

= Mac Pro =

The Mac Pro line is a series of Intel Xeon ? based workstation and server computers manufactured by Apple Inc . The Mac Pro , in most configurations and in terms of speed and performance , is the most powerful computer that Apple offers . It is the high @-@ end model of the three desktop computers in the current Mac lineup , the other two being the iMac and Mac Mini .

The first @-@ generation Mac Pro has a rectangular tower case which outwardly resembles the last version of the Power Mac G5 , and has similar expansion capabilities . The first Mac Pro has dual Dual @-@ core Xeon Woodcrest processors . It was replaced by a dual Quad @-@ core Xeon Clovertown model on April 4 , 2007 , and again on January 8 , 2008 by a dual Quad @-@ core Xeon Harpertown model . The 2012 Mac Pro is largely based on a model that was announced on July 27 , 2010 . It features Nehalem / Westmere architecture Intel Xeon processors . These CPUs offer optionally twelve processing cores . The machine itself at its most evolved is able to accommodate up to four 2 TB hard disk drives or 512 GB solid state drives , as well as the ATI Radeon HD 5770 / 5870 GPU units , one per slot .

The second @-@ generation design of Mac Pro was announced at the 2013 Apple Worldwide Developers Conference (WWDC) opening keynote on June 10 , 2013 . Apple states that the new Mac Pro achieves twice the overall performance of the last model . The redesigned Mac Pro takes up less than one eighth the volume of immediately previous model , being shorter (9 @.@ 9 inches (25 cm)) , thinner (6 @.@ 6 inches (17 cm)) and less massive (11 pounds (5 @.@ 0 kg)) . The machine supports one central processing unit (CPU) (up to a 12 @-@ core Xeon E5 CPU) , four 1866 MHz DDR3 slots , dual AMD FirePro D series GPUs (up to D700 with 6 GB VRAM each) , and PCIe @-@ based flash storage . There is updated wireless communication and support for six displays . Reviews have been generally positive , with caveats .

= = 1st generation = =

Apple stated that an Intel @-@ based replacement for the PowerPC @-@ based Power Mac G5 machines had been expected for some time before the Mac Pro was formally announced on August 7 , 2006 at the annual Apple Worldwide Developers Conference (WWDC) . The iMac , Mac Mini , MacBook , and MacBook Pro had moved to an Intel @-@ based architecture starting in January 2006 , leaving the Power Mac G5 as the only machine in the Mac lineup still based on the PowerPC processor architecture Apple had used since 1993 . Apple had dropped the term " Power " from the other machines in their lineup , and started using " Pro " on their higher @-@ end laptop offerings . As such , the name " Mac Pro " was widely used before the machine was announced . The Mac Pro is in the Unix workstation market . Although the high @-@ end technical market has not traditionally been an area of strength for Apple , the company has been positioning itself as a leader in non @-@ linear digital editing for high @-@ definition video , which demands storage and memory far in excess of a general desktop machine . Additionally , the codecs used in these applications are generally processor intensive and highly threadable , which Apple 's ProRes whitepaper describes as scaling almost linearly with additional processor cores . Apple 's previous machine aimed at this market , the Power Mac G5 , has up to two dual @-@ core processors (marketed as " Quad @-@ Core ") , but lacks the storage expansion capabilities of the newer design .

Original marketing materials for the Mac Pro generally referred to the middle @-@ of @-@ the @-@ line model with 2 x dual @-@ core 2 @.@ 66 GHz processors . Previously , Apple featured the base model with the words " starting at " or " from " when describing the pricing , but the online US Apple Store listed the " Mac Pro at \$ 2499 " , the price for the mid @-@ range model . The system could be configured at US \$ 2299 , much more comparable with the former base @-@ model dual @-@ core G5 at US \$ 1999 , although offering considerably more processing power . Post revision , the default configurations for the Mac Pro includes one quad @-@ core Xeon 3500 at 2 @.@ 66 GHz or two quad @-@ core Xeon 5500s at 2 @.@ 26 GHz each . Like its predecessor , the Power Mac G5 , the pre @-@ 2013 Mac Pro was Apple 's only desktop with standard expansion slots for graphics adapters and other expansion cards .

Apple received criticism after an incremental upgrade to the Mac Pro line following the 2012 WWDC . The line received more default memory and increased processor speed but still used Intel 's older Westmere @-@ EP processors instead of the newer E5 series . The line also lacked then @-@ current technologies like SATA III , USB 3 , and Thunderbolt , the last of which had been added to every other Macintosh at that point . An email from Apple CEO Tim Cook promised a more significant update to the line in 2013 . Apple stopped shipping the first @-@ generation Mac Pro in Europe on March 1 , 2013 after an amendment to a safety regulation left the professional Mac non @-@ compliant . The last day to order was February 18 , 2013 . The first generation Mac Pro was removed from Apple 's online store following unveiling of the redesigned second generation Mac Pro at a media event on October 22 , 2013 .

== CPU ==

The 2010 and later Mac Pro systems were available with one or two central processing units (CPU) with options giving four , six , eight , or twelve cores . As an example , the eight core standard configuration Mac Pro uses two Quad core x 8 Intel E5620 Xeon CPUs at 2 @. 4 GHz , but could be configured with two Hexa Core Intel Xeon X5670 CPUs at 2 @. 93 GHz . Since the CPUs are socketed , the CPUs can be removed and replaced with compatible 64 @-@ bit Intel Xeon CPUs .

== Memory ==

The original Mac Pro 's main memory uses 667 MHz DDR2 ECC FB @-@ DIMMs ; the early 2008 model uses 800 MHz ECC DDR2 FB @-@ DIMMS , the 2009 and onward Mac Pro use 1066 MHz DDR3 ECC DIMMs for the standard models , and 1333 MHz DDR3 ECC DIMMs for systems configured with 2 @. 66 GHz or faster CPUs . In the original and 2008 models , these modules are installed in pairs , one each on two riser cards . The cards have 4 DIMM slots each , allowing a total of 32 GB of memory (8 x 4 GB) to be installed . Notably , due to its FB @-@ DIMM architecture , installing more RAM in the Mac Pro will improve its memory bandwidth , but may also increase its memory latency . With a simple installation of a single FB @-@ DIMM , the peak bandwidth is 8 GB / s , but this can increase to 16 GB / s by installing two FB @-@ DIMMs , one on each of the two buses , which is the default configuration from Apple . While electrically the FB @-@ DIMMs are standard , for pre @-@ 2009 Mac Pro models Apple specifies larger @-@ than @-@ normal heatsinks on the memory modules . Problems have been reported by users who have used third party RAM with normal size FB @-@ DIMM heatsinks . (see notes below) . 2009 and later Mac Pro computers do not require memory modules with heatsinks .

== Hard drives ==

The Mac Pro had room for four internal 3 @. 5 " SATA @-@ 300 hard drives in four internal " bays " . The hard drives were mounted on individual trays (also known as " sleds ") by captive screws . A set of four drive trays was supplied with each machine . Adding hard drives to the system did not require cables to be attached as the drive was connected to the system simply by being inserted into the corresponding drive slot . A case lock on the back of the system locked the disks trays into their positions . The Mac Pro also supported Serial ATA solid @-@ state drives (SSD) in the 4 hard drive bays via an SSD @-@ to @-@ hard drive sled adapter (mid @-@ 2010 models and later) , and by third @-@ party solutions for earlier models (e.g. , by an adapter / bracket which plugged into an unused PCIe slot) . Various 2 @. 5 @-@ inch SSD drive capacities and configurations were available as options . The Mac Pro was also available with an optional hardware RAID card . With the addition of a SAS controller card or SAS RAID controller card , SAS drives could be directly connected to the system 's SATA ports . Two optical drive bays were provided , each with a corresponding SATA port and an Ultra ATA / 100 port . The Mac Pro had one PATA port and could support two PATA devices in the optical drive bays . It had a total of six SATA ports ? four were connected to the system 's drive bays , and two were not connected . The extra SATA ports

could be put into service through the use of after @-@ market extender cables to connect internal optical drives , or to provide eSATA ports with the use of an eSATA bulkhead connector . However , the two extra SATA ports were unsupported and disabled under Boot Camp . A built @-@ to @-@ order Mac Pro could be configured with up to 8 TB of storage (4 × 2 TB disks) or 2 TB (4 × 512 GB SSD) .

== Expansion cards ==

The 2008 model had two PCI Express (PCIe) 2 @.@ 0 expansion slots and two PCI Express 1 @.@ 1 slots , providing them with up to 300 W of power in total . The first slot was double wide and intended to hold the main video card , arranged with an empty area the width of a normal card beside it to leave room for the large coolers modern cards often use . In most machines , one slot would be blocked by the cooler . Instead of the tiny screws typically used to fasten the cards to the case , in the Mac Pro a single " bar " held the cards in place , which is itself held in place by two " captive " thumbscrews that can be loosened by hand without tools and will not fall out of the case . On the original Mac Pro introduced in August 2006 , the PCIe slots can be configured individually to give more bandwidth to devices that require it , with a total of 40 " lanes " , or 13 GB / s total throughput . When running Mac OS X , the Mac Pro did not support SLI or ATI CrossFire , limiting its ability to use the latest " high @-@ end gaming " video card products ; however , individuals have reported success with both CrossFire and SLI installations when running Windows XP , as SLI and CrossFire compatibility is largely a function of software . The bandwidth allocation of the PCIe slots can be configured via the Expansion Slot Utility included with Mac OS X only on the August 2006 Mac Pro . The Early @-@ 2008 and later Mac Pros had PCIe slots hardwired as follows :

== External connectivity ==

For external connectivity , the Mac Pro included five USB 2 @.@ 0 ports , two FireWire 400 and two FireWire 800 (Late 2006 until Early 2008) , respectively four FireWire 800 (Early 2009 until Mid 2012) ports . Networking was supported with two built @-@ in Gigabit Ethernet ports . 802 @.@ 11 a / b / g / n Wi @-@ Fi support (AirPort Extreme) required an optional module in the Mid 2006 , Early 2008 and Early 2009 models , whereas in the 2010 model and later Wi @-@ Fi was standard . Bluetooth also required an optional module in the Mid 2006 model , but was standard in the Early 2008 and newer models . Displays were supported by one or (optionally) more PCIe graphics cards . More recent cards featured two Mini DisplayPort connectors and one dual @-@ link Digital Visual Interface (DVI) port , with various configurations of on @-@ card graphics memory available . Digital (TOSlink optical) audio and analog 3 @.@ 5 mm stereo mini jacks for sound in and out were included , the latter becoming available on both the front and back of the case . Unlike other Mac computers , the Mac Pro did not include an infrared receiver (required to use the Apple Remote) . In Mac OS X Leopard , Front Row could be accessed on the Mac Pro (and other Macs) using the Command (?) -Escape keystroke .

== Case ==

From 2006 through 2012 , the exterior of the Mac Pro 's aluminum case was very similar to that of the Power Mac G5 , with the exception of an additional optical drive bay , and a new arrangement of I / O ports on both the front and the back . The G5 has the added feature of plastic covering that protects the internal hardware . You can also remove the exterior covering to display the interior , as the plastic will keep everything inside protected . . The case could be opened by operating a single lever on the back , which unlocked one of the two sides of the machine , as well as the drive bays . All of the expansion slots for memory , PCIe cards and drives could be accessed with the side panel removed and no tools were required for installation . The Xeon processors generated much less heat than the previous dual @-@ core G5s , so the size of the internal cooling devices had been reduced significantly . This allowed the interior to be re @-@ arranged , leaving more room at the

top of the case and doubling the number of internal drive bays . Less heat also meant less air to move out of the case for cooling during normal operations ; the Mac Pro was very quiet in normal operation , quieter than the much noisier Power Mac G5 , and proved difficult to measure using common sound pressure level meters .

== Operating systems ==

The Mac Pro comes with EFI 1.0, a successor to Apple's use of Open Firmware and the wider industry's use of BIOS .

Apple's Boot Camp provides BIOS backwards compatibility , allowing dual and triple boot configurations . These operating systems are installable on Intel x86 based Apple computers :

Mac OS X 10.4 and later

Microsoft Windows XP , Vista , and Windows 7 32-bit & 64-bit (hardware drivers are included in Boot Camp)

Other x86 operating systems such as Linux x86 , Solaris , and BSD

This is made possible by the presence of an x86 Intel architecture as provided by the CPU and the BIOS emulation which Apple has provided on top of EFI . Installing any additional operating system other than Windows is not supported directly by Apple . Though Apple's Boot Camp drivers are only for Windows , it is often possible to achieve full or nearly full compatibility with another OS by using third-party drivers .

== Specifications ==

== Reception ==

Ars Technica reviewed the 2006 Mac Pro , rating it 9 out of 10 .

== 2nd generation ==

Apple Senior Vice President of Marketing Phil Schiller presented a " sneak peek " of the completely redesigned Mac Pro during the 2013 Worldwide Developers Conference keynote . The video revealed an overhauled case design , a polished reflective aluminum cylinder built around a central thermal dissipation core and vented by a single fan , which pulls air from under the case , through the core , and out the top of the case . Apple states that the second generation Mac Pro achieves twice the performance of the last model . The model is assembled in Austin , Texas , on a highly automated line . Apple released the new Mac Pro on December 19 , 2013 .

== Hardware ==

The redesigned Mac Pro occupies less than one eighth the volume of immediately previous model , being shorter (9.9 inches (25 cm)) , thinner (6.6 inches (17 cm)) and lighter (11 pounds (5.0 kg)) . It supports one central processing unit (CPU) (up to a 12-core Xeon E5 CPU) , four 1866 MHz DDR3 slots , dual AMD FirePro D series GPUs (up to D700 with 6 GB VRAM each) , and PCIe-based flash storage . There is a 3x MIMO antenna system for the unit's 802.11ac WiFi networking interface , Bluetooth 4.0 to facilitate close-range wireless functions such as music transfer , keyboards , mice , tablets , speakers , security , cameras , and printers . The system can simultaneously support six Apple Thunderbolt Displays , or three 4K resolution computer monitors .

The second generation Mac Pro has a redesigned configuration of ports . It has a HDMI 1.4 port , dual Gigabit Ethernet ports , six Thunderbolt 2 ports , four USB 3 ports , and combined digital Mini-TOSlink optical / analog 3.5 mm stereo mini jack for sound out , as well as a dedicated headphones mini jack (the two are distinctly selectable within the Sound System

Preference panel , Output tab) . There is no Sound in port ; the system has a low @-@ fidelity internal mono speaker . The Thunderbolt 2 ports support up to thirty @-@ six Thunderbolt devices (six per port) and can support up to three simultaneous 4K displays . This design requires two GPUs to support the seven display outputs (HDMI and six Thunderbolt) . The I / O panel is illuminated when the unit senses it has been moved to make it easier for the user to see the ports . Unlike the previous model , it has no FireWire 800 ports , dedicated digital audio in / out ports , a SuperDrive , DVI port , 3 @. @ 5 @-@ inch drive bays for replaceable storage drives , or changeable internal PCIe slots . Instead , there are six Thunderbolt 2 ports to connect high @-@ speed external peripherals , including enclosures for internal PCIe cards .

Apple 's website mentions only RAM as user @-@ serviceable , though third party tear @-@ downs show nearly all components can be removed and replaced . A lock switch on the aluminum casing allows for easy access to the internals , as well as fitting a security lock with its own cable , and components are secured with standard screws . The flash storage and GPUs use proprietary connectors and are specially sized to fit into the enclosure . Unlike the rest of the Macintosh line the CPU is not soldered to the logic board and can be replaced with another LGA 2011 socket processor , including processor options not offered by Apple . The type of RAM modules that Apple supplies with the late @-@ 2013 Mac Pro are either ECC unbuffered (UDIMM) on the up to 8 GB modules (shown on each module as PC3 @-@ 14900E) . The optional 16 GB modules are ECC registered (RDIMM) modules (shown on each module as PC3 @-@ 14900R) . The higher @-@ capacity 32 GB modules that some third @-@ party vendors offer are also RDIMM . The UDIMM and RDIMM module types cannot be mixed . Apple publishes recommended configurations to use .

= = = Specifications = = =

= = = Reception = = =

Reception of the new design has been generally positive , at times with caveats . The performance has been widely lauded , especially handling video tasks on the dual GPU units , with some reviewers noting the ability to apply dozens of filters to realtime 4K resolution video in Final Cut Pro X. Drive performance , connected via PCIe , is also widely mentioned as a strong point . Technical reviewers praised the OpenCL API under which the machine 's powerful twin GPUs and its multi @-@ core CPU can be treated as a single pool of computing power . However , in late 2013 through early 2014 , some reviewers have noted the lack of internal expandability , second CPU , serviceability , and questioned the then @-@ limited offerings via Thunderbolt 2 ports .

= = Mac Pro Server = =

On November 5 , 2010 , Apple introduced the Mac Pro Server , which officially replaced the Xserve line of Apple servers as of January 31 , 2011 . The Mac Pro Server includes an unlimited Mac OS X Server license and an Intel Xeon 2 @. @ 8 GHz Quad @-@ Core processor , with 8 GB of DDR3 RAM . In mid @-@ 2012 , the Mac Pro Server was upgraded to an Intel Xeon 3 @. @ 2 GHz Quad @-@ Core processor . The Mac Pro Server was discontinued on October 22 , 2013 , with the introduction of the second @-@ generation Mac Pro . However , the OS X Server software package can be purchased from the Mac App Store .