

# HP and ANSYS 18

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 can leverage parallel processing. There are three parallel processing capabilities available in Mechanical.

When using **Shared-memory parallel processing** (shared-memory ANSYS aka SMP), you can reduce each of the three main parts of the overall solution time by using multiple cores. However, this approach is often limited by the memory bandwidth. Typically, there is very little reduction in solution time beyond four CPU cores.

**Distributed-memory parallel processing** (Distributed ANSYS aka DMP) allows the entire solution phase to run in parallel. As a result, a simulation using distributed-memory parallel processing usually achieves much faster solution times than a similar run performed using shared-memory parallel processing, particularly at higher CPU core counts.

**GPU acceleration** (a type of shared-memory parallel processing) can be used to offload key solver computations onto graphics cards. The CPU cores continue to handle most operations and will automatically offload some of the time-intensive parallel operations performed by certain equation solvers.

## Recommendations for running ANSYS Mechanical on HP Workstations

- Solution time is best when the equation solver executes in-core system main memory
  - Solution time is sensitive to system main memory performance (particularly memory bandwidth)
  - Use identical memory DIMMS in all locations (size, fastest speed, rank)
  - Use all available memory channels
  - Configure 4-8GB memory per CPU core when planning workstation deployment
  - Mechanical v18sp-5 benchmark used 100GB memory on 44 CPU cores
  - HP Performance Advisor can be used to monitor memory usage
- DMP solution time typically scales up to 32-36 CPU cores on single 44 CPU core workstation
  - V18.2 provides access to Intel AVX-512 features
  - Intel AVX-512 doubles the flops per cycle
  - HP G4 workstations have intel AVX-512 features
- Solution time is sensitive to storage performance
  - Use a dedicated NVMe PCIe SSD for the Mechanical working data set
  - Use a dedicated SSD for the Operating system and ANSYS application install
  - Move/archive previous simulation data sets to a larger storage drive if required
- Intel MPI is recommended when running DMP solutions
- GPU acceleration should be characterized with your solutions
  - Simulation conditions can cause GPU acceleration device to not be used
- Simulation post-processing requires Open-GI capable graphics video card
  - HP Performance Advisor can be used to monitor GPU utilization
- HP Performance Advisor can be used to configure OS and BIOS settings for ANSYS applications (Table 2.)

Table 1. Recommended HP Workstation configuration specifications for ANSYS



**HP Z4 G4**  
(simulation up to 256GB memory and up to 18 CPU Cores)

**HP Z6 G4**  
(simulation up to 384GB memory and up to 48 CPU Cores)

**HP Z8 G4**  
(simulation up to 768GB memory and up to 56 CPU Cores)

	HP Z4 G4 (simulation up to 256GB memory and up to 18 CPU Cores)	HP Z6 G4 (simulation up to 384GB memory and up to 48 CPU Cores)	HP Z8 G4 (simulation up to 768GB memory and up to 56 CPU Cores)
<b>Processor<sup>1</sup></b>	Intel® Xeon® W-2100  W-2155 (10 Cores) W-2175 (14 Cores) W-2195 (18 Cores)	Intel® Xeon® Scalable  Qty2, 6144 (16 Cores) 6154 (18 Cores) Qty2, 6146 (24 Cores)	Intel® Xeon® Scalable  Qty2, 6144 (16 Cores) Qty2, 6146 (24 Cores) Qty2, 6154 (36 Cores)
<b>Main Memory<sup>2</sup></b>	128GB (8x16GB)  RDDR4-2666 79GB Max Bandwidth	192GB (6x32GB) 192GB (12x16GB)  RDDR4-2666 119GB Max Bandwidth	192GB (12x16GB)  RDDR4-2666 119GB Max Bandwidth
<b>PCIe Solid State Drive for ANSYS dataset</b>	Z Turbo Drive 1TB NVMe SSD	Z Turbo Drive 1TB NVMe SSD	Z Turbo Drive 1TB NVMe SSD
<b>SATA Solid State Drive for Windows 10 Operating System</b>	512GB SATA SSD	512GB SATA SSD	512GB SATA SSD
<b>Graphics</b>	NVIDIA® Quadro® P4000 (up to 2x)	NVIDIA® Quadro® P5000 (up to 2x)	NVIDIA® Quadro® P6000 (up to 3x)

Table 2. Recommended HP Workstation G4 desktop settings for ANSYS

	Default	Recommended
Operating System		Windows 10v1709
Operating System Power & Sleep	Balanced	High Performance
BIOS Advanced/Power Management Options\Runtime Power Management	Enable	Enable
BIOS Advanced/Power Management Options\Hardware P-States	Enable	Enable
BIOS Advanced/Power Management Options\Energy/Performance Bias Control	OS Controls EPB	OS Controls EPB
BIOS Advanced\System Options\Turbo Mode	Enable	Enable
BIOS Advanced\System Options\Intel Hyper-Threading Technology	Enable	Disable
BIOS Advanced\System Options\Active CPU Cores Per Processor	All	All
BIOS Advanced\System Options\Non-Uniform Memory Access (NUMA)	Enable	Enable
BIOS Advanced\System Options\Workload Configuration	Balanced	Balanced

# ANSYS Fluent

ANSYS Fluent is used for fluid flow design engineering analysis. The equation solvers used to drive the simulation are computation intensive.

ANSYS Fluent can be run in **serial compute mode** or **parallel processing mode** as either shared memory on a workstation or distributed memory on a cluster of workstations. Distributed ANSYS Fluent requires an MPI software layer for inter-process communication.

## Recommendations for running ANSYS Fluent on HP Workstations

- Solution time is sensitive to system main memory performance (particularly memory bandwidth)
  - Use identical memory DIMMS in all locations (size, fastest speed, rank)
  - Use all available memory channels
  - Configure 2-4GB memory per 1M cells size in the simulation
  - Fluent benchmark aircraft\_wing\_14m used 41GB memory
  - HP Performance Advisor can be used to monitor memory usage
- Distributed solution time typically scales up to 32-36 CPU cores on a single 44 CPU core workstation
- Solution time is sensitive to storage performance
  - Use a dedicated NVMe PCIe SSD for the Fluent working data set
  - Use a dedicated SSD for the Operating system and ANSYS application install
  - Move/archive previous simulation data sets to a larger storage drive if required
- Intel MPI is recommended when running Distributed solutions
- GPU acceleration should be characterized with your solutions
  - Simulation conditions can cause GPU acceleration device to not be used
- Simulation post-processing requires Open-GLE capable graphics video card
  - HP Performance Advisor can be used to monitor GPU utilization
- HP Performance Advisor can be used to configure OS and BIOS settings for ANSYS applications (Table 2.)

# ANSYS CFX

ANSYS CFX is used for general-purpose computational fluid dynamics (CFD). The equation solvers used to drive the simulation are computation intensive.

ANSYS CFX can be run in **serial compute mode** or can be run in **parallel processing mode** as either local parallel on a workstation or distributed parallel on a cluster of workstations. Distributed ANSYS CFX requires an MPI software layer for inter-process communication.

## Recommendations for running ANSYS CFX on HP Workstations

- Solution time is sensitive to system main memory performance (particularly memory bandwidth)
  - Use identical memory DIMMS in all locations (size, fastest speed, rank)
  - Use all available memory channels
  - Configure 2GB system memory per CPU core used when planning workstation for deployment
  - CFX benchmark perfAirfoil\_10m used 25GB memory
  - HP Performance Advisor can be used to monitor memory usage
- Distributed solution time typically scales up to 24-28 CPU cores on single 44 CPU core workstation
- Solution time is sensitive to storage performance
  - Use a dedicated NVMe PCIe SSD for the CFX working data set
  - Use a dedicated SSD for the Operating system and ANSYS application install
  - Move/archive previous simulation data sets to a larger storage drive if required
- Intel MPI is recommended when running Distributed solutions
- GPU acceleration should be characterized with your solutions
  - Simulation conditions can cause GPU acceleration device to not be used
- Simulation post-processing requires Open-GLE capable graphics video card
  - HP Performance Advisor can be used to monitor GPU utilization
- HP Performance Advisor can be used to configure OS and BIOS settings for ANSYS applications (Table 2.)

### Resources, contacts or additional links

[hp.com/go/thinkz](http://hp.com/go/thinkz)

[hp.com/go/whitepapers](http://hp.com/go/whitepapers)

[hp.com/go/ansys](http://hp.com/go/ansys)

[hp.com/go/performanceadvisor](http://hp.com/go/performanceadvisor)

<sup>1</sup> Multicore is designed to improve performance of certain software products. Not all customers or software applications will necessarily benefit from use of this technology. Performance and clock frequency will vary depending on application workload and your hardware and software configurations. Intel's numbering, branding and/or naming is not a measurement of higher performance.

<sup>2</sup> 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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