# Adding RAM Makes Nearly Any Computer Faster

ONE OF THE MOST QUOTED RECOMMENDATIONS FOR IMPROVING THE SPEED OF A COMPUTER IS TO ADD MEMORY. EXTRA RANDOM-ACCESS MEMORY (RAM) CAN MAKE ALMOST ANY COMPUTER FASTER.

The primary exceptions to this rule are computers that still have 32-bit operating systems. Starting with Windows XP, Microsoft offered 64-bit operating systems and most computers sold in the past 5 years or so are 64-bit systems, so they can take advantage of whatever RAM you install. But 4GB is the most 32-bit operating systems can access.

Two kinds of RAM exist and you'll find both in most computers these days: Volatile RAM, usually referred to as dynamic RAM (DRAM) or static RAM (SRAM) and non-volatile memory such as ROM and Flash. DRAM and SRAM must be refreshed constantly to maintain the information it holds while ROM and Flash memory can store data even when the system is turned off.

Most of the RAM in a computer is DRAM because it's faster and less expensive than SRAM, but all information is lost when power is removed. Because non-volatile RAM can store information when it's not powered, it's used in thumb drives and memory cards.

Companies are working on some other technologies that could someday replace one or both of the standard RAM types. One is called phase-change RAM (PCRAM), which uses a special type of glass. The technology dates back to the
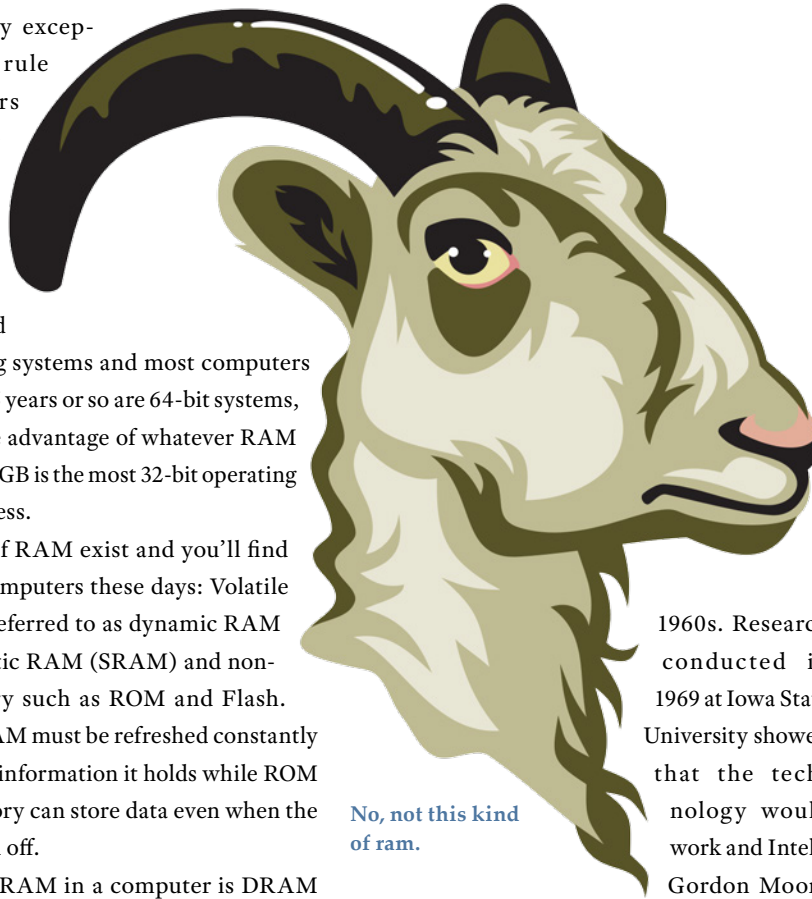
No, not this kind of ram.

1960s. Research conducted in 1969 at Iowa State University showed that the technology would work and Intel's Gordon Moore has published an article on the technology. Power consumption has been the primary roadblock to using PCRAM.

Magnetoresistive random-access memory (MRAM) is a new technology with what appears to be the greatest chance of success. It's non-volatile and technicians have been working on it since the 1990s. MRAM has only a tiny market share now, but it's seen as a possible successor to both volatile and non-volatile memory.

Unlike conventional RAM, data in MRAM is stored magnetically instead of as an electric charge (SRAM) or current flows (DRAM). Two ferromagnetic plates, each of which can hold magnetization are separated by an insulating layer. Read and write speeds for MRAM are fast enough to position it as a possible contender to replace DRAM. Currently, though, it's more expensive than either of the two primary technologies.

Some computer devices are already using MRAM components, but mainly in specialized applications.

Another technology people are working on is resistive random-access memory (RRAM and sometimes ReRAM), which is non-volatile and works by changing resistance across a dielectric solid-state material.

This is another of the newer and less-developed technologies, but it might have a size advantage. Because electrical signals travel at a finite speed, anything that limits the distance the signal must travel has the potential to improve speed.

Don't Forget the Disk Drive

ONE OF THE SLOWER COMPONENTS IN A COMPUTER IS THE HARD DISK DRIVE.

Booting and the process of opening programs can be accelerated considerably by installing a solid-state drive (SSD). These are still more expensive than mechanical drives, so you may still need one or more additional drives to store data.

Many notebook computers now have SSDs because they're fast and also because they are less likely to be damaged by movement. Ω

Desktop Publishing after Nearly Three Decades

It's been 27 years since I wrote a booklet about desktop publishing (or electronic typesetting, if you prefer). Aldus PageMaker and Xerox Ventura Publisher had just been released.

Neither PageMaker nor Ventura Publisher has survived, but their successors have changed forever how we work with words on paper.

In the early 1970s, I was in charge of creating some publications for the State of Ohio's Travel and Tourism Bureau. After typing the information and consuming large amounts of *Wite-Out*, I carried pages across an alley to the printing operation where the information was entered into a photo-typesetting machine. The print shop sent proofs, which I read and corrected. After a few iterations of the process, we usually had something that contained only a few mistakes.

By 1982, I had returned to private enterprise where I was responsible for a newsletter. Typewritten copy was still the starting point, but I created it on a computer. Although the typesetter use a computer, he couldn't accept an electronic file from a word processor, so typewritten pages were still the norm.

But then things started to change and those changes put hundreds, if not thousands, of small typesetters out of business. Xerox invented the laser printer and licensed the technology to Hewlett Packard. Two guys invented a way to control type electronically, named it Postscript, and set up a business called Adobe. Aldus invented PageMaker. Xerox purchased the rights to Ventura Publisher.

Typesetters were unimpressed because of the low quality of the output, but within a few years, the software produced better output and laser printers became capable of resolution that nearly matched the output of dedicated typesetting systems. The technology had become *good enough*.

Word Processing programs advanced, too, and began to mimic some typesetting capabilities, but typesetting and page layout programs are still needed for professional output. After all, word processors are designed for letters, envelopes, and labels. Their ability to produce multi-column, multi-article, illustrated publications such as newsletters continues to improve, but inefficiencies remain.

Today's Publishing Programs

Adobe InDesign is the primary player these days. It's an application that Adobe developed, incorporating features from PageMaker and Frame along the way. Both of those programs have been discontinued. Additional features have been added to InDesign and now, under Adobe's Creative Cloud program, updates are provided continuously. InDesign is the application I recommend.
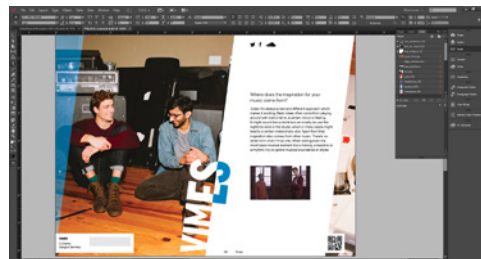
Scribus is an open-source application, released under the GNU General Public License, as free software. It is based on the free Qt toolkit, which means that it's available for Windows and Apple systems as well as for Linux and Unix systems. This is a good choice for those who need a powerful publishing application, but have a limited budget.
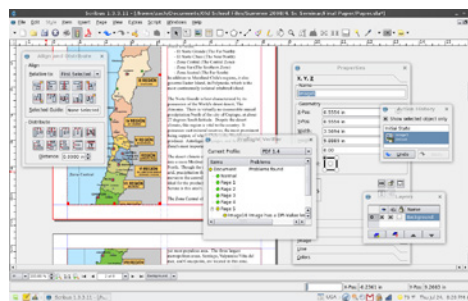
Quark Xpress, introduced a few years after PageMaker, gained substantial market share among high-end users, but has seen that market share reduced since Adobe's introduction of InDesign. Adobe intended InDesign to be a "Quark Killer", but it also killed Ventura Publisher.
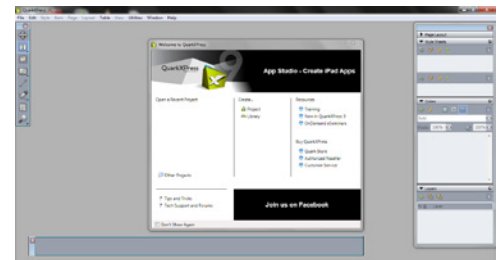
Apple Pages and Microsoft Publisher are inexpensive publishing programs that are sufficient for small tasks, but aren't robust enough for large, complex publishing needs.

TeX and LaTeX combined are a typesetting system written by Donald E. Knuth, professor emeritus at Stanford University. They are free under terms of the GNU General Public License ("Copyleft") and are available for most computing platforms.

Ventura Publisher was acquired by Corel Corporation and then allowed languish. It no longer exists. Ω