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Hardware Document Updated at ANSYS release 2022 R.x

This document is designed to help you get started with your hardware selection. ANSYS is vendor neutral as we partner with all the major hardware vendors. At the end of this document are some suggested hardware recommendations based on the vendor that you normally purchase from. Please visit the vendor's website and attach any specifications to your Service Request for further review. Before you purchase any hardware Ansys highly recommends that you contact us to look through your specifications to understand your workflow for best practices.

Thank you

ANSYS Support

NOTE: Quad Core Sockets – NUMA - In most cases ANSYS does not recommend quad core socket systems because of memory bandwidth. Please consult ANSYS if you are considering Quad-Core.

Processors Recommended:

- Intel® Xeon® Core series 62xx (Workstation line)
- Intel Xeon Cores series 63xx (Server line)
- *AMD (Threadripper) (Workstation Line)*
- AMD EPYC™ 7003 series known as "**Milan**" Processors (Server Line)

Overview of Intel Ice Lake processor family:

Detailed Specifications of the "Ice Lake SP" Intel Xeon Processor Scalable Family CPUs - Microway

Overview of AMD Milan processor family:

Detailed Specifications of the AMD EPYC "Milan" CPUs - Microway

AMD Support for ANSYS Solvers

- **Mechanical**: Support for the AMD BLIS library has been added at 2021R2.
- **HFSS**: AMD processors are not recommended because of the lack of optimized math library support. AMD support should be available for AEDT at 2022R2
- **Fluids**: AMD processors are fully supported

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Memory (Fastest memory, at least DDR-4 2933 MHz)

- **To operate at maximum speed all memory channels in both processors should be populated with equal amounts of memory.**
- Memory banks should be populated by a multiple of 6 for each socket of a 6 memory Channel processor Minimum 192 GB RAM per machine.
- Memory banks should be populated by a multiple of 8 for each socket of a 8 memory Channel processor Minimum 256 GB RAM per machine.

Interconnect (Server/Cluster solution ONLY)

Omni-Path, EDR, QDR or FDR IB interconnect if you will be running on 2 or more nodes in parallel (on a cluster, minimum 10 G network**.**)

BIOS settings:

- Turn off Hyper-threading
- Leave Turbo boost on

AVX 512 (Fluent, Mechanical, HFSS & Icepack)

- AVX 512 usage has started with ANSYS flag ship products starting with version 18.2.
- HFSS – AVX 512 is not 100% implemented. However, most of the computations in the matrix solution are using AVX-512 instructions through MKL.
- SBR+ does not support the AVX 512 extension set

NOTE: See the Tables Below for Suggested Configurations

EBU - Electronics

NOTE: HFSS is primarily an in-core solver, so clock speed and RAM speed is important

For efficiency HFSS needs at least one host CPU core for each PCIe GPU. So, for 8 GPUs it needs 8 cores minimum.

As a general guideline for most applications, scalability will saturate quickly for more than 32 cores in a single machine.

How the GPUs are used depends on the HFSS solver. For example, for HFSS Transient the solver will first use all GPUs for solver tasks and the remaining tasks will use multi-core CPUs. The other solvers have a similar logic. In general, the solvers will try to maximize GPUs usage when GPU acceleration is enabled.

The following guidelines are a viable choice:

- 2x 16-core Intel Processors at 2.8-3.1GHz.
- ANSYS does not recommend AMD processors due to the lack of optimized AMD math library support.
- AMD math library Support tentatively scheduled for HFSS 2022R2

Electronics - GPU and CPU - General Guidelines:

- Several Ansys Electronics Desktop solvers can benefit from GPU acceleration:
- HFSS frequency domain, transient, and SBR+ solvers.
- HFSS 3D Layout for matrix solves and eye analysis.
- Maxwell 3D eddy current matrix solves.
- Circuit Design for eye analysis.
- Circuit Netlist for eye analysis.
- EMIT

Electronics - GPU selection is based on the type of solve

- SBR+ solvers can benefit from single precision GPU's with higher memory bandwidth, such as NVIDIA RTX series.
- All other solvers require GPU's that are capable of double precision floating point calculations, such as NVIDIA A100 or V100 or P100 series.
- If installing multiple GPU's make sure all GPUs are from the same series and as adequate level CUDA installed and GPU's set to computational mode
- PCIe4
- CPU RAM at least 2x of the accumulated GPU RAM
- Enough power from PSU

Hard Drives (See additional information below based on the solver you will be running)

- SSD NVMe – 2 x 2TB for 4 TB of off-core additional memory/storage
- Local disk is recommended for the solver for temporary file I/O during solves.

NOTE: Ansys recommends at least one drive for boot and applications (SSD) and at least one drive for solving M2, NVMe drives

Graphics (Rendering)

- See table below

NOTE: For rendering/display – Ansys requires OpenGL and the workflow that is recommended is that you do all pre/post processing on a workstation and not on a server unless it is a graphics server. A high-end OpenGL graphics card and recent vendor drivers are required.

CFD (Fluids)

Hard Drives

SSD (**NVMe, M2 interface**) drives.

Graphics (Rendering)

- See table below

NOTE: For rendering/display – Ansys requires OpenGL and the workflow that is recommended is that you do all pre/post processing on a workstation and not on a server unless it is a graphics server. A high-end OpenGL graphics card and recent drivers are required.

GPU - Fluids

Fluent

- A brand-new Multi-GPU Fluent solver (beta) accelerates steady-state simulations, with results showing 4 high-end GPUs provide the same performance as more than 1,000 CPUs.

CFX

- CFX does not support GPU Acceleration.

Mechanical

Hard Drives

- SSD (**NVMe, M2 interface**) drives. Local disk is recommended for the solver for temporary file I/O during solves.

NOTE: Ansys recommends at least one drive for boot and applications (SSD) and at least one drive for solving M2, NVMe drives). See table below

Graphics (Rendering)

- See table below

NOTE: For rendering/display – Ansys requires OpenGL and the workflow that is recommended is that you do all pre/post processing on a workstation and not on a server unless it is a graphics server. A high-end OpenGL graphics card and recent drivers are required.

Solver GPU acceleration

GPU solver acceleration exist for direct & iterative solver, but some settings are not supported. please search on ANSYS Help for **GPU Supported Analysis Types** or check with ANSYS support. In general GPU solver acceleration is possible but needs a high-end GPU with high memory bandwidth (iterative technology) and fast FP64 (direct technology). For instance, the average CPU power on dual socket machines/nodes can achieve at least more than 1 Teraflops because the data is first offloaded to the GPU, GPU power should be higher.

https://en.wikipedia.org/wiki/List_of_Nvidia_graphics_processing_units#Quadro_RTX_/_T_x000_series

Additional Hard drive information (Electronics and Mechanical)

I/O to the hard drive is the third component of a balanced system for some I/O intensive situations, for example ANSYS Mechanical and ANSYS Electronics.

Some best practices are to separate the Operating system and applications from simulation scratch data.

While IT can setup redundancy on the Operating System and Applications (RAID 5, RAID 10) the scratch disk must be tuned for performance (RAID 0).

If no fast network share exists for keeping the opened project for their lifetime, then some local “third data disk” may be added. It is often a larger disk space, with redundancy.

SSD’s may be a solution for all storage and typically offer superior performance over HDDs (Hard Disk Drive), but there are other factors to consider such as cost and mean-time-to-failure.

A high-performance file system is mandatory for scratch drives. It should consist of solid-state drives (mixed use or write intensive with NVMe interface). Multiple NVme SSDs can be combined in a RAID 0 array (to keep a high level of performance we recommend having 1 physical SSD drive per 16 cores in the stripped array).

PCIe Gen 4 NVMe SSD’s deliver the fastest I/O speed

It is good to keep in mind that systems with dual sockets may require dual SSD in RAID 0.

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ANSYS Help Documentation

Be sure to download Ansys Product Help and Release Notes from the link below

https://download.ansys.com/Product%20Documentation

What's New in ANSYS 2022 R2

You will find each “What’s New” informati9on in Ansys Help

https://download.ansys.com/Installation%20and%20Licensing%20Help%20and%20Tutorials

ANSYS Discovery Hardware Requirements

Minimum requirements for Ansys Discovery Software are as follows:

- 64-bit Intel or AMD system, running Windows 10 version 21H1, 20H2, 1909, or later (Professional, Enterprise and Education)
- 32 GB RAM or greater
- 32 GB Disk space.
- Model and Refine Stages in Discovery require the use of NVIDIA Quadro or AMD Radeon Pro graphics card, with latest vendor drivers supporting OpenGL version 4.6 and a minimum of 4GB memory.
- **Explore Stage** requires a dedicated NVIDIA GPU, Maxwell series or newer. (Pascal series or newer).
  A minimum of 4GB dedicated GPU RAM, although 8 GB GPU RAM is recommended.
- For recommended Laptops and Workstations from DELL please visit: www.dell.com/ansys

SpaceClaim

For recommended Laptops and Workstations from DELL please visit: www.dell.com/ansys

Servers versus Workstations

- If you have or will obtain in the future 32 or more parallel licenses (HPC Packs or Enterprise Licenses) and have 0ne or more users that need to submit jobs using a higher core count than what is available on current Workstations, we tend to recommend servers (or a cluster) and a supported Job Scheduler is required.

IT Support

- If you decide, based on best practices and recommendations from Ansys, to buy a server or build a cluster, IT expertise is required or third party ANSYS Partner support for configuring your cluster and job scheduler (resource

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manager). Ansys does not configure clusters or job schedulers, but we do provide full support for configuring Ansys supported applications on Servers, Workstations, or Clusters. If you need a third-party Ansys partner to assist, for a fee please contact one of the third-party ANSYS partners below.

Third Party Vendors

Third party vendors that can help assist in the configuration and setup of ANSYS and maintain your cluster

North America:

- Nor-Tech - Bob Dreiss - bdreis@reasonco.com - Kyle Gross, Kyleg@nor-tech.com http://www.nor-tech.com/
- TotalCAE - Rod Mach - rod@totalcae.com http://www.totalcae.com/
- X-ISS - Dylan Campbell - dcampbell@x-iss.com - Office/Cell: (346) 250-1484 - https://x-iss.com/

X-ISS Information

X-ISS is a High-Performance Computing (HPC) solutions company that provides exceptional technical computing products and services. X-ISS designs, integrates, and manages HPC cluster systems, as well as monitoring, reporting, and deliver analytics that are important to HPC users. Taking advantage of their world-class full-service HPC Management services, customers can focus on their research and not have to worry about the cluster running optimally.

Datasheet

https://x-iss.com/wp-content/uploads/X-ISS%20ANSYS%20Starter%20Kit%20Final.pdf

X-ISS Website Announcement

https://x-iss.com/about-us/partner-solutions/ansys-hpe-solution/

ANSYS Partnership with X-ISS

https://www.ansys.com/about-ansys/partner-ecosystem/high-performance-computing-partners/x-iss

Europe

OCF Limited

- https://www.ansys.com/partner-ecosystem/high-performance-computing-partners/ocf-limited

Asia

- https://www.ansys.com/partner-ecosystem/high-performance-computing-partners/hpc-systems

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Suggested Hardware Solutions from ANSYS Partners

Please review ANSYS Platform Strategy for 2022R2**. Windows 11 is supported with release 2022 R2.**
https://www.ansys.com/content/dam/it-solutions/platform-support/2022-r2-ansys-platform-support-strategy-plans-july-2022.pdf

DELL

Workstations

Dell Precision 7920, 5820

Laptops

Precisions Mobile - https://www.dell.com/en-us/work/shop/dell-laptops-and-notebooks/sf/precision-laptops

Dell Suggestions for Servers

Dell PowerEdge R640, R740, R740xd

HP Inc.

Workstations

HP Z6, Z8 - http://www.hp.com/go/Z

Laptops

HP EliteBook
https://www.hp.com/us-en/shop/mlp/laptops/elite-352503--1

HPE

https://www.hpe.com/us/en/product-catalog/servers/proliant-servers/pip.hpe-proliant-xl230k-gen10-server.1010027178.html

HPE Suggestions for servers**:**

XL230k, DL380 Gen10, Apollo 2000, 86xx

Ansys Reference Configurations for Apollo 2000 Gen10 Intel Cluster
Ansys Reference Configurations for Apollo 2000 Gen10 AMD Plus Cluster

LENOVO

Workstations

For recommended Workstations, Laptops and Servers please visit: https://www.lenovo.com/us/en/pc/

Suggestions for servers

SR650, https://lenovopress.com/lp0644-lenovo-thinksystem-sr650-server

SR630, https://lenovopress.com/lp0643-lenovo-thinksystem-sr630-server

SD530, https://lenovopress.com/lp0635-thinksystem-sd530-server

HPC Systems

https://www.ansys.com/content/dam/resource-center/brochure/lenovo-ansys-solution-manufacturing-cae.pdf"

SuperMicro

Workstations

https://www.supermicro.com/en/products/superworkstation

Supermicro SYS-5039

Supermicro SYS-5049

Supermicro SYS-7039

https://www.supermicro.com/products/system/

Exxact Corporation – Workstations for Ansys

Exxact Corporation provides a wide range of workstation options and works closely with customers to build system that fits their specific Ansys needs. To view Exxact's range of Ansys workstations please browse to https://www.exxactcorp.com/Ansys-Certified-Workstations, or select one of the following options.

- Entry Level Workstation for Ansys

- Mid-Level Workstation for Ansys
- High-End Workstation for Ansys

BOXX

https://www.ansys.com/partner-ecosystem/high-performance-computing-partners/boxx-technologies

Configuration Information

- https://www.boxx.com/solutions/manufacturing-and-product-design/ansys
- https://www.boxx.com/ansys-promo

KOI Computers

- https://www.ansys.com/partner-ecosystem/high-performance-computing-partners/koi-computers

Configuration Information

- https://www.koicomputers.com/partners/ansys/

EMEA

GNS Systems

- https://www.ansys.com/partner-ecosystem/high-performance-computing-partners/gns-systems-gmbh

Configuration Information

- https://digital-simulation-pack.com/en

Possible Hardware configuration examples are given in the table below (Vendor Neutral)

VDI Configuration – 8 Memory Channels

	Standard	Advanced	Ultimate
Simultaneous Simulation Tasks	1	1 or 2	1, 2 or 3
Operating System Recommended	Windows10, 11	Windows 10, 11, Server 2016, Server 2019	Windows 10, 11, Server 2016, Server 2019

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Total Cores	18	48	64
RAM (DDR4 >= 3200)	128 or 256	512	512 or 1024
Hard Drives for Operating System	1 TB read intensive	1 TB read intensive	1 TB read intensive
Project Disk *			
Hard Drives for Operating System	1 TB mixed use	2 x 1 TB mixed use	3 or 4x 1 TB mixed use
Graphics Card - NVIDIA	RTX 4000	RTX 5000	GV 100
* Size of the Disk is Based on all Users & Projects Needs			
We recommend a Network Shared Drive for VDI not a local Drive			

NOTE: ANSYS Fluent does very little Disk I/O so the configuration above is more for Mechanical for the Scratch Disk recommendations. ANSYS CFX does some Disk I/O.

Workstation - 6 Memory Channels

	Standard	**Advanced**	**Ultimate**
Simultaneous Simulation Tasks	1	1 or 2	1, 2 or 3
Operating System Recommended	Windows 10, 11	Windows 10, 11, Server 2016, Server 2019	Windows 10, 11, Server 2016, Server 2019
Total Cores	18	40	48
RAM (DDR4 >= 2933)	96 or 192	384	384 or 768
Hard Drives for Operating System	1 TB read intensive	1 TB read intensive	1 TB read intensive
Project Disk *			
Scratch Disk (NVME) - Mechanical and HFSS	1 TB mixed use	2 x 1 TB mixed used Raid 0	3 or 4 1 TB mixed Raid 0
Graphics Card - NVIDIA	RTX 4000	RTX 5000	GV 100
Memory Bandwidth GB/Sec/Core	6		
GPU Solver Acceleration - NVIDIA			1 or 2 A100
* Size of the Disk is Based on all Users & Projects Needs			

NOTE: ANSYS Fluent does very little Disk I/O so the configuration above is more for Mechanical for the Scratch Disk recommendations. ANSYS CFX does some Disk I/O.

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Workstation - 8 Memory Channels

	Standard	Advanced	Ultimate
Simultaneous Simulation Tasks	1	1 or 2	1, 2 or 3
Operating System Recommended	Windows 10, 11	Windows 10, Server 2016, Server 2019	Windows10, 11, Server 2016, Server 2019
Total Cores	18	48	64
RAM (DDR4 >= 3200)	128 or 256	512	512 or 1024
Hard Drives for Operating System	1 TB read intensive	1 TB read intensive	1 TB read intensive
Project Disk (RAID 5 for Redundancy STD SSD) *			
Scratch Disk (NVME) - Mechanical and HFSS	1 TB mixed use	2 x 1 TB mixed use- Raid 0	3 or 4 1 TB mixed use Raid 0
Graphics Card - NVIDIA	RTX 4000	RTX 5000	GV 100
Memory Bandwidth GB/Sec/Core	8		
GPU Solver Acceleration - NVIDIA			1 or 2 A100
* Size of the Disk is Based on all Users & Projects Needs			

NOTE: ANSYS Fluent does very little Disk I/O so the configuration above is more for Mechanical for the Scratch Disk recommendations. ANSYS CFX does some Disk I/O.

Laptops - Possible Configurations

	Basic	Standard	Advanced	Ultimate
Simultaneous Simulation Tasks	1	1	1	1 or 2
Operating System Recommended	Windows10, 11	Windows 10, 11	Windows 10, 11	Windows 10, 11
Total Cores	6	6	8	8
RAM DDR4 >= 3200 MHz	32	64	64	128
Hard Drives for Operating System	1 TB	1 TB	1 TB	1 TB
Project Disk *				
Scratch Disk (NVME) - Mechanical and HFSS	1 TB	1 TB	2 x 1 TB Raid 0	3 x 1 TB Raid 0
Graphics Card - NVIDIA	RTX 2000	RTX A3000	RTX A4000	RTX A5000

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* Size of the Disk is Based on all Users & Projects Needs				

NOTE: ANSYS Fluent does very little Disk I/O so the configuration above is more for Mechanical for the Scratch Disk recommendations. ANSYS CFX does some Disk I/O.

Supported Job Schedulers

- Microsoft HPC Pack 2016 Update 2, Microsoft Server HPC Pack 2019
- IBM Platform LSF (Linux)
- Altair PBS Pro (Linux)
- Univa (SGE) (Linux)
- Slurm

Platform Support

Defining the optimum computer infrastructure for use of ANSYS software begins with understanding the computing platforms that are tested and supported by ANSYS. Follow the links below to learn about the computing platforms we support as well as reference system architectures recommended by valued partners.
https://www.ansys.com/Solutions/Solutions-by-Role/IT-Professionals/Platform-Support

Current Release Support Data

The PDF files below provide platform support information for the current Ansys release, including certification and test information for operating systems, graphics cards, job schedules and other platform components.

- Ansys Platform Support Strategy & Plans July 2022 (PDF)
- Ansys 2022 R2 - Platform Support by Application / Product (PDF)
- Ansys 2022 R2 - 3Dconnexion Devices Certification (PDF)
- Ansys 2022 R2 - Browser Support (PDF)
- Ansys 2022 R2 - CAD Support (PDF)
- Ansys 2022 R2 - Graphics Cards Tested (PDF)
- Ansys 2022 R2 - GPU Accelerator Capabilities (PDF)
- Ansys 2022 R2 - Job Schedulers and Queuing Systems Support (PDF)
- Ansys 2022 R2 - Message Passing Interface Support for Parallel Computing (PDF)
- Ansys 2022 R2 - Remote Display and Virtual Desktop Support (PDF)

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Ansys Benchmarks

- Standard Benchmarks: Overview and Performance

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