

CATbench Update Spring 2004

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Updated Workstations with new processors and graphics cards offer improved performance while maintaining low pricing

by Phil Harrison

Editor's note: CATIA Solutions Magazine's CATbench benchmark is now the CATIA Community's benchmark. This update is the last in our CATbench 2003 annual series, based on CATIA V5 r10; this summer, we will publish the CATbench 2004 Annual Benchmark, which will test V5 r12. Here, reviewer Phil Harrison tests four new systems from Dell and HP.

In this Spring update column, we test systems using variants of Intel's new 3.2 GHz processor and NVIDIA's new FX-1100 graphics card rushed to us by workstation vendors Dell and HP, respectively.

To ensure that the results of this update are comparable with those from the main benchmark, all systems were loaded with CATIA Version 5 Release 10 SP3, and tests were performed in an identical manner. When it came to results analysis, we used the same test weightings as in the main benchmark effort and did not re-compute the average system scores. Thus, these new CATbench 2004 results remain comparable to those of the machines tested earlier in CATbench cycle.

CATIA Solutions' CATbench 2004

benchmark issues four ratings:

- CATbench 2004S measures the performance of the CPU, Bus and I/O subsystems;
- CATbench 2004G measures the graphics performance of each system;
- CATbench 2004 is the combination of CATbench 2004G and CATbench 2004S, giving each equal weighting to both system and graphics performance;
- CATbench 2004DMU: The Digital Mock Up (DMU) results are not included in the System performance measurement, but are used to create a separate measurement specific to DMU. We apply the same relative graphics/DMU weight factors as applied to our overall results to create our DMU performance measure.

While any vendor can put a system together that is fast, CATIA Community feels that price/performance also should be taken into account. For this reason, all systems will be compared on two variables, one rating systems on a pure performance

basis and the other taking price into consideration. Our rating system is as follows:

- ***** = Excellent
- **** = Good
- *** = Average
- ** = Below Average
- * = Poor

Table 1 gives prices and detailed system specifications for each of the systems submitted for this CATbench 2004 update. A summary of the results for the three workstation systems tested can be found in Table 2. These results also are displayed in Graphs 1, 2, 3 and 4 for overall (CATbench 2004), graphics (CATbench 2004G), system (CATbench 2004S), and Digital Mock-Up (DMU) (CATbench 2004DMU) performance respectively. We have left the original machine results in CATbench 2004 graphs for comparison. We were very pleased to see that all four systems submitted are already certified by Dassault Systèmes.

Dell Precision 360

The first system we tested from Dell is a 360 with a single 3.2 GHz Pen-

| | Dell 360 P4 3.2 GHz FX-1000 | Dell 360 P4 3.2 GHz Extreme FX-1000 | Dell 450 2x3.2GHz Xeon FX-3000 | HP XW4100 P4 3.2 GHz |
|-----------------------------------|---|---|---|---|
| Phone Number | 1-(800)-www-DELL | 1-(800)-www-DELL | 1-(800)-www-DELL | 1-(800)-652-6672 |
| Web site | www.dell.com | www.dell.com | www.dell.com | www.hp.com |
| CPU Type | Intel Pentium 4 (1 MB L2 Cache) | Intel Pentium 4 Extreme Edition | Intel Xeon (512 KB L2 2MB L3) | Intel Pentium 4 |
| CPU Speed | 3.2 GHz | 3.2 GHz (512 KB L2 2MB L3) | 3.2 GHz | 3.2 GHz |
| I/O Bus | 800 MHz front side bus | 800 MHz front side bus | 533 MHz FSB | 800 MHz FSB |
| # of CPU's (Max. #) | 1 (1) | 1 (1) | 2 (2) | 1 (1) |
| Chip Set | Intel 875P | Intel 875P | Intel E7505 | Intel 875 P |
| Graphics Card | Nvidia Quadro FX1000 | Nvidia Quadro FX1000 | Nvidia Quadro FX3000 | Nvidia Quadro FX1100 |
| Graphics driver | BIOS 4.30.20.16.05 Driver 6.14.10.5330 | BIOS 4.30.20.16.04 Driver 6.14.10.4521 | BIOS 4.35.20.23.07 Driver 6.14.10.5330 | BIOS 4.36.2022.05 Driver 6.14.10.5218 |
| Chips set | nVIDIA | nVIDIA | nVIDIA | nVIDIA |
| Bus type | AGP 8x | AGP 8x | AGP Pro50 8x | AGP 8x |
| Video RAM | 128 MB | 128 MB | 256 MB | 128 MB 800 MHz DDR2 graphics DRAM |
| Graphics Output | 2 x DVI | 2 x DVI | 2 x DVI | 2 x DVI |
| Resolution for test | 1280x1024 75 Hz | 1280x1024 75 Hz | 1280x1024 75 Hz | 1280x1024 75 Hz |
| Number of colors for test | 32 bit | 32 bit | 32 bit | 32 bit |
| Monitor used for test | Dell 1701 FP (17" LCD Panel) | Dell 1701 FP (17" LCD Panel) | Dell 1701 FP (17" LCD Panel) | Dell 1701 FP (17" LCD Panel) |
| Memory (maximum) | 1 GB (4 GB) | 2 GB (4 GB) | 1 GB (4 GB) | 1 GB (4 GB) |
| Slots Used (total) | 2 (4) | 4 (4) | 2 (4) | 4 (4) |
| Memory type | PC3200 400 MHz Dual channel ECC DDR SDRAM | PC3200 400 MHz Dual channel ECC DDR SDRAM | 266 MHz ECC DDR SDRAM Unbuffered | PC3200 400 MHz Dual channel ECC DDR SDRAM |
| Virtual memory | 1536 MB | 2046 MB | 1536 MB | 1536 MB |
| Disk size/type | 120 GB Western Digital 1200WD-75GBO | 110 GB Seagate ST3120026AS | 2x74 GB Western Digital WD740GD-75FLA0 | 80 GB Seagate ST380013AS |
| Bus type | Serial ATA | Serial ATA | Serial ATA + Raid 0 | Serial ATA |
| Controller | Integrated Intel 82801EB Ultra ATA | Integrated Intel 82801EB Ultra ATA | Promise Fastrak S150 TX2 | Integrated Intel 82801EB Ultra ATA |
| File system type | NTFS | NTFS | NTFS | NTFS |
| Free Storage Bays | 1 x 3.5", 1 x 5.25" | 1 x 3.5", 1 x 5.25" | 1 x 5.25" | 2x5.25", 1 x 3.5" |
| Network card ethernet | Intel Pro/1000 MT Integrated | Intel Pro/1000 MT Integrated | Intel Pro/1000 MT Integrated | HP Broadcom Gigabit Ethernet (integrated) |
| Ports Serial+Parallel+1394 | 2+1+0 | 2+1+0 | 2+1+0 | 2+1+1 |
| USB | 2 on Front, 6 on rear | 2 on Front, 6 on rear | 2 on Front, 4 on rear | 2 on Front, 4 on rear |
| Sound Inputs/Outputs | Headphone socket on front, Mic, sound in/out on rear | Headphone socket on front, Mic, sound in/out on rear | Headphone socket on front, Mic, sound in/out on rear | Headphone socket on |
| PCI Slots Available | 4 | 4 | 3 | 5 |
| Unique Features | Easy access case JVM | Easy access case JVM | Easy access case JVM | |
| As configured | CD/RW inc DVD | CD/RW inc CD/DVD | CD/RW + CD/DVD | CD/RW |
| Dimensions HxWxD(mm) | 473 x 165 x 445 | 473 x 165 x 445 | 473 x 445 x 451 | 450 x 172 x 465 |
| Software with machine | Dell Bundle incl. Internet Explorer, Roxio Easy CD Creator, Sun JVM | Dell Bundle incl. Internet Explorer, Roxio Easy CD Creator, Sun JVM | Dell Bundle incl. Internet Explorer, Roxio Easy CD Creator, Sun JVM | IE, Diagnostics, Roxio Easy CD Creator |
| Technical Support | 24-7/365 Dedicated Phone Support | 24-7/365 Dedicated Phone Support | 24-7/365 Dedicated Phone Support | 24-7/365 |
| Dedicated Phone Support | 24x7 Standard | | | |
| Warranty | 3Yr Parts + Onsite Labor (Next Business Day) | 3Yr Parts + Onsite Labor (Next Business Day) | 3Yr Parts + Onsite Labor (Next Business Day) | 3Yr Parts + Onsite Labor |
| OS/software | Windows XP Pro SP1 | Windows XP Pro SP1 | Windows XP Pro SP1 | Windows XP Pro SPK1 |
| Dassault Certification | Complete | Complete | Complete | Complete |
| Street price w/19" monitor | \$2,832 | \$3,863 | \$6,302 | \$2,752 |

TABLE 1: System Specifications

| | Dell 360 P4 3.2 GHz FX-1000 | Dell 360 P4 3.2 GHz Extreme FX-1000 | Dell 450 2x3.2GHz Xeon FX-3000 | HP XW4100 P4 3.2 GHz |
|-------------------------|--------------------------------|--|-----------------------------------|----------------------|
| Graphics | | | | |
| Shaded+Edge | 75.3 | 88.6 | 70.6 | 79.4 |
| Shaded | 75.0 | 94.9 | 64.6 | 74.2 |
| Edges | 86.9 | 94.2 | 75.7 | 91.7 |
| CATBench 2003G | 79.1 | 92.6 | 70.3 | 81.8 |
| System | | | | |
| Piston | 98.5 | 98.6 | 81.7 | 98.5 |
| Crankshaft | 96.4 | 95.5 | 91.3 | 99.5 |
| Engine Block | 85.4 | 79.1 | 83.1 | 89.6 |
| Engine Assembly | 87.8 | 86.5 | 70.6 | 85.3 |
| Migration | 81.4 | 76.3 | 81.9 | 87.2 |
| Analysis | 68.4 | 65.1 | 66.6 | 68.5 |
| CATBench 2003S | 85.6 | 82.8 | 78.7 | 87.3 |
| CATBench 2003 | 82.3 | 87.7 | 74.5 | 84.5 |
| DMU | 82.5 | 74.0 | 69.6 | 90.2 |
| CATBench 2003DMU | 80.8 | 83.3 | 70.0 | 86.0 |
| Cost | \$2,832 | \$3,863 | \$6,302 | \$2,752 |

TABLE 2: Results Summary

tium 4 processor. This provides a useful comparison to the system we tested last spring in our main benchmark edition (which had a 3.0 GHz processor) and a good comparison against the other Dell systems that we tested in this update with different processors.

Dell's Precision 360 model is the entry model in the Precision Workstation line and is packaged in a mid-sized tower configuration. Our example came with a 3.2 GHz Intel Pentium 4 processor, 1 GB of 400 MHz DDR memory, a massive 120 GB Serial ATA disk drive, and NVidia Quadro FX1000 graphics.

The chassis of the 360 model is very similar to that of the 340/350 workstations, with an ingenious case opening method that gives ready access to all components without requiring tools. The 360 offers a total of 8 USB ports, and even though the chassis is compact, it still

offers space to add extra 3.5" and 5.25" devices such as a hard disk and CD/DVD drive. The Nvidia FX1000 card has become the standard by which other graphics cards are measured.

We were pleased to see that Dell had taken the initiative to supply Sun's Java Virtual Machine (JVM) now that Microsoft is not shipping any, as this would make setting up Dassault's Portal applications easier.

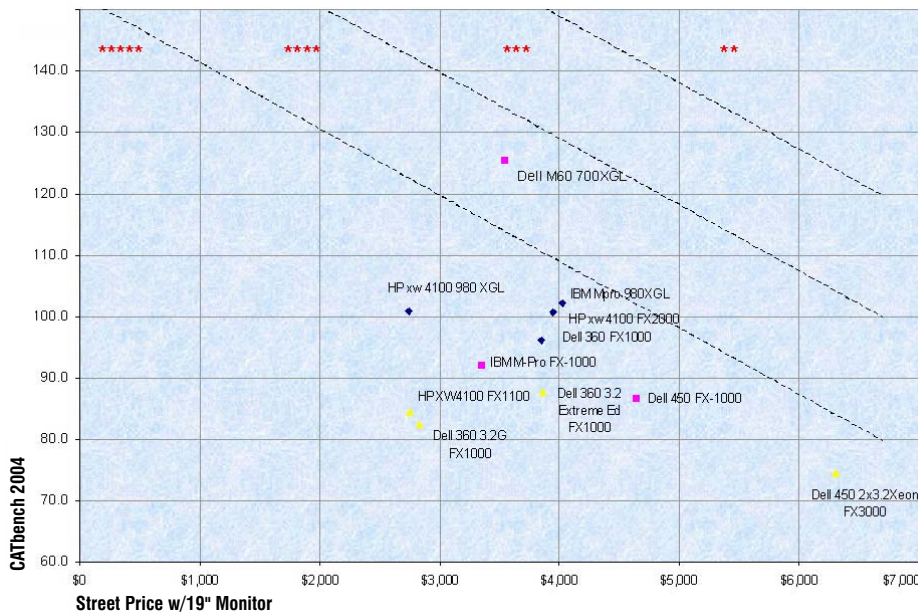
System performance was excellent with a CATbench 2004S score of 85.6—a 3.5 point improvement over the 3.0 GHz system we previously tested. Performance was particularly good in loading our large engine assembly and in the analysis scenarios, indicating that the Serial ATA drive provided excellent performance. The graphics performance of the NVIDIA card was extremely good and received a CATbench 2002G score of 79.1, a



Dell 360 Precision Workstation

dramatic improvement from the score of 100 that the system rated last year: no doubt because of much better drivers supplied by NVidia.

Dell's 360 series workstations are value-priced; the system we tested is priced at \$2,832, including a 19" Trinitron class monitor, a drop of over \$1000 from the system price last spring. This outstanding budget system achieved the CATBench 2004 score of 82.3 and the CATBench 2004DMU score of 80.8. At \$2,832,



GRAPH 1: Overall Rating

the Dell Precision360 workstation offers world-class performance in all areas of CATIA with no bottlenecks. The Dell 360 with 3.2 GHz Pentium 4 gains a 5-star rating.

Price/Performance 5 stars *****
Performance 5 stars *****

Dell 360 Precision Workstation with Intel P4 Extreme Edition Processor

The second system we tested from Dell came with Intel's new P4 Extreme Edition Processor which gives the processor 512 KB of L2 cache and 2 MB of L3 cache, in line with Intel's Xeon Processors. This adds about \$800 to the cost of the system. The question we wanted answered was, "is there a significant improvement in application performance?"

This system also differed from the first Dell 360 in that it came with 2 GB of 400 MHz DDR memory.

The system score was slightly better than the base 360, with a score of 82.8 against 85.6. The graphics

score, however, was slower than the base system, with a score of 92.6 versus 79.1

Combining the system and graphics rating gave an overall CATBench 2004 score of 87.7 (vs. 82.3 for the base system). DMU performance of the Extreme Edition system was significantly better than the base system; however this is more than compensated for by the slower graphics.

Given that this system is over \$1000 more expensive than the base system and is slightly slower, we would advise users to stay with the basic P4 processor and avoid the Extreme Edition.

Price/Performance 4 stars ****
Performance 5 stars *****

Dell 450 Precision Workstation

The third system we tested from Dell was a 450 Precision Workstation loaded with two 3.2 GHz Xeon processors. The 450 series is designed to fit in the company's product range between its entry-

level 360 machine and the top-of-the-line 650 workstation. Its mid-size case can be used horizontally as a desktop (normally with the monitor on top) or vertically as a tower.

Dell has invested a good deal of engineering effort into creating an almost silent system, an advantage for users that may be on the 450 for eight or more hours a day. The mid-size chassis leaves space to add additional storage devices with provision for two 3.5" and two 5.25" drive bays. Our system came equipped with two Western Digital 74 GB SATA drives and a RAID 0 Promise Fastrak controller, which made the drives appear as a 148 GB array. The



Dell 450 Precision Workstation

Dell motherboard has integrated network as well as storage controllers and provides sound and USB 2.0 support. This particular system came equipped with dual Intel 3.2 GHz Xeon processors and was configured with Nvidia's high-end Quadro FX 3000 graphics card with AGP 8x graphics bus.

System performance was the best we have ever seen, with a CATBench 2004S score of 78.7. Performance was exceptional on the analysis portion of our benchmark and loading our large assembly in design mode. CATIA R10 is not multi-threaded, so we would not have expected any performance improvements from the second Xeon processor in our systems tests; however, this will

| | Ref System (P4 2.4 GHz Quadro2 Pro) - V5R9 SP1 | Dell 360 FX-1000 | HP XW4100 980XGL | HP XW4100 FX-2000 | IBM M-Pro 980XGL |
|-------------------------|--|---------------------|---------------------|----------------------|---------------------|
| Graphics | | | | | |
| Shaded+Edge | 201.7 | 100.5 | 96.2 | 97.4 | 105.9 |
| Shaded | 281.1 | 89.8 | 91.5 | 99.2 | 119.6 |
| Edges | 145.6 | 118.8 | 91.5 | 88.4 | 101.3 |
| CATBench 2003G | 209.4 | 103.0 | 93.1 | 95.0 | 108.9 |
| System | | | | | |
| Piston | 228.7 | 99.3 | 101.0 | 96.6 | 103.1 |
| Crankshaft | 193.5 | 97.4 | 101.4 | 97.5 | 103.7 |
| Engine Block | 143.9 | 92.3 | 102.2 | 101.3 | 104.2 |
| Engine Assembly | 163.5 | 87.4 | 112.9 | 108.7 | 91.0 |
| Migration | 151.0 | 89.7 | 104.6 | 104.6 | 101.2 |
| Analysis | 183.0 | 72.8 | 125.6 | 125.6 | 74.7 |
| CATBench 2003S | 177.5 | 89.1 | 108.6 | 106.5 | 95.4 |
| CATBench 2003 | 193.5 | 96.1 | 100.8 | 100.8 | 102.2 |
| DMU | 136.6 | 86.1 | 107.0 | 107.0 | 99.9 |
| CATBench 2003DMU | 173.0 | 94.6 | 100.0 | 101.0 | 104.4 |
| Cost | \$2,100 | \$3,848 | \$2,748 | \$3,948 | \$4,022 |

TABLE 3: Results Summary

change in CATBench 2004 where we will be using CATIA Version 5 Release 12, where both Digital Mockup & Analysis will take advantage of multiple processors.

The system scored an exceptional 69.6 in our DMU tests. The performance of the graphics system was also exceptional, with a CATbench 2004G score of 70.3—probably because of the second processor as much as the better graphics card. The Nvidia FX 3000 card is helped by the ability of the second Xeon processor to cull data in parallel. Scores were particularly impressive for our automotive driveline scenario.

Combining our System, DMU & Graphics scores, we get a CATbench 2004 DMU rating of 70.0 and a CATBench 2004 rating of 74.5. The latter is 8 points better than any other system we have ever tested! This is an outstanding system that

would be ideally suited for DMU applications now that R12 is multi-threaded.

Price/Performance 4 stars ****
Performance 5 stars *****

HP Workstation xw4100 with Nvidia Quadro FX1100 graphics

The consolidation of Compaq's and Hewlett-Packard's workstation lines is now complete, and HP chose to submit a freshened version of the xw4100 workstation submitted for our main benchmark, with NVIDIA's new Quadro FX1100 graphics card (which will replace the FX1000).

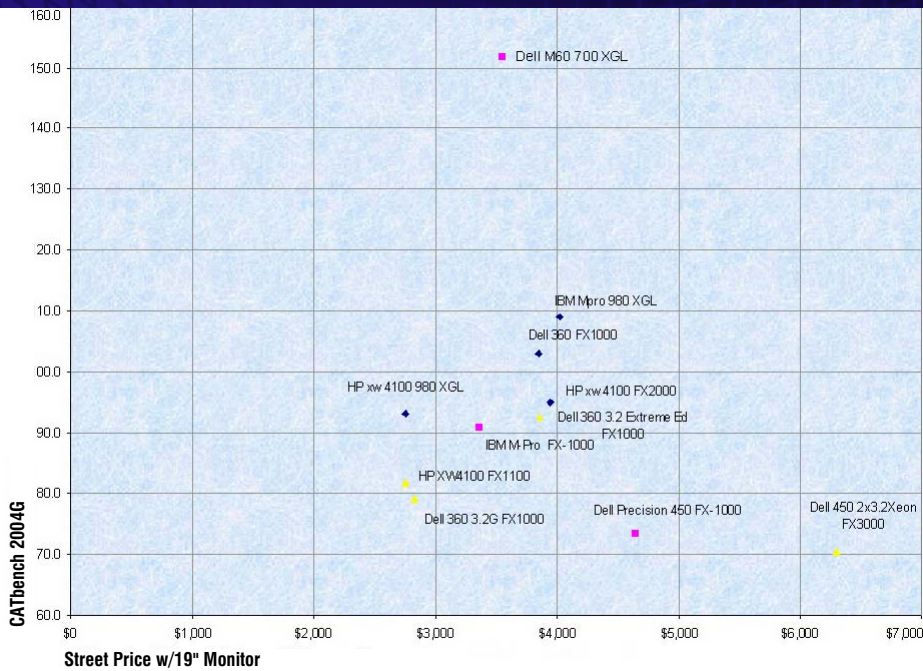
The xw4100 workstation line uses Intel Pentium 4 processors; our test unit came with a 3.2 GHz processor, 1 GB of PC3200 400 MHz DDR memory, and an 80 GB Serial ATA disk drive. Serial ATA drives are fast becoming the stan-



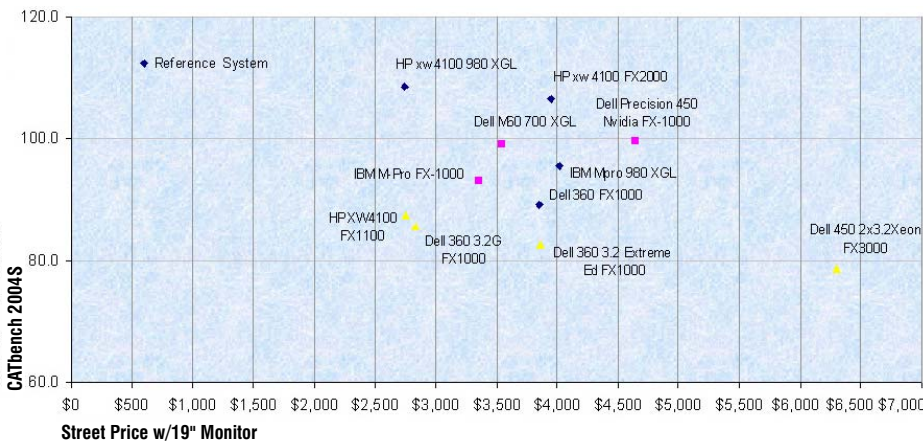
HP Workstation xw4100

dard hard drives in end-user workstations because of their low cost and near SCSI performance. As with the Dell system, the system board used an Intel 875P chipset with 800 MHz FSB and an 8x AGP port for the graphics card.

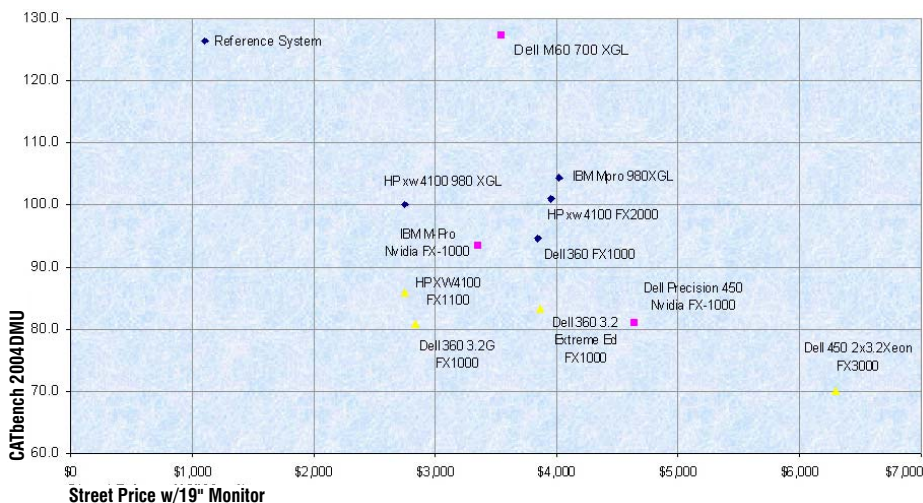
System performance was excellent, with a CATBench 2004S score of 87.3, a massive improvement from the score we saw last year (106), largely due to more memory. The graphics performance of the new



GRAPH 2: Graphics Rating



GRAPH 3: System Rating



GRAPH 4: Digital Mockup (DMU) Rating

Nvidia Quadro FX1100 was similar to that of the FX1000 with an extremely good CATbench 2004G score of 81.8. Overall, the HP system scores 84.5 for CATbench 2004 and 86 for CATbench 2004DMU. At \$2,752, this system offers outstanding value and is suitable for use in design, analysis and digital mockup domains.

Price/Performance 5 stars *****
Performance 5 stars *****

Conclusion

The Dell and HP workstation entries we tested for this update offered similar outstanding performance. The Dell 450 demonstrated improved graphics performance because of a second processor, while our benchmark indicated that Intel's Extreme Edition processor is not valuable for CATIA use.

Both Dell & HP low-end workstations showed significant gains in system and graphics performance compared to similar models submitted just 9 months ago, while pricing has continued to decline. Frankly, I never thought that sub \$3,000 systems would offer these levels of performance.

Phil Harrison is principal of LionHeart Solutions, Inc., a consulting firm specializing in CATIA and ENOVIA implementation and usage, located in Cold Spring Harbor, NY. Harrison is president of the CATIA Operators Exchange (COE). He also is the author of the CATIA Community's CATbench CATIA Version 5 Hardware Benchmark. He has 14 years' experience installing and using CATIA on UNIX, mainframe and NT systems. He can be reached by e-mail at pph@lionheartsolutions.com.