*Opti*Mem
The Software Memory Upgrade

NOT JUST MORE MEMORY— BETTER MEMORY

A technical discussion of OptiMem's unique role in the Macintosh memory market, intended for reviewers, analysts, marketing professionals, users of OptiMem, and other interested evaluators.

Summary

There has been much interest in— and some confusion about—the new category of Macintosh software ushered in last year with the introduction of *Opti*Mem, *The Software Memory Upgrade.* More details about *Opti*Mem's features and benefits are provided elsewhere. This note goes into some depth to address questions raised about the differences and similarities between *Opti*Mem and the alternatives for getting more useful memory on the Macintosh (such as System 7's virtual memory and RAM Doubler™ by Connectix).

- *Opti*Mem is very different from other methods of getting more usable memory for your Macintosh. Where *Opti*Mem *optimizes allocation of the logical memory space* but does not *expand* it, the alternatives do the opposite: they *expand the logical memory space but do not optimize* the use of it.

- Optimizing memory, rather than simply expanding it, provides a unique and important benefit. With *Opti*Mem, applications work as if their previously fixed memory partitions can grow and shrink dynamically. So they only use the amount of memory which is actually needed at any given moment. This is especially beneficial to users who run several programs at a time or have a widely varying mix of documents and applications.

- *Opti*Mem works well *in conjunction with* all methods of expanding the logical memory space (including RAM Doubler and virtual memory). Users who are already using RAM Doubler or VM are amazed by the increased
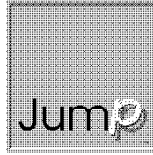
memory, and optimization benefits they get when they use *Opti*Mem in addition.

- For Macs without an MMU, and already at their physical memory barrier, *Opti*Mem is the only alternative for more useful memory. Since *Opti*Mem is designed to work with all Macintosh hardware and does not require any special processor support (such as the virtual memory mapping MMU available on 68030 and 040 processors) it will optimize any Mac running System 7—including 68000 Macs like the Plus, SE, or Classic; Macs with third party accelerators; and the new Power Macs.

- Unlike the other memory upgrade methods, *Opti*Mem works on a per-application basis—so you can easily specify optimization for some applications and not others. This allows you to use any combination of optimized and unoptimized applications simultaneously. Other software methods require you to disable the

product and restart the computer in order to use any software which doesn't work well with it.

Introduction to Software Memory Upgrades

First let's clarify some terms used. The *logical memory space* in a Macintosh is what is seen by the user (for example, in the About This Macintosh window), or by the application software. This logical memory space is usually equivalent to what is provided by the *physical or hardware memory* (often referred to as RAM). The logical memory is most easily expanded by installing additional physical memory and maintaining the usual one-to-one mapping between physical and logical space.

Providing a logical space that is larger than the physical memory requires a selective mapping of blocks of physical memory into the logical space. This differentiation of logical and physical memory access and the mapping between the two spaces is commonly called *virtual*
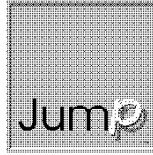
memory. (The resulting logical space is also called the *virtual address space*.) As can be imagined, the constant address lookup and translation necessary to support such a scheme has considerable processing overhead. Therefore, it is only used on Macs that have special memory mapping hardware in their processors, to minimize this overhead.

With the standard Mac virtual memory, the extra blocks of logical memory (which are not mapped to physical memory at a given point in time) are stored on disk and swapped with other blocks in physical memory when
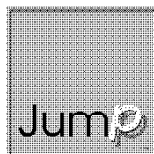
the processor must access them. However, virtual memory can be implemented using other methods of storing the swapped-out blocks, such as the in-memory compressed buffers used by RAM Doubler.

Using these terms, we define the fundamental difference between *Opti*Mem and other methods of getting more useful memory as this: *Opti*Mem *optimizes allocation of the logical memory space* but does not *expand* the logical space. The alternatives do the opposite: they *expand the logical memory space but do not optimize* the use of it.

This might be confusing when examining virtual memory techniques for implementing a larger logical memory space. The virtual memory manager (as provided by the system or by a third party product like RAM Doubler) uses a block replacement strategy to minimize swapping data. This could be described as optimizing the allocation of physical memory, but is more commonly called a *memory policy* or a *paging algorithm*. An important thing to notice is that this applies to the allocation of *physical* memory rather than the logical space, dealt with by applications, that *Opti*Mem optimizes.

The Benefits of *Opti*Mem Technology

Optimized applications open using minimum sized initial partitions, but are not limited to them. They use additional memory only where and when they need it (for example, when opening or expanding documents, printing and checking spelling), and each application has access to all the free memory on the machine. When an app releases memory no longer being used (for example, when closing a document or finishing printing), it is immediately available for reuse by other programs—including optimized applications that are already open.

Since *Opti*Mem optimizes the logical memory space, in contrast to expanding it, *Opti*Mem is compatible with and works very well with the other methods for getting more
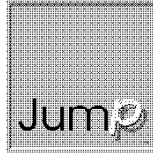
usable memory (such as virtual memory and RAM Doubler). Jump Development Group has done a lot of testing with *Opti*Mem and RAM Doubler and finds they work extremely well together, without any downside. The technologies are entirely different. RAM Doubler uses virtual memory techniques to expand the logical memory space, and then *Opti*Mem is happy to optimize allocation of the increased logical space provided. And, in fact, the two together give you much more useful memory than either one alone.

So, the two products really complement each other: *Opti*Mem provides the reduction of initial application partitions and dynamic resizing of apps, while they remain open, so you get more into the memory you have. RAM Doubler compresses your in-memory data and maps in additional virtual address space, so you have more to allocate in the first place.

Since *Opti*Mem works on any Mac running System 7, it is able to provide benefits for all Mac users,

including those unable to use virtual memory expansion for one reason or another. (Virtual memory and RAM Doubler can only be used on machines with the memory management hardware.) *Opti*Mem is the only way to more useful memory for millions of Macs, including all the 68000 machines like the Pluses, SEs, and Classics—or for any Mac which is already at the limit of its physical memory capacity. Even Macs with third party accelerators and Power Macs can benefit from *Opti*Mem.

The owners of many Macs with memory limitations have held off upgrading to System 7 because of the additional memory demands. Now, with *Opti*Mem, these people can upgrade to the latest system and application software, keep multiple major applications open at the same time, and still have enough memory to work productively.

No memory upgrade is 100% compatible in all situations (yes, even adding physical memory can cause problems for some
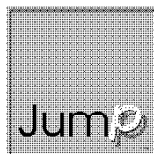
configurations of hardware and software). Unlike the other techniques, *Opti*Mem applies its improvements on a per-application basis. That means it can be turned off for some applications while it continues to optimize others. This allows you to use any combination of optimized and unoptimized applications simultaneously. Virtual memory and RAM Doubler require you to stop what you're doing, close/quit all of your work and restart the computer with the expanded space completely disabled in order to use any product which doesn't work well with them.