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Macintosh LC II: Virtual Memory

Article Created: 23 March 1992

Article Last Reviewed:

Article Last Updated:

TOPIC -----

The Macintosh LC II supports a demand paged virtual memory environment -- a distinct advantage over its predecessor, the Macintosh LC. The 68030 microprocessor comes equipped with the MC68851 PMMU (page memory management unit).

DISCUSSION -----

Addressing Scheme

The Macintosh LC II can generate either 24-bit or 32-bit virtual addresses.

The 24-bit mode allows a total of 11MB virtual memory. In 24-bit mode the total addressing space is 16MB. In this address space, 2MB is reserved for ROM, 1MB for I/O, 1MB for video, and 1MB is just reserved for a total of 5MB used in this 16MB space. The PDS slot also takes up 1MB. So when a card isn't installed, virtual memory can use this space. With a PDS card present, 10MB of virtual memory is available.

In 32-bit mode, because the ROM is 32-bit clean (that is, the ROM code has the ability to use the full 32 bits of address space), the total addressing space is 2³², or 4 gigabytes. Of this 4 gigabytes, 3 gigabytes is used for ROM, I/O, slot space, and expansion, leaving a maximum of 1 gigabyte for virtual memory.

Virtual Memory

With the Macintosh LC II, limited RAM expandability and the cost of RAM SIMMs makes virtual memory an attractive option. Virtual addressing allows the Macintosh LC II to address data on a disk drive as if it were in main memory. That means that you can launch more applications and data on the Macintosh LC II than the amount of installed RAM can contain.

The 68030 and its PMMU provide the hardware support for virtual memory. PMMU performs memory paging, a technique where a needed page of memory is transferred (swapped) into main memory from the disk. In addition, the

PMMU swaps out of main memory, a page that isn't currently needed. The PMMU keeps track of 64 pages in memory.

With 32-bit addressing on and enough space available to allocate on hard disk, you can create a very large virtual memory address space. However, it's best for performance reasons to limit the size of your virtual memory to twice the size of installed RAM. By limiting the size of your virtual memory, you'll help eliminate excessive paging activity known as thrashing. Copyright 1992, Apple Computer, Inc.

Keywords: <None>

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19960215 11:05:19.00

Tech Info Library Article Number: 9950