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Virtual Memory: The Resulting Total RAM and Hard Disk Speed

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TOPIC ---

Why does total RAM always equal virtual memory? What happens to the
physical RAM on board?

Since virtual memory uses the hard disk, doesn't the speed go from
nanoseconds to milliseconds?

DISCUSSION --

Total RAM and Virtual Memory

Virtual memory extends the available amount of memory beyond the limits
of physical RAM. It uses a logical address space formed from:

• Main memory (physical RAM to keep portions of programs and data currently
  in use), and

• Secondary storage (such as a hard disk) to hold those portions currently
  not in use.

If an application needs a portion of memory (or page), the operating system
loads the page(s) back into main memory, and swaps out the unused page(s)
from main memory into secondary storage. This process occurs transparently
through the use of the PMMU (Paged Memory Management Unit), and is called
demand paging.

Total RAM equals virtual memory because of this scheme. Both physical RAM
and secondary storage combine to make the total amount of "virtual" memory.
But in reality only the currently used pages are in main memory.

Hard Disk Speed and Performance Using Virtual Memory

The speed does drop to milliseconds when accessing the hard disk. This is
true only when the needed page(s) isn't in main memory, and the system must
access it from secondary storage.

It's best to limit the amount of virtual memory to twice the size of
physical RAM to eliminate excessive paging activity known as thrashing. As
the ratio of virtual to physical RAM increases, performance may degrade
respectively, depending on the behavior of the applications running.
As the ratio decreases, performance will most likely increase.

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