Economics of Purchasing RAM

In the past three years the US price of a 1MB SIMM has plummeted by a factor of ten. This rapid decline was partly due to a change in import regulations; SIMM prices typically reduce by about 30–50% per year. This has two implications. First, if your Macintosh is in the 1–8MB range, the cost of the RAM today is usually less than 5% of the total system cost, so it pays to be liberal in investing at this level. It doesn't make sense to cripple a several thousand dollar computer for the lack of a hundred dollars worth of memory. However, memory for the Portable and PowerBooks is generally 3–5 times as expensive as other RAM. So smaller RAM configurations are more common and often more appropriate for these systems.

Second, if you contemplate going beyond 8MB, bear in mind that your investment will be depreciating as RAM prices come down. When new, higher densities of RAM are first introduced, the supplies are very limited and the prices can be unaffordable except for those who have no reasonable alternative.

An easy way to tell if the initial steep decline has passed is to check the price per megabyte against the price of the previous generation, the one with one quarter the capacity. Today, 4MB SIMMs are just about the same price per megabyte as 1MBs, while 16MBs still sell at a substantial premium. So, 4MB SIMMs have reached the price level where they are worth considering even for the general purpose office Macintosh, while 16MB SIMMs are clearly for special applications.

Note that the standard industry products are the 256K, 1MB, 4MB, and 16MB versions. The 512K, 2MB, and 8MB intermediate products can sometimes be a reasonable choice, but they are usually on a slightly higher cost curve because of the lower production volumes. Also, the 512K SIMM only works on the Macintosh IIsi and IIci, while the 2MB SIMM only works on the Macintosh LC, LC II, IIsi, IIvx, IIci and Performa 400 and 600.

Benefits of Adding Memory

One advantage of having more memory is simply that you can open up more applications at the same time. Time saved not opening and closing files adds up. If you need to open up more applications than your application memory can hold, you must either install more RAM or increase your virtual memory usage. Otherwise, there just isn't enough space in application memory to do your work.

Effects of Memory on Speed

There are also circumstances where adding RAM is a good idea because it will actually speed up processing of tasks. A classic example is if you are using an application like Adobe Photoshop which can work with an image that is mostly on the hard drive. Photoshop transfers images a piece at a time into RAM according to the amount of

available memory. Each time data is swapped in and out of RAM your Mac becomes "I/O limited." This means the CPU is waiting around for external data transfers to occur before it can do any useful work. If you add RAM in such a situation, the amount of disk activity can be reduced and the I/O limitations will occur less often.

You can be I/O limited by virtual memory swapping in a similar fashion. This happens when you use System 7 VM or Connectix Virtual and open applications that are larger than the physical RAM not taken up by the System.

One way to overcome the I/O bottleneck is to use a very fast disk, like a RAM disk (see "RAM Caches, Disks, and Drives"). When you use a RAM disk, information is available as fast as the CPU can accept it, so I/O limits are essentially removed. Another improvement is to use a high performance virtual memory manager, like Connectix Virtual 3.0 (see "Virtual Memory"). Often, however, your Mac is slower than you would like because you are "CPU–limited." The data is all available, but the CPU takes a long time to process it.

If this is the problem, more RAM won't help–you need to speed up your CPU. The five main ways to do this are 1) add a third–party CPU accelerator, 2) install an Apple CPU upgrade, 3) add a cache card (IIci, IIsi), 4) add a math coprocessor (which will speed up mathematical calculations only), or 5) buy a new, faster Mac. By the way, unless you speed your Mac up by at least 20% it will be hard to notice, even though smaller improvements will save you time.

As mentioned in the "About SIMMs" section, SIMMs come in different speeds. The current range is 70 to 150ns. If the RAM is too slow for your system, it often just won't work. But buying faster RAM will not have any effect on the speed performance of your Macintosh. (For speed requirements see the Reference Guide.)

What Happens When You Have Too Little Memory?

When you try to use an application but don't have enough memory, two problems may occur. If you are really short on memory, the application may simply refuse to launch. The Mac will display a dialog box that says "The application could not be opened." Worse, it may let you open the document but later quit in the middle of the session displaying "Application has unexpectedly quit." Usually you get a warning before you launch such a configuration, telling how much RAM you ought to have vs. how much is actually available.

If the amount left is less than about 75% of the total normally required, you are probably risking an Unexpected Quit. If this happens, your recent changes (since the last Save) will be lost. Be sure to save frequently! Some applications warn you of low memory by reversing some elements of the screen (white on black instead of black on white).

These are all signs that you need more memory for that application, but not necessarily that you need more RAM. If you are using System 7 or System 6 MultiFinder it may just be necessary to increase the amount of memory allocated to that application. To do this, quit the application into the Finder, click once on the application's icon so that it is selected, then hit Command–I (or select "Get Info" from the Finder "File" menu). Increase the number in the lower box in the lower right hand corner ("Application Memory Size") and close the Info window. You do not have to restart.

When you launch the application you will now have more of your application memory assigned to this application. If you want to run several applications at once, and the combined size of all the applications plus the System is bigger than your total application memory, you will need to use virtual memory, install more RAM, or run the risk of opening an application with less than the designated partition size, possibly leading to an Unexpected Quit.

Similar limitations apply under System 6 Finder, but only if you want to run an application which, when combined with the System, requires more application memory than you have. Under System 6 Finder, the one open application always gets all available memory so the partition adjustment procedure is unnecessary.

Sometimes when you are very low on memory, printing will not work properly— some fonts may not come out right. If there is no other way to get more memory, a quick trick is to use Background Printing (selected from the Chooser). Save your document and start printing as normal. Immediately after sending the job to the printer, quit the

application. Wait until printing is finished before opening another application.

Portable and PowerBook Issues

On the Portable and PowerBooks, extended battery life can be a further benefit to adding memory. Most applications are segmented, meaning that only part of the software comes up from the hard drive when the application is launched. The rest is brought into RAM whenever code in another segment (or other program resources) is needed. On a Portable, this means that a launched application is often still forcing the hard drive to keep spinning even after it is launched because new segments are frequently being called. The hard drive uses a lot of battery power.

With more memory installed you can use three tricks to save the battery. First, some applications allow you to force the whole program to load into RAM at once. Go into the Preferences box and look for selectors that say Keep Program in Memory or Keep File in Memory.

Second, you can also use MAXIMA to store your applications in a RAM disk during run time (see “RAM Caches, Disks and Drives”). Then, even if you do have to keep accessing different program segments, the hard drive will not be accessed, only the RAM disk.

A third way to extend battery life is to install Connectix PowerBook Utilities (CPU). This improves your ability to control and monitor battery use, as well as to maintain the battery. CPU also offers a complete set of utilities designed exclusively for PowerBooks including security, cursor finder, hot keys, instant sleep and wake, and an LCD screen saver (see Page 13).