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What is Main memory ?

The main memory is central to the operation of a Modern Computer. Main Memory is a large array of words or bytes, ranging in size from hundreds of thousands to billions. Main memory is a repository of rapidly available information shared by the CPU and I/O devices

Main memory is the place where programs and information are kept when the processor is effectively utilizing them.

In a multiprogramming computer, the Operating System resides in a part of memory, and the rest is used by multiple processes. The task of subdividing the memory among different processes is called Memory Management

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1. Virtual Memory

Virtual memory in FreeBSD allows each process to have its own isolated address space, independent of the actual physical memory. This abstraction enables efficient multitasking and the illusion that each process has its own dedicated memory.

The use of virtual memory enhances system stability and flexibility, enabling processes to execute as if they have access to a larger pool of memory than physically available.

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2. Page System

The page system in FreeBSD divides physical memory into fixed-size pages, typically 4 KB each. This granularity facilitates efficient memory management by allowing the operating system to allocate and deallocate memory in smaller, manageable units.

The page system plays a crucial role in optimizing memory usage and facilitates the efficient swapping of data between RAM and the hard drive.

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3. Memory Allocation

FreeBSD employs various memory allocation algorithms, with one notable example being the buddy system. This algorithm manages memory blocks of different sizes, allocating and deallocating them dynamically as per the needs of processes.

Dynamic memory allocation ensures effective use of available resources and adapts to the changing memory requirements of running processes.

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4. Swap Space

Swap space is a designated area on the hard drive used by FreeBSD when the physical memory is insufficient to meet the system's demands. It acts as a temporary storage location for data that is not actively used, allowing the system to continue running.

Swap space prevents system crashes due to insufficient physical memory and provides a mechanism for handling memory overflow gracefully.

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5.Memory Protection Mechanisms

FreeBSD implements memory protection mechanisms to ensure the isolation and security of processes. These mechanisms prevent one process from accessing or modifying the memory space of another process, enhancing system stability and security.

Memory protection safeguards against unintended interference between processes, contributing to the overall reliability and security of the FreeBSD operating system.

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