater than 1M nodes
Throughput <sup>1</sup>	Single job	Single job	Single job
CPU <sup>2</sup>	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or AMD EPYC 7002 or 7003 series	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or AMD EPYC 7002 or 7003 series	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or AMD EPYC 7002 or 7003 series
Number of CPU / node	1-4	1-4	1-4
Number of cores / node	32 – 128	32 – 128	32 – 128
Number of nodes	1-8	8 – 48	>48
Minimum Memory Configuration / node <sup>3</sup>	300MB to 3GB	3GB to 30GB	More than 30GB (3KB per CFD node)
Storage (minimum)	500 GB SATA or SSD	1.5 TB local storage	1.5 TB local storage
Network Interconnect	Gigabit Ethernet Or Infiniband	Infiniband	Infiniband
Operating System	Linux kernel 2.6.32 or higher Windows 7 or 10	Linux kernel 2.6.32 or higher	Linux kernel 2.6.32 or higher
GPU	Yes	Yes	Yes
MPI	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher

Problem Size	Small	Medium	Large
Setup (2000-3000 computational nodes per core)	Pure OpenMP or Hybrid OpenMP/MPI	Hybrid OpenMP/MPI	Hybrid OpenMP/MPI
Hyper Threading	Not recommended	Not recommended	Not recommended

## Feko Solver

Table 2:

Problem Size	Small	Medium	Large
General recommendations given for MoM and MLFMM dependent on problem size in terms of number of unknowns / mesh elements. For other solution methods (FEM, FDTD, RL-GO, PO, UTD) many factors to be considered.	Pure Mom: less than 50k unknowns. MLFMM: between 100k and 500k unknowns	Pure Mom: between 50k and 100k unknowns. MLFMM: between 500k and 5M unknowns	Pure Mom: >100k unknowns MLFMM: >5M unknowns
Throughput <sup>1</sup>	Single job	Single large job or few jobs in parallel	Single very large job or multiple jobs
CPU <sup>2</sup>	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or later	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or later	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or later
Number of CPU / node	2	2	2
Number of cores / node	32 – 56	32 – 56	32 – 56
Number of nodes	1	8 – 16	> 16
Minimum Memory Configuration / node <sup>3</sup>	64 GB	128 GB	256 GB
Storage (minimum)	500 GB SATA or SSD	500 GB SATA or SSD	500 GB SATA or SSD

Problem Size	Small	Medium	Large
Network Interconnect	Gigabit Ethernet	Infiniband	Infiniband
Operating System	RHEL or CentOS 8.3 Windows 10	Linux kernel 2.6.32 or higher	Linux kernel 2.6.32 or higher
GPU	Yes	No	No
MPI	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher
Setup	Pure MPI	Pure MPI	Pure MPI
Hyper Threading	Not recommended	Not recommended	Not recommended

## Flux Solver

Table 3:

Problem type	Small	Medium	Large
Typical Workload (depending on number of DOF, element type, and other factors)	< 300 000 DOF	Around 500 000 DOF	Around 5M DOF
Throughput <sup>1</sup>	Single	Single	Single
CPU <sup>2</sup>	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"
Number of CPU / node	1	2	2
Number of cores / node	8	16	16+
Number of nodes	1	1	1-4
Minimum Memory Configuration / node <sup>3</sup>	8 GB	16-32 GB	300GB
Storage (minimum)	500 GB SATA or SSD	1 TB local storage SSD	1.5 TB local storage SSD
Network Interconnect			Infiniband

Problem type	Small	Medium	Large
Operating System	Linux kernel 3.10.0-693 or higher Windows 7 or 10 with SSD	Linux kernel 3.10.0-693 or higher Windows 7 or 10 with SSD	Linux kernel 3.10.0-693 or higher Windows 7 or 10 with SSD
GPU	No	No	No
MPI	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher
Setup	SMP	SMP or Hybrid 2MPI/node	SMP or Hybrid 2MPI/node
Hyper Threading	Not recommended	Not recommended	Not recommended

## Radioss Solver

Table 4:

Problem Size	Small	Medium	Large
Typical Workload Crash & Impact	Component tests, sled test, drop test, ... Less than 500K elements	Medium crash model, between 1 and 6 millions of elements model	Accurate car crash model (rupture), very large model with size > 6 million elements
Throughput <sup>1</sup>	Single job	Single large job or few jobs in parallel	Single very large job or multiple jobs
CPU <sup>2</sup>	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or AMD EPYC 7002 or 7003 series	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake" or AMD EPYC 7002 or 7003 series	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lke" or AMD EPYC 7002 or 7003 series
Number of CPU / node	2	2	2
Number of cores / node	32 – 64	32 – 128	32 – 128
Number of nodes	1	8 – 16	> 16
Minimum Memory Configuration / node <sup>3</sup>	64-128GB	64-256GB	64-256GB



Problem Size	Small	Medium	Large
Storage (minimum)	500 GB SATA or SSD	1,5 TB local storage	1,5 TB local storage
Network Interconnect	Gigabit Ethernet	Infiniband	Infiniband
Operating System	Linux kernel 2.6.32 or higher Windows 7 or 10	Linux kernel 2.6.32 or higher	Linux kernel 2.6.32 or higher
GPU	No	No	No
MPI	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher	Intel MPI 2018.4 or higher
Setup	Pure MPI	Pure MPI or Hybrid with 2 or 4 OpenMP threads per MPI	Hybrid with 2 or 4 OpenMP threads per MPI
Hyper Threading <sup>5</sup>	Yes, Hybrid with 2 OpenMP per MPI	Not recommended	Not recommended

## OptiStruct Solver

Table 5:

Problem type	Small or medium	Large static	Large dynamic
Typical Workload (depending on number of DOF, element type, and other factors)	Nonlinear - less than 2M DOF; linear static - less than 5M DOF; NVH - less than 5M DOF	Nonlinear - more than 2M DOF; linear static - more than 5M DOF	NVH - more than 5M DOF
Throughput <sup>1</sup>	Single	Single	Single or few jobs in parallel
CPU <sup>2</sup>	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"	Dual CPU socket For example, Intel Xeon Gold "Cascade Lake" or "Ice Lake"
Number of CPU / node	2	2	2
Number of cores / node	8-24	24+	24+
Number of nodes	1	1-8	1-8

Problem type	Small or medium	Large static	Large dynamic
Minimum Memory Configuration / node <sup>3</sup>	16-64GB	128GB	256GB
Storage (minimum)	512GB local storage	1TB local storage	3 TB local storage, SSD and RAID0 recommended
Network Interconnect		Infiniband	Infiniband
Operating System	Linux kernel 2.6.32 or higher Windows 7 or 10 with SSD	Linux kernel 2.6.32 or higher Windows 7 or 10 with SSD	Linux kernel 2.6.32 or higher Windows 7 or 10 with SSD
GPU	Yes	Yes	Yes (Eigenvalue Extraction – AMSES or Lanczos)
MPI	Linux: Intel MPI 2018.4 (recommended) Windows: Intel MPI 5.1.0.078 (recommended)	Linux: Intel MPI 2018.4 (recommended) Windows: Intel MPI 5.1.0.078 (recommended)	Linux: Intel MPI 2018.4 (recommended) Windows: Intel MPI 5.1.0.078 (recommended)
Setup	SMP or DDM hybrid or SMP+GPU	DDM hybrid or SMP+GPU	SMP or DDM hybrid or SMP+GPU
Hyper Threading	Not recommended	Not recommended	Not recommended

1. Number of simultaneous jobs. Use of a workload management middleware like Altair PBS is highly recommended to insure optimal and dedicated usage of the CPU resource
2. Typical node configuration is based on dual CPU socket processors
3. It is extremely important to populate all the memory banks on the mother board.
4. In Hybrid mode, it is recommended to set a number of MPIs that is a multiple of the number of sockets and then set the number of OpenMP in a way that number of MPIs x number of OpenMP equal number of physical cores.
5. Hyper Threading (HT) may increase performance by around 10% on single node. In this case, recommended setup is to run 2 OpenMP per MPI, with a number of MPIs that matches the total number of physical cores on the node. On multi-node, it is better not using HT

## Recommended GPU Computing Processor List

Recommended graphic boards for use with the Altair Solver applications for high-powered GPU computing.

The following table lists the recommended graphic boards for use with the Altair Solver applications for high-powered GPU computing.

	Manufacturer and Model	Graphics Card	Driver Version (Minimum or Higher)
AcuSolve	NVIDIA (Tesla)	P100	Linux (64-bit) 418.39
		V100	Windows (64-bit) 396.26
	NVIDIA (Quadro)	GP100	Linux (64-bit) 418.39
		GV100	Windows (64-bit) 396.26
OptiStruct	NVIDIA (Tesla)	P100	Linux (64-bit) 440.33
		V100	Windows (64-bit) 441.22
	NVIDIA (Quadro)	GP100	Linux (64-bit) 440.33
		GV100	Windows (64-bit) 441.22



**Note:**

- The most recent vendor/manufacturer drivers should be used and all driver support for these cards should be addressed to the appropriate manufacturer of the graphics board.
- Double Precision GPU cards should be used to run OptiStruct. Single precision GPU cards (such as RTX 600, etc) are not recommended for OptiStruct runs.

## Additional Information on Driver Installations

The NVIDIA Driver Update recommendation is to use the **Custom installation** option and select the **Perform clean installation** option to validate that there are no conflicts in DLL/drivers.

The same should be done with AMD hardware and drivers as well using AMD's custom uninstall tools.



Figure 1: