

Sun Ultra 20 M2 Workstation Just the Facts

SunWIN # 477754

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Version August 11, 2006: This version supercedes all previous versions.
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Title	Sunwin Token # or URL
Sun Ultra 20 M2 Workstation –Technical White Paper	443536
Sun Ultra 20 M2 Workstation – Product Datasheet	443530
Sun Services Datasheet for x64 workstations	443663
Sun Services for Ultra 20 @ a Glance	443665
Sun Ultra 20 M2 Workstation – Customer Presentation	460170
Sun Ultra 20 M2 Workstation – Technical Presentation	TBD
Sun Ultra 20 M2 Workstation – Reviewer's Guide	TBD
Sun Ultra 20 M2 Workstation – Competitive Beat Sheet	443532
Sun Ultra 20 M2 Workstation – Benchmark Results	http://www.sun.com/desktop/workstation/ultra20/benchmarks.jsp
Sun Ultra 20 M2 Workstation – ISV Certification	http://www.sun.com/x64/mcad/
Sun Ultra 20 Workstation – Just the Facts	443533
Sun Ultra 25 Workstation – Just the Facts	473547
"Stuttgart" – Just the Facts	TBD
Solutions Brief for EDA	429802
Solutions Brief for MCAE	429805
Solutions Brief for MCAD	450625
Success Stories	http://www.sun.com/x64/success-stories/
Sun Ultra 20 M2 Workstation - Service Manual	www.sun-beta.com/munich
Sun Ultra 20 M2 Workstation – Installation Guide	www.sun-beta.com/munich
Sun Ultra 20 M2 Workstation - Product Notes	www.sun-beta.com/munich
Sun Ultra 20 M2 Workstation - OS Installation Guide	www.sun-beta.com/munich
Sun Ultra 20 M2 Workstation – Safety and Compliance Guide	TBD

Introduction

Professionals prefer to use the highest-quality, highest-performing tools. Such tools best enable the fullest talents of an engineer or a software developer, allowing them to express themselves, their vision, and their skills to the greatest effect. Organizations employing these tools get products to market more quickly, and with higher quality than organizations that employ lesser tools.



Figure 1 – Sun Ultra 20 M2 Workstation

The Sun Ultra 20 M2 Workstation, successor to the Sun Ultra 20 Workstation, demonstrates Sun's commitment in delivering one of most compelling entry-level workstations in the industry. Targeted toward Fortune 1000 companies who are open to the best x64 (x86, 64-bit) workstation, the Sun Ultra 20 M2 Workstation offers an easy migration to 64-bit computing at a starting price under \$1,000. With a single architecture, the Sun Ultra 20 M2 Workstation supports both 32-bit and 64-bit operating systems and applications, offering high flexibility for customers who want to run existing 32-bit operating systems and applications and at the same time, migrate to the next-generation 64-bit operating systems and applications. Above all, the Sun Ultra 20 M2 Workstation meets or exceeds the buying criteria of the discerning workstation buyer, at a price-performance ratio not previously available from Sun. "Entry-level" only from a pricing perspective, the Sun Ultra 20 M2 Workstation is inherently a workstation worthy to be placed in the critical path of mission-critical projects.

Target Workloads

Customer requirements for workstations vary by market segments. In market segments such as software development, programmers care about fast compilations and the tight integration of development tools on the workstation. In the EDA segment, ASIC or CPU designers run processor-intensive applications and usually evaluate a workstation based on its published SPEC CPU2000 benchmark results. In market segments such as MCAD, mechanical engineers run applications that require not only high processor performance but mid-range to high-end 3D graphics performance as well, and they therefore also evaluate a workstation based on its published SPECviewperf 9 benchmark results. Examples of primary needs for each market segment are explained in the next three paragraphs and also summarized later in Table 1.

Software Development

Software engineers value binary compatibility, reliability, scalability and convenience for their projects. Software engineers demand a workstation pre-installed with software development tools for them to start their project immediately. It is a powerful feature to have the ability to offer a cost-effective Solaris platform on which they can develop and test software applications that will eventually run on higher-end Solaris-based servers. Software engineers tend to develop code on standalone workstations with back-end servers for final compilation and integration.

Electronic Design Automation (EDA)

The most complex IC projects, including the Sun UltraSPARC T1 processor with 32 simultaneous processing threads, were completed on a Sun workstation. Sun workstations run applications from companies such as Mentor Graphics, Cadence Designs, and Synopsys, which are used to design, verify, and test complex IC products for the consumer and commercial market. Many companies have also developed in-house applications that run on Solaris and Linux. The complexity of IC devices is increasing dramatically and it is not uncommon to find devices with hundreds of millions of gates. Since the simulation run time of a device with 500M gates is much longer than a device with 50M gates, customers place a premium on high processor performance as it allows them to run more simulations in less time. EDA customers in general are extremely performance sensitive and require high-performance processors (measured by SPEC CPU2000 benchmark results), memory (determined by capacity, reliability, memory-CPU bandwidth and latency), and hard disks (determined by bandwidth, latency, and capacity). EDA customers generally do not need 3D graphics support but still require fast 2D graphics performance for routing and layout applications.

Mechanical Computer Aided Design (MCAD)

Sun has a significant presence in the high-end MCAD market. High-end MCAD customers run applications from Independent Software Vendors (ISVs) such as PTC, CATIA, I-DEAS, and Unigraphics which are used to design various products ranging from fan assemblies to complete automobiles. Customers in the MCAD market often integrate these software applications into their design and production processes and hence switching cost is high. Therefore, customers in this market, place a high premium on binary compatibility and the ability to run their applications on Solaris or Windows without having to port or retest them. These customers typically, but not always, purchase workstations with high-performance 3D graphics with emphasis on geometry performance.

Table 1 - Target Markets and Customers of the Sun Ultra 20 M2 Workstation

Target Markets	Target Customers	Customer Needs
Software Development	Software developers who develop and test commercial applications and data sets	Flexible, low-cost development platform that supports 32-bit and 64-bit computing environments Support for multiple operating systems. Eliminate issues associated with transitioning software applications and datasets
Semiconductor manufacturers	Electronics engineers who design and verify complex ASICs and CPUs	High-performance processors Professional 2D or entry-level 3D graphics Large memory capacity
Automobile Aerospace Heavy machinery	Mechanical engineers who design automobiles and aircraft and simulate crash tests of automobiles and aircraft	Professional high-performance graphics Large amounts a memory Increased I/O bandwidth

To finish their projects on time, these users require professional graphics solutions, large memory capacity, high-performance disks, and a high degree of reliability. All of these applications demand the highest level of performance and support from a platform. Furthermore, users of these applications insist on a high level of support and expertise from their IT department, equipment suppliers, and application software vendors.

Features

Workstation technology is different than that of a PC. The unique technological features that a workstation utilizes, generally allow professionals to get more from their IT investments. A PC is a general-purpose, lower-cost machine designed for a variety of home and standard business tasks, such as running word processing, spreadsheets, etc, whereas a workstation has been designed to meet the requirements of a number of more specific and heavier workloads. How users employ their systems, i.e. "workload", directly influences the technology that manufacturers use as the basis for the product. Technology such as high-performance AMD Optron Processors, ECC memory, SAS hard disk drives, and ISV-certified graphics accelerator cards. Another aspect of the Sun Ultra 20 M2 Workstation is not what appears on screen, but what goes on behind the scenes, such as certification testing and driver optimization. Sun has earned a solid reputation in all of these areas.

The Sun Ultra 20 M2 Workstation is targeted toward workstation customers who are not bound to Intel-based workstations. Featuring the AMD Optron 1200-series Processor, the Sun Ultra 20 M2 Workstation has a feature set as described in Table 2.

Table 2 – Feature Summary of the Sun Ultra 20 M2 Workstation

Features	Descriptions
Processor Type	AMD Optron 1200-series Processor Dual-core only
Number of Processors	One
Processor Models	1220SE (Dual Core 2.8GHz 125W) 1218 (Dual Core 2.6GHz 103W) 1214 (Dual Core 2.2GHz 103W) 1210 (Dual Core 1.8GHz 103W) In Q1CY07: 1222SE (Dual Core 3.0 Ghz 125W)
HyperTransport	1 HyperTransport™ link version 2.0
Memory	Unbuffered DIMMs, DDR2-667, 4 DIMM slots, 8GB maximum. Three DIMM sizes: 512MB (ECC) and 1GB (ECC), 2GB (ECC)
Graphics	One NVIDIA Quadro FX 3500 graphics acclerator card One NVIDIA Quadro FX 1500 graphics acclerator card One NVIDIA Quadro FX 560 graphics acclerator card One NVIDIA Quadro NVS 285 graphics acclerator card ATI ES1000 graphics controller (mounted on motherboard) In Q1CY07: Up to two NVIDIA Quadro FX560 cards or NVS 285 cards, simultaneously
Networking	Dual Gigabit Ethernet integrated on motherboard Two RJ-45 ports (rear)
Optical Disk Drives	DVD-ROM or DVD-Dual
Hard Disk Drives	Up to two SATA drives, 1TB maximum: 80, 250, 500GB (7,200 rpm) In Q1CY07: Up to two SAS drives, 292GB maximum: 146GB (15,000 rpm)
RAID Levels	0 and 1 (Windows XP Professional & XP Professional x64 Edition only)
FireWire Ports	Two
USB 2.0 Ports	Six
Audio	7.1 Channel
Serial Ports	One (via internal header)
PCI Express Slots	One full-length x16 slot One full-length x16 slot wired as x8 One full-length x1 slot
5V/32-bit/33-MHz PCI slots	Three full-length slots
Operating Environments Validated by Sun	Solaris 10 6/06 (Update 2) Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) Update 3 and later SuSE Linux Enterprise Server 9 (64-bit) Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Pre-Installed Software	Solaris 10 6/06 (aka Update 2) Sun Studio 11 Sun Java Studio Enterprise Sun Java Studio Creator 2 Net Beans 5 IDE
Height	433.6mm (17.07 in)
Width	199.6mm (7.86 in)
Depth	467.45mm (18.40 in)
Weight	26.31 kg (58 lbs)
Power Supply	400 Watt
(U.S.) List Price Range	\$995 to \$2,795
Warranty	One Year Next Business Day HW Coverage Hours: Business Hours HW Response Times: Next Business Day Delivery Method: Parts Exchange or Onsite

Value Propositions

The Sun Ultra 20 M2 Workstation and Sun's value-added activities, such as installed software, ISV certification, driver optimization, and support, have been focused, above all else to benefit the workstation buyers, i.e. software developers, mechanical engineers, ASIC/CPU designers, and the IT organizations that support them. Examples of value propositions for each market segment are described in the following paragraphs.

Develop Software in Less Time

Software developers can start developing Solaris applications and Java applications immediately after unpacking. Every Sun Ultra 20 M2 Workstation comes with a pre-installed fully-licensed copy of Solaris 10. Additionally, a rich suite of Sun software development tools has been pre-installed on it. These intuitive, easy to use tools, coupled with the high-performance dual-core AMD Opteron 1200-series Processor enable rapid development of Web services as well as traditional applications.

The Solaris 10 Operating Environment contains new features such as Dtrace, Predictive Self-Healing, Solaris Containers, and ZFS. Dtrace, a real-time application debugging and optimization tool, gives the programmer unprecedented observability into the system. Predictive Self-Healing, a feature to improve availability, supports automatic diagnosis and recovery from hardware and application faults to maximize system uptime. Solaris Containers, an industry-first utilization feature, helps consolidate, isolate, and manage many applications on a single workstation.

In addition to Solaris, every Sun Ultra 20 M2 Workstation comes pre-installed with a rich suite of Sun software development tools, including Sun Studio Creator 2, Sun Java Studio 11, Sun Java Studio Enterprise, and Net Beans 5.0 IDE. Sun Studio Creator provides a comprehensive, integrated suite of tools for enterprise C, C++, and Fortran applications. Sun Java Studio provides a visual tool to help developers manage their business-critical Java applications. Sun Java Studio Enterprise delivers a unified platform of tools, supports and services that have been integrated with the capabilities of the Sun Java Enterprise System. Net Beans IDE 5.0 offers comprehensive support for building IDE plug-in modules and rich client applications on the Net Beans platform. These application development tools have been conveniently pre-installed on the Sun Ultra 20 M2 Workstation to help developers to create a range of applications and services, in less time.

Accelerate Design Cycles

The Sun Ultra 20 M2 Workstation features the dual-core AMD Opteron 1200-series Processor, the best workstation processor in the industry. The dual-core AMD Opteron 1200-series Processor contains an integrated dual-channel memory controller to reduce latency and increase bandwidth. HyperTransport, a high-performance, high-speed interconnect with the lowest possible latency, provides the connection between the processor and the chipset. The AMD Opteron 1200-series Processor is available only in dual-core, to benefit environments where multiple applications are running at once, or for applications that can split a task across processors.

The Sun Ultra 20 M2 Workstation has high-density, high-performance, and reliable internal storage. Utilizing Serial ATA for density, Sun Ultra 20 M2 Workstation accommodates up to two internal 500GB drives for a maximum capacity of 1TB. Utilizing RAID 0 for high-performance (within the Microsoft Windows XP Professional environment only), Sun Ultra 20 M2 Workstation delivers very high transfer rate to load quickly the largest engineering drawings. Utilizing RAID 1 for redundancy (also within the Microsoft Windows XP Professional environment), Sun Ultra 20 M2 Workstation safeguards customer data for mission-critical application.

Sun Ultra 20 M2 Workstation has a large, fast, and reliable memory footprint. **Available up to 8GB, Sun Ultra 20 M2 Workstation doubles the memory footprint of the Sun Ultra 20 Workstation.** The memory subsystem on Sun Ultra 20 M2 Workstation is fast. Based on DDR2-667, Sun Ultra 20 M2 Workstation delivers a maximum memory bandwidth of 10.6 Gbps, compared to 6.4 Gbps on Sun Ultra 20 Workstation. Last, Sun Ultra 20 M2 Workstation uses ECC memory exclusively to protect mission-critical data sets. ECC (Error Correction), a method of checking integrity of data in DRAM, detects multiple-bit errors and locates and corrects single-bit errors.

Visualize More Data Sets, Simultaneously

The Sun Ultra 20 M2 Workstation can drive up to four displays (available in Q1CY07), twice as many displays as the Sun Ultra 20 Workstation. The Sun Ultra 20 M2 Workstation is the first 1-socket x64 workstation from Sun to have two PCI Express x16 ("16 lane") expansion slots for graphics accelerators to drive up to four displays to help customers visualize more data sets simultaneously and make quicker decisions during design. The Sun Ultra 20 M2 Workstation supports a wide variety of workstation-class graphics accelerators from NVIDIA to catapult Sun's customers to the next level of creativity with OpenGL high-performance graphics and support for multiple displays and visualization software.

Nurturing content is critical and Sun treats it very seriously. Sun maintains strategic partnerships with leading ISVs to certify the Sun Ultra 20 M2 Workstation for compatibility with the most complex MCAD applications. Through rigorous validation, Sun helps ensure compatibility in the most complex and technically demanding computing environments. Additionally, the Sun Ultra 20 M2 Workstation has been tuned for optimal performance with each application and deliver a best-in-class price-performance workstation. Table 3 list the dates of Sun Ultra 20 M2 Workstation certification at leading engineering ISVs.

Table 3 – ISV Certification Plan for the Sun Ultra 20 M2 Workstation

ISV	Application	Target Certification Date
PTC	Pro Engineer Wildfire 2.0 & 3.0	Q4CY2007
Dassault Systeme	CATIA v5 32-bit & 64-bit	Q4CY2007
Solidworks	Solidworks 2004, 2005, 2006	Q4CY2007
UGS	NX2, NX3, versions v5.0, v5.1. SolidEdge	Q4CY2007
Autodesk	Inventor 10	Q4CY2007
ICEM	Surf	Q4CY2007

Deploy With Confidence

Sun Ultra 20 M2 Workstation has been designed to help IT organizations support their environment. The Sun Ultra 20 M2 Workstation is compatible with many operating systems, factory lead-time is a week or less, pricing is competitive, investment in 32-bit software is protected, and service is backed by the Global Sun Services organization.

When an IT manager buys the Sun Ultra 20 M2 Workstation, it can be deployed in more environments, because it has been certified to be compatible with more operating systems than any workstation in its class. The Sun Ultra 20 M2 Workstation supports Solaris 10, Red Hat Enterprise Linux WS, SUSE Linux Enterprise Server, and Microsoft Windows XP Professional. Customers can purchase either Solaris or Linux operating systems from Sun and obtain complete system support from Sun. For customers who deploy Windows XP Professional or Windows XP Professional x64, note that the Sun Ultra 20 M2 Workstation has been certified by Microsoft and support for Windows XP Professional operating systems can be purchased from Sun. In Q1CY07, it will also support Vista, SuSE Linux Enterprise Desktop (SLED) 10.

Workstations are placed at the critical paths of the most important engineering projects. Hence, time-to-delivery is important and Sun treats it very seriously. Factory lead time for standard configurations (pre-built in factory) of the Sun Ultra 20 M2 Workstation is five days or less. Factory lead time for Assemble to Order (ATO) and X-Options of the Sun Ultra 20 M2 Workstation is seven days or less. Factory lead time of Field Replacement Units (FRUs) is 13 days or less. For more details on factory lead-time, please see the chapter on Availability and Ordering.

With a starting NTE list price (U.S.) under \$1,000, the Sun Ultra 20 M2 Workstation competes head-to-head with any workstation based on the Intel Core 2 Duo ("Conroe") Processor. With price points similar to mini-tower workstations based on the Intel Core 2 Duo Processor, as well as high performance 32-bit x64 capability, the Sun Ultra 20 M2 Workstation effectively replaces any workstations based on the Intel Core 2 Duo Processor.

By using the same architecture to run 32-bit and 64-bit operating systems and applications, Sun Ultra 20 M2 Workstation helps customers protect their investments in 32-bit operating systems/applications, while giving them a simplified migration path to 64-bit operating systems/applications. With Sun Ultra 20 M2 Workstation, customers can take advantage of today's improved 32-bit performance enhancements and protect their 32-bit investments while retaining the ability to upgrade to 64-bit operating systems and applications as needed.

Every Sun Ultra 20 M2 Workstation is supported by the power of Sun Global Services organization. This organization provides a wide range of services to help customers migrate from legacy environments, reduce cost and complexity, accelerate network deployment, and deliver mobility with security—all from a single source. A one-year, next business day warranty is standard with every Sun Ultra 20 M2 Workstation.

These user-driven features, engineered to accelerate design cycles and reduce errors in design, demonstrates Sun's commitment to deliver the most compelling x64-based workstation portfolio in the industry. Coupled with pre-installed Solaris 10, pre-installed Sun development tools, competitive pricing, a one-year warranty and next-business-day support, the Sun Ultra 20 M2 Workstation offers an exceptional low total cost of ownership (TCO) among 1-socket x64 workstations.

System Architecture

The Sun Ultra 20 M2 Workstation is targeted toward workstation customers who are open to the best solution. Featuring the dual-core AMD Opteron 1200-series Processor, Sun Ultra 20 M2 Workstation retains the familiar, highly integrated, system architecture as the Sun Ultra 20 Workstation, while improving key components such as CPU, memory, chipset, and I/O expansion slots. Compared to the Sun Ultra 20 Workstation, Sun Ultra 20 M2 Workstation contains a more powerful processor, higher-bandwidth expansion slots higher memory performance, and a more powerful set of graphics accelerators (a detail comparison between it and the Sun Ultra 20 Workstation is located in the Appendix). Figure 2 shows the internal view of the Sun Ultra 20 M2 Workstation.



Figure 2 – Internal View of the Sun Ultra 20 M2 Workstation

Figure 3 shows the block diagram of the Sun Ultra 20 M2 Workstation. The AMD Opteron 1200-series Processor drives four DDR2 DIMMs and interfaces to the NVIDIA nForce Professional 3400 chipset (code named MCP55-Pro). The NVIDIA nForce Professional 3400 chipset provides bridging interfaces, such as PCI Express, gigabit Ethernet, SATA, and USB, to the AMD Opteron 1200-series Processor. These two key, highly integrated, components drive the system architecture of Sun Ultra 20 M2 Workstation.

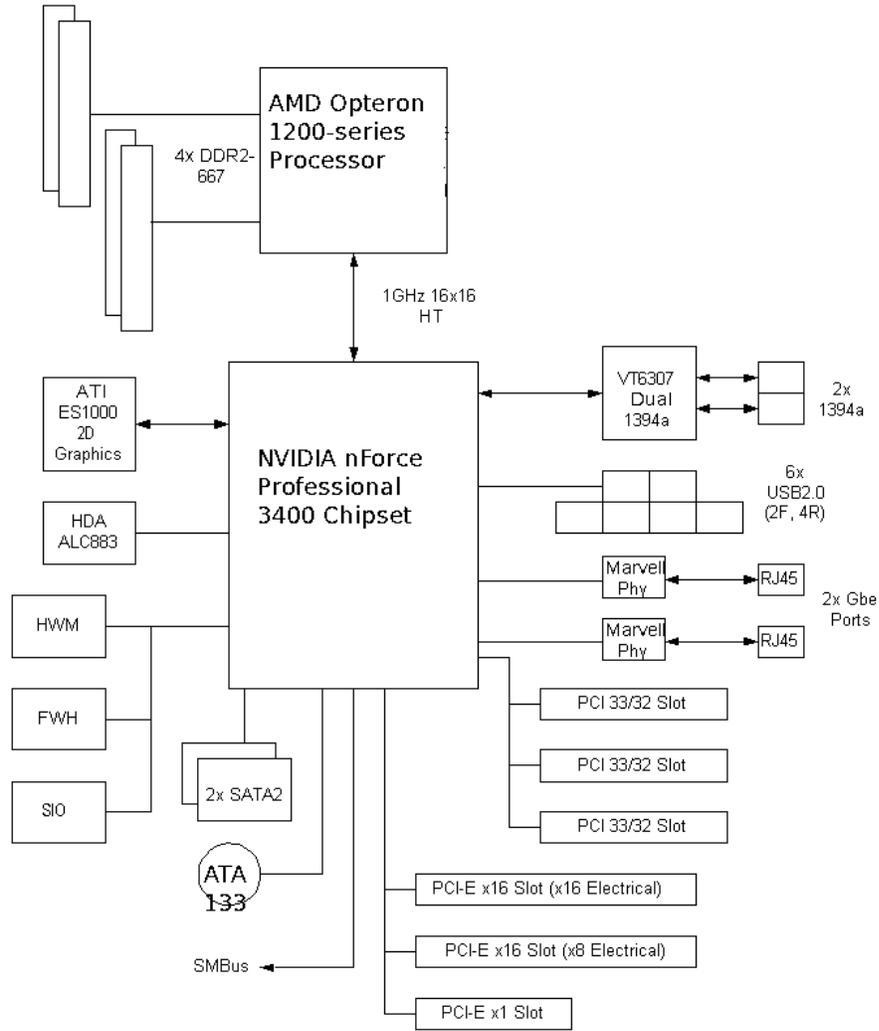


Figure 3 – Block Diagram of the Sun Ultra 20 M2 Workstation

The AMD Opteron 1200-series Processor

The Sun Ultra 20 M2 Workstation is powered by the dual-core AMD Opteron 1200-series Processor. This processor, enabling simultaneous 32- and 64-bit computing, is designed to run existing 32-bit applications with outstanding performance and offers customers a simplified migration path to 64-bit computing. Furthermore, this processor provides a dramatic leap forward in compatibility, performance, investment protection, and reduced total cost of ownership (TCO).

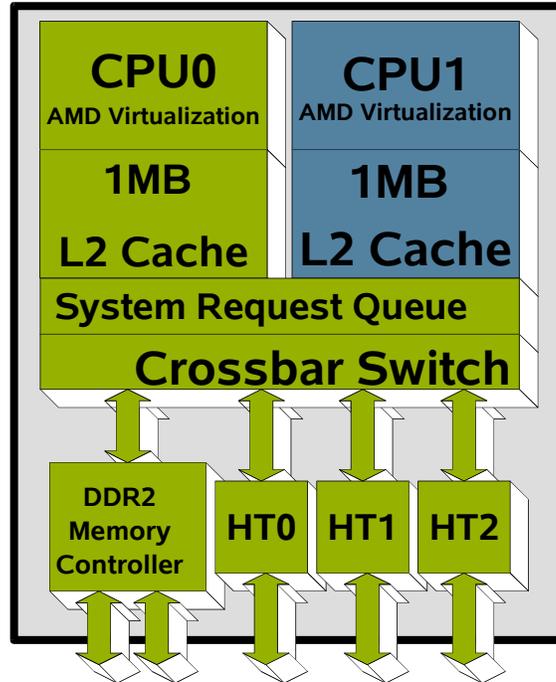


Figure 4 – Block Diagram of the AMD Opteron 1200-series Processor

As shown in Figure 4, the AMD Opteron 1200-series Processor has three key features:

- **Integrated 128-bit DDR2 Memory Controller:** The integration of the memory controller near the processor core, instead of traditional north bridge, significantly increases application performance by dramatically reducing memory latency.
- **Two AMD64 Cores:** The AMD64 core enables simultaneous 32- and 64-bit computing and eliminates the 4GB memory barrier imposed by 32-bit only systems.
- **HyperTransport™ Technology:** The AMD Opteron 1200-series processor has one HyperTransport link. HyperTransport directly connects CPUs enabling scalability and provides up to 8GB/s peak bandwidth – reducing I/O bottlenecks.

Table 4 shows the key features and benefits of the AMD Opteron 1200-series Processor. For more details, including block diagrams and specifications, please visit www.amd.com.

Table 4 - Features and Benefits of the AMD Opteron 1200-series Processor

Feature	Benefit
AMD64 Dual-Core Technology directly connects two processor cores to a single die for reduced latencies between processors	Improves system efficiency and application performance for computers running multiple applications at the same time or compute-intensive multi-threaded applications.
Simultaneous 32-bit and 64-bit computing capabilities.	Allows users to run 32-bit and/or 64-bit applications and operating systems without sacrificing performance.
One HyperTransport link, with up to 8GB/s peak bandwidth.	Provides substantial I/O bandwidth for current and future application needs.
256 Terabytes of memory address space.	Creates a significant performance benefit for applications in which large (or multiple) datasets are held in memory.
Integrated 128-bit DDR2 memory controller.	Yields fast computational processing for increased performance and productivity.

The NVIDIA nForce Professional 3400 Chipset

The Sun Ultra 20 M2 Workstation uses the high-performance NVIDIA nForce Professional 3400 chipset to complement the AMD Opteron 1200-series Processor. The NVIDIA nForce Professional 3400 chipset offers a highly-integrated single-chip design for high performance and reliability. Additionally, it provides a comprehensive suite of connectivity and I/O suitable for workstations.

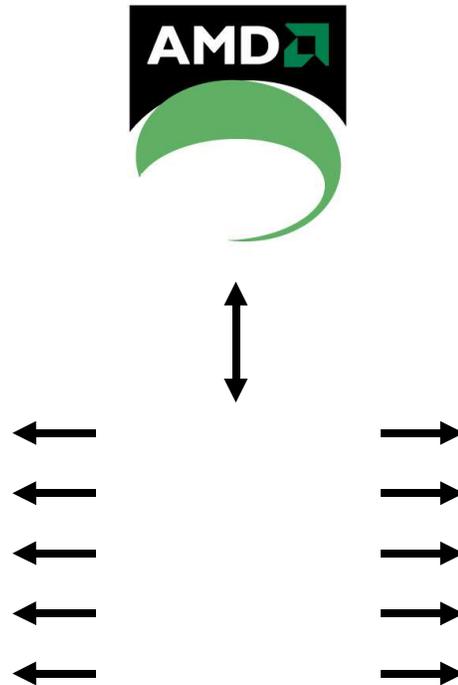


Figure 5 – Block diagram of the NVIDIA nForce Professional 3400 Chipset

As shown in Figure 5, the NVIDIA nForce Professional 3400 chipset provides the following bridging interfaces and features:

- PCI Express interfaces to graphics accelerators and expansion boards
- HyperTransport™ interface to the AMD Opteron 1200-series Processor
- Two 10/100/1000BASE-T Ethernet interfaces
- SATA 3Gb/s with RAID 0 and RAID 1 (on Windows XP Professional)
- EIDE Controller, supporting up to ATA-133
- 7.1 channel High Definition Audio
- USB 2.0
- I/O buses: 32-bit/33Mhz PCI, LPC, and SMBus

Table 5 shows the key features and benefits of the NVIDIA nForce Professional 3400 chipset. For more details, including block diagrams and specifications, please visit www.nvidia.com

Table 5- Features and Benefits of the NVIDIA nForce Professional 3400 chipset

Feature	Benefit
HyperTransport	HyperTransport is a state-of-the-art I/O bus interface—up to 8.0GB/s—between the NVIDIA nForce Professional 3400 and the AMD Opteron Processor. NVIDIA's fifth-generation HyperTransport design integrates tightly with the AMD Opteron™ Direct Connect Architecture to deliver leading-edge 32-bit and 64-bit performance.
PCI Express	Architected to support PCI Express, the NVIDIA nForce Professional 3400 chipset offers the highest number of PCI-Express lanes in the industry.
Single-chip architecture	Revolutionary single-chip architecture enables higher-quality, full-featured motherboards and delivers maximum performance with the lowest latency. The single-chip design also means less power consumption and less heat dissipation.

Expansion Slots

Sun Ultra 20 M2 Workstation has six (6) expansion slots, the most of any workstations in its class:

- One PCI Express x16 slot
- One PCI Express x16 slot wired as x8
- One PCI Express x1 slot
- Three 5V, 32-bit/33-MHz PCI card slots

The PCI Express x16 slots are intended for graphics accelerators but can be used for any qualified PCI Express expansion cards with x16, x8, x4 or x1 connector. The Sun Ultra 20 M2 Workstation can be configured for sale without a graphics accelerator installed. If a graphics accelerator is not installed into one of the PCI Express x16 slot of Sun Ultra 20 M2 Workstation, the on-board ATI ES1000 graphics controller will serve as the graphics controller. When one or two graphics accelerators are installed, the ES1000 graphics controller becomes inactive. The remaining slots, one PCI-Express x1 slot and three 32-bit/33-MHz PCI slots can be used for optional cards such as Gigabit NICs, SAS adapters, others. Table 6 explains the layout of the expansion slots.

Table 6 - Sun Ultra 20 M2 Workstation Expansion Slot Layout

Slot #	Slot Type	Full Length?	Maximum Power	Description
1	PCI Express x16	Yes	80W	Located nearest power supply. For graphics accelerator card or any PCI-Express cards up to 80W
2	PCI Express x1	Yes	25W	Not intended for graphics accelerator cards. Intended for PCI Express I/O cards (NICs, SAS)
3	PCI Express x16 <u>wired as x8</u>	Yes	30W	<u>This slot does not support the FX 3500, FX 1500, FX 560, or NVS 285</u> In Q1CY07, this slot will be upgraded to support the FX 560 or NVS285, only This slot supports any non-graphics PCI-Express cards up to 30W
4	5V, 32-bit/33-MHz PCI	Yes (up to 13.4-inch)	25W	5V, 32-bit/33-MHz PCI cards only Do not install 64-bit PCI cards. Do not install PCI-X cards
5	5V, 32-bit/33-MHz PCI	Yes (up to 13.4-inch)	25W	Can accept 5V 32-bit/33-MHz PCI cards Can accept 64-bit PCI cards Do not install PCI-X cards
6	5V, 32-bit/33-MHz PCI	Yes (up to 13.4-inch)	25W	Located farthest from power supply.. Can accept 5V 32-bit/33-MHz cards Can accept 64-bit PCI cards Do not install PCI-X cards

Sun Ultra 20 M2 Workstation has six expansion slots, one less expansion slot than the Sun Ultra 20 Workstation. However, customers of Sun Ultra 20 M2 Workstation gain one additional PCI Express x16 slot wired as x8 to allow the addition of a second graphics accelerator (available in Q1CY07), something the Sun Ultra 20 Workstation cannot do. Table 7 compares the slot assignment of Sun Ultra 20 M2 Workstation versus the Sun Ultra 20 Workstation.

Table 7 – Slot Assignment Comparison of Sun Ultra 20 M2 Workstation versus Sun Ultra 20 Workstation

Slot	Sun Ultra 20 M2 Workstation	Sun Ultra 20 Workstation
1	PCI Express x16 card slot	PCI Express x16 card slot
2	PCI Express x1 card slot	PCI Express x1 card slot
3	PCI Express x16 card slot <u>wired as x8</u>	PCI Express x1 card slot
4	5V, 32-bit/33-MHz PCI card slot	5V, 32-bit/33-MHz PCI card slot
5	5V, 32-bit/33-MHz PCI card slot	5V, 32-bit/33-MHz PCI card slot
6	5V, 32-bit/33-MHz PCI card slot	5V, 32-bit/33-MHz PCI card slot
7	Does not exist	5V, 32-bit/33-MHz PCI card slot

NOTE: Slot #3 has a physical PCI Express x16 slot, but it has been wired as x8 and supports up to 30 watts. Please do not install into Slot #3 of Sun Ultra 20 M2 Workstation, the NVIDIA Quadro FX 3500, FX 1500, FX 560, or NVS 285 Graphics Accelerator card. In Q1CY07, this slot will be upgraded to support the NVIDIA Quadro FX 560 Graphics Accelerator and the NVIDIA Quadro NVS 285 Graphics Accelerator. At this time, the NVIDIA Quadro FX 560 or NVS 285 may be used simultaneously with a graphics accelerator card in Slot #1 to drive up to four displays. Note that Slot #3 will never support the NVIDIA Quadro FX 3500 Graphics Accelerator card, nor the NVIDIA Quadro FX 1500 Graphics Accelerator card.

Memory

The AMD Opteron 1200-series Processor integrated a DDR2 memory controller and improves the way typical x64 processors access main memory, resulting in increased bandwidth, reduced memory latencies, and increased processor performance. The dual-channel integrated DDR2 memory controller is capable of yielding a memory bandwidth of 10GB/s and supports up to four unbuffered DDR2-667 DIMMs. The Sun Ultra 20 M2 Workstation can reach up to a maximum of 8GB using its 4 DIMM slots. Sun Ultra 20 M2 Workstation supports a 4GB Memory Kit (2x 2GB ECC DIMMs), a 2GB Memory Kit (2x 1GB ECC DIMMs), and a 1GB Memory Kit (2x 512MB ECC DIMMs). Each memory kit contains two identical DIMMs from the same supplier. Both DIMMs must be installed to ensure proper electrical matching and to deliver full dual-channel of memory bandwidth. DIMMs are not available for sale in a quantity of one. The entry configuration of Sun Ultra 20 M2 Workstation makes an exception to this rule. This configuration has one 512MB DIMM and thus does not benefit from the full dual-channel memory bandwidth as other configurations. Table 8 explains the memory upgrade paths for the Sun Ultra 20 M2 Workstation:

Table 8 – Memory Upgrade Paths for Sun Ultra 20 M2 Workstation

From	To	Actions	Remaining DIMM Sockets
Sun Ultra 20 M2 Workstation w/ 512MB (1x 512MB DIMM)	1GB	<ul style="list-style-type: none"> Remove existing single 512MB DIMM Install one 1GB (2x 512MB) Memory Kit 	<ul style="list-style-type: none"> Two
	2GB	<ul style="list-style-type: none"> Remove existing single 512MB DIMM Install one 2GB (2x 1GB) Memory Kit or install two 1GB (2x 512MB) Memory Kits 	<ul style="list-style-type: none"> Zero DIMM sockets remaining if installing two 1GB (2x 512MB) Memory Kits Two DIMM sockets remaining if installing one 2GB (2x 1GB) Memory Kits
	3GB	<ul style="list-style-type: none"> Remove existing single 512MB DIMM Install one 2GB (2x 1GB) Memory Kit and install one 1GB (2x 512MB) Memory Kit 	<ul style="list-style-type: none"> Zero
	4GB	<ul style="list-style-type: none"> Remove existing single 512MB DIMM Install two 2GB (2x 1GB) Memory Kits 	<ul style="list-style-type: none"> Zero
	5GB	<ul style="list-style-type: none"> Install one 4GB (2x 2GB) Memory Kit and install one 1GB (2x 512MB) Memory Kit 	<ul style="list-style-type: none"> Zero
	6GB	<ul style="list-style-type: none"> Install one 4GB (2x 2GB) Memory Kit and install one 2GB (2x 1GB) Memory Kit 	<ul style="list-style-type: none"> Zero
	8GB	<ul style="list-style-type: none"> Install two Sun 4GB (2x 2GB) Memory Kits 	<ul style="list-style-type: none"> Zero
	Sun Ultra 20 M2 Workstation w/ 1GB (2x 512MB DIMMs)	2GB	<ul style="list-style-type: none"> Leave in existing two 512MB DIMMs Install one Sun 1GB (2x 512MB) Memory Kit
3GB		<ul style="list-style-type: none"> Leave in existing two 512MB DIMMs Install one Sun 2GB (2x 1GB) Memory Kit 	<ul style="list-style-type: none"> Zero
4GB		<ul style="list-style-type: none"> Remove existing two 512MB DIMMs Install one Sun 4GB (2x 2GB) Memory Kit or two Sun 2GB (2x 1GB) Memory Kits 	<ul style="list-style-type: none"> Zero DIMM sockets remaining if installing two Sun 2GB (2x 1GB) Memory Kits Two DIMM sockets remaining if installing one Sun 4GB (2x 2GB) Memory Kits
5GB		<ul style="list-style-type: none"> Leave in existing two 512MB DIMMs Install one Sun 4GB (2x 2GB) Memory Kit 	<ul style="list-style-type: none"> Zero
6GB		<ul style="list-style-type: none"> Remove existing two 512MB DIMMs Install one Sun 4GB (2x 2GB) Memory Kit and install one Sun 2GB (2x 1GB) Memory Kit 	<ul style="list-style-type: none"> Zero
8GB		<ul style="list-style-type: none"> Remove existing two 512MB DIMMs Install two Sun 4GB (2x 2GB) Memory Kits 	<ul style="list-style-type: none"> Zero
Sun Ultra 20 M2 Workstation w/ 2GB (2x 1GB DIMMs)		3GB	<ul style="list-style-type: none"> Leave in existing two 1GB DIMMs Install one Sun 1GB (2x 512MB) Memory Kit
	4GB	<ul style="list-style-type: none"> Leave in existing two 1GB DIMMs Install one Sun 2GB (2x 1GB) Memory Kit 	<ul style="list-style-type: none"> Zero
	5GB	<ul style="list-style-type: none"> Not possible 	<ul style="list-style-type: none"> Not applicable
	6GB	<ul style="list-style-type: none"> Leave in existing two 1GB DIMMs Install one Sun 4GB (2x 2GB) Memory Kit 	<ul style="list-style-type: none"> Zero
	8GB	<ul style="list-style-type: none"> Remove existing two 512MB DIMMs Install two Sun 4GB (2x 2GB) Memory Kits 	<ul style="list-style-type: none"> Zero

Expansion Bays

The Sun Ultra 20 M2 Workstation has one external drive bay and two internal drive bays (same as the Sun Ultra 20 Workstation). The external bay is always occupied by either the DVD Dual drive or the DVD-ROM drive. The internal drive bays are reserved for hard disk drives only. Table 9 describes the different expansion bays.

Table 9 - Sun Ultra 20 M2 Workstation Expansion Bays

Bay	Type	Size	Description
1	External	5.25-inch half-height	Occupied by DVD-Dual or DVD-ROM
2	Internal	3.5-inch half-height	Occupied by 80GB, 250GB, or 500GB SATA hard disk drive or 146GB SAS hard disk drive (available in Q1CY07)
3	Internal	3.5-inch half-height	Occupied by 80GB, 250GB, or 500GB SATA hard disk drive or 146GB SAS hard disk drive (available in Q1CY07)

Hard Disk Drives (HDDs)

3.0GBps Serial ATA is the primary method of storage for the Sun Ultra 20 M2 Workstation. The Sun Ultra 20 M2 Workstation is available in standard configurations with one SATA drive and has the option to add one more SATA drive for a maximum of two drives. The Sun Ultra 20 M2 Workstation will be available with SATA RAID 0 and RAID 1 at General Availability for Windows XP Professional and Windows XP Professional x64 only. Parallel SCSI hard disk drives are not available.

The Sun Ultra 20 M2 Workstation will support Serial Attached SCSI (SAS) in Q1CY07. Customers may obtain SAS by ordering an internal SAS adapter (Part Number 4219A) and a SAS 146GB 15,000-rpm hard disk drive (Part Number x RA-SS1CA-14G15K). The Sun Ultra 20 M2 Workstation supports up to two SAS 146GB 15,000-rpm hard disk drives.

Note that the Sun Ultra 20 M2 Workstation is available for sale without HDD installed for diskless environments.

Optical Disk Drives (ODDs)

The Sun Ultra 20 M2 Workstation offers two types of optical drives, DVD-ROM (plays DVD/CD only, does not record) and the DVD-Dual (records DVD in +/- format, on both layers). Sun Ultra 20 M2 Workstation does not support CD-ROM, CD-RW, or DVD-ROM/CD-RW drives. The Sun Ultra 20 M2 Workstation employs the familiar tray-loading mechanism from the Sun Ultra 20 Workstation.

Table 10 – Specifications of Sun Ultra 20 M2 Workstation's Optical Disk Drives

Format	DVD-Dual (records in +/- format, on both layers)	DVD-ROM (plays DVD only, does not record)
DVD-ROM Read	16x	16x
DVD+R Write	16x	Not available
DVD-R Write	16x	Not available
DVD-RW Write	6x	Not available
CD-R Write	48x	48x
CD-RW Write	24x	Not available

Connectivity

The Sun Ultra 20 M2 Workstation shares the same chassis as the Sun Ultra 20 Workstation. Therefore, the locations and quantity of the external drive bays and key I/O ports remain largely unchanged. The Sun Ultra 20 M2 Workstation builds upon the rich suite of connectivity ports of the Sun Ultra 20 Workstation by adding a second gigabit Ethernet port. Key I/O ports and visual indicators remain conveniently located in the front of the chassis. Figure 6 shows the front I/O ports of the Sun Ultra 20 M2 Workstation. The tray-loading DVD-ROM or the DVD-Dual always occupies the external drive bay. The LED shows the activity of the system and blinks when the system is in sleep mode (it does not have any error indication capability). The LED in the front panel provides only limited information—PC Check diagnostic utility software (included with the Sun Ultra 20 M2 Workstation) should be used to gain detailed information about the system. Rounding out the front panel, the Sun Ultra 20 M2 Workstation provides convenient attachment to external portable hard drives or video cameras via two USB 2.0 connectors and two IEEE 1394a (FireWire) connector. Additionally, an input for a microphone (pink) and an output for headphone (green) are also included. The remaining complementary connectors are provided in the rear panel.



Figure 6 – Front I/O Ports of Sun Ultra 20 M2 Workstation



Figure 7 – Rear View of Sun Ultra 20 M2 Workstation

Figure 7 shows the rear view of the Sun Ultra 20 M2 Workstation. It contains the remaining USB ports and the audio ports introduced earlier. Starting from the top of the chassis, the Sun Ultra 20 M2 Workstation provides the VGA connector for the on-board ATI ES1000 graphics controller, followed by the remaining audio connectors: line in (blue), line out (green), microphone in (pink). Next, two RJ-45 ports are stacked above two USB 2.0 ports and the final USB 2.0 ports. Table 11 summarizes the I/O port locations of the Sun Ultra 20 M2 Workstation.

Table 11 – Summary of I/O Port Locations of Sun Ultra 20 M2 Workstation

Port Type	Front	Back
USB 2.0	2	4
1394a	2	0
Gigabit Ethernet	0	2
Audio	2	3
Parallel	0	0
Serial	0 (1 serial port available via header on motherboard)	0

NOTE: The Sun Ultra 20 M2 Workstation does not have an external serial port. Customers may “bring out” the serial port by attaching a 10-pin-to-DB9 ribbon serial cable to a 10-pin header located on the motherboard. Figure 8 shows an example of this cable.



Figure 8 – 10-pin-to-DB9 ribbon serial cable

Graphics Accelerators

Customers of the Sun Ultra 20 M2 Workstation gain a selection of four workstation-class graphics accelerator cards, ranging from professional 2D, suitable for SW Development or Education to high-end professional 3D, suitable for professional MCAD and Scientific Visualization applications. Additionally, a cost effective solution for fundamental analog 2D graphics (ATI ES1000 graphics controller) has been mounted directly on the motherboard, thus minimizing the need to add a graphics accelerator card and freeing up a valuable PCI-Express slot. The on-board ATI ES1000 graphics controller will become inactive when a graphics accelerator board is installed. Table 12 shows the graphics options for the Sun Ultra 20 M2 Workstation.

Table 12 – Graphics Options for Sun Ultra 20 M2 Workstation

	NVIDIA Quadro FX 3500	NVIDIA Quadro FX 1500	NVIDIA Quadro FX 560	NVIDIA Quadro NVS 285	ATI ES1000
Form Factor	Card	Card	Card	Card	Chip mounted on motherboard
Memory	256MB	256MB	128MB	128MB	16MB
Bus Type	PCI Express x16	PCI Express x16	PCI Express x16	PCI Express x16	Conventional PCI (32-bit/33-MHz)
Display Connector(s)	Dual Link DVI-I Dual Link DVI-I 3-pin mini-DIN stereo-out connector	Dual Link DVI-I Dual Link DVI-I 3-pin mini-DIN stereo-out connector	Dual Link DVI-I Single Link DVI-I 7-pin mini-DIN HDTV-out connector	59-pin DMS-59 connector & DMS-59 connector-to-DVI cable	DB15 VGA (analog)
Number of Cards per Sun Ultra 20 M2 Workstation	One	One	One (Up to two in Q1CY07)	One (Up to two in Q1CY07)	Not Applicable (Not a card)
Maximum Resolution (Digital)	3840 x 2400 at 24Hz	3840 x 2400 at 24Hz	3840 x 2400 at 24 Hz	1920 x 1200	Not Applicable
Maximum Resolution (Analog)	2048 x 1536 at 75Hz	2048 x 1536 at 75Hz	Unknown	2048 x 1536 at 75Hz	1280 x 1024 at 85Hz
Sun Display Support	24.1-inch LCD 20-inch LCD 19-inch LCD 17-inch CRT	24.1-inch LCD 20-inch LCD 19-inch LCD 17-inch CRT	24.1-inch LCD 20-inch LCD 19-inch LCD 17-inch CRT	24.1-inch LCD 20-inch LCD 19-inch LCD 17-inch CRT	24.1-inch LCD 20-inch LCD 19-inch LCD 17-inch CRT

There are PCI-Express graphics accelerator boards with a x1 connector available. However, these graphics accelerator boards provided only 2D console graphics suitable, for servers or entry-level 2D suitable for SW development or Education. Virtually all high-performance PCI Express graphics accelerators chose a PCI Express x16 connector to gain the full bandwidth intended by PCI Express. The Sun Ultra 20 M2 Workstation supports only PCI Express x16 graphics accelerator boards and has validated only the ones listed in Table 16.

The Sun Ultra 20 M2 Workstation provides two PCI Express x16 physical slots (Slot #1 is wired as x16. Slot #3 is wired as x8). Each slot can accept a PCI Express x16 card shown in Table 13. "Slot #1" (located nearest to the power supply) delivers full PCI Express x16 bandwidth (8GB/s), and thus can accept any graphics accelerators listed in Table 13. "Slot #3" (located two slots away from Slot #1) delivers PCI Express x8 bandwidth (4GB/s), and thus can accept only the NVIDIA Quadro FX 560 Graphics Accelerator card or the NVIDIA Quadro NVS 285 Graphics Accelerator card, starting in Q1CY07. **Please do not install the NVIDIA Quadro FX 3500 or NVIDIA Quadro FX 1500 into Slot #3.**

Table 13 – Sun Ultra 20 M2 Workstation Slot Limitation According to Graphics Accelerator

	NVIDIA Quadro FX 3500	NVIDIA Quadro FX 1500	NVIDIA Quadro FX 560	NVIDIA Quadro NVS 285	ATI ES1000
Slot 1	Yes	Yes	Yes	Yes	Not a card
Slot 3	No	No	Yes (starting Q1CY07)	Yes (starting Q1CY07)	Not a card

NVIDIA Quadro FX 3500 Graphics Accelerator Card

The NVIDIA® Quadro® FX 3500 Graphics Accelerator card provides to customers the highest-performance workstation graphics solution in the high-end workstation segment for professional MCAD and Scientific Visualization applications. It contains performance features such as full 128-bit floating point pipeline, 8 pixel-per-clock rendering engine, hardware accelerated lines, planes, and lighting. It contains programmability features such as vertex processing, pixel shading, and full support for Microsoft Shader Model 3.0. It supports Microsoft DirectX 9.0c (and earlier) and OpenGL 1.5 (and earlier) to ensure full compatibility.



Figure 9 – Connectors of NVIDIA Quadro FX 3500 Graphics Accelerator Card



Figure 10– Board Layout of NVIDIA Quadro FX3500 Graphics Accelerator Card

Each NVIDIA Quadro FX 3500 Graphics Accelerator card can drive two LCDs in digital mode at resolution up to 3840 x 2400 at 24Hz, via its two DVI-I output connectors. Each NVIDIA Quadro FX 3500 Graphics Accelerator card also can drive two LCDs in analog mode or two CRTs, via the optional DVI-to-VGA adapter (Sun Part Number X8015A), at resolutions up to 2048 x 1536 at 75Hz. The NVIDIA Quadro FX 3500 Graphics Accelerator card supports stereoscopic video output through a 3-pin DIN connector to carry sync signal to stereo shutter glasses devices. Only one NVIDIA® Quadro® FX 3500 Graphics Accelerator card may be installed in Sun Ultra 20 M2 Workstation and it must only be installed in Slot #1 (nearest power supply). Table 14 summarizes key specifications and features of the NVIDIA Quadro FX 3500 Graphics Accelerator card.

Table 14 – Summary of NVIDIA Quadro FX 3500 Graphics Accelerator Card Features and Specifications

Form Factor	PCI-Express x16 Full Height (7.8 inches x 4.376 inches)
Memory	256MB of GDDR3 SDRAM (256-bit interface)
Clock Rates	• Memory Clock = 600MHz. Graphics Clock = 450MHz
Connectors	<ul style="list-style-type: none"> • Dual Link DVI-I (digital) • Dual Link DVI-I (digital) • 3-pin mini-DIN stereo connector
Display Support	<ul style="list-style-type: none"> • Dual Link DVI-I output: Drives a digital display at resolutions up to 3840 x 2400 at 24Hz • Analog display output: Drives an analog display at resolutions up to 2048 x 1536 at 75Hz • Dual internal 400MHz RAMDAC
Power Dissipation	80W
Available Drivers	Solaris 10 6/06 (Update 2) or later Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9 (64-bit only)– Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Notes	Install in Slot #1only. Never install in Slot #3.

NVIDIA Quadro FX 1500 Graphics Accelerator Card

The NVIDIA® Quadro® FX 1500 Graphics Accelerator card provides to customers the highest-performance mid-range workstation graphics solution for professional MCAD. It contains performance feature such as full 128-bit floating point pipeline, 8 pixel-per-clock rendering engine, hardware accelerated lines, planes, and lighting. It contains programmability features such as vertex processing, pixel shading, and full support for Microsoft Shader Model 3.0. It supports Microsoft DirectX 9.0c (and earlier) and OpenGL 1.5 (and earlier) to ensure full compatibility.



Figure 11 – NVIDIA Quadro FX 1500 Graphics Accelerator Card



Figure 12 – Board Layout of NVIDIA Quadro FX 1500 Graphics Accelerator Card

Each NVIDIA Quadro FX 1500 Graphics Accelerator card can drive two LCDs in digital mode at resolution up to 3840 x 2400 at 24Hz, via its two DVI-I output connectors. Each NVIDIA Quadro FX1500 Graphics Accelerator card also can drive two LCDs in analog mode or two CRTs, via the optional DVI-to-VGA adapter (Sun Part Number X8015A), at resolutions up to 2048 x 1536 at 75Hz. The NVIDIA Quadro FX 1500 Graphics Accelerator card supports stereoscopic video output through a 3-pin DIN connector to carry sync signal to stereo shutter glasses devices. Only one NVIDIA® Quadro FX 1500 Graphics Accelerator card may be installed in Sun Ultra 20 M2 Workstation and must only be installed in Slot #1 (nearest power supply). Table 15 summarizes key specifications and features of the NVIDIA Quadro FX 1500 Graphics Accelerator card.

Table 15 – Summary of NVIDIA Quadro FX 1500 Graphics Accelerator Card Features and Specifications

Form Factor	PCI-Express x16 Full Height (7.8 inches x 4.376 inches)
Memory	256MB of GDDR3 SDRAM (256-bit interface)
Clock Rates	<ul style="list-style-type: none"> Memory Clock = 625MHz. Graphics Clock = 325MHz
Connectors	<ul style="list-style-type: none"> Dual Link DVI-I (digital) Dual Link DVI-I (digital) 7-pin mini-DIN HDTV-out connector
Display Support	<ul style="list-style-type: none"> Dual Link DVI-I output: Drives a digital display at resolutions up to 3840 x 2400 at 24Hz Analog display output: Drives an analog display at resolutions up to 2048 x 1536 at 75Hz Dual internal 400MHz RAMDAC
Power Dissipation	65W per board
Drivers Available	Solaris 10 6/06 (Update 2) or later Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9 (64-bit only) – Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Notes	Install in Slot #1only. Never install in Slot #3.

NVIDIA Quadro FX 560 Graphics Accelerator Card

The NVIDIA® Quadro® FX 560 Graphics Accelerator card provides to customers an entry-level 3D workstation graphics solution for professional MCAD and EDA applications. Unlike the NVIDIA Quadro FX 3500 Graphics Accelerator card and the NVIDIA Quadro FX 1500 Graphics Accelerator card, up to two NVIDIA® Quadro® FX560 Graphics Accelerator cards can be installed in Sun Ultra 20 M2 Workstation simultaneously (in Slot #1 and Slot #3), to drive a maximum of four displays. This feature will be available in Q1CY07. At the introduction of Sun Ultra 20 M2 Workstation in August 2006, only one NVIDIA Quadro FX 560 Graphics Accelerator may be installed in Sun Ultra 20 M2 Workstation (Slot #1 only).



Figure 13 – Connector of the NVIDIA Quadro FX 560 Graphics Accelerator Card



Figure 14 – Board Layout of the NVIDIA Quadro FX 560 Graphics Accelerator Card

Each NVIDIA Quadro FX 560 Graphics Accelerator can drive up to two LCDs in analog mode, one at resolutions up to 3840 x 2400 at 24 Hz and another at resolution up to 1920 x 1200 at 60Hz. Each NVIDIA Quadro FX 560 Graphics Accelerator card can also drive two LCDs, in analog mode, or two analog CRTs via an optional DVI-to-VGA adapter (Sun Part Number X8015A). Table 16 summarizes key specifications and features of the NVIDIA Quadro FX 560 Graphics Accelerator card.

Table 16 – Summary of NVIDIA Quadro FX 560 Graphics Accelerator Card Features and Specifications

Form Factor	PCI-Express x16 Full Height (4.376 inches by 6.8 inches)
Memory	128MB of GDDR3 SDRAM (256-bit interface)
Clock Rates	<ul style="list-style-type: none"> Memory Clock = 600MHz. Graphics Clock = 350MHz
Graphics clock	<ul style="list-style-type: none"> 350MHz
Connectors	<ul style="list-style-type: none"> Primary connector: Dual-link DVI-I (digital) Secondary connector: Single-Link DVI-I (digital) 7-pin mini-DIN HDTV-out connector
Display Support	<ul style="list-style-type: none"> Dual Link DVI-I output <ul style="list-style-type: none"> Drives a digital display at resolution up to 3840 x 2400 at 24 Hz. Maximum resolution over digital port: 1920 x 1200 x 32 bpp at 60Hz with reduced blanking in single link Single Link DVI-I output <ul style="list-style-type: none"> Maximum resolution over digital ports: 1920 x 1200 x 32 bpp at 60Hz with reduced blanking Dual internal 400 MHz RAMDAC
Power Dissipation	30 W per board
Available Drivers	Solaris 10 6/06 (Update 2) or later Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9 (64-bit only)– Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Notes	Install in Slot #1 only. OK to install in Slot #3 after Q1CY07.

NVIDIA Quadro NVS 285 Graphics Accelerator Card

The NVIDIA® Quadro® NVS 285 Graphics Accelerator card provides to customers the highest-quality professional 2D workstation graphics solution for SW Development or EDA applications. Unlike the NVIDIA Quadro FX 3500 Graphics Accelerator card and the NVIDIA Quadro FX 1500 Graphics Accelerator card, up to two NVIDIA® Quadro NVS 285 Graphics accelerator cards can be installed in Sun Ultra 20 M2 Workstation simultaneously (Slot #1 and Slot #3), to drive a maximum of four displays. This feature will be available in Q1CY07. At the introduction of Sun Ultra 20 M2 Workstation in August 2006, only one NVIDIA Quadro NVS 285 Graphics Accelerator Card can be installed in Sun Ultra 20 M2 Workstation (Slot #1 only).



Figure 15 – DMS59-to-DVI Cable



Figure 16 – Connector of NVIDIA Quadro NVS 285 Graphics Accelerator Card



Figure 17 –Board Layout of NVIDIA Quadro NVS 285 Graphics Accelerator Card

The NVIDIA Quadro NVS 285 Graphics Accelerator Card can drive up to two LCDs in digital mode at resolutions up to 1920 x 1200. Each NVIDIA Quadro NVS 295 Graphics Accelerator card also can drive up to two LCDs, in analog mode, or up to two CRTs via an optional DVI-to-VGA adapter (Sun Part Number X8015A). Table 17 summarizes key specifications and features of the NVIDIA Quadro NVS 285 Graphics Accelerator.

Table 17 – Summary of NVIDIA Quadro NVS 285 Graphics Accelerator Card Features and Specifications

Form Factor	PCI-Express x16 - Low profile PCB with full height connector (2.731 inches x 6.6 inches)
Memory	128MB of DDR2 SDRAM (64-bit interface) Solaris 10 6/06 (Update 2) Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9(32-bit & 64-bit)– Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Memory Clock	• 300MHz
Graphics clock	• 275MHz
Connector	• 59-pin DMS-59 connector & DMS-59 connector-to-DVI cable
Display Support	• Drives a digital display at resolutions up to 1920 x 1200 • Drives an analog display at resolutions up to 2048 x 1536 at 75Hz Dual internal 350MHz RAMDAC
Power Dissipation	18 W per board
Drivers Available	Solaris 10 6/06 (Update 2) or later Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9 (64-bit only)– Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later
Notes	Install in Slot #1 only as of now. In Q1CY07, also OK to install in Slot #3. Natively, the NVIDIA Quadro NVS 285 has one high-density DMS59 connector. The DMS59 connector will not physically fit any display on the market, digital or analog. The DMS59 connector was chosen due to space constraints on the NVS285. A DMS59-to-DVI cable is always included with the NVIDIA Quadro NVS285 Graphics Accelerator to allow it to interface digital LCDs.

ATI ES1000 Graphics Controller



Figure 18 – DB15 VGA Connector on Sun Ultra 20 M2 Workstation



Figure 19 – ATI ES1000 Graphics Controller (Mounted on Motherboard)

The ATI® ES1000 graphics controller is not a graphics accelerator card. Mounted directly on the motherboard, the ATI ES1000 graphics controller provides to customers a cost effective solution for applications with fundamental 2D graphics functionality suitable for SW Development or Education, while freeing up a valuable PCI-Express slot. The ATI ES1000 graphics controller has its own 16MB of DDR memory to display a maximum resolution of 1280x1024 at 85Hz. The ATI ES1000 graphics controller connects to one CRT or LCD via the VGA connector located in the rear I/O panel of Sun Ultra 20 M2 Workstation (Figure 18). When one or more graphics accelerator cards are installed, the ATI ES100 graphics controller will cease its operation and the graphics accelerator card(s) becomes the only interface to the displays. Table 18 summarizes key specifications and features of the on-board ATI® ES1000 Graphics Controller.

Table 18 – Summary of ATI ES1000 Features and Specifications

Form Factor	Chip (mounted directly on motherboard of Sun Ultra 20 M2 Workstation)
Bus Type	Conventional PCI (32-bit/33MHz)
Memory	16MB of DDR SDRAM
Memory Clock	250MHz
Graphics Clock	200MHz
Connector	DB15 VGA
Display Support	Analog display output: Drives an analog display at resolutions up to 1280x1024 at 85Hz Internal 350 MHz MHz RAMDAC
Power Dissipation	2.6W (peak)
Drivers Available	Solaris 10 6/06 (Update 2) and later Red Hat Enterprise Linux WS 3 (32-bit & 64-bit) – Update 7 and later Red Hat Enterprise Linux WS 4 (32-bit & 64-bit) – Update 3 and later SuSE Linux Enterprise Server 9 (64-bit only)– Service Pack 3 and later Windows XP Professional Service Pack 2 and later Windows XP Professional x64 Service Pack 0 and later

Displays

The Sun Ultra 20 M2 Workstation and its graphics accelerators have been fully validated to support the following Sun displays:

Table 19 – Sun Displays Validated on Sun Ultra 20 M2 Workstation

	Sun 24.1 inch LCD	Sun 20.1 inch LCD	Sun 19 inch LCD	Sun 17 inch CRT
				
Part Number	X7203A	X7200A	X7144A	X7201A
Resolution	1920x1200	1600x1200	1280x1024	1280x1024
Pixel Pitch	0.27mm	0.255m	0.294m	0.24m
Contrast Ratio	1000:1	700:1	350:1	Unknown
Brightness	400 cd/m ² (typical)	400 cd/m ² (typical)	230 cd/m ² (typical)	100±10 cd/m ²
Response Time	16ms	16ms	Unknown	Unknown
Viewing Angle	± 89 degrees	± 88 degrees	Unknown	Unknown
Inputs	DVI-D (Digital) HD15 (Analog) YpbPr (component) S-Video C-Video	DVI-D (Digital) HD15 (Analog)	DVI-D (Digital) HD15 (Analog)	HD15 (Analog)
Cables (All cables detachable unless noted)	DVI-D to DVI-D (3-meter) 1.8-meter HD15 to HD15 Component video cable (YPbPr) S-Video cable C-Video cable USB 2.0 cable	DVI-D to DVI-D (1.8-meter) HD15 to HD15 (length unknown)	DVI-D to DVI-D (3-meter) and HD15 to HD15 (2-meter)	Non-detachable HD15 to HD15 (2-meter)
Power	90W	Unknown	46W	90W
W x H x D (mm)	564.6 x 408.3 x 277.1	442 x 408.5 x 120	412.5 x 406.5x 151	420 x 415 x 420
Weight	9.4kg (20.72lbs)	8.4kg (18.5lbs)	8.75kg (19.3lb)	16.3kg (36lbs)
List Price (U.S)	\$1,995	\$995	\$800	\$250

Operating Systems

Interoperability in a heterogeneous environment is important to IT managers. The Sun Ultra 20 M2 Workstation is a 64-bit workstation that offers the widest available range of operating systems support—more than other workstations offered by Sun's competitors. Sun Ultra 20 M2 Workstation supports multiple 32-bit and 64-bit operating systems, including Linux and Solaris. Sun Ultra 20 M2 Workstation will also be listed in the Windows Catalog as being fully certified for the Windows XP Professional and Windows XP Professional x64. Table 20 shows the operating systems supported on Sun Ultra 20 M2 Workstation.

Table 20 - Supported Operating Systems on Sun Ultra 20 M2 Workstation

Operating System	Version	When Supported on Sun Ultra 20 M2 Workstation	Pre-installed Option at the Factory?	Sold by Sun?	Supported by Sun
Solaris 10	6/06 (Update 2) & later	Revenue Release	Yes	Yes	Yes
Linux					
Red Hat Enterprise Linux 3.0 WS 3 (32-bit & 64-bit)	Update 7 & later	Revenue Release	No	Yes	Yes
Red Hat Enterprise Linux 3.0 WS 4 (32-bit & 64-bit)	Update 3 & later	Revenue Release	No	Yes	Yes
SuSE Linux Enterprise Server 9 (64-bit)	Service Pack 3 & later	Revenue Release	No	Yes	Yes
Windows					
Windows XP Professional	Service Pack 2 & later	Revenue Release	No	No	Yes
Windows XP Professional x64	Service Pack 0 & later	Revenue Release	No	No	Yes

All Red Hat Enterprise Linux OS's, SuSE Linux Enterprise Server OS's, and Solaris 10 can be ordered from Sun. Support contracts are also available for these operating systems.

The Sun Ultra 20 M2 Workstation will also be listed in the Windows Catalog as being fully certified for the Windows XP Professional and Windows XP Professional x64. It has earned the "Compatible with Windows" designation as a certified platform to run the Microsoft Windows XP Professional and Windows XP Professional x64 Operating system. Sun Ultra 20 M2 Workstation will be listed on the Microsoft Hardware Compatibility List (HCL) which can be seen by visiting the Microsoft Windows Hardware and Driver Central (WHDC) at <http://www.microsoft.com/whdc/hcl/search.msp>. While qualified to run the Microsoft Windows XP Professional operating systems, these operating systems cannot be procured from Sun. However, Sun does support the Windows XP Professional operating systems.

Availability & Ordering

PRESTO

The Sun Ultra 20 M2 Workstation will be formally and fully disclosed, in the form of an “intro”, to Sun Field Sales and Sun's Partners on August 15, 2006, the PRESTO date. PRESTO is a cross-Sun review prior to launch that is designed to ensure that Sun products are ready for sale: quotable, orderable, and shippable to Sun customers/partners worldwide, including through online vehicles such as the Sun Catalog, Sun Store and European Portals. The EZ Launch ID for the Sun Ultra 20 M2 “intro” is EZLaunch ID #6116. Please read the “intro” for the Sun Ultra 20 M2 Workstation at <http://ezlaunch.central.sun.com:9000/APPROVED/6116SI.html>.

Webdesk

Webdesk provides the capability to quote and order the Sun Ultra 20 M2 Workstation. Inside Webdesk, the user can place an order for the Sun Ultra 20 M2 Workstation in any configuration. Webdesk will be available on August 15, 2006.

Revenue Release

The Sun Ultra 20 M2 Workstation will reach Revenue Release (RR) on August 15, 2006. RR is the term associated with the first product unit shipped for revenue. RR indicates that the Sun Ultra 20 M2 Workstation meets all of its planned and approved functional feature and quality requirements)

General Availability

The Sun Ultra 20 M2 Workstation will reach General Availability (GA) on August 30, 2006. GA refers to the dates when the Sun Ultra 20 M2 Workstation is available in all planned languages and on all planned media types, with standard processes in place to order, build, deliver and bill for any of them on a worldwide basis. (All orders taken and still pending shipment when GA is declared are to be filled on a first priority basis using standard lead times).

End Of Life (EOL)

End of Life (EOL) is the date in which Sun announces the end-of-life schedule for a stated product. The Sun Ultra 20 M2 Workstation will be EOL in Q1CY2008. Last Order Date (LOD) is the last date that Sun can take an order for the stated product. The LOD of the Sun Ultra 20 M2 Workstation will be Q2CY2008. Last Ship Date (LSD) is the last date that Sun will ship stated product. The LOD of the Sun Ultra 20 M2 Workstation will be Q3CY2008.

Factory Lead Time (FLT)

No amount of standard configurations (configurations pre-built in factory) can meet the various workloads and budget intended for customers of Sun Ultra 20 M2 Workstation. Sun strongly advises resellers and direct customers to order via ATO (Assemble to Order) to get exactly what they want. Unlike previous experiences, there are nearly zero lead time penalties for ATO and nearly zero price premiums for ATO, when compared to standard configurations. Table 21 describes the factory lead time of Sun Ultra 20 M2 Workstation.

Table 21 – Factory Lead Time of Sun Ultra 20 M2 Workstation

	Factory Lead Time	Orders Received by Monday 8am PDT will direct ship to customers or arrive at Sun cross-dock by:
ATO Configurations		
US	5 days	Friday
EMEA	5 days	Friday
APAC	7 days	Following Monday
Standard Configurations		
US	4 days	Thursday
EMEA	5 days	Friday
APAC	4 days	Thursday
X-Options		
US	4 days	Friday
EMEA	5 days	Friday
APAC	4 days	Following Monday
Field Replacement Units	7 – 13 days	Following Monday to second Monday

Assemble to Order (ATO)

Table 22 shows the part numbers and descriptions for Sun Ultra 20 M2 Workstation ATO. ATO provides the ultimate flexibility to Sun's customers, at nearly zero price premium and nearly zero added factory lead time. ATO is available only via WebDesk. ATO is not available via store.sun.com. An ATO Sun Ultra 20 M2 Workstation order will be built in Sun's factory according to the content specified by the customer.

Table 22 - Sun Ultra 20 M2 Workstation ATO Options

ATO Part Number	List Price	Discount Category	Description
A88-AA-ROHS	\$420	E	ATO Base for Sun Ultra 20 M2 Workstation (chassis , motherboard, accessory kit)
4214A-Z	\$1095	E	AMD Opteron Processor Model 1220SE (Dual Core 2.8GHz 125W)
5270A-Z	\$995	E	AMD Opteron Processor Model 1218 (Dual Core 2.6GHz 103W)
5271A-Z	\$495	E	AMD Opteron Processor Model 1214 (Dual Core 2.2GHz 103W)
5273A-Z	\$195	E	AMD Opteron Processor Model 1210 (Dual Core 1.8GHz 103W)
5279A-Z	\$1495	E	4GB Unbuffered ECC DDR2-667 Memory Kit (2x 2GB)
5278A-Z	\$495	E	2GB Unbuffered ECC DDR2-667 Memory Kit (2x 1GB)
5277A-Z	\$295	E	1GB Unbuffered ECC DDR2-667 Memory Kit (2x 512MB)
4186A-Z	\$965	E	NVIDIA Quadro FX 3500 Graphics Accelerator Card
4185A-Z	\$545	E	NVIDIA Quadro FX 1500 Graphics Accelerator Card
4184A-Z	\$245	E	NVIDIA Quadro FX 560 Graphics Accelerator Card
4183A-Z	\$145	E	NVIDIA Quadro NVS 285 (128MB DDR2) Graphics Accelerator Card
SG-XPCIE4SAS-Z	TBD	E	LSI Logic 4-port SAS (Serial Attached SCSI) Internal Adapter (Available in Q1CY07)
RB-SS1CE-146G15K	\$995	H	146GB Internal SAS 15,000-RPM 3.5-inch HDD (Available in Q1CY07)
RB-ST1CE-500GB7K	\$699	E	500GB Internal SATA 3Gbps 7,200-RPM 3.5-inch HDD
RB-ST1CE-250GB7K	\$299	E	250GB Internal SATA 3Gbps 7,200 RPM 3.5-inch HDD
RB-ST1CE-80GB7K	\$149	E	80GB Internal SATA 3Gbps 7,200-RPM 3.5-inch HDD
8013A-Z	\$64	E	DVD-Dual (16X DVD+/-RW Drive supports read/write in dual +/- formats. Supports double-layer DVD to hold up to 8.5GB or single-layer DVD to hold up to 4.7GB)
4215A-Z	\$38	E	DVD-ROM (16X DVD-ROM drive reads CD/DVD only. Does not write)
8015A-Z	\$15	E	ATO Option DVI-to-VGA Adapter
8016A-Z	\$0	E	No HDD option
Not available via ATO	\$60	E	Intel Pro/1000 PT Desktop Adapter (PCI-Express x1, 1-port desktop copper NIC – Intel P/N EXP19300PT)
Not available via ATO	\$269	E	Sun PCI-Express x4 Dual Gigabit Ethernet NIC (Copper)
Not available via ATO	\$889	E	Sun PCI-Express x4 Dual Gigabit Ethernet NIC (Fiber)

Standard Configurations

Sun Ultra 20 M2 Workstation has three standard configurations. Table 23 shows the part numbers and descriptions for each standard configuration of Sun Ultra 20 M2 Workstation.

Table 23 - Sun Ultra 20 M2 Workstation Standard Configurations

Part Number	U.S. List Price	Discount Category	Description
A88-GGZ1-AA-2GBGA	\$2,795	E	Sun Ultra 20 M2 Workstation: AMD Opteron Processor Model 1218 (Dual Core 2.6GHz), unbuffered 2GB ECC memory (2x 1GB DIMMs), 250GB SATA 3Gbps HDD, NVIDIA Quadro FX 1500 Graphics Accelerator card, 16x DVD +/- RW Drive
A88-GFZ1-AA-1GBFA	\$1,495	E	Sun Ultra 20 M2 Workstation: AMD Opteron Processor Model 1214 (Dual Core 2.2GHz), unbuffered 1GB ECC memory (2x 512MB DIMMs), 80GB SATA 3Gbps HDD, NVIDIA Quadro FX 560 Graphics Accelerator card, 16x DVD-ROM Drive
A88-GWZ1-AA-512FA	\$995	E	Sun Ultra 20 M2 Workstation: AMD Opteron Processor Model 1210 (Dual Core 1.8GHz), unbuffered 512MB ECC memory (1x 512MB DIMM), 80GB SATA 3Gbps HDD, ATI ES1000 graphics controller mounted on motherboard (no graphics accelerator card installed), 16x DVD-ROM Drive

X-Options

Table 24 shows the part numbers and descriptions for Sun Ultra 20 M2 Workstation X-options. X-Options are upgrade components such as graphics accelerators, hard disk drives, memory, and are deemed by Sun to be end-user installable. X-Options may be purchased directly at store.sun.com or Webdesk. X-Options comes in individual packaging and contain end-user friendly instructions to aid installation. Some items such as CPUs, are available via ATO only and not X-Options because these items must be installed in Sun Ultra 20 M2 Workstation before shipped to customer.

Table 24 - Sun Ultra 20 M2 Workstation X-Options

Part Number	List Price	Discount Category	Description
Not available as X-Option	\$1,095	E	AMD Opteron Processor Model 1220SE (Dual Core 2.8GHz 125W)
Not available as X-Option	\$995	E	AMD Opteron Processor Model 1218 (Dual Core 2.6GHz 103W)
Not available as X-Option	\$495	E	AMD Opteron Processor Model 1214 (Dual Core 2.2GHz 103W)
Not available as X-Option	\$195	E	AMD Opteron Processor Model 1210 (Dual Core 1.8GHz 103W)
X5279A-Z	\$1495	E	4GB Unbuffered ECC DDR2-667 Memory Kit (2x 2GB)
X5278A-Z	\$495	E	2GB Unbuffered ECC DDR2-667 Memory Kit (2x 1GB)
X5277A-Z	\$295	E	1GB Unbuffered ECC DDR2-667 Memory Kit (2x 512MB)
X4186A-Z	\$965	E	NVIDIA Quadro FX 3500 Graphics Accelerator Card
X4185A-Z	\$545	E	NVIDIA Quadro FX 1500 Graphics Accelerator Card
X4184A-Z	\$245	E	NVIDIA Quadro FX 560 Graphics Accelerator Card
X4183A-Z	\$145	E	NVIDIA Quadro NVS 285 (128MB DDR2) Graphics Accelerator Card
XSG-XPICE4SAS-Z	TBD	E	LSI Logic 4-port SAS Internal Adapter (Available Q1CY07)
XRBS-S1CE-146G15K	\$995	H	146GB Internal SAS 15,000-RPM 3.5-inch HDD (Available Q1CY07)
XRBS-ST1CE-500G7K	\$699	E	500GB Internal SATA 3Gbps 7,200-RPM 3.5-inch HDD
XRBS-ST1CE-250G7K	\$299	E	250GB Internal SATA 3Gbps 7,200 RPM 3.5-inch HDD
XRBS-ST1CE-80G7K	\$149	E	80GB Internal SATA 3Gbps 7,200-RPM 3.5-inch HDD
SG-XTAPDAT72-D2	\$995	H	Sun StorEdge DAT 72 (3MBps, 72GB per cartridge – available Q1CY07)
SG-XTAPSDLT600-D-Z	\$4.85 5.00	H	Sun StorEdge SDLT Drive 600 Table-Top Local Backup (36MBps, 300GB per cartridge – available Q1CY07)
SG-XTAPLTO2V-D	\$2195	H	Sun StorEdge “LTO 2V” Tape Drive (24MBps, 200GB per cartridge – available Q1CY07)
SG-XTAPLTO2-D-2	\$4855	H	Sun StorEdge “LTO ” Tape Drive (30MBps, 200GB per cartridge – available Q1CY07)
SG-XTAPLTO3-D-2	\$5685	H	Sun StorEdge “LTO 3” Tape Drive (80MBps, 400GB per cartridge – available Q1CY07)
X8013A-Z	\$80	E	DVD-Dual (16X DVD+/-RW Drive supports read/write in dual +/- formats. Supports double-layer DVD to hold up to 8.5GB or single-layer DVD to hold up to 4.7GB)
X4125A-Z	\$38	E	DVD-ROM (16X DVD-ROM drive reads CD/DVD only. Does not write)
X8015A	\$15	E	Option DVI-to-VGA Adapter
X4218A	\$60	E	Intel Pro/1000 PT Desktop NIC (PCI Express x1, 1-port copper - EXPI9300PT)
X7280A-2	\$269	E	Sun PCI Express x4 Dual Gigabit Ethernet NIC (Copper)
X7281A-2	\$889	E	Sun PCI Express x4 Dual Gigabit Ethernet NIC (Fiber)

Field Replacement Units (FRUs) and Customer Replacement Units (CRUs)

Table 25 shows the part numbers and descriptions for Sun Ultra 20 M2 Workstation Field Replacement Units (FRUs) and Customer Replacement Units (CRUs). CRUs are components that can be replaced at the buyer's location without having to send the entire system to be repaired. FRUs are not deemed by Sun to be end-user installable due to their complexity (mechanical, electrical, others). Only processors and motherboard assembly of the Sun Ultra 20 M2 are FRUs. FRUs and CRUs may be purchased from Sun via store.sun.com.

Table 25 - Sun Ultra 20 M2 Workstation FRUs and CRUs

Part Number	FRU / CRU	Price	Description
#371-1977	FRU	TBD	AMD Opteron Processor Model 1220SE (Dual Core 2.8GHz 125W)
#371-1975	FRU	\$508.76	AMD Opteron Processor Model 1218 (Dual Core 2.6GHz 103W)
#371-1973	FRU	\$312.42	AMD Opteron Processor Model 1214 (Dual Core 2.2GHz 103W)
#371-1971	FRU	\$142.47	AMD Opteron Processor Model 1210 (Dual Core 1.8GHz 103W)
#540-6645	CRU	\$318.47	500GB Internal SATA 3-Gbps 7,200-RPM 3.5-inch HDD
#540-6485	CRU	\$131.96	250GB Internal SATA 3-Gbps 7,200 RPM 3.5-inch HDD
#540-6644	CRU	\$77.48	80GB Internal SATA 3-Gbps 7,200-RPM 3.5-inch HDD
#370-7949	CRU	\$75.93	DVD-Dual (16X DVD+/-RW Drive supports read/write in dual +/- formats. Supports double-layer DVD to hold up to 8.5GB or single-layer DVD to hold up to 4.7GB)
#371-2276	CRU	\$39.57	DVD-ROM (16X DVD-ROM drive reads CD/DVD only. Does not write)
#371-1800	CRU	\$685.95	NVIDIA Quadro FX 3500 Graphics Accelerator Card
#371-1801	CRU	\$386.49	NVIDIA Quadro FX 1500 Graphics Accelerator Card
#371-1802	CRU	\$180.21	NVIDIA Quadro FX 560 Graphics Accelerator Card
#371-1803	CRU	\$105.56	NVIDIA Quadro NVS 285 (128MB DDR2) Graphics Accelerator Card
#530-3474	CRU	\$10	Option DVI-to-VGA Adapter
#371-0905	CRU	\$97.42	Sun PCI Express x4 Dual Gigabit Ethernet NIC (Copper)
#371-0904	CRU	\$229.60	Sun PCI Express x4 Dual Gigabit Ethernet NIC (Fiber)
#371-2133	CRU	TBD	Intel Pro/1000 PT Desktop NIC (PCI Express x1, 1-port copper – Intel Part Number EXPI9300PT)
#317-2094	CRU	TBD	SAS Internal Adapter (available Q1CY07)
#3100108	CRU	TBD	Processor Fan Kit / Heatsink
#300-1950	CRU	\$60.06	Power Supply
#371-2108	CRU	TBD	System Fan Assembly
#371-1800	FRU	\$685.95	Motherboard Assembly
#375-3432	CRU	TBD	Front I/O Panel
#373-0057	CRU	TBD	HDD Backplane

Country Kits (Mouse, Keyboard, Power Cords)

Sun Ultra 20 M2 Workstation has been fully validated with 27 different Sun Country Kits shown in Table 26. Country kits include the keyboard, mouse, and power cord compatible to a specific geography. Sun Ultra 20 M2 Workstation has been validated with Type 7 keyboards and Type 7 mice only. Type 6 keyboards and Type 6 mice have been discontinued and have not been validated on Sun Ultra 20 M2 Workstation.

<p>Sun Type 7 Keyboard</p> 	<p>Full size keyboard with Solaris short-cut keys</p> <ul style="list-style-type: none"> • Tilt legs for adjustable typing angles • 6.5 ft. (2 meter) Cable • UNIX and PC layouts available (UNIX layout uses different layout for non-standard keys, such as ESC, Backspace, Caps Lock and Control functions) • Multi-language support (support for 25 different languages) • Includes 2 USB hubs for plugging in other devices such as mouse and smart card reader • RoHS-6 (Lead Free) Compliant • Sleek new Sun industrial design • Fully tested for compatibility with Sun workstation and Sun Ray thin clients
<p>Sun Type 7 Mouse</p> 	<p>Three button with optical tracking and scroll wheel</p> <ul style="list-style-type: none"> • Optical sensor records motion more precisely than a traditional mouse • Ease-of-use and increased reliability because there are no moving parts to wear out or collect dust/dirt • No mouse pad needed for this device • Convenient, faster scrolling through documents without clicking on scroll bar • Ergonomic design • RoHS-6 (Lead Free) Compliant • Sleek, intuitive new Sun industrial design • Fully tested for compatibility with Sun workstations and Sun Ray thin clients

Table 26 - Sun Type 7 Country Kits

Country Kit	Part Number	Country Kit	Part Number
Type 7 Arabic	X3791A	Type 7 Norwegian	X3760A
Type 7 Australian	X3766A	Type 7 Portuguese	X3761A
Type 7 Belgian	X3790A	Type 7 Russian	X3785A
Type 7 Chinese	X3782A	Type 7 Spanish	X3762A
Type 7 Danish	X3763A	Type 7 Swedish	X3736A
Type 7 Dutch/Netherlands	X3765A	Type 7 Euro Universal	X3868A
Type 7 Euro Universal	X3868A	Type 7 Euro UNIX	X3759A
Type 7 Euro UNIX	X3759A	Type 7 Swiss-French	X3734A
Type 7 Finnish	X3767A	Type 7C Swiss-German	X3735A-COM
Type 7 French	X3732A	Type 7C Taiwanese	X3754A-COM
Type 7 German	X3733A	Type 7C Turkish-Q	X3787A-COM
Type 7 Italian	X3764A	Type 7C UK	X3737A-COM
Type 7 Japanese	X3756A	Type 7C US PC	X3731A-COM
Type 7 Korean	X3755A		

Table 27 - Sun Power Cords

Power Cord	Part Number
US/Asia	X311L
Continental Europe	X312L
Australia	X386L
UK	X317L
Switzerland	X314L
Italy	X384L
Denmark	X383L
Chinese	X312E
Argentina, AC	X312F
Korean, 250V	X312G

Appendix

Comparison: Sun Ultra 20 M2 Workstation versus Sun Ultra 20 Workstation

Sun Ultra 20 M2 Workstation intends to replace the Sun Ultra 20 Workstation. The Sun Ultra 20 Workstation, featuring the AMD Opteron 100-series processor, represented a tremendous price-performance ratio at its introduction. At the heart of many complex and demanding projects, the Sun Ultra 20 Workstation offered the flexibility of single-core or dual-core processor, economical non-ECC DDR-400 memory. Sun Ultra 20 M2 Workstation, featuring the dual-core AMD Opteron 1200-series Processor, improved upon this legacy. Sun Ultra 20 M2 Workstation doubles the memory bandwidth, visualizes much larger data sets, and delivers higher system performance than the Sun Ultra 20 Workstation, while retaining the starting list price of under \$1,000 (U.S. List Price). Table 28 compares the differences of these two workstations.

Sun Ultra 20 M2 Workstation will enable customers to:

- Visualize very large data sets (up to 8GB of main memory)
- See multiple data sets, simultaneously (up to four displays)
- Reduce the cost of networking down time (integrated dual gigabit Ethernet ports)
- Be more productive by running multiple applications once, or for applications that can split a task across two processor cores
- Gain the highest overall performance found on a 1-socket workstation (integrated memory controller & DDR2-667)

The Sun Ultra 20 Workstation is ideal for customers who:

- Only have the need for two displays maximum
- Requires the highest performance available for single-threaded applications
- Requires modest memory performance (DDR-400)
- Wants more flexibility by using ECC or non-ECC memory
- Wants the flexibility of using single-core or dual-core processors

Table 28 - Improvements of Sun Ultra 20 M2 Workstation to the Sun Ultra 20 Workstation

Features	Sun Ultra 20 M2 Workstation	Sun Ultra 20 Workstation	Improvements
Processor Type	AMD Opteron 1200-series Processor Dual-core only	AMD Opteron 100-series Processor Single-core and Dual-core	DDR2
Processor Models	1220SE (Dual Core 2.8GHz 125W) 1218 (Dual Core 2.6GHz 103W) 1214 (Dual Core 2.2GHz 103W) 1210 (Dual Core 1.8GHz 103W) Q1CY07: 1222SE (Dual Core 3GHz 125W)	185 (Dual Core 2.6GHz) 180 (Dual Core 2.4GHz) 156 (Single Core 3.0GHz) 154 (Single Core 2.8GHz) 152 (Single Core 2.6GHz) 148 (Single Core 2.2GHz) 144 (Single Core 1.8GHz)	Dual Core only (Single core not available on Sun Ultra 20 M2 Workstation)
Memory	Unbuffered DDR2-667, 8GB maximum 3 DIMM sizes (512B ECC, 1GB ECC, 2GB ECC)	Unbuffered DDR-400, 8GB maximum 3 DIMM sizes (256MB non-ECC, 512B ECC, 1GB ECC, 2GB ECC)	Doubles memory bandwidth
Graphics Accelerators	One Quadro FX 3500 One Quadro FX 1500 One Quadro FX 560 One Quadro NVS 285 ATI ES1000 (on-board) In Q1CY07: Up to two FX560 or NVS 285	One Quadro FX 3450 One Quadro FX 1400 One Quadro FX 540 One Quadro NV S285 ATI RageXL (on-board)	Dual graphics cards supported. Faster, more programmable graphics cards. Faster fundamental 2D graphics (on motherboard)
Storage	Up to two SATA drives, 1TB maximum: 80, 250, 500GB (7,200-rpm) Q1CY07: Up to two SAS drives, 292GB maximum: 146GB (15,000-rpm)	Up to two SATA drives, 1TB maximum: 80, 250, 500GB (7,200-rpm)	Faster SAS drives
Networking	Two Gigabit Ethernet ports integrated on motherboard. Two RJ-45 ports (rear)	One Gigabit Ethernet port integrated on motherboard. One RJ-45 port (rear)	Additional Gigabit Ethernet port
Audio	High Definition 7.1 Channel	AC '97	High Definition Audio
PCI-Express slots	One full-length @ x16 slot One full-length @ x16 slot <u>wired as x8</u> One full-length @ x1 slot	One full-length @ x16 slot One full-length @ x1 slots	One additional x16 slot
32-bit/33-MHz PCI Slots	Three full-length slots	Four full-length slots	
O/S Validated by Sun	Solaris 10 6/06 (Update 2) or later RHEL WS 3 Update 7 & later RHEL WS 4 Update 3 & later SLES 9 SP3 & later Windows XP Professional SP2 & later Windows XP Professional x64 SP0 & later	Solaris 10 RHEL WS 3 Update 4 & later RHEL WS 4 Update 1 & later SLES 9-bit) SP3 & later Windows XP Professional SP2 & later Windows XP Professional x64 SP0 & later	New updates
Height	433.6mm (17.07 in)	433.6mm (17.07 in)	No change
Width	199.6mm (7.86 in)	199.6mm (7.86 in)	No change
Depth	467.45mm (18.40 in)	467.45mm (18.40 in)	No change
Price Range	\$995 to \$2,795 (U.S. List)	\$895 to \$2,695 (U.S. List)	

Comparison: Sun Ultra 20 M2 Workstation versus Sun Ultra 25 Workstation

Sun Ultra 20 M2 Workstation complements and broadens Sun's UltraSPARC-based workstation portfolio. The Sun Ultra 25 Workstation, featuring the UltraSPARC IIIi Processor, represents 24 years of Sun designing and delivering enterprise-class technical workstations. At the heart of the most complex and demanding projects, Sun has shipped more than 1M UltraSPARC-based workstations to date. Sun Ultra 20 M2 Workstation, featuring the AMD Opteron 1200-series processor, represents the best performance for x64 applications and addresses customer needs for compatibility of x64 32-bit applications with the seamless ability to move into the future of 64-bit computing. Table 29 compares the differences of these two workstations.

The Sun Ultra 20 M2 Workstation enables customers to:

- Run both 32-bit x64 and 64-bit x64 applications
- Get more performance / \$
- Run more applications on a wider range of operating systems (Solaris, Linux, and Windows)
- Acquire a 64-bit x64 workstation at a starting list price of about \$995 (USD)
- Get much higher memory bandwidth

The Sun Ultra 25 Workstation is ideal for customers who:

- Require binary compatibility with Sun SPARC processors
- Want to run applications available only on SPARC/Solaris
- Have modest graphics requirements
- Require SAS hard disk drives

Table 29 - Comparison of the Sun Ultra 20 M2 Workstation to the Sun Ultra 25 Workstation

Features	Sun Ultra 20 M2 Workstation	Sun Ultra 25 Workstation	Advantages
Processor Type	AMD Opteron 1200-series Processor	Sun UltraSPARC IIIi Processor	M2
Processor Models	1220SE (Dual Core 2.8GHz 125W) 1218 (Dual Core 2.6GHz 103W) 1214 (Dual Core 2.2GHz 103W) 1210 (Dual Core 1.8GHz 103W) Q1CY07: 1222SE(Dual Core 3GHz 125W)	Single Core 1.6GHz	M2
Memory	Unbuffered DDR2-667 8GB maximum 3 DIMM sizes (512B ECC, 1GB ECC, 2GB ECC)	Unbuffered DDR-333 8GB maximum 3 DIMM sizes (512B ECC, 1GB ECC, 2GB ECC)	M2
Graphics Accelerators	One Quadro FX 3500 One Quadro FX 1500 One Quadro FX 560 One Quadro NVS285 ATI ES1000 (on-board) Q1CY07: Up to 2 FX560 or NVS 285	Up to 2 Sun XVR-2500 Up to 2 Sun XVR-100	M2
Optical Drives	Tray-load DVD-ROM Tray-load DVD Dual	Slot-loading DVD-Dual	Sun Ultra 25
Hard disk drives	Up to two SATA drives, 1TB maximum: 80, 250, 500 GB (7,200-rpm) Q1CY07: Up to two SAS drives, 292GB maximum: 146GB 15,000-rpm	Up to four SATA drives, 1TB maximum: 80, 250 GB (7,200-rpm) Up to four SAS drives, 584GB maximum: 146GB (15,000-rpm)	Sun Ultra 25
RAID	0 and 1	None	M2
Audio	7.1 Channel	AC '97	M2
Serial Ports	One (via internal header)	Two (rear)	Sun Ultra 25
PCI-Express slots	One full-length x16 One full-length x16 wired as x8 One full-length x1	One full-length x16 wired as x8 One full-length x16 wired as x4 One full-length x8 wired as x4	M2
PCI-X slots (3.3V, 64-bit, up to 133MHz)	None	Two full-length slots	Sun Ultra 25
Conventional PCI slots (32-bit, 33MHz)	Three full length slots	One full-length slot	M2
O/S Validated by Sun	Solaris 10 6/06 (Update 2) and later RHEL WS 3 Update 7 & later RHEL WS 4 Update 3 & later SLES 9 SP3 & later Windows XP Professional SP2 & later Windows XP Professional x64 SP0 & later	Solaris 10	M2
Height	433.6mm (17.07 in)	445mm (17.50 in)	M2
Width	199.6mm (7.86 in)	205 mm (8.10 in.)	M2
Depth	467.45mm (18.40 in)	569 mm (22.40 in.)	M2
Weight	26.31 kg (58 lbs)	26.31 kg (58 lbs)	M2
Power supply	400 Watt	1000 Watt	Sun Ultra 25
Price Range	\$995 to \$2,795	\$3,695 to \$4,095	M2

Comparison: NVIDIA Quadro NVS 285 (X4183A-Z) versus NVIDIA Quadro NVS 285 (X7266A)

Although they may share the same name, the NVIDIA Quadro NVS 285 Graphics Accelerator card for Sun Ultra 20 M2 Workstation is superior, in all aspects, than the NVIDIA Quadro NVS 285 Graphics Accelerator card for the Sun Ultra 20 Workstation. The NVIDIA Quadro NVS 285 Graphics Accelerator card for Sun Ultra 20 M2 Workstation has higher-performance, doubles the memory, displays higher resolution, and dissipate lower power than the NVIDIA Quadro NVS 285 Graphics Accelerator card for the Sun Ultra 20 Workstation. Sun Ultra 20 M2 Workstation supports only the NVIDIA Quadro NVS 285 Graphics Accelerator card described by part Number X4183A-Z. Sun Ultra 20 M2 Workstation does not support the NVIDIA Quadro NVS 285 Graphics Accelerator card described by part number (X)7266A. Vice versa, the Sun Ultra 20 Workstation supports only the NVIDIA Quadro NVS285 Graphics Accelerator card described by part number (X)7266A. It does not support the NVIDIA Quadro NVS 285 Graphics Accelerator card described by part number (X)4183A-Z. Table 30 describe the advantages of the NVIDIA Quadro NVS 285 Graphics Accelerator card for Sun Ultra 20 M2 Workstation

Table 30 – Key Differences between two versions of NVIDIA Quadro NVS 285 Graphics Accelerator card

	NVIDIA Quadro NVS 285 Graphics Accelerator Card for Sun Ultra 20 M2 Workstation	NVIDIA Quadro NVS 285 Graphics Accelerator Card for Sun Ultra 20 Workstation	Advantages
Part Number	X4183A-Z	X7266A	
Dimensions	2.731 inches x 6.60 inches	2.731 inches x 6.60 inches	
Bus Type	PCI Express x16	PCI Express x16	
Memory	128MB of DDR2 SDRAM (64-bit)	64MB of DDR SDRAM (64-bit)	M2
Memory Clock	275MHz	275MHz	
Graphics clock	300MHz	275MHz	M2
Connector	59-pin DMS-59 connector	59-pin DMS-59 connector	
Display Support	Drives a digital display at resolutions up to 1920 x 1200 Drives an analog display at resolutions up to 1920 x 1200 at 75Hz	Drives a digital display at resolutions up to 1600 x 1200 Drives an analog display at resolutions up to 2048 x 1536 at 75Hz	M2
Maximum Quantity of Displays per Board	Two	Two	
Maximum Quantity of Boards per Workstation	Two boards for Sun Ultra 20 M2 Workstation (Q1CY07)	One board per Sun Ultra 20 WS	M2
Power Dissipation	18W per board	23 W	M2

Comparisons to be added in future version of Sun Ultra 20 M2 Workstation JTF

1. AMD Opteron 1200-series versus Intel Core 2 Duo
2. AMD Opteron 1200-series versus AMD Opteron 100-series
3. AMD Opteron 1200-series versus AMD Opteron 2000-series
4. Sun Ultra 20 M2 Workstation versus Stuttgart