

Mac vs PC

The study of why Macs are better than PCs

Which Computer Is More Powerful: Mac or PC?

Calculating computer performance is a tricky issue, and there are a variety of methods that attempt to do this. Most of these focus on very narrow tests, like floating-point calculations, etc. A major limitation of many of these tests is that they are actually more dependent on the software used in the test than the hardware of the computer itself. **To date, there is NO industry standard measurement method that gives a real world indication for an average user as to which computer is faster or more powerful than an other.** [Here is a reasoned [discussion](#) of some benchmarking issues, and [another](#) at *USA Today*.]

However, since we need to get *some* reasonable indication, **one accepted way to measure computer processing power and performance is by looking at MTOPS** (Millions of Theoretical Operations Per Second). You may not have heard, but when Apple's G4 machines were first introduced it almost caused a major international incident. The root of the problem was that the US government has severe restrictions about exporting Super Computers to certain other countries. The government says (not Apple Computer) that what determines whether a computer is categorized as a "Super Computer" is its MTOPS performance.

Apple's G4 was the first desktop computer to break the Super Computer barrier. (By the way, the government's solution to the export issue was to rewrite the specs to raise the limit.)

If you check out [Apple's specs](#) and [Intel's specs](#), and then [AMD's specs](#) you will see that there is a surprisingly BIG difference in MTOPS performance. Pretty obvious from this perspective which is more powerful.

Microprocessor	MTOPS
Intel 3.2 GHz Pentium 4	9,067
AMD dual 246 Opteron	13,667
AMD quad 846 Opteron	26,667
Apple 800 MHz G4 Power PC (e.g. iMac/eMac)	11,450
Apple 933 MHz G4 Power PC	13,400
Apple dual 1000 MHz G4 Power PC	27,000
Apple dual 1420 MHz G4 Power PC	38,340
Apple 1800 MHz G5 Power PC	21,753
Apple dual 2000 MHz G5 Power PC	45,000

Don't be fooled by the "speed" (i.e. MHz) numbers posted by Intel and the PC assemblers! Many tests show that Macs have superior performance to Pentiums with **three times** the MHz rating.

Why might this be? Consider this example:

two cars are traveling from Los Angeles to San Francisco.
Car A will average 65 MPH, while car B will average 50 MPH.
Assume they start together and neither car makes any stops.
Which one will get there first?

If you subscribe to the misconception that speed is the most important specification, then you'd pick car A – and you would be wrong. The variable we did not discuss is the **route** each car would take. In our example, Car B is going the most direct route, while car A is going through San Diego (i.e. quite indirect).

I know, you ASSUMED that both cars would take the most straightforward route. Many people have undoubtedly assumed the same thing when comparing Pentiums/Athlons to PowerPC microprocessors – and that assumption would be incorrect. The fact is that for several reasons (e.g. that they were designed from day one to operate a Graphical User Interface) that PowerPC microprocessors are more efficiently designed.

In 2001 MacCentral published a VERY detailed write-up about the [Megahertz Myth](#) that is still well worth reading. (Make sure to go back to the Part I and Part II links.) Here are some additional articles (from other sources) on the same subject: [Washington Post \(9/02\): Processor Speeds Almost Passe](#), and TechNews: [Does MHz Really Matter Anymore?](#), and iGeek: [MHz and GHz](#), and [MHz and GHz Have Lost Some Meaning](#), and [Mr. Software Fights the MHz Myth](#).

Another person wrote "RPM is a better automotive analogy for MHz: a Viper at 2000 RPM smokes a Neon at 5000 RPM"... Apple also has posted an eight minute [QuickTime movie](#) demonstrating how a 1.7 GHz Pentium 4 is **considerably slower** than several lower MHz G4 versions. Check it out!

Still another writer proposed: "If Intel wants to be the de-facto standard then let them. We'll call that standard 'IntelHertz'. On each new box leaving Apple, there will be a sticker next to the standard MHz telling the consumer that this 1000 MHz Mac is equal to a 3000 MHz Pentium or 3.0 'IntelHertz'. In every advertisement and promotional material Apple produces it will be there, plain as day, it's chips equal to 'IntelHertz'. This new standard will bring us on par with Intel and show the world how the Mac is more than equal to the PC offerings."

This [article](#) explains AMD's new plan in its battle against the PC megahertz myth. (AMD makes the Athlon microprocessor chips that are the prime PC competitors to Intel's Pentium microprocessors.) It seems that the new AMD Athlons will be specified by model rather than by GHz.

Model A1600, for instance, is a 1.4GHz Athlon, which AMD views as equivalent in performance to an Intel P4 1.6GHz. AMD now demands that no motherboard/BIOS maker ever reveal the actual clockspeed of the chip, and even goes as far as to forbid the printing of the CPU's clockspeed in the motherboard's reference manual.

Hmmm. Seems like some PC people are now also catching on to the Megahertz myth...

Here is a relatively new standard you might not have heard about. [NewsFactor reports](#) that "Apple is getting some help from the [Embedded Microprocessor Benchmark Consortium](#) (EEMBC), which in 2002 published statistics for the MPC7455 – Motorola's latest incarnation of the G4 – that is used in the dual 1 GHz Power Mac. The EEMBC tested 46 different kernels and **found Motorola's G4 to be faster than all other contenders across all five specific target markets.**"

Also included in the information Apple provided to NewsFactor were details of a test involving BLAST (Basic Local Alignment Search Tool), an open source biotechnology application used to find similarities in DNA and protein sequences.

Apple compared the performance of its dual 1 GHz Power Mac G4 running A/G BLAST to that of a Linux workstation with a 2 GHz Pentium 4 processor running NCBI BLAST. Both computers given the task of seeking similarities between human and mouse chromosomes.

Depending on the type of search performed the Power Mac delivered anywhere from **3 to 50 times the performance of the Linux workstation.**

In mid-2002, because Gateway ads were touting its Profile 4 as being much faster than an iMac (i.e. the low end of Apple's computer line), Gannett News Service [tested](#) a loaded Gateway Profile 4 XL, and compared it to a high end iMac, computers that were similarly priced. Their conclusion: "The comparison chart says it all. While the Gateway toasted the iMac in 3-D game frame rates at a resolution of 640x480 using Quake III Arena, the scores were much closer when the crisper, more realistic resolution of 1,024x768 was used. The Gateway registered 66.2 frames per second, while the iMac scored 62.5 frames per second, **an insignificant difference** for casual gamers."

They also "applied test routines employing nine common Adobe Photoshop functions. **Here the huge megahertz gap was mostly surmounted.** The iMac's 800-megahertz G4 sprinted through the tests in 49.6 seconds. The Gateway's 2.8-gigahertz Pentium 4 completed the same tasks in 44.7 seconds."

Obviously these performances in no way correlate to a 2800 MHz vs 800 MHz difference. It should also be clear to see that a more powerful Mac (e.g. a dual 1250-megahertz G4) would beat the 2.8-gigahertz Pentium 4.



Popular Mechanics has a well-written June 2002 [article](#) that says for a computer salesperson (or anyone else) who tells a typical user (i.e. one who does "basic word processing, e-mail, Web browsing, maybe some digital camera stuff") that a higher MHz Pentium will be any more suitable than an iMac is a "classic case of speed bigotry in which computers are judged not by the contents of their systems, but by the speed of their CPUs. **This is an incredibly limited view on how to choose the right computer system.** The dirty 'secret' of the computer industry is this: Chip speed doesn't matter much anymore."

They go on to say that there are several items that are more important to the performance than the microprocessor's MHz rating. **"RAM is much more important than chip speed for almost everything your computer does...** The speed of your hard drive is the next choke point on system performance, and it's a critical component for digital video and audio because writing to or from the disk always takes time.... Like RAM, video cards are vital... Finally, the speed at which you connect to a network can affect how fast your computer feels." They conclude by saying that "Despite all this, chip speed remains central to computer manufacturers' marketing plans. That's because chip speed is the easiest way to catch your attention: misinformed consumers figure the faster, the better."

All true. In addition *Popular Mechanics* could also have mentioned that the speed of your connection to **peripherals** has a big influence on your perception of your computer's performance. In an attempt to compete with Apple's wildly successful Firewire (IEEE-1394) Intel has been promoting USB 2.0 as a higher speed alternative. As usual, when you look below the surface, this is just not so.

In the July 2002 article entitled [The Numbers Game](#) the author explains "The crucial difference between USB 2.0 and FireWire is this: **FireWire is faster and more reliable**. The reason is subtle, and not mentioned at all by the proponents of USB 2.0. Moving data around using USB demands the involvement of a processor. FireWire doesn't. If you're trying to download a digital video from your camcorder on to your hard disk to edit it, then with USB 2.0 each chunk of data has to pass to your processor and then to the hard disk. With FireWire, the hard disk and the camcorder talk directly to each other."

The bottom line is that Macs are **very competitive** in any performance test, and typically perform equal to or better than PCs advertising twice the MHz rating.

With all the advertising we see, it's not surprising that the typical consumer might conclude that the Pentium 4 is a superior microprocessor. Don't be taken in by Madison Avenue. Here's some technical observations you may not have heard before:

[A PC company's CEO](#) (in an **extraordinarily** detailed analysis) concludes that "the new Intel architecture has serious fatal flaws that in some cases can throttle the speed of a 1.5 GHz Pentium 4 chip down to the equivalent speed of a mere 200 MHz Pentium MMX chip of 4 years ago, **even slower than the level of any Celeron, Pentium II, or Pentium III chip ever released!** It's a huge setback for Intel..."

A Techweb [analysis](#) says: "For today's buyer, the Pentium 4 simply doesn't make sense. It's slower than the competition (including a Pentium III) in just about every area; it's more expensive; it's using an interface that won't be the flagship interface in six to nine months; and it requires a considerable investment outside of the price of the CPU itself..."

An August 2002 [PCWorld article](#) reports that there is a class action against Intel (and selected PC assemblers) about them over-stating performance specifications. The plaintiffs claim the companies deceived the public when marketing Intel's flagship processor and allege that it is a "material fact that there is no benefit to consumers in choosing the Pentium 4 over the Pentium III, as **the Pentium 4 is less powerful and slower than the Pentium III...**".

There is considerable excitement about Apple's latest release: the G5 computer, which uses a 64-bit microprocessor from IBM: the 970. [This January 2004 [article](#) gives a bit of history here.]

Here is an a sample [release](#) by IBM about the 970. [This](#) gives more details how IBM's 970 compares to it's larger Power4 chip sibling. More good news is that IBM is well along on the next generation, the [Power5](#). Here is a late 2003 [writeup](#) on the Power5. IBM is [saying](#) that the Power5+ will be shipping in 2005 and Power6 in 2006. (Here is their official [roadmap](#).) All of these advances will be reflected in upgrades to the 970 version.

[Where does all this leave Motorola, you ask. Good question. On the one hand there are articles like [this](#). On the other hand there is [this](#). My guess is that due to Motorola's slowness in updating the G4 plus their continued business problems companywide, that the latter may be more likely.]

Not familiar with the ins-and-outs for the 64 bit architecture – then read this *PCWorld* piece [Are You Ready For A 64-Bit PC?](#). This September 2002 *eWeek* [story](#) goes into some detail about the IBM 970 chip, and the connection with Apple. [iGeek](#) gives even more info on the IBM chip, as does [Real World Tech](#). This [analysis](#) of Apple's G5 says "Suddenly The Leader", and, in a similar vein, this January 2004 [article](#) calls the G5 "The Hummer of the Computer World." [This](#) story call it the "Ferrari of Computers." Take your pick.

How fast is the G5? Naturally there are some conflicting reports. Apple says that it is the world's fastest PC, and backs this up with some impressive test [results](#). Here is an independent [snapshot](#). As you might expect, some PC ubergeeks are distraught with this situation, and have been looking hard for stones to throw. (For example, here is the [perspective](#) from *PCWorld*.) "[The Smell Of Fear](#)" story makes some good points. Note that usually only in the small print do you see mentioned the fact that the applications often used on a comparison test have not been optimized for a G5, while they typically have been for a Pentium 4. Read "[Benchmark Silliness](#)" for another discussion. See what NASA [says](#).

Here is a lengthy, technically detailed, and reasoned [discussion](#) of the situation by *InfoWorld*, published on December 31, 2003. This independent December 2003 [analysis](#) states that "the G5 is notably faster than high-end PCs." And this January 2004 independent testing [concluded](#) that "Apple G5 Smokes Intel Competition." [This](#) series of tests shows how the G5 compares favorably to the AMD 64 bit Opteron. Sounds like a consensus to me.

[An amazing, lesser known [feature](#) of the latest G5 is that it uses only 25% of the power that Intel's state-of-the-art Prescott processor uses!]

This January 2004 *Forbes* [story](#) says "When noted biologist David Botstein was lured from Stanford University to head the Lewis-Sigler Institute for Integrative Genomics at Princeton, he had his choice of computing systems. But Botstein says he outfitted the entire center with Apple computers and servers, which are used for everything from desktop applications to comparing lengths of genetic code." His explanation for choosing Macs was that he wants maximum power for minimum cost.

If that is not enough to convince you, then you won't know what to make of these next stories. "November 20, 2003--Engineered Intelligence (EI) introduced its new [Parallel Programming Software](#) offering at the Supercomputing 2003 conference. EI's CxC(R) parallel programming software allows scientists and engineers to easily create programs for Apple's Power Mac G5, **the world's fastest personal computer.**"

(Related to this, there is still another outstanding Apple leadership effort in [XGrid](#), which some are [calling](#) "The Future of Computing". There is also exciting work being done in a similar way with [Pooch](#).)

Or the undisputed FACT that Virginia Tech has stunned the supercomputer world building the **third fastest computer in the world**, within a **few months**, and at about **10% the cost of a typical supercomputer** – using only stock Apple G5s. Here is a super inside [summary](#) which includes photos, a slide show, etc.. With literally hundreds of reports about this amazing accomplishment, it is difficult to select something representative, but here is one [story](#), and [another](#). [Here](#) is what their Dean of Engineering wrote in January 2004. Apologies to the rest.

Less well known is that Dell is trying to compete in this area, and supported a similar effort at the University of Texas. This [report](#) is about their \$38M Dell/Linux cluster that will achieve 3.7 Tflops. Compare that to Virginia Tech's \$5.2M Apple/Mac OS X cluster that achieves 17.6 Tflops. Cost per Tflop: Dell = \$10.3 million, Apple = \$295,000. Conclusion: **Apple is the fastest and lowest cost.**

This is an excellent [collection](#) of articles concerning microprocessors, entitled "Let The Chips Fall Where They May! – Mac Processors & Wintel Processors: A Resource"

In another progressive effort to improve performance, Apple is one of the founding members of the [HyperTransport Consortium](#) Consortium of companies backing this new standard. Apple will use HyperTransport as a high-speed link between the two processors that make up the chipset in new desktop Macintosh systems, sources [said](#). A chipset is a group of chips that manages the internal functions of a computer. (The companies include AMD, Cisco, Sun Microsystems – but not Intel.)

In a related area, there is periodic speculation about whether Apple will port Mac OS X to run on Intel or AMD type microprocessors. For years this has been a favorite rumor, as there is just enough plausibility to make it interesting. Here is a good [discussion](#) of the topic, and [another](#), plus a somewhat more [technical](#) one. There are a variety of reasons why this change would be **1)** difficult, and **2)** undesirable. Here is a [sample](#) from that side of the fence, plus a [follow-up](#). To my knowledge, these are Apple's latest [comments](#) (November 2003). Stay tuned.

One contributor accurately pointed out that "It makes absolutely no difference if your machine is 'faster' if you are blankly looking at the screen, trying to figure out what to do next. **For most users in most tasks, a consistent interface, ease of use, and easy to learn software are much more important than raw horsepower.**

"The minute differences in time taken to do average tasks between 'fast' computers and not-so-fast computers are not important for most people in most applications. Who cares if a task is performed in the blink of an eye or three quarters of the blink of an eye? I am writing this on a 250 MHz machine. Can I tell that it is not a 450 MHz machine? No."

Another author observed "You can have the fastest computer on the planet, but if you type 50 words a minute, it'll be the same 50 words a minute regardless of the potential of your PC." In a similar vein read this [entertaining story](#) of how one individual's Mac compared to the Dell of his friend, when running similar everyday tasks.

A third person wrote in: "Were there enough time, **I could spend an entire month with all the anecdotes of suffering I experienced as a PC user.** I wasted a good part of 13 years, using 22 PC operating systems – all in the name of trying to find a computer that I hoped would do the same things my Mac now does effortlessly.

"Regardless of issues of personal preferences and priorities, my bottom line for getting a Macintosh was that I was losing time by not being productive. This is not a matter of a few hours here and there – it is much more a matter of many months, **if not years** trying to accomplish with Windows what the Mac has made a matter of due course.

"There is no comparison study or benchmark that adequately equates the amount of lost time, frustration and utter despair I experienced as a PC user compared to the joy, satisfaction and relaxed peace of mind I've been able to receive as an owner of a brand new Mac. At every opportunity I point out how Macs save time, money, and effort in **every task a person would seek to undertake using a computer.** Those numbers tell a story that leaves a lasting impression on everyone I've spoken to. In short, there are a lot of people who have switched to Macs and a lot more who want to when the time is right for their particular financial situation.

"I never would have considered myself someone to evangelize, but I now do so at each and every chance I get, with all the vigor and passion I can muster. **Macs are that good – and better.** I have now gotten my life back and I can sleep without any of the anxieties I used to face with Windows staring back at me."

Still another said "The measure of 'power' is not absolute speed, but rather **the net combination of the positive element of productivity plus the negative element of lost/down time.**

"Productivity is enhanced by a consistent and powerful interface design, multiple applications being readily available, doing more than one thing at a time in a true multitasking environment, and the ability to integrate a diverse tool set through scripting, programming, etc.

"Negative elements include reboots due to system crashes, lost data due to crashes, time spent wasted trying to figure out what settings will allow me do accomplish a task (printer selection, network interfaces), and how I go about controlling those settings, time lost due to viruses, downtime for maintenance and reconfigurations, etc.

"Apple's Macintosh computers do a much better job than Wintel PC's in terms of personal productivity. With OS X, I can have dozens of applications simultaneously open, the system never crashes or hangs, and things 'just work'. An these are just some of the **free** productivity tools I have access to: Apple script, the Cocoa Development Environment (C,C++, Java, Objective-C, or Applescript Studio), Perl, and a Unix Shell."

I couldn't have phrased it better! My observation, putting it again into the car analogy, would be to compare the Pentium/Athlon to a Corvette, while the Mac is a Lexus. The Corvette may have faster 0 to 60 acceleration or higher top end speed, but what does this **really** mean to the everyday driver? Furthermore, the trade-offs for owning the Corvette are many: higher gas mileage, much harsher ride, less trunk space, more frequent repairs, etc., etc. **So it is in the computer world.**

Although we have talked a lot about hardware as it relates to speed, the operating system itself is, of course, a major contributor to performance. You should know that, in addition to offering more features, Apple's OS revisions are also aimed at improved performance (e.g. by making more things 'native'). Here are some November 2003 test [results](#) that show their progress.

Please read this 2002 [Wired article](#). *The whole thing*.

Particularly interesting are the remarks by physicists at UCLA, who explain that they have been grouping Macs together (clustering) to get an even more powerful machine to perform complex scientific calculations. They use Macs because "Not only was the performance faster than the Pentiums but it was comparable to the performance achieved on some Crays."

This is a simply astounding observation! A Cray Super Computer (costing in the millions) is a true no-holds-barred super computer...

The article continues by saying "Most clusters are based on Pentium machines that run Linux. But according to these UCLA Physicists, Linux clusters require a PhD to set up and to run. By contrast, Mac clusters are so easy to make, even teenagers can do it.

"There's a book called *How to Build a Better Beowulf* that's 230 pages long and tells you how to set up clusters with Linux. We have a **one-page manual** that shows you how to do it on PowerMacs. We've had high school students do it. We've had junior high school students do it. We even had a sixth grader in Hawaii do it.

"It took NASA's Jet Propulsion Laboratory two weeks to put together a 16-node Linux cluster. We could do the same thing with Macs in less than an hour."

They go on to say that "Linux clusters are also extremely fragile: If all the machines in the cluster aren't running the same version of the kernel, everything grinds to a halt. By contrast, a Macintosh cluster can be made from a mix of G3 and G4 Macs running Mac OS 9 or X."

This August 2002 [article](#) in the Boston Globe makes the same point when it interviews several different engineers. For example: "...Craig Hunter, an aerospace engineer at NASA's Langley Research Center in Virginia, is replacing Silicon Graphics workstations with Macintoshes. Hunter uses computational fluid dynamics software to simulate airflow over the wings of an airplane. It's extremely complex work that he sometimes runs on a Cray supercomputer with 64 processor chips. But Hunter says the PowerPC G4 processors used by the Mac are as powerful as those in the Cray. 'If I put together 64 G4s, we'll get the same performance as the Cray for a lot less money'."

If you want to see how easy it is to set up your own Mac cluster, go [here](#).

Here is somebody else that picked up on Mac performance. Terra Soft co-founder and CEO Kai Staats told [NewsFactor](#) (March 2002) "in real-world applications, PowerPC processors are better equipped for Linux than their Intel counterparts. **When considering the price/performance/power consumption/footprint ratio, PowerPC wins nearly every time.**"

In another technology area, Jeff posted this on Java.Net in November of 2003: "I run JBuilder and CVS on both my Mac laptop and my Wintel box, and use CVS to move code between them quickly and easily... The Mac VM is unique among Java VMs currently in that it shares static data between versions of the VM. Thus IME once you have a first VM up, launching subsequent ones is like greased lightning.. In short I think Apple's got a lot of support for their claim that they are the 'best Java desktop environment around.'"

Awhile back I received an email from the Department of Physics and Astronomy at Oak Ridge, Tennessee. It said, "We are a group of computational astrophysicists here at Oak Ridge National Laboratory and UTK. **We all use three or four of the top 20 most powerful computers on the planet almost daily. We are all, to lesser and much greater degrees, computer experts.** We are computational, not computer scientists. By that I mean we USE computers to get complicated tasks done and hard problems solved. **And... we are completely a Mac shop – including laptops and home machines, throughout.** "

If Macs perform well enough to satisfy the demanding users of some of the most powerful heavyweight computers in the universe, they should do just fine for YOU...

Conclusion: *If you want the most powerful, productive, and easiest to use computer available: buy a Mac.*

This section's Haiku
(see the bottom of page 1 for more explanation):

***Aborted effort:
Close all that you have worked on.
You ask way too much.***

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— Section #9 —