CATIA Community's
2005 CATIA Version 5
Workstation Benchmark
CATbench 2005 Winter Update Column

*By **Phil Harrison***

This update column tests seven systems from ATI graphics, Dell, H-P, IBM & Xi. You'll find the results surprising!

Editor's note: CATIA Community's seventh annual workstation benchmark **CATbench2005** reported how workstations performed when tested with CATIA Version 5 Release 14 In this CATbench 2005 update column. Reviewer Phil Harrison tests.

It has been a full six months since our main CATbench article in the spring & there have been a number of significant developments by various hardware companies:

AMD's Athlon & Opteron processors have been added by Dassault Systemes into certified configurations. While AMD processors are only supported from CATIA Version 5 Release 14 Service Pack 3 running our benchmark with Release 14 will provide an interesting comparison to Intel's CPUs.

Intel has continued to push it's dual core processors & has increased the speed of all it's processors, with the Pentium M now at 2.26 GHz & the dual core Pentium 4 at 3.80 GHz. There are a lot of offerings from Intel, with the choice among single & dual core processors & a choice of the amount of L2 cache between 1 MB & 2MB.
Graphic cards have continued to develop so we are pleased to be able to offer a review of the High-End NVIDIA 3450 & 4500 graphics cards, as well as a look at the ATI FireGL V7100 card.

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 12 SP4 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.

CATIA Community' CATbench 2005 benchmark issues four ratings:

- CATbench2005S measures the performance of the CPU, Bus and I/O subsystems
- CATbench2005G measures the graphics performance of each system
- CATbench2005 is the combination of CATbench2005G and CATbench2005S, giving each equal weighting to both system and graphics performance.

CATbench2005DMU: 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.

With no financial restrictions 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 prices into consideration. Our rating system is as follows:

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

Tables 1 gives detailed system specifications and prices for each of the systems submitted for this CATbench 2005 update column. A summary of the results for the seven workstation systems tested can be found in Table 2. These results also are displayed in Graphs 1, 2, 3 and 4 for overall (CATbench2005), graphics (CATbench2005G) system (CATbench2005S) & Digital Mock-Up (DMU) (CATBench2005DMU) performance respectively. We have left the original machine results in CATbench2005 graphs for comparison.

Dell Precision Workstation 380

Let's take a look at each of the unique features of each system and see how they rated:

Dell Precision Workstation 380 with NVIDIA FX3450 graphics

Dell has updated their Precision workstation 380 line with faster Intel dual core processors, the system we tested came with a 3.8 GHz processor while the system we tested in spring came with a 3.2 GHz Processor. First let's explain what dual core means, prior processor families from Intel have a single processor per chip. To have two processors in the past we had to have two chips & use Intel's Xeon or AMD's Opteron 200 series processors. Now with dual core Intel is actually packaging two processors on a single chip. This allows us to run multi-threaded applications or multiple applications faster as the operating system can allocate tasks concurrently to the processors.

The Precision 300 series of workstations are actually Dell's low end "value" offering. This system equipped with a Pentium dual core 3.8 GHz processor with a 800 MHz front side bus, 2 GB of fast 533 MHz DDR2 memory, a 160 GB serial ATA disk drive & NVIDIA Quadro FX3450 graphics card. The

380's case is compact & has 1 3.5" & 1 5.25" drive bays available. The system comes with an integrated Gigabit Ethernet card & 5 free PCI card slots, two of which are on a PCI card.

As with several other vendors, the system uses a USB keyboard & mouse.

System performance of the Dell 380 was satisfactory with a system score (CATBench2005S) of 108.2, just 4 points ahead of the system we tested in the springtime. This demonstrates how application performance does not necessarily scale with processor performance. The system did well in our analysis scenario but lagged in our other design scenarios. We noticed that CATIA was particularly slow to start, this impacts all of our design scenarios. The graphics performance of the NVIDIAFX3450 graphics card was superb with a CATbench2005G score of 81.2; the best score we have ever seen with strong performance on all tests & across all graphics modes . The NVIDIA Quadro FX3450 becomes the graphics card to beat.

Combining the graphics and systems scores yields an overall CATBench2005 score of 95.0, while the system scored well with 91.3 in our digital mockup benchmark. The Dell Precision workstation 380 offers good performance for $3,453 & we were particularly pleased with the performance of the NVIDIA FX3450 graphics card.

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

Dell Precision M70 Mobile Workstation

Dell's M70 workstation impressed us last year when it was released & it has continued to be the class leader. Dell has now refreshed the system by upgrading the processor to a Pentium 4m (Centrino) at 2.26 GHz with 2 MB of L2 cache. As we have noted in the past the performance of these mobile workstations approaches that of desktop/desk side systems so we ran it through CATBench2005. For CATbench2005, we set the mobile workstation's screen resolution at 1280 x 1024 pixels as compared to the Dell M70's native 1920 x 1200 pixel display. Thanks to a magnesium case the M70 weighs a reasonable 8.4 lbs (with it's power supply) even with the extra wide aspect ratio 15.4" display. In the configuration tested, the M70 came with 1 GB of RAM and a 60GB 7,200 RPM Ultra ATA 100 hard disk. The system also came with a CD-RW that will be useful for back-ups in the fixed bay. The system includes an integrated mini-PCI

Dell Precision M70 Mobile Workstation

wireless network card and a 56K modem. The configuration is feature packed for the mobile worker who needs access to CATIA. The display was stunning with a 15.4" screen with a resolution of 1920 x 1200 pixels. The M70 comes with a touch pad & a pointing device so we added a 3-button mouse to take advantage of CATIA's mouse manipulations. The system performance of the M70 surprised us with a CATbench2005 score of 92.8, that's 23 points ahead of the M70 that we tested in Spring. Its also16 points ahead of the Dell Precision 380 & well ahead of many of the workstations that we have tested. The system performed extremely well in our engine block & analysis scenario. Graphics performance was better than the average of all systems with a CATBench2005G score of 93.1.

Combining the System & Graphics score gives a CATbench2005 rating of 92.9, while the CATbench2005DMU score is a similar rating of 96.9; demonstrating that these workstations can now be used as replacements for desktop CAD workstations. At $3,484 the Dell M70 raises the bar for mobile computing once again with its stunning display; it is a lightweight machine with excellent performance all around. It is the ideal machine for mobile workers & offers performance comparable to leading desktop workstations.

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

IBM Intellistation M Pro

IBM Intellistation M Pro 6218-45U

The machine submitted by IBM was a refresh of the popular M-Pro, in fact this system was very similar to that submitted for our benchmark back in the Spring. The M-Pro is a mid-range offering, equipped with a Pentium 4 3.6 GHz processor with 2 GB of L2 cache 800 MHz front side bus, 2 GB of 444 MHz DDR memory, a fast 80 GB U320 SCSI disk drive & NVIDIA Quadro FX1400 graphics card. The case has both a 3.5" & a 5.25" drive bay available as well as 2 hard disk slots available for more storage. The system comes with an integrated Gigabit Ethernet card & 2 free PCI card slots.

System performance of the M-Pro was very similar to the system submitted in Spring with a CATBench2005S score of 107.8; performance was good in our design scenarios but poor in our analysis scenarios. The graphics performance of the NVIDIAFX1400 graphics card was good with a CATbench2005G score of 92.0; surprisingly 8 points worse than the IBM M-Pro we tested before with the same graphics card. However the NVIDIA Quadro FX1400 still appears to offer good performance at a low price.

Combining the graphics and systems scores yields an overall CATBench2005 score of 99.9. The system scored 98.6 in our digital mockup benchmark. Priced at a mere $3,387 the M Pro provided good performance in all but the analysis scenario & is highly recommended for entry level & mid-range use. It earns a 5 star rating for price/performance.

It's been quite a while since we had system's submitted by H-P, so we were delighted to receive a xw4300 & xw9300 for review

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

HP Workstation xw4300 with NVIDIA Quadro FX1400 graphics

The xw4200 workstation has been a firm price/performance favorite of ours for quite some time. H-P has replaced the xw4200 with the xw4300 in a similar package with Intel's new processors & NVIDIA's Quadro FX1400 graphics card.

The xw4300 workstation line is

HP Workstation xw4300

equipped with Intel Pentium 4 processors; our test unit came with a 3.8 GHz processor with 2 GB of L2 cache, 2 GB of fast 533 MHz DDR memory & a 80 GB Serial ATA disk drive. Serial ATA drives have become the standard hard drives in end-user workstations due to their low cost & near SCSI performance. Like the Dell Precision 380 & IBM M-Pro the system board uses Intel's 955X Express chipset with 800 MHz FSB & an PCI Express x16 graphics bus for the graphics card. The xw4300 comes with an integrated 4 channel SATA controller offering RAID 0 & RAID 1 capability.

System performance was satisfactory with a CATBench2005S score of 107.5. The graphics performance of the NVIDIA Quadro FX1400 was extremely good with a CATBench2004G score of 84.3, just 2.4 points behind the FX3450 in the Dell system. Overall the H-P system scores 95.9 for CATBench2005 & 93.3 for CATBench2005DMU. At $3,096 this system offers outstanding value & is suitable for use in design, analysis & digital mockup domains. The Xw4300 continues where the xw4100 & xw4200 workstations left off.

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

HP Workstation xw9300 with NVIDIA Quadro FX3450 graphics

The H-P xw9300 is H-P's high-end workstation line utilizing dual AMD Opterion processors in a large chassis offering lots of space for storage. AMD support is new so we were particularly pleased to be able to test this system, which incidentally is already certified by Dassault Systems (at R15 SP3 & above.)

This particular workstation was configured with two 2.8 GHz Opteron 254 processors with 1 MB of L2 cache, 2 GB of 400 MHz of DDR memory, a 80 GB SATA disk drive & NVIDIA's high end FX-3450 graphics card. The motherboard of the xw9300 comes with an NVIDIA chipset & support for up to 16 GB, which will prove useful for 64 bit application support with large data sets.

System performance of the xw9300 was excellent with a CATBench2005S score of 81.5 with particularly good performance in our engine assembly, migration & analysis scenarios. The graphics performance of the NVIDIA Quadro FX3450 was satisfactory with a CATBench2005G score of 95.9, some 14 points worse than the same card in the Dell 380; an anomaly we are unable to explain. Overall the H-P system scores an excellent 88.7 for CATBench2005 & 88.8 for CATBench2005DMU. At $8,645 this

HP Workstation xw9300

system is relatively expensive but offers extremely good performance in our most intensive scenarios; we heartily recommend the H-P xw9300 for Digital Mock Up applications.

Price/Performance 3 stars ***
Performance 5 stars *****

Monarch/ ATI FireGL 7100

ATI submitted a system from Monarch so that we could test their FireGL V7100 graphics card. Monarch is a manufacturer of systems largely for the gaming & entry level CAD market allowing users to specify all the components in their systems, believe it or not down to the brand of heat transfer grease used on the CPU!.

The case of the Monarch 80308 Versall Custom Workstation is large with lots of room for expansion with 3 free 3.5" drive bays & 3 free 5.25" drive bays. The case & keyboard came with a red custom paint job, a first for CATbench; the system was however very noisy.

ATI FireGL 7100

In addition to the ATI V7100 graphics card the Monarch system was configured with a single Intel Pentium 4 3.8 GHz processor with 2 GB of L2 cache (aka extreme edition), 2 GB of memory & an integrated SATA controller with 2 400 GB disk drives.

The Monarch system is not certified by Dassault Systemes to run CATIA; however we found absolutely no issues in our extensive test suite.

The system gave average system performance with a CATBench2005S score of 100.0; performance was very good in our analysis scenarios, but disappointing our larger design scenarios. The graphics performance of the ATI V7100 graphics card was satisfactory with a CATbench2005G score of 98.4.

Combining the graphics and systems scores yields an overall CATBench2005 score of 99.2. The system scored 104.9 in our digital mockup benchmark. Priced at a $3,261 the Monarch system was on a par with other systems that we tested in spring; ATI has some work to do to overtake NVIDIA in performance but competition is good for us as customers.

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

Xi Mtower NVIDIA FX4500 graphics

ATI submitted a system from Xi in our main benchmark last spring so that we could test their FireGL V7100 graphics card. Xi is another manufacturer of systems largely for the gaming & entry level CAD market allowing users to specify all the components in their systems. They did well the last time around so they decided to submit a system on their own, this time with NVIDIA graphics.

The Xi Mtower system was configured with an AMD Athlon 64 FX57 processor running at 2.88 GHz, 2 GB of 400 HZ memory & twin Western Digital 160 GB disk drives in a RAID 0 configuration.

The case of the Xi is large with lots of room for expansion with 2 free 3.5" drive bays & 3 free 5.25" drive bays offering plenty of space for additional storage.

The Xi system is not certified by Dassault Systemes to run CATIA; however we found absolutely no issues in our extensive test suite.

The system gave superb system performance with a CATBench2005S score of 75.8, by far the best score we have ever seen. Performance was amazing in our analysis, migration & larger scenarios. The graphics performance of the NVIDIA FX4500 graphics card was excellent with a CATbench2005G score of 82.2 but considering the price premium over the FX1400 probably not worth it.

Combining the graphics and systems scores yields an overall CATBench2005 score of 79. The system scored 76.9 in our digital mockup benchmark. Priced at a $4,442 the Xi system surpassed all other systems that we have tested by a significant margin. AMD's Athlon processor takes CATIA performance to a new level & we award our first dual 5 start award this year to this Xi system.

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

Conclusion

This benchmark update column delivered a few surprises:

While Dell & IBM's mid-range offerings have had their Intel processors upgraded their performance remains largely unchanged. Having said that, both still offer good value for money.

Dell's M70 has been upgraded & offers markedly better performance with the Intel Pentium M2.26 GHz processor than the systems we tested 6 months ago.

AMD Processor support offers great promise for the future. The HP xw9300 system showed the best Digital Mock Up performance we have seen, while the Xi Mtower with an Athlon processor demonstrated the best performance we have ever seen.

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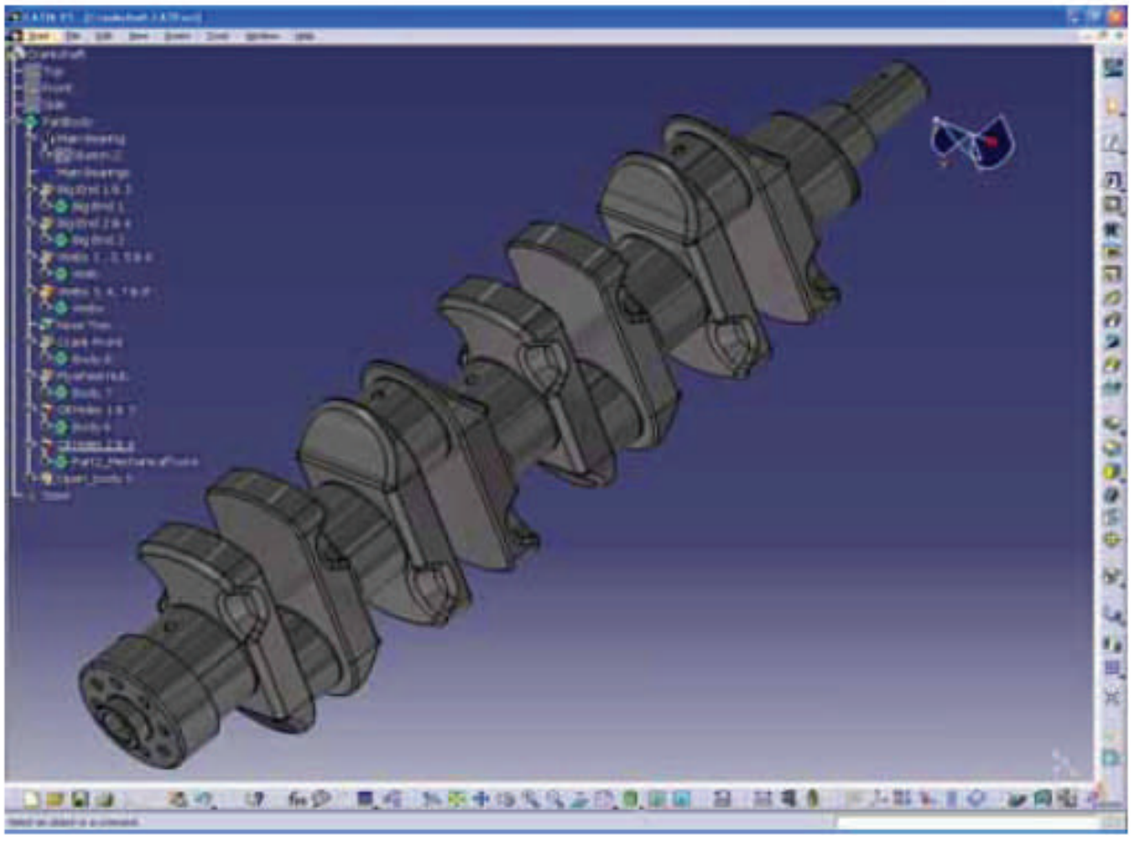

Table 1: System Specificiations

Vendor	Dell	Dell	IBM
Model Number	**Dell Precision M70**	**Dell Precision 380**	**IntelliStation M Pro 6218-45U**
Phone Number	1-(800)-388-8542	1-(800)-388-8542	1-(888)-SHOP-IBM
Web site	www.dell.com	www.dell.com	www.ibm.com/pc/us/intellistation
CPU Type	Intel Pentium M (Dothan)	Intel Pentium D Dual core	Intel Pentium 4
CPU Speed	2.26 GHz / 800 MHz 2MB L2	3.80 GHz	3.6 GHz 2 MB L2
I/O Bus	533 MHz FSB	800 MHz FSB	800 MHz front side bus
# of CPU's (Max. #)	**1 (1)**	**1 (1)**	**1(1)**
Chip Set	**Intel 915 PM (Alviso)**	**Intel 955x**	**Intel 955x**
Graphics Card	**NVIDIAFX Go 1400**	**NVIDIAGeForce Quadro FX3450**	**NVIDIA Quadro FX1400**
Graphics driver	BIOS 5.41.02.28.A3 Driver 6.14.10.7203	BIOS 5.41.02.43.05 Driver 6.14.10.7718	BIOS 5.41.02.17.24 Driver 6.14.10.7756
Chips set	NVIDIA	NVIDIA	NVIDIA
Bus type	PCI Express	PCI Express 16x	PCI Express 16x
Video RAM	256 MB	256 MB	128 MB DDR-SDRAM
Graphics Output	VGA	2 x DVI	2 x DVI
Resolution for test	1920x1200 60 Hz	1280x1024 75 Hz	1280x1024 75 Hz
Number of colors for test	32 bit	32 bit	32-bit
Monitor size	15.4" WUXGA Wide aspect screen	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)
Memory (maximum)	**1 GB (2 GB)**	**2 GB (8 GB)**	**2 Gb (8Gb)**
Slots Used (total)	1 (2)	4 (4)	2 (4)
Memory type	533 MHz DDR2 Dual Channel	533 MHz DDR2 SDRAM	PC 4200 444MHz ECC DDR2-SDRAM
Virtual memory	4 GB	4 GB	2 GB
Disk size/type	**Hitachi Travelstar 60 GB UATA 7200 rpm HTS726060M9AT00**	**Seagate Barracuda V 160 GB 7200 RPM ST31600223AS**	**IBM-ESXS ST373207 73GB 10,000rpm U320 SCSI**
Bus type	Ultra ATA-100 EIDE	SATA II	SCSI U320
Controller	Integrated Intel 82801FBM UATA	Integrated Intel 82801 GB UATA	Adaptec AIC7901 U320 SCSI + Intel 82801G Ultra ATA
File system type	NTFS	NTFS	FAT32/NTFS
Free Storage Bays	0	1 x 3.5" 2 x 5.25"	1 x3.5", 1x5.25"
Network card ethernet	Intel Pro/Wireless lan 2200BG mini PCI Broadcom NetXtreme 57xx Gbit Wireless	Broadcom NetXtreme 5751 Gigabit Integrated	Broadcom NetXtreme 57xx Gigabit Integrated
Ports Serial + Parallel + 1394	**1+0+0**	**1+1+3** **2 on PCI card**	2 + 1 +2
USB	2 on rear, 2 on side	2 on Front, 5 on rear	2 on front , 5 on rear
Sound Inputs/Outputs	Headphone socket Mic in on side	Headphone/Mic socket on front, Mic, sound in/out on rear	Mic & sound out Front & Rear
PCI Slots Available	1 PCMCIA	3 PCI	2 PCI
Unique Features	Infrared Port Integrated Wireless Network-ing	Compact Design, quiet USB Keyboard+Mouse	Limited expansion
As configured	CD/RW/DVD HL-DT-ST GCC-42434B	CD/RW/DVD HL-DT-ST GWA-4164B	CD/RW/DVD HL-DT-ST GCC-4481B
Dimensions Height x Width x Depth(mm)	42.4 x 361 x 260	447x468x172	435 x178 x 452
Software packaged with the machine	Dell Quick Set Sonic! Record now Power DVD	Dell Quick Set Sonic DigitalMediaPlus Power DVD	None
Technical support	24-7/365 Dedicated Phone Support	24-7/365 Dedicated Phone Support	(800) 772 2227 Standard: 24x7, Worldwide
Warranty	3Yr Parts + Onsite Labor (Next Business Day)	3Yr Parts + Onsite Labor (Next Business Day)	3 Yr Parts and Labor Onsite Repair
OS/software	**Windows XP Pro SP2**	**Windows XP Pro SP2**	**Windows XP Pro SP2**
Dassault Certification	**Complete**	**Complete**	**Complete**
Street price w/19" monitor as of 11/1	**$3,484**	**$3,453**	**$3,387**

Table 1: System Specificiations (Cont.)

Vendor	Hewlett Packard	Hewlett Packard	Monarch	Xi Computer
Model Number	HP Workstation xw4300	HP Workstation xw9300	80308 Versall Custom Workstation	Xi Mtower 64 SLI
Phone Number	1-(800)-652-6672	1-(800)-652-6672	1-(800)-652-6672	1-(888)-432-0486
Web site	www.hp.com	www.hp.com	www.monarchcomputer.com	www.xicomputer.com
CPU Type	Intel Pentium 4	AMD Opterion 254	Intel Pentium 4 Extreme Edition	AMD Athlon 64 FX57
CPU Speed	3.8 GHz 2 MB L2	2.8 GHz 1 MB L2	3.8 GHz 1 MB L2	2.88 GHz
I/O Bus	800 MHz FSB	1 GHz Hyper transport	800 MHz FSB	1 GHz Hypertransport
# of CPU's (Max. #)	1 (1)	2 (2)	1 (1)	**1(1)**
Chip Set	**Intel 955x**	NVIDIA nForce Professional 2000	**Intel 955x**	**nVidia nForce 4 SLI**
Graphics Card	**NVIDIA Quadro FX1400**	**NVIDIA Quadro FX3450/4000 SDI**	**ATI FireGL V7100**	**NVIDIA FX4500**
Graphics driver	BIOS 5.41.02.17.24 Driver 6.14.10.7723	BIOS 5.41.02.43.05 Driver 6.14.10.7782	BIOS 113-A32201-103 Driver 6.14.10.6561	BIOS 5.41.02.43.05 Driver 6.14.10.7756
Chips set	NVIDIA	NVIDIA	ATI	NVIDIA
Bus type	PCI Express 16x	PCI Express 16x	PCI Express 16x	PCI Express 16x
Video RAM	128 MB DDR-SDRAM	256 MB DDR-SDRAM	256 MB DDR3-SDRAM	512 MB DDR-SDRAM
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 size	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)
Memory (maximum)	**2 Gb (8Gb)**	2 GB (16 GB)	**2 Gb (8Gb)**	**2 Gb (12Gb)**
Slots Used (total)	2 (4)	2 (8)	2 (4)	2 (6)
Memory type	Dual channel 533 MHz ECC DDR2 SDRAM	PC3200 Dual channel 400 MHz ECC DDR2 SDRAM	DDR2 (800) PC2-6400	PC 3200 400MHz ECC DDR2-SDRAM
Virtual memory	2 GB	2 GB	2 GB	2 GB
Disk size/type	**Samsung HD080HJ 80GB 7200 rpm SATA**	**Samsung HD080HJ 80GB 7200 rpm SATA**	**2x Western Digital Caviar SD 400GB 7200 rpm SATA RAID 0**	**2 x Western Digital WD1600JS 160GB 7200rpm SATA RAID 0**
Bus type	IntegratedSerial ATA	Serial ATA	Integrated SATA	SATA
Controller	Intel 82801GB Ultra ATA	LSI Logic PCI-X U320 SCSI NVIDIA nForce4 SATA	Intel 82801GR/GH SATA RAID	NVIDIA IntegratedSATA Raid 0/1/5/10 Controller
File system type	NTFS	NTFS	NTFS	NTFS
Free Storage Bays	2x5.25", 1 x 3.5"	3 x3.5", 1x5.25"	3 x3.5", 3x5.25"	2 x3.5", 3x5.25"
Network card ethernet	Broadcom NetXtreme 57xx Gigabit Integrated	Integrated NVIDIA nForce controller	Realtek RTL8139 PCI fast Ethernet NIC	1 NVIDIA nForce + 1 Marvell Yukon
Ports Serial + Parallel + 1394	1+1+0	0+1+2	1+1+1	**1 + 1 + 1**
USB	2 on Front, 6 on rear	2 on Front, 4 on rear	4 on rear	2 on front, 4 on rear extra 2 on PCI USB Card
Sound Inputs/Outputs	Front & Rear	Front & Rear	rear	Mic + Spkr out on front multi input/output on rear
PCI Slots Available	4 PCI	5 PCI	4 PCI	3
Unique Features	V. Quiet	V. Quiet	V. Noisy Hot swappable disk drives Logitech Wireless keyboard & Mouse Custom Paint	Fan on side for CPU 2 Integrated NICs Logitech Mose + Keyboard
As configured	Lite-on Combo SOHC-4832K CD/RW inc DVD	CD/RW/DVD HL-DT-ST GCC-4481B	2x NEC DVD_RW ND-3540A	Sony DVD-RW DW-Q30A
Dimensions Height x Width x Depth(mm)	450 x 168 x 456	448x212x550	537 x 210 x 485	440x203x495
Software packaged with the machine	HP Cool Tuning tool PDF Complete Roxio / RetrospectBackup Mgr	HP Cool Tuning tool	Cyberlink Power DVD Nero	Nero CyberLink PowerDVD Arcsoft Graphic Software Bit DefenderPro 1 Yr Antivirus subscription.
Technical support	24x7 Standard	24x7 Standard	24x7 Standard	(800) 772 2227 Standard: 24x7, Worldwide
Warranty	3Yr Parts + Onsite Labor	3Yr Parts + Onsite Labor	3Yr Parts + Onsite Labor optional	1 Yr Parts and Labor
OS/software	**Windows XP Pro SP2**	**Windows XP Pro x64 Edition SP1**	**Windows XP Pro SP2**	**Windows XP Pro SP2**
Dassault Certification	**Complete**	**Complete**	**None Planned**	**None Planned**
Street price w/19" monitor as of 11/1	$3,096	$8,645	$3,261	$4,442

Table 1: System Specificiations (Cont.)

Vendor	Dell	Dell	IBM
Model Number	**Dell Precision M70**	**Dell Precision 380**	**IntelliStation M Pro 6225-23z**
Phone Number	1-(800)-388-8542	1-(800)-388-8542	1-(888)-SHOP-IBM
Web site	www.dell.com	www.dell.com	www.ibm.com/pc/us/intellistation
CPU Type	Intel Pentium M (Centrino)	Intel Pentium EE840 Dual core	Intel Pentium 4
CPU Speed	2.13 GHz / 800 MHz	3.20 GHz 2x1MB L2	3.80 GHz
I/O Bus	533 MHz FSB	800 MHz FSB	800 MHz front side bus
Chip Set	**Intel 915 PM**	**Intel 955x**	**Intel 925x**
Graphics Card	**NVIDIAFX Go 1400**	**NVIDIAQuadro FX 1400**	**NVIDIA Quadro FX1400**
Graphics driver	BIOS 5.41.02.28.103 Driver 6.14.10.6771	BIOS 5.41.02.17.24 Driver 6.14.10.7041	BIOS 5.41.02.17.24 Driver 6.14.10.7184
Chips set	nVIDIA	nVIDIA	NVIDIA
Bus type	PCI Express	PCI Express 16x	PCI Express 16x
Video RAM	256 MB	128 MB	128 MB DDR-SDRAM
Graphics Output	VGA	2 x DVI	2 x DVI
Resolution for test	1920x1200 60 Hz	1280x1024 60 Hz	1280x1024 75 Hz
Number of colors for test	32 bit	32 bit	32-bit
Monitor size	15.4" WUXGA Wide aspect screen	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)
Memory (maximum)	**1 GB (2 GB)**	**1 GB (8 GB)**	**1 Gb (4Gb)**
Slots Used (total)	1 (2)	2 (4)	2 (4)
Memory type	533 MHz DDR2 Dual Channel	533 MHz DDR2 SDRAM	PC 3200 400MHz ECC DDR2-SDRAM
Virtual memory	4 GB	2 GB	2 GB
Disk size/type	**60 GB UATA 7200 rpm Toshiba MK8026GAX**	**WDC WD800GGD-75FLC3 80 GB SATA**	**IBM ESXS MAP3735NP 80 GB U320 SCSI**
Bus type	ATA/100	Serial ATA	SCSI U320
Controller	Integrated Intel 82801FBM UATA	Integrated Intel 82801 GB UATA 4 SATA + 2 PATA	Adaptec AIC7901 U320 SCSI + Intel 82801FB/FBM
File system type	NTFS	NTFS	NTFS
Free Storage Bays	0	1 x 3.5" 1 x 5.25"	1 x3.5", 1x5.25" 2 x Hdisk
Network card ethernet	**Intel Pro/Wireless lan 2200BG mini PCI Broadcom NetXtreme 57xx Gbit Wireless**	Broadcom NetXtreme 5751 Gigabit Integrated	Broadcom NetXtreme 57xx Gigabit Integrated
Ports Serial + Parallel + 1394	**1+0+1**	**1+1+1**	**2 + 1 +2**
USB	2 on rear, 2 on side	2 on Front, 5 on rear	2 on front , 6 on rear
Sound Inputs/Outputs	Headphone socket sound out on side	Headphone/Mic socket on front, Mic, sound in/out on rear	Mic & sound out Front & Rear
PCI Slots Available	1 PCMCIA	5	2 PCI
Unique Features	Infrared Port Integrated Wireless Network-ing	Compact Design, quiet USB Keyboard+Mouse	Limited expansion
As configured	CD/RW DVD	48x/32x CD/RW DVD	CD/RW HL-DT-ST GCE-8384B
Dimensions Height x Width x Depth(mm)	42.4 x 361 x 260	447x468x172	500 x178 x 435
Software packaged with the machine	Dell Quick Set Sonic! Record now Power DVD	Dell Bundle incl. Internet Ex-plorer	None
Technical support	24-7/365 Dedicated Phone Support	24-7/365 Dedicated Phone Support	(800) 772 2227 Standard: 24x7, Worldwide
Warranty	3Yr Parts + Onsite Labor (Next Business Day)	3Yr Parts + Onsite Labor (Next Business Day)	3 Yr Parts and Labor Onsite Repair
OS/software	**Windows XP Pro SP2**	**Windows XP Pro SP2**	**Windows XP Pro SP2**
Dassault Certification	**Complete**	**In Process**	**Complete**
Street price w/19" monitor as of 6/16	**$3,137**	**$3,298**	**$2,897**

Table 1: System Specificiations (Cont.)

Vendor	Sun	Sun	Xi Computer
Model Number	Java Workstation W1100z	Java Workstation W2100z	Xi Mtower 64 SLI
Phone Number	1-800-555-9SUN	1-800-555-9SUN	1-(888)-432-0486
Web site	www.sun.com/desktop/	www.sun.com/desktop/	www.xicomputer.com
CPU Type	AMD Opteron 100 Series	AMD Opteron 250	AMD Athlon FX 55
CPU Speed	2400 MHz	2400 MHz	2.61 GHz
I/O Bus			
Chip Set	**AMD 8131**	**AMD 8111**	**nVidia nForce 4 SLI**
Graphics Card	**NVIDIAQuadro FX3000**	**NVIDIAQuadro FX3000**	**ATI FireGL V7100**
Graphics driver	BIOS Driver 6.14.10.6722	BIOS Driver 6.14.10.6722	BIOS 113-A32201-103 Driver 6.14.10.6497
Chips set	nVIDIA	nVIDIA	ATI
Bus type	AGP 8x	AGP 8x	PCI Express
Video RAM	256 MB	256 MB	256 MB
Graphics Output	2 x DVI	2 x DVI	2 x DVI
Resolution for test	1280x1024 75 Hz	1280x1024 75 Hz	1280x1024 75 Hz
Number of colors for test	32-bit	32-bit	32-bit
Monitor size	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)	17" Flat Panel (1702FP)
Memory (maximum)	**2 GB (4 GB)**	**4 GB (16 GB)**	**2 Gb (8Gb)**
Slots Used (total)	2 (4)	4 (8)	2 (4)
Memory type	PC 3200 400MHz ECC DDR2-SDRAM	PC 3200 400MHz ECC DDR2-SDRAM	PC 3200 400MHz ECC DDR2-SDRAM
Virtual memory	2 GB	8 GB	2 GB
Disk size/type	**80 GB UATA 7200 rpm HDS 722580VLAT20**	**73 GB U320 SCSI 15000 rpm Fujitsu MAP3735 NP**	**2 x Western Digital WDC7400GD00FLA 72GB SATA**
Bus type	Ultra ATA 100	SCSI U320	SATA
Controller	AMD-8111 SATA + 2xAdaptec AIC7902B U320 SCSI	AMD-8111 SATA + 2xAdaptec AIC7902B U320 SCSI	IntegratedSATA Raid 0/1/5/10 Controller
File system type	NTFS	NTFS	NTFS
Free Storage Bays	1 x3.5", 2x5.25"	1 x3.5", 2x5.25"	1 x3.5", 1x5.25" 2 x Hdisk
Network card ethernet	Broadcom NetXtreme 57xx Gigabit Integrated	Broadcom NetXtreme 57xx Gigabit Integrated	1 NVIDIA nForce + 1 Marvell Yukon
Ports Serial + Parallel + 1394	**2+1+2**	**2+1+2**	**1 + 1 + 1**
USB	2 on Front, 3 on Rear	2 on Front, 3 on Rear	6 on rear
Sound Inputs/Outputs	Headphone/Mic socket on front, Mic, sound in/out on rear	Headphone/Mic socket on front, Mic, sound in/out on rear	Mic + Spkr out + multi input/ output on rear
PCI Slots Available	4	4	4
Unique Features	Good compnent location diagrams inside case USB Keyboard & Mouse	Good compnent location diagrams inside case USB Keyboard & Mouse	Transparent case side Hot swappable disk enclosures 3 Fans
As configured	52x CD/RW DVD	52x CD/RW DVD	CD/RW DVD Lite-On Combo SOHC-5232K
Dimensions Height x Width x Depth(mm)	475 x 250 x 560	475 x 250 x 560	545 x205 x 485
Software packaged with the machine	None	None	AntiVirus + Video Editing
Technical support	24-7/365 Dedicated Phone Support	24-7/365 Dedicated Phone Support	(800) 772 2227 Standard: 24x7, Worldwide
Warranty	1 Yr Parts and Labor Onsite Repair	1 Yr Parts and Labor Onsite Repair	3 Yr Parts and Labor Onsite Repair
OS/software	**See Text**	**See Text**	**Windows XP Pro SP2**
Dassault Certification	**None Planned**	**None Planned**	**None Planned**
Street price w/19" monitor as of 6/16	**$4,018**	**$7,263**	**$3,368**

Table 2: Results Summary

	Dell 380 NVIDIA 3450	Dell M70 Mobile Workstation 2.26GHz FXGo 1400	IBM M-Pro 6218-45U FX1400	HP XW4300 FX1400	HP XW9300 FX3450	Monarch ATI 7100	Xi NVIDIA FX4500
Graphics							
Shaded+Edge	83.5	96.3	85.7	82.8	95.6	97.8	84.4
Shaded	80.0	90.3	96.4	83.8	95.8	113.0	82.1
Edges	82.2	92.8	94.0	86.2	96.3	84.5	80.0
CATBench2005G	**81.9**	**93.1**	**92.0**	**84.3**	**95.9**	**98.4**	**82.2**
System							
Piston	129.4	106.8	95.6	114.5	101.2	100.8	98.4
Crankshaft	119.3	97.6	101.7	117.2	90.6	102.0	84.5
Engine Block	117.3	84.4	111.0	116.8	82.3	112.2	74.6
Engine Assembly	104.9	95.5	94.4	105.4	79.1	111.2	74.9
Migration	102.0	91.5	99.0	116.6	72.0	104.0	64.9
Analysis	82.5	83.2	137.6	81.0	67.5	75.8	61.2
CATBench2005S	**108.2**	**92.8**	**107.8**	**107.5**	**81.5**	**100.0**	**75.8**
CATBench2005	**95.0**	**92.9**	**99.9**	**95.9**	**88.7**	**99.2**	**79.0**
DMU	**100.7**	**100.7**	**105.1**	**102.4**	**81.7**	**104.9**	**71.6**
CATBench2005DMU	**91.3**	**96.9**	**98.6**	**93.3**	**88.8**	**101.7**	**76.9**
Cost	**$3,453**	**$3,484**	**$3,387**	**$3,096**	**$8,645**	**$3,261**	**$4,442**

Table 3: Results Summary

	Dell M70 Mobile Workstation 2.1 GHz FX Go 1400	Dell 380 NVIDIA FX1400	IBM Mpro 3.8 GHz FX-1400	Sun Java Workstation W1100z	Sun Java Workstation W2100z	Xi ATI FireGL 7100	Reference Dell M60 1.7 GHz FX Go 700	Reference Dell 340
Graphics								
Shaded+Edge	95.7	89.0	83.5	110.9	110.9	110.0	156.4	226.3
Shaded	96.4	89.2	86.4	106.8	106.8	114.5	154.9	287.8
Edges	97.1	90.5	83.3	114.8	114.8	99.4	151.2	161.7
CATBench2005G	**96.4**	**89.6**	**84.4**	**110.8**	**110.8**	**108.0**	**154.2**	**225.2**
System								
Piston	139.7	94.3	95.4	103.7	84.0	82.9	178.7	173.0
Crankshaft	122.8	112.0	99.9	95.0	87.8	82.5	146.3	208.4
Engine Block	93.7	134.6	112.7	89.6	90.3	79.2	130.9	205.8
Engine Assembly	149.3	111.4	95.1	84.5	85.8	74.0	173.1	180.3
Migration	110.1	134.3	126.8	77.0	81.4	70.4	176.0	215.0
Analysis	87.9	91.5	140.8	79.1	136.9	63.7	117.9	233.2
CATBench2005S	**116.1**	**112.2**	**113.0**	**87.8**	**96.1**	**75.0**	**152.4**	**203.8**
CATBench2005	**106.2**	**100.9**	**98.7**	**99.3**	**103.4**	**91.5**	**153.3**	**214.5**
DMU	**128.1**	**111.4**	**99.5**	**98.0**	**86.8**	**76.2**	**144.2**	**172.0**
CATBench2005DMU	**112.3**	**100.5**	**91.9**	**104.4**	**98.8**	**92.1**	**149.2**	**198.6**
Cost	**$3,137**	**$3,298**	**$2,897**	**$4,018**	**$7,263**	**$3,368**	**$3,546**	**$2,100**

Table 3: Mobile Systems Results Summary

	Dell M70 Mobile Workstation 2.26GHz FXGo 1400	Dell M70 Mobile Workstation 2.1 GHz FX Go 1400	Reference Dell M60 1.7 GHz FX Go 700
Graphics			
Shaded+Edge	93.2	100.0	161.1
Shaded	93.7	100.0	162.4
Edges	95.6	100.0	153.5
CATBench2004MG	**94.2**	**100.0**	159.0
System			
Piston	76.5	100.0	**128.0**
Crankshaft	79.5	100.0	**119.1**
Engine Block	90.1	100.0	**139.8**
Engine Assembly	64.0	100.0	**116.0**
Migration	83.1	100.0	**159.9**
Analysis	94.6	100.0	**134.1**
CATBench2004MS	**79.9**	**100.0**	**131.3**
Battery Life	**100.0**	**100.0**	**116.8**
Weight	**100.0**	**100.0**	**100.0**
CATBench2004M	**89.6**	**100.0**	**137.8**
DMU	**78.6**	**100.0**	**112.5**
CATBench2004DMUM	**86.4**	**100.0**	**135.7**
Cost	**$3,484**	**$3,137**	**$3,849**

Table 5: Weighting Factors for

	Weight Factor
Design	
Load CATIA	1
Re-Load CATIA	4
Load Part/ Assembly	12
Write Part	9
Export STL File	1
Export STEP File	1
Read Drawing	8
Modify Solid	16
Update Drawing	12
Write Drawing	8
Export DXF File	1
Create Std 7 View Drawing	2
Autogenerate Dimensions	1
Migrate - Paste	1
Migrate - Update	1
Migrate - Batch	1
DMU	**79**
DMU 1st Load	1
DMU 2nd Load	8
DMU Clash	2
Analysis	**11**
Mesh	5
Solve	5
	10
Total	**100**

Table 6: Weighting Factors for Graphics

Graphics Weighting	
Shading + Edge	33%
Shading	33%
Edges	33%
Total	100%

Table 8 : Average Graphics Test Results

Mode	Average Total Delay (ms)
Shading + Edge	784.92
Shading	438.43
Edges	421.96

Table 9: Systems Domain Weighting

Scenario	Rating
Design	80%
Analysis	20%
Total	100%

Table 7 : Average System Test Results

	Design					
	Piston	*Crankshaft*	*Block*	*Eng. Assy*	*Migration*	*Analysis*
System Average	378.73	275.32	1089.19	983.60	36.02	305.72

Table 10: Overal weighting Factors

Overall Weighting	
System	50%
Graphics	50%
Total	100%