Technical white paper

HP and ANSYS 17

HP Workstations

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ANSYS Mechanical

ANSYS Mechanical is used for mechanical and structural engineering analysis or simulation to compute the response of a structural system. The equation solvers used to drive the simulation are computation intensive and utilize parallel processing. The equation solver runs on either a central processing unit (CPU) or a graphics processing unit (GPU) accelerator together with a CPU.

The GPU accelerator is a massively parallel architecture; the large arrays of the equation solver and dataset used in the simulation require a fast memory system. Simulation results are obtained the fastest when the data remains in core.

A fast local disk storage system is recommended for optimal performance because ANSYS Mechanical writes files as the analysis progresses. To minimize storage I/O during the simulation, it is recommended to configure the required main memory. ANSYS Mechanical provides both shared memory parallel processing (default two cores) and distributed memory parallel processing.

ANSYS Mechanical can be distributed to run on a single workstation or across workstations/nodes (in a cluster) connected via high-speed interconnect. Distributed ANSYS Mechanical requires a message passing interface (MPI) software layer for inter-process communication.

HP Workstation recommendations for running ANSYS Mechanical

- Fastest results are obtained when simulation runs in core (main memory).
- Configure 4-8 GB[3] system memory per physical processor used in simulation. The ANSYS Mechanical v17sp5 benchmark required 144 GB memory at 44 cores. Simulation result files contain information on the memory required.
- HP Performance Advisor can be used to monitor memory usage.
- Fill memory channels and balance across CPU sockets with fastest memory DIMMs 2400 MHz.
- Intel® Core™ frequency (GHz) is a top priority since it impacts all processor operations.
- Intel® Turbo Boost core frequency depends on the number of active cores[2].
- Configure high Intel® CPU core clock frequency.
- Intel® AVX CPU core clock frequency impacts the AVX floating point operations. ANSYS Mechanical uses AVX2.
- Distributed simulation results scaled up through 40 cores.
- Configure a solid-state drive (SSD) for operating system and application install.
- Configure SSDs for the ANSYS Mechanical working directory data storage (tier 1).
- Configure higher capacity hard disk drives (HDDs) for larger ANSYS Mechanical working directory or archive data (tier 2).
- Configure the graphics card choice depending on post-processing requirement.
- GPU accelerator can be used with certain solvers. Simulation conditions can cause GPU accelerator to not be used.
- Characterize the GPU accelerator usage with your simulations.
- Intel® MPI software when running distributed on Intel® Xeon® E5 v4 processors.

Recommended HP Workstation configurations for ANSYS Mechanical simulations

	HP Z440 Workstation (Simulation up to 128 GB and 8 cores)	HP Z640 Workstation (Simulation up to 256 GB and 44 cores)	HP Z840 Workstation (Simulation up to 512 GB Windows 10 and 44 cores)
Processor[1]	Intel® Xeon® E5-1680 v4 8-core 3.4/4.0 Turbo Boost	Two Intel® Xeon® E5-2697 v4 18-core 2.3/3.6 Turbo Boost	Two Intel® Xeon® E5-2699 v4 22-core 2.2/3.6 Turbo Boost
Instruction set	AVX 2.0	AVX 2.0	AVX 2.0
Graphics	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000
Memory[3]	128 GB memory	256 GB memory	512 GB memory
Storage	SSD or HP Z Turbo Drive G2	SSD or HP Z Turbo Drive G	SSD or HP Z Turbo Drive G2

HP Workstation tips for running ANSYS Mechanical: Operating System

	Default	Recommendation
Windows 10 64-bit		Latest feature update
Control panel / power options	Balanced	High performance

HP Workstation tips for running ANSYS Mechanical: BIOS setting

	Default	Recommendation
Power / OS power management / runtime power management	Enable	Disable
Power / OS power management / idle power savings	Extended	Normal
Power / OS power management / turbo mode	Enable	Enable
Advanced / device options / hyper-threading	Enable	Disable
Advanced / performance / non-uniform memory access (NUMA) dual-socket HP Z640 or HP Z840	Enable	Enable
Advanced / performance / QPI snoop mode dual-socket HP Z640 or HP Z840	Early snoop	Home snoop

ANSYS Fluent

ANSYS Fluent is used for fluid flow design engineering analysis. The solvers are computation intensive and utilize parallel processing. Similar to ANSYS Mechanical, the equation solver runs on a central processing unit CPU or a GPU accelerator together with a CPU. The GPU accelerator is a massively parallel architecture; the large arrays of the equation solver and dataset used in the simulation require a fast memory system. ANSYS Fluent can be run in serial compute or parallel processing as shared memory on a local machine or distributed memory on a cluster. Distributed ANSYS Fluent requires an MPI software layer for inter-process communication.

HP Workstation recommendations for running ANSYS Fluent

- Fastest results are obtained when simulation runs in core (main memory).
- Configure 2-4 GB[3] of system memory per 1M cells size used in simulation. HP Performance Advisor can be used to monitor memory usage.
- Fill memory channels and balance across CPU sockets with fastest memory DIMMs 2400 MHz.
- Intel® Core™ frequency (GHz) is a top priority as it impacts all processor operations.
- Intel® Turbo Boost core frequency depends on the number of active cores[2].
- Configure high Intel® CPU core clock frequency.
- Intel® AVX core frequency impacts the AVX floating point operations.
- Distributed simulation results scaled up through 40-44 cores.
- Configure an SSD for operating system and application install.
- Configure SSDs for the ANSYS Fluent working directory data storage (tier 1).
- Configure higher capacity HDDs for larger ANSYS Fluent working directory or archive data (tier 2).
- Configure the graphics card choice depending on post-processing requirement.
- GPU accelerator can be used with some simulations. Simulation size can cause GPU accelerator to not be used.
- Characterize the GPU accelerator usage with your simulations.
- Intel® MPI software when running distributed on Intel® Xeon® E5 v4 processors.

Recommended HP Workstation configurations for ANSYS Fluent simulations

	HP Z440 Workstation (Simulation up to 128 GB and 8 cores)	HP Z640 Workstation (Simulation up to 256 GB and 44 cores)	HP Z840 Workstation (Simulation up to 512 GB Windows 10 and 44 cores)
Processor[1]	Intel® Xeon® E5-1680 v4 8-core 3.4/4.0 Turbo Boost	Two Intel® Xeon® E5-2697 v4 18-core 2.3/3.6 Turbo Boost	Two Intel® Xeon® E5-2699 v4 22-core 2.2/3.6 Turbo Boost
Instruction set	AVX 2.0	AVX 2.0	AVX 2.0
Graphics	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000
Memory[3]	128 GB memory	256 GB memory	256 GB memory
Storage	SSD or HP Z Turbo Drive G2	SSD or HP Z Turbo Drive G2	SSD or HP Z Turbo Drive G2

HP Workstation tips for running ANSYS Fluent: Operating System

	Default	Recommendation
Windows 10 64-bit		Latest feature update
Control panel / power options	Balanced	High performance

HP Workstation tips for running ANSYS Fluent: BIOS setting

	Default	Recommendation
Power / OS power management / runtime power management	Enable	DIsable
Power / OS power management / idle power savings	Extended	Normal
Power / OS power management / turbo mode	Enable	Enable
Advanced / device options / hyper-threading	Enable	Disable
Advanced / performance / non-uniform memory access (NUMA) dual-socket HP Z640 or HP Z840	Enable	Enable
Advanced / performance / QPI snoop mode dual-socket HP Z640 or HP Z840	Early snoop	Home snoop

ANSYS CFX

ANSYS CFX is used for general-purpose computational fluid dynamics (CFD). The equation solvers that are used to drive the simulation are computation intensive. The equation solver runs on a CPU. The large arrays of the equation solver and dataset used in the simulation require a fast memory system. ANSYS CFX can be run in serial compute or parallel processing as local parallel or distributed parallel on a cluster. Distributed ANSYS CFX requires an MPI software layer for inter-process communication.

HP Workstation recommendations for running ANSYS CFX

- Fastest results are obtained when simulation runs in core (main memory).
- Configure 2 GB[3] system memory per physical processor used in simulation. HP Performance Advisor can be used to monitor memory usage.
- Fill memory channels and balance across CPU sockets with highest frequency memory DIMMs 2400 MHz.
- Intel® Core™ frequency (GHz) is a top priority since it impacts all processor operations.
- Intel® Turbo Boost core frequency depends on the number of active cores[2].
- Configure high Intel® Processor CPU core clock frequency.
- Intel® AVX core frequency impacts the AVX floating point operations.
- Distributed simulation results scaled up through 40 cores.
- Configure an SSD for operating system and application install.
- Configure SSDs for the ANSYS CFX working directory data storage (tier 1).
- Configure higher capacity HDDs for larger ANSYS CFX working directory or archive data (tier 2).
- Configure the graphics card choice depending on post-processing requirement.
- Intel® MPI software when running distributed on Intel® Xeon® E5 v4 processors.

Recommended HP Workstation configurations for ANSYS CFX simulations

	HP Z440 Workstation (Simulation up to 128 GB and 8 cores)	HP Z640 Workstation (Simulation up to 256 GB and 44 cores)	HP Z840 Workstation (Simulation up to 512 GB Windows 10 and 44 cores)
Processor[1]	Intel® Xeon® E5-1680 v4 8-core 3.4/4.0 Turbo Boost	Two Intel® Xeon® E5-2697 v4 18-core 2.3/3.6 Turbo Boost	Two Intel® Xeon® E5-2687W v3 22-core 2.2/3.6 Turbo Boost
Instruction set	AVX 2.0	AVX 2.0	AVX 2.0
Graphics	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000	NVIDIA® Quadro® M2000
Memory[3]	128 GB memory	256 GB memory	256 GB memory
Storage	SSD or HP Z Turbo Drive G2	SSD or HP Z Turbo Drive G2	SSD or HP Z Turbo Drive G2

HP Workstation tips for running ANSYS CFX: Operating System

	Default	Recommendation
Windows 10 64-bit		Latest feature update
Control panel / power options	Balanced	High performance

HP Workstation tips for running ANSYS CFX: BIOS setting

	Default	Recommendation
Power / OS power management / runtime power management	Enable	Disable
Power / OS power management / idle power savings	Extended	Normal
Power / OS power management / turbo mode	Enable	Enable
Advanced / device options / hyper-threading	Enable	Disable
Advanced / performance / non-uniform memory access (NUMA) dual-socket HP Z640 or HP Z840	Enable	Enable
Advanced / performance / QPI snoop mode dual-socket HP Z640 or HP Z840	Early snoop	Home snoop

Resources, contacts or additional links

hp.com/go/thinkz
hp.com/go/whitepapers
hp.com/go/ansys
hp.com/go/hpperformanceadvisor

[1] Multi-Core is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. 64-bit computing on Intel® architecture requires a computer system with a processor, chipset, BIOS, operating system, device drivers, and applications enabled for Intel® 64 architecture. Processors will not operate (including 32-bit operation) without an Intel® 64 architecture enabled BIOS. Performance will vary depending on your hardware and software configurations.
[2] Intel® Turbo Boost technology requires a PC with a processor with Intel® Turbo Boost capability. Intel® Turbo Boost performance varies depending on hardware, software and overall system configuration. See intel.com/technology/turboboost for more information.
[3] Maximum memory capacities assume Windows 64-bit operating systems or Linux. With Windows 32-bit operating systems, memory above 3 GB may not all be available due to system resource requirements.

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