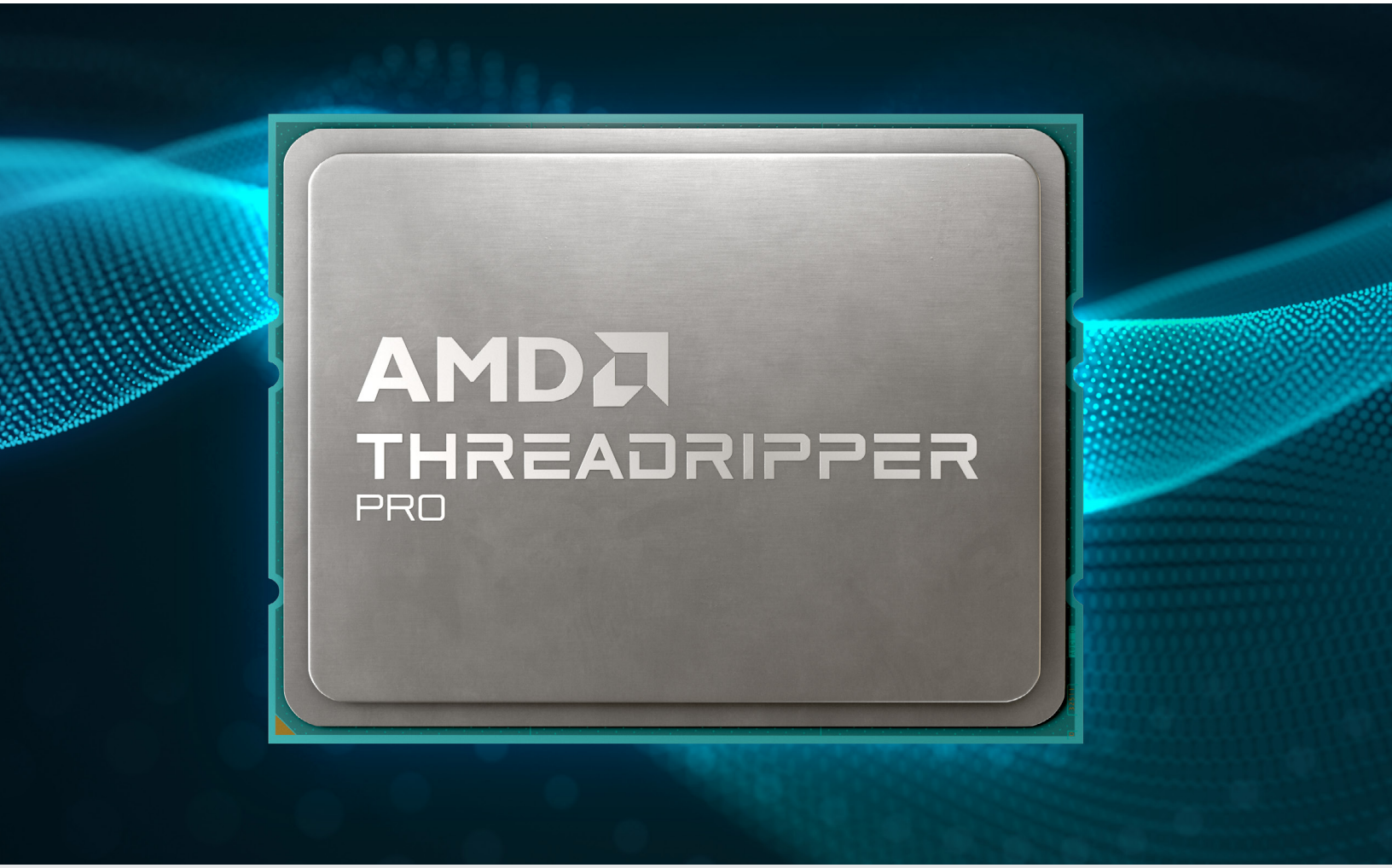
AMD
THREADRIPPER
PRO



TECH BRIEF

AMD RYZEN™ THREADRIPPER™ PRO 7000 WX-SERIES PROCESSORS: RAISING THE BAR ON AEC COMPUTING

THE PREMIER NEXT-GENERATION WORKSTATION COMPUTING PLATFORM, BUILT TO SERVE NEXT-GENERATION WORKFLOWS IN ARCHITECTURE, ENGINEERING AND CONSTRUCTION (AEC).

With its introduction of the first AMD Ryzen™ Threadripper™ PRO processors in 2020, AMD ushered in a new era of high-performance workstation computing, marrying the best of superscalar and multi-core CPU design with the proven multi-die integration capability of the AMD Infinity Fabric architecture. Now in its third generation, the AMD Threadripper PRO 7000 WX-Series processors have again achieved dramatic performance scaling to serve the rapidly expanding range of modern professional workloads.

The 7000 WX-Series retains the breadth of available CPU core counts of the preceding 5000WX line to serve the full range of workstation-caliber workloads and computing professionals' budgets: from the 12-core 7945WX to the 64-core 7985WX. And with the 7000 WX-Series generation, AMD Threadripper PRO expands the performance scaling envelope a significant step further, raising the industry bar to 96 cores with the 7995WX.

Processor	Cores / Threads	Base / Boost Frequency (GHz)	Total Cache	TDP
AMD Ryzen™ Threadripper™ PRO 7995WX	96 / 192	5.1 / 2.5	480 MB	350 W
AMD Ryzen™ Threadripper™ PRO 7985WX	64 / 128	5.1 / 3.2	320 MB	350 W
AMD Ryzen™ Threadripper™ PRO 7975WX	32 / 64	5.3 / 4.0	160 MB	350 W
	24 / 48	5.3 / 4.2	152 MB	350 W
AMD Ryzen™ Threadripper™ PRO 7955WX	16 / 32	5.3 / 4.5	80 MB	350 W
AMD Ryzen™ Threadripper™ PRO 7945WX	12 / 24	5.3 / 4.7	76 MB	350 W

Table 1: Primary specifications of AMD Ryzen Threadripper PRO 7000 WX-Series workstation CPUs (Source: AMD)

AMD Threadripper PRO 7000 WX-Series generation leverages a trio of key technologies: the "Zen 4" microarchitecture, with major advancements in superscalar processing and instructions per cycle (IPC); a consistent progression in leading-edge manufacturing to enable higher-density on-chip cores; and the AMD Infinity Fabric architecture, a novel and proven approach to multi-die processor implementation that opens the door to massive performance scaling and a broad range of core counts. "Zen 4" microarchitectural improvements lead to a substantial generational jump in IPC, up to 14% higher than previous generation "Zen 3" on the same workloads.

Boost and base clocks are cranked up significantly as well, the product of judicious design engineering coupled with a leading-edge 5 nm silicon process. AMD Threadripper PRO 7000 WX-Series manages boost clock rates on average 16.9% faster than previous-generation Threadripper PRO 5000WX , along with 13% faster base clocks. And finally, the combination of the 5 nm leap in transistor density, combined with the Infinity Architecture's fine-tuned aptitude for multi-die implementation, once again allows Threadripper PRO to shatter the ceiling on CPU core counts available within a single processor socket.

SCALABLE, BALANCED PERFORMANCE CRUCIAL TO RUN EVOLVING AEC WORKFLOWS

There was a time when an architect, engineer or builder out shopping for a new workstation might be advised simply to "pick the processor with the highest GHz" – but that rule of thumb is long gone. Yes, clock rates absolutely matter, and AMD Threadripper PRO's highest-in-class clock rates are integral in producing the industry-leading single-thread (1T), per-core performance to best drive that most common of CAD sequences: refine a model, visualize, and repeat. Both parametric modeling and 3D graphics (from the perspective of CPU processing), represent workloads that largely remain single (or lightly) threaded.

But in an age where much of the horsepower of modern CPUs stems from its ability to concurrently execute multiple threads (MT), ISVs today strive to squeeze every drop of parallelism from their core operations, from architecture to engineering to BIM. Workloads that have always naturally taken advantage of multiple compute cores are rapidly moving from nicety to necessity. Consider next-level visualization like physically based renderings and light simulations, imparting far more subtle and realistic impressions of interior and exteriors, at any time of day, lit by full sun or muted by overcast skies.

Figure 1: No longer will smooth-shaded raster graphics images suffice ... studio-quality rendering essential for presenting and selling architectural design

Think ahead to machine learning workloads, driving an explosion in artificial intelligence that will rapidly permeate structural engineering and construction across the board. Sometimes AI's role will be visible on the surface, invoked by a user explicitly as with a generative tool invoked by the user, for example. But it may more likely be in the form of comprehensive AI "assistants" hidden deep under the hood, riding shotgun and ingrained in every stage of the workflow: like exploring novel alternatives beyond established norms or analyzing architectural choices, engineering decisions and build specifications, and flagging possible issues before they manifest in schedule-crushing reworks, client-disappointing change orders, or worse, structural failures. And AEC providers across the board will need to prepare for the ubiquity of digital twins, a crossroads of heavy-duty multi-threaded AI, simulation and visualization workloads, and where ribbon-cutting no longer represents the end of the project but in many respects just the beginning.

Handling it all effectively takes a computing platform that can optimally address a range of processing types, from the still-critical lightly threaded legacy workloads like parametric modeling and 3D graphics, to the forefront of modern heavily threaded tasks in rendering, simulation and artificial intelligence that will increasingly differentiate AEC businesses from their competitors. Exploiting those advances in "Zen 4" IPC, 5 nm improvements in silicon density, power efficiency and speed, and the 3rd Gen Infinity Architecture's proven high-performance scaling, AMD Threadripper PRO 7000 WX-Series processors checks the usual boxes – and more. Single-thread performance climbs dramatically, up 28%[iii] on average running single-thread workloads and a more dramatic 41%[iv] on common workstation-caliber multi-thread computation.

Moreover, the 7000 WX-Series performance shines bright when compared to the industry's current alternative, the Intel Xeon W-3400 processor family. On average, comparing each 7000 WX-Series SKU with the same – or next lower – core-count SKU of the Intel Xeon W-3400 family, the 7000 WX-Series manages up to 47%[v] faster rendering, and up to 39% higher performance running some of the most common MT tasks workstation professionals face in their core day-to-day workflows. Even when comparing each 7000 WX-Series SKU with the same or next higher core count Intel Xeon W-3400 SKU, AMD Threadripper PRO still manages up to 18%v more throughput, supporting the proposition the former consistently delivers better performance with substantially fewer cores.

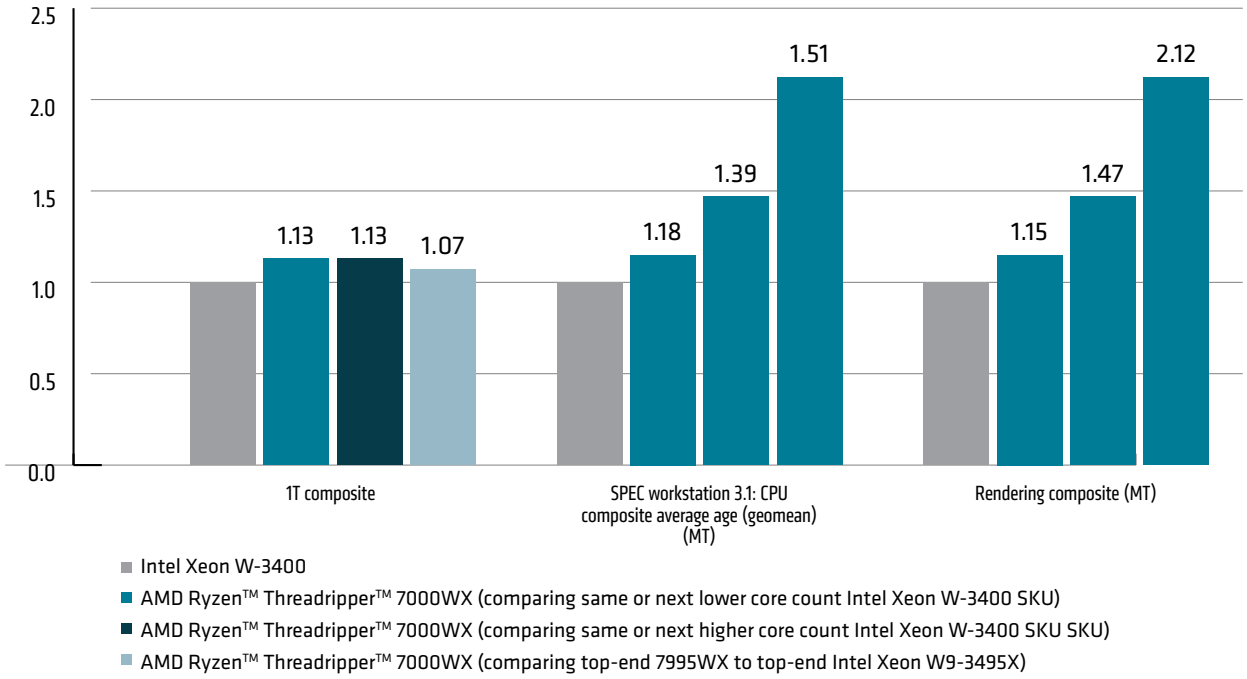


Figure 2: Aggregate performance advantage of AMD Ryzen Threadripper PRO 7000 WX-Series CPUs, normalized to the Intel Xeon W-3400 product line [iii]

Finally, consider the AMD Threadripper PRO 7995WX, with 96 cores that literally put it in a class of its own. Comparing the top-end members of the two competing product lines, the superior multi-threaded performance of the 7995WX is both clear and dramatic, achieving up to 112% higher performance[v] than the 56-core Intel Xeon W-3400 SKU, the W9-3495X.

A BEST OF BOTH WORLDS PROPOSITION FOR AEC COMPUTING

Clients' expectations of architectural and structural design, validation and visualization are climbing faster than ever. Architects can't hang their hat on simple wireframes or primitive smooth-shaded 3D raster graphics, not when competitors are offering photorealistic renderings and walk-throughs. Civil engineers need computing platforms that dial up level-of-detail in the typical pre-construction simulation and analyses, while extending into the domain of on-going AI-assisted maintenance in the decades post-construction. And the pressure on builders has never been higher – to streamline construction, minimize schedule and maximize integrity.

Particularly in AEC applications, the computational workloads to serve all those demands have become too varied to handle with any generic "high GHz" CPU. Rather, it demands a processor that can deliver best-in-class performance for both the 1T and MT workloads pervading rapidly evolving AEC workflows. Now available in premium workstation models from leading workstation OEM partners including Dell, Lenovo and HP, the AMD Ryzen Threadripper PRO 7000 WX-Series processors is purpose-built to answer that challenge. For a deeper dive into Threadripper PRO's novel architectural approach to workstation computing, refer to the white paper AMD Ryzen™ Threadripper™ PRO 7000 WX-Series Processors: Raising the Bar on Workstation Performance.

[i] Based on AMD internal testing as of 09/19/2022, geomean performance improvement at the same fixed-frequency on a 4th Gen AMD EPYC™ 9554 CPU compared to a 3rd Gen AMD EPYC™ 7763 CPU using a select set of workloads (33) including est.SPECrate®2017_int_base, est.SPECrate®2017_fp_base, and representative server workloads.

[ii] Average boost clock gain for each of the 12C, 16C, 24C, 32C and 64C SKUs in the Threadripper PRO 7000 WX-Series line relative to the boost clock of the matching core-count SKU in the Threadripper PRO 5000 WX family.

[iii] Comparing average of Cinebench R23 (single thread mode) and PerformanceTest 11 CPU Single Threaded for each of the 12C, 16C, 24C, 32C and 64C SKUs in the Threadripper PRO 7000WX line normalized to the same scores of matching core-count SKU in the Threadripper PRO 5000 WX family.

[iv] Comparing average of SPECworkstation 3.0.4, PerformanceTest 10.2 and Cinebench R20 scores for each of the 12C, 16C, 24C, 32C and 64C SKUs in the Threadripper PRO 7000WX line normalized to the same scores of matching core-count SKU in the Threadripper PRO 5000 WX family.

[v] Compares each of the four tested CPU SKU in the Intel Xeon W-3400 family with the comparable AMD Ryzen Threadripper PRO 7900WX SKUs. Where the 7900WX family has a core count that exactly matches one of the W-3400 SKUs, the comparison 7900WX SKUs include both the matching core count model as well as the SKU with the next fewer core count. Where the 7900WX family does not have a core count that exactly matches one of the W-3400 SKUs, the comparison 7900WX SKUs include both the next higher core count model as well as the model with the next fewer core count. In each of the four comparisons, scores for the W-3400 SKU and the comparable 7900WX SKU's scores are calculated from an average of the following tests, then normalized to the W-3400 SKU's scores:

SPECworkstation 3.1: Product Development
Rendering composite (average of normalized results for Cinebench R23) and Blender Cycles 3.0.6 (geometric mean of all scenes)

Run with respective system specifications:

	Intel® Xeon® W-3400	AMD Ryzen™ Threadripper™ PRO 7900WX
SKUs tested	W9-3495X / W7-3465X W7-3445X / W5-3435X	7945WX / 7955WX /7965WX 7975WX / 7985WX / 7995WX
Memory DIMMs	DDR5-4800 with ECC	DDR5-5600 with ECC
Memory capacity (channels x rank x DIMM capacity)	128 GB (8ch x 1r x 16 GB)	512 GB (8ch x 1r x 64 GB)
Storage	(4) PCIe NVMe M.2 SSD (1 TB)	(1) PCIe 4.0 NVMe M.2 SSD (1 TB)
Operating system	Microsoft Windows 10 Professional	
Chassis volume (liters)	30.8	65.0
Cooling	Conventional air-cooling	