



TECHNOLOGY PARTNER

# OPTIMIZING SUPERMICRO SYSTEMS WITH AMD RYZEN THREADRIPPER PRO (5995WX, 3995WX) FOR ANSYS FLUENT AND ANSYS MECHANICAL SOFTWARE SUITE

*Supermicro Workstation and Servers Systems Excel at Simulation Applications*



AS -5014A-TT



AS -2114GT-DP NR

## TABLE OF CONTENTS

Executive Summary .....	1
Benefits of Single CPU Systems .....	2
Performance Results .....	2
Test Scenarios and Performance Settings .....	6
Ansys Fluent and Mechanical Software.....	6
AMD Threadripper PRO CPU .....	7
Supermicro Workstation .....	7
Supermicro 2U-2Node Server .....	8
Conclusion and References .....	8

## Executive Summary

New technologies are driving the delivery of many new products that interact with people and the environment, whether they are flying vehicles or systems that affect the environmental temperature of airflow. Ansys® Fluent® and Ansys® Mechanical™ applications running on Supermicro systems enable fast development of these products.

[Supermicro workstations](#) and servers supporting the AMD Ryzen Threadripper PRO CPU (single socket) run Ansys applications in a shorter time but at two-thirds the power consumption of dual processor systems. As a result, these are ideal solutions for mission-critical Ansys Fluent simulation for enterprises and SMBs alike.

This solution brief explains the performance and power savings for Ansys software running on a Supermicro workstation and the [Supermicro 2U-2Node server](#).



## SUPERMICRO

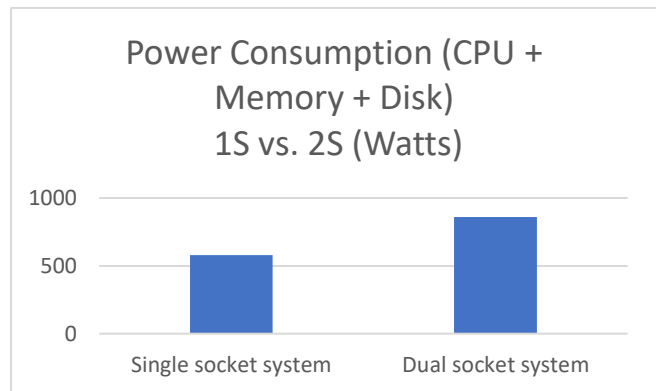
As a global leader in high performance, high efficiency server technology and innovation, we develop and provide end-to-end green computing solutions to the data center, cloud computing, enterprise IT, big data, HPC, and embedded markets. Our Building Block Solutions® approach allows us to provide a broad range of SKUs, and enables us to build and deliver application-optimized solutions based upon your requirements.

In addition to supporting the high-performance AMD Ryzen Threadripper PRO CPUs, the Supermicro workstation and Supermicro 2U-2Node server also support GPU options to enhance Ansys software operations.

Whether for individual users or as scalable data center compute clusters, Supermicro workstations and the Supermicro 2U-2Node server systems provide the performance and energy savings that can address the demands of high-performance Ansys Fluent, Mechanical, and other software in the Ansys offering.

### Benefits of Single CPU in a System

The Supermicro workstation and the Supermicro 2U-2Node system support a single AMD CPU in the system. Since the AMD Ryzen Threadripper PRO delivers up to 64-core in a single CPU, the system performance rivals dual-CPU systems. These systems offer the latest two generations of AMD Ryzen Threadripper PRO processors: 3995WX and 5995WX for 64-core systems. Other AMD CPUs for single-socket systems are also supported.

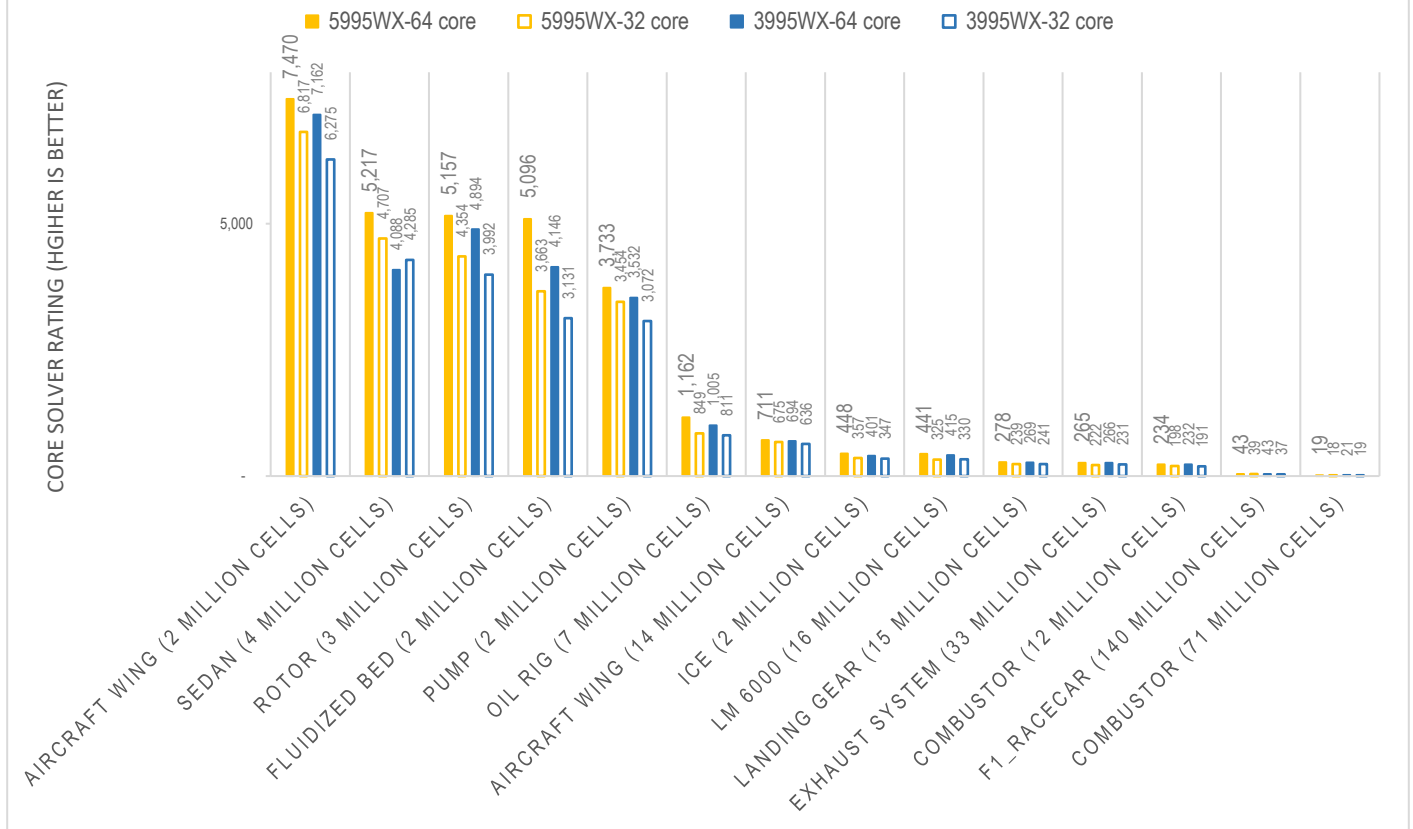


### Performance Results

Below are the performance results of the Ansys Fluent and Ansys Mechanical benchmarks for two generations of the AMD Ryzen Threadripper PRO CPU running in the Supermicro workstation. For each CPU, the benchmarks were run with 32 active CPU cores (processes) and 64 active CPU cores (processes).

The key result is that the 3<sup>rd</sup> generation 5995WX CPU delivers significantly better performance than the 2<sup>nd</sup> generation 3995WX. While the CPUs running with 64-cores deliver higher performance compared to when running with 32-cores, the improvement is incremental. For 32-core operations, 5995WX and 3995WX are similar in performance. There are potential software licensing implications of using 32-core CPUs instead of the 64-core CPU. Regardless of running the software with 32-core or 64-core active, it is better to use the 5995X processor as the processor has a larger L3 cache, significantly improving the system's performance running the Ansys software.

## ANSYS FLUENT BENCHMARKS ON SINGLE 3995WX/5995WX, RUNNING WITH 32-PROCESS AND 64- PROCESS, WINDOWS OS, ANSYS 2021 R2

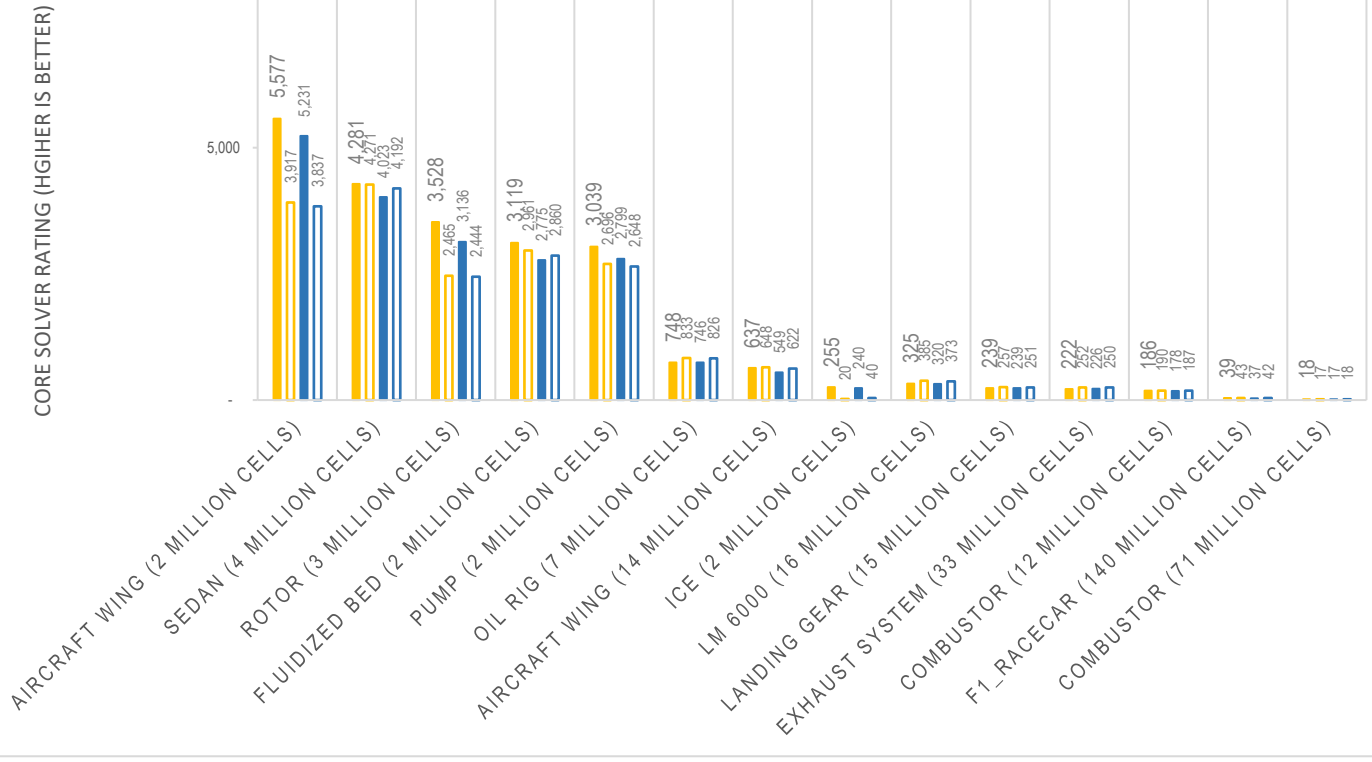


Ansyes Fluent benchmarks (version 2021 R2) include the following:

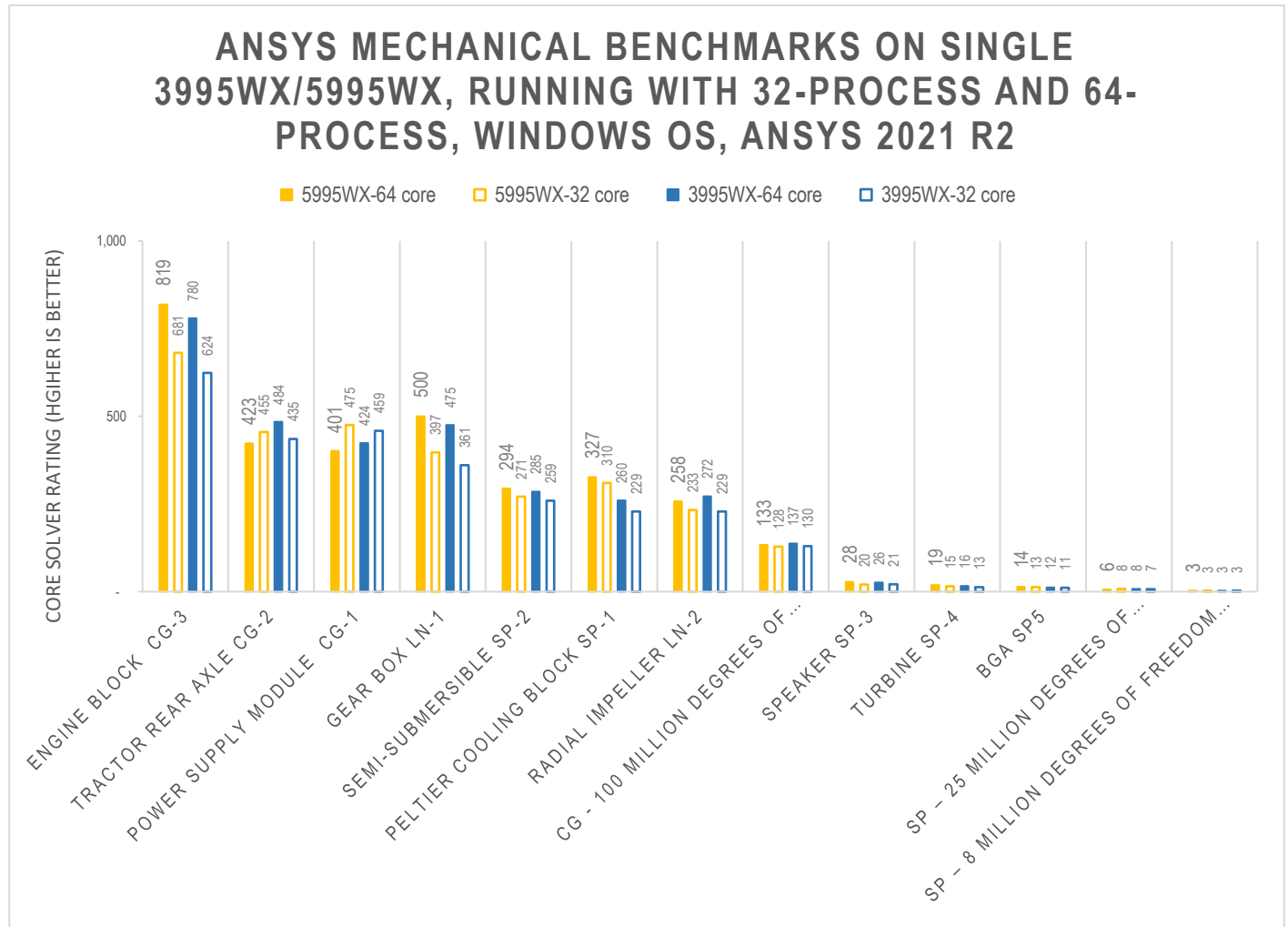
<ul style="list-style-type: none"> <li>• Pump (2 million cells)</li> <li>• Aircraft Wing (2 million cells)</li> <li>• Fluidized Bed (2 million cells)</li> <li>• ICE (2 million cells)</li> <li>• Rotor (3 million cells)</li> <li>• Sedan (4 million cells)</li> <li>• Oil rig (7 million cells)</li> </ul>	<ul style="list-style-type: none"> <li>• Combustor (12 million cells)</li> <li>• Aircraft Wing (14 million cells)</li> <li>• Landing gear (15 million cells)</li> <li>• LM 6000 (16 million cells)</li> <li>• Exhaust system (33 million cells)</li> <li>• Combustor (71 million cells)</li> <li>• F1_racecar (140 million cells)</li> </ul>
--	--

# ANSYS FLUENT BENCHMARKS ON SINGLE 3995WX/5995WX, RUNNING WITH 32-PROCESS AND 64- PROCESS, WINDOWS OS, ANSYS 2022 R1

■ 5995WX-64 process   
 ■ 5995WX-32 process   
 ■ 3995WX-64 process   
 ■ 3995WX-32 process



Ansys Mechanical benchmarks include the following:



Engine Block	V21cg-3
Tractor Rear Axle	V21cg-2
Power Supply Module	V21cg-1
Gear Box	V21ln-1
Semi-Submersible	V21sp-2
Peltier Cooling Block	V21sp-1
Radial Impeller	V21ln-2
CG - 100 million degrees of freedom	V21cg-100mdof
Speaker	V21sp-3
Turbine	V21sp-4
BGA	V21sp5
SP - 25 million degrees of freedom	V21sp-25mdof
SP - 8 million degrees of freedom	V21sp-8mdof

## Test Scenarios and Performance Settings

Ansys® Fluent is a general-purpose computational fluid dynamics (CFD) application that models fluid flow, heat, mass transfer, chemical reactions, and more. This study analyzes the performance of Ansys Fluent software as measured by fourteen common benchmark workloads provided by Ansys. These workloads vary in size and complexity, so the aggregate scores offer a representative view of performance for a wide variety of end-user scenarios.

Testing was conducted by the performance consulting firm MVConcept. MVConcept ran the benchmarks on the Supermicro systems with the AMD Ryzen Threadripper PRO CPU using multiple permutations of CPU, operating system, software versions, launch modes, and BIOS settings.

- **Systems Configurations tested:**
  - The Supermicro workstation and the Supermicro 2U-2Node systems, each with the following configurations
    - 3995WX processor with 512GB memory
    - 5995WX processor with 512GB memory
  - While the CPU supports 64-core, some tests were run with 32 cores active (to explore the impact of the available L3 cache), while other tests used all 64 available cores
- Operating system: Windows 10 Professional (x64) Build 19044.1706 (21H2) and CentOS Linux release 8.5.211
- **Ansys Fluent versions:** 2020 R1 and 2021 R2
- **Launch mode:** Default is the way to launch as explained inside Ansys Doc  
`-r20.1.0 -g 3d -mpi=intel -t36 -i C:/fluent_bench/combustor_12m_36.jou`
- Intel MPI Version 2018 Update 3 Build 20180411
- BIOS settings: For the AMD Ryzen Threadripper PRO:
  - NPS (NUMA per socket) equal to 1, 2, or 4 (**4 is recommended**)
  - SMT (Symmetric Multithreading) equal to ON and OFF (**OFF is recommended**)
- The BIOS settings proved to be especially important for realizing the optimal performance from the AMD Ryzen Threadripper PRO when running the tested applications. **NPS** (NUMA Per Socket) controls the number of NUMA (Non-uniform Memory Access) nodes, which enables fine-tuning of the transfer speed between specific CPU cores and the closest (fastest) available memory channels. **SMT** (Symmetric Multithreading) determines whether each physical core can appear to the operating system as two “logical” cores, which can boost performance significantly in applications that perform many smaller or random tasks. However, the tested Ansys applications perform best when each physical core is fully dedicated to the compute-intensive and memory bandwidth intensive simulation workload. Therefore, **Supermicro recommends using NPS=4 and SMT=OFF when running Ansys Fluent and Ansys Mechanical on systems with AMD Ryzen Threadripper PRO.**

## Ansys Fluent and Mechanical Software

Ansys develops some of the most widely used Multiphysics engineering simulation software solutions for product design, testing, and operation. With the Supermicro systems, designers and engineers can run complex simulations on the desktop earlier in the design process to test and validate design ideas without tying up valuable data center resources.

Ansys Fluent is a general-purpose computational fluid dynamics (CFD) application that models fluid flow, heat, mass transfer, chemical reactions, and more. The software runs in individual workstations or in a scalable server cluster.

Ansys Mechanical enables you to solve complex structural engineering problems and make better, faster design decisions. With the finite element analysis (FEA) solvers available in the suite, you can customize and automate solutions for your structural mechanics problems and parameterize them to analyze multiple design scenarios. In addition, Ansys Mechanical is a dynamic tool that has a complete range of analysis tools.

## AMD Ryzen™ Threadripper™ PRO Processor

64-core AMD Ryzen Threadripper PRO processor (3995WX) specs and 5995WX specs. The 32-core CPUs in this family are also listed here. The 5995WX and 3995WX with bigger cache improve performance, even when running with 32-process Ansys software.

CPU	3995WX	3975WX	5995WX	5975WX
AMD Ryzen Generation	SECOND GEN	SECOND GEN	THIRD GEN	THIRD GEN
# CPU cores	64	32	64	32
Base Clock	2.7GHz	3.5GHz	2.7GHz	3.6GHz
L3 Cache	<b>256MB</b>	128MB	<b>256MB</b>	128MB
Default TDP	280W	280W	280W	280W
Memory Support	8 x DDR4-3200	8 x DDR4-3200	8 x DDR4-3200	8 x DDR4-3200
PCIe Generation	PCIe 4.0	PCIe 4.0	PCIe 4.0	PCIe 4.0

## Supermicro Workstation with the AMD Ryzen Threadripper PRO Processor

Supermicro workstation with the AMD Ryzen Threadripper PRO

AMD Ryzen™ Threadripper™ PRO 5000WX/3000WX Series Processor, up to 64 Cores
8 DIMMs; up to 2TB Registered ECC DDR4 3200-MHz Memory
6 PCI-E 4.0 x16 slots
M.2 Interface: 4 PCI-E 4.0 x4, RAID 0, 1, 5 & 10, M.2 Form Factor: 2280, 22110, M.2 Key: M-Key
U.2 Interface: 2 U.2 sockets (Software RAID 0,1)
1x 10GBase-T LAN port, 1x 1GbE LAN port (shared with IPMI)
4 fixed internal 3.5"/2.5" SATA drive bays, 2 fixed front 2.5" SATA drive bays, 4 M.2
1 VGA port (dedicated for IPMI)
7.1 HD Audio
2000W Platinum Level Power Supply
GPU support and applications.
Height 21.06" (535mm), Width 8.74" (222mm), Depth 22.56" (573mm)



AS -5014A-TT

## Supermicro 2U-2Node Server with the AMD Ryzen Threadripper PRO Processor

Supermicro 2U-2Node server supporting the AMD Ryzen Threadripper PRO

Two hot-pluggable systems (nodes) in a 2U form factor. Each node supports the following:
Single Threadripper PRO 5000WX/3000WX Series Processor, or Single AMD EPYC™ 7003/7002 Series Processor (The latest AMD EPYC™ 7003 Series Processor with AMD 3D V-Cache™ Technology requires BIOS version 2.3 or newer)
Max 2TB Registered ECC DDR4 3200MHz SDRAM in 8 DIMMs
Up to 6 PCI-E Gen 4 x16 (4 internal, 2 external) slots, 1 PCI-E 4.0 x8 AIOM slot
M.2 Interface: 2 PCI-E 4.0 x4, M.2 Form Factor: 2280, 22110, M.2 Key: M-key
Integrated IPMI 2.0 + KVM with dedicated LAN
2 front Hot-swap 2.5" U.2 NVMe Gen4 drive bays
AST2600 BMC
2600W Redundant (1+1) Power Supplies, Titanium Level (96%)
GPU support and applications
Height 3.47" (88mm), Width 17.6" (447mm), Depth 29.9" (760mm)



AS-2114GT-DPNR

### Conclusion

The Supermicro workstation and the Supermicro 2U-2Node servers deliver dual-CPU performance with a single processor, and ISV is certified for multithreaded application environments. The Supermicro 2U-2Node server has two systems in a 2U form factor that enables the customer to use one server to run pre-processing of data before running Ansys software, while the second server would run the Ansys software. With up to 64 cores, 128 PCIe lanes (Gen 4), up to 2TB of memory, and an 8-channel memory architecture, designers and engineers now have access to data center power on their desktops in a compact and economical package. Backed by enterprise-level features for seamless security, manageability, and support; the Supermicro systems are ideal solutions for enterprises and SMBs alike, creating mission critical simulations.

Supermicro offers these as integrated solutions, including systems, software, and support. Please call your Supermicro representative for more information.

### References

1. [Supermicro Workstation with AMD Threadripper PRO](#)
2. [Supermicro 2U-2Node Server](#)
3. [Supermicro 2U-Node Server with AMD Threadripper PRO](#)
4. [AMD Threadripper PRO](#)
5. [Ansys Fluent](#)
6. [Ansys Mechanical](#)
7. [MVConcept](#)