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HP's Z Workstations

Advancements mean game-changing performance for CAD users.

By Robert Green, *Cadalyst* Contributing Editor

Do you like your computers fast? Do you wish your software ran better? Do you want to run more complex renderings in less time?

Of course, you answered yes to all these questions. You're a CAD user, and you're genetically programmed to want everything faster! The problem is that in recent times new computers have delivered only marginal increases in performance rather than night-and-day differences that really allow you to design differently. No more! The Z workstations from HP are here, and they bring the big performance gains CAD users crave.

What's new in the HP Z workstations? What's not might be a better question. With major changes in chip architecture, memory speed, graphics card support, solid-state disks, reduced power consumption, and ambient noise reduction, HP Z workstations are game-changing systems. In this newsletter, I'll summarize my experiences with the new HP Z workstations from a CAD user's point of view.

The HP Z Family

The HP Z workstation family includes three models with progressively more impressive specifications. The HP Z400 is the entry-level model, the HP Z600 occupies the mid-range, and the HP Z800 is the no-holds-barred, high-end machine. All systems have clean lines and rack-mountable dimensions for easy vertical stacking in rack-formatted data centers (see the photo below).

The HP Z600 (center) and HP Z800 (right) have brushed aluminum skins and integrated carrying handles (one visible at the top front, the other in the back). The HP Z400 (left) maintains the traditional HP look.

The HP Z400 is based on the Intel X58/3500 chipsets, but the HP Z600 and HP Z800 use the Intel 5520/5500 chipsets, which allow for dual quad-core Xeon processors, and provide a maximum of 16, 24, and 192 GB of DDR3 RAM, respectively. Base configurations for the new workstations range in price from $1,000 for the HP Z400 to $1,800 for the HP Z800 but increase as you add more drives, RAM, and graphics cards.

Intel and HP have worked together closely to make sure the HP Z workstations squeeze every bit of performance from their chipsets and memory to yield big increases in system performance. I'm told the goal in designing the HP Z workstations was to not leave any performance out of the design, which becomes evident as you delve into the HP Z series specifications.

The Specs

Speaking of specifications, here they are. I'll provide a high-level summary and then provide a link to a full datasheet for each workstation, should you wish to dig deeper.

HP Z400. The HPZ400 has single-processor architecture based on the X58/3500 chipset with as much as 16 GB of 1,333-MHz DDR3 RAM via the new Intel QuickPath architecture for maximum processor-to-RAM bandwidth. Two internal drive bays and two front-mounted drive bays support an integrated 3-GB/second RAID-compliant SATA drive controller. Support for the new NVIDIA Quadro FX and CX series and ATI FirePro V series graphics cards enables graphics options from 2D through high-end 3D rendering. An integrated Gigabit NIC card handles network connectivity. To learn more, read the full Z400 specifications.

HP Z600. The HP Z600 has a dual-processor, quad-core architecture based on the 5520/5500 chipset with as much as 24 GB of DDR3 1,333-MHz six-channel RAM on six DIMM slots for maximum processor-to-RAM bandwidth. Two internal drive bays and two front-mounted drive bays support an integrated 3-GB/second RAID-compliant SATA drive controller. Support for the new NVIDIA Quadro FX and CX series and ATI FirePro V series graphics cards (dual graphics capable) enable graphics options from 2D through high-end 3D rendering. An integrated Gigabit NIC card handles network connectivity. To learn more, read the full Z600 specifications.

HP Z800. The dual-processor, quad-core architecture of the HP Z800 is based on the 5520/5500 chipset and offers 192 GB of DDR3 1,333-MHz six-channel RAM on 12 DIMM slots for maximum processor-to-RAM bandwidth. Four internal drive bays and three front-mounted drive bays support an integrated 3-GB/second RAID-compliant SATA drive controller. Support for the new NVIDIA Quadro FX 5800 (4 GB of GPU RAM, dual

graphics capable) assures almost unlimited graphics power. An integrated Gigabit NIC card handles network connectivity. To learn more, read the full Z800 specifications.

If you're a computer geek like me, you may be wondering if you read the specs for the Z800 correctly. You did. You really can wedge eight CPU cores, 192 GB of memory, and dual 4-GB graphics processing units into the box!

Turbo Boost Processors

One of the slick innovations built into the Intel® processors (see photo below) that power the HP Z workstations is Turbo Boost Technology. Turbo Boost essentially monitors the processor cores to determine the processor computational and thermal loads and to boost the processor speed if possible. But unlike supercharged or overclocked processors that constantly run hot and have shorter chip lives, Turbo Boost automatically throttles the speed of the chip back if the thermal loads become a concern. Another way Turbo Boost increases performance is by raising the speed of a single core on the processor when the other cores aren't in use. So even if you use older CAD programs that don't take advantage of multiple cores, you still can see a significant speed increase when Turbo Boost is enabled.

Intel Xeon 5500 series processors offer core management features such as Turbo Boost Technology to maximize CPU performance and thermal stability.

"The new Intel Xeon processor 5500 series and Intel QuickPath Technology blow the doors off of previous workstation performance benchmarks," says Kirk Skaugen, vice-president and general manager, workstations and servers, Intel. "HP has a unique ability to take our processors and highly tune them into digital workhorses. HP workstation customers will love the intelligent performance, energy efficiency, and expandability that are enabled by the new Xeon processors."

I've come to think of Turbo Boost as the processor's operating system it transparently manages clock speeds and thermal loads to yield the highest performance with no user intervention and no fear of damaging processor components. All users need to know is that the computer runs faster.

Quieter, Cheaper, and Easier to Maintain

Although the raw speed, memory capacity, and graphics capabilities of the new HP Z workstations are what most grabs my attention, a number of other design innovations are worth noting.

Energy consumption. All power supplies in the HP Z workstations are at least 85% efficient. In fact, the HP Z800 is 89% efficient to cut power consumption as much as possible while the workstation is running. HP WattSaver technology allows for less than 1-W power consumption in hibernate or standby mode. An expanded number of power management states in the Intel 5500 processor allow the HP Z600 and HP Z800 workstations to shave an additional 15% to 30% energy savings in idle processor states.

Lower noise. The cases for the HP Z series workstations have been designed to move air through the chasses with maximum efficiency and to reduce cooling fan speeds thus yielding quieter operation. Liquid cooling is planned to be available in units later this year, and is expected to further reduce fan speeds to an almost inaudible rate.

Tool-free chassis. The HP Z600 and HP Z800 make great strides in serviceability with

their new tool-free, snap fit, compartmentalized chassis design (see photo below) that eliminates interior clutter and makes swapping or adding components simple and quick for IT personnel.
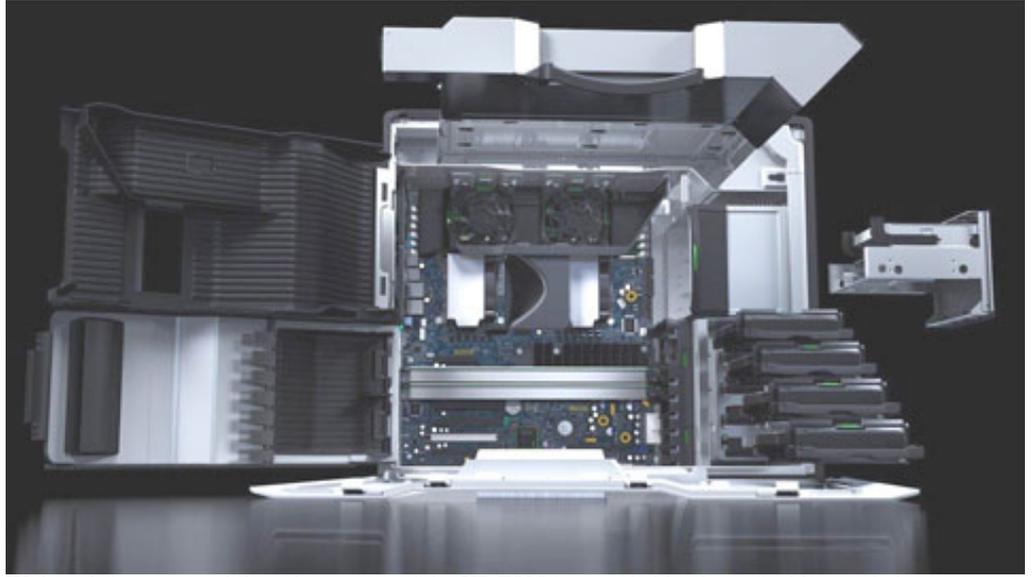
With tool-free serviceability, the interior of the HP Z800 is remarkably clear of cabling and electronics, which allows for better airflow which in turn translates to lower speed, quieter fans. All hard drives are mounted in a five-slot internal bay (lower-right corner) and optical drives are accessed from a removable front bay (right center). Notice the dual processor fans and completely removable power supply at top center.

None of these innovations by itself would make you buy an HP Z workstation, but the combined effect of energy savings, quieter desktops and data centers, and ease of serviceability add up to cost savings. And saving money is always good, right?

Justifying the Cost

Obviously, the big performance gains produced by the HP Z workstations don't make them cheap. Your IT or engineering department managers will thus understandably need a financial justification for purchasing one. The bottom line for justifying an HP Z workstation is saving substantial amounts of user time so that those savings will pay for the workstation.

Here's a simple way to look at it:

Three Years' Savings = Saved Time per Week x Labor Rate x 48 weeks/year x Three Years Life, where

- Saved Time is in hours per week
- Labor Rate is in dollars per hour
- A three-year service life for the workstation is assumed

So if you could save 1 hour per week for a $45/hour designer, your total savings would be

1 x 45 x 48 x 3 = $6,480

If you save 3 hours per week for a $55/hour rendering specialist, your savings would be

3 x 55 x 48 x 3 = $23,760

If you save 1.5 hours per week for a $90/hour engineering analyst, your savings would be

$$1.5 \times 90 \times 48 \times 3 = \$19,440$$

Next simply divide your savings by the cost of the workstation, and you can estimate your three-year return on investment (ROI) for the workstation. These calculations show that even a $10,000 workstation may be justified easily for power users running processing-intensive applications such as BIM, mechanical CAD, animations, renderings, finite-element analysis, and 3D simulation.

Wrapping Up

I hate to gush over computers because they are, after all, simply machines. But every once in a while, I'm treated to a genuine breakthrough in computer performance that allows me to rethink how we work with computers. The HP Z series workstations fall into this category. If you work with big models, produce renderings or animation, or perform digital simulation or other computer-intensive tasks, you'll want to try one of these computers with your software applications and see how much time — and therefore money — you can actually save.

About the Author

Robert Green
Robert provides CAD implementation, consulting and programming services for a variety of companies throughout the United States and Canada. He holds a degree in mechanical engineering from the Georgia Institute of Technology and is the author of *Expert CAD Management: The Complete Guide.* Reach him via his web site at www.cad-manager.com.