**Main Memory**

**What is memory?**

Before I distinguish “main memory” I should probably briefly describe what memory refers to in general, that is in the context of computers of course. Memory refers to the place where data/information can be stored and read from. There are five main types of memory that a computer utilizes:

* Random Access Memory(RAM)
* Read Only Memory(ROM)
* Cache
* Registers
* Non volatile storage devices(to be discussed later on)

I will not dwell on the function of Cache and Registers as for all intensive purposes they are a buffer between main memory and the CPU( the “brain” of the computer )to allow faster execution of programs. In general main memory refers to RAM which is not to be confused with ROM which is used to store essential system programs that are not to be erased or overwritten.

**Volatile and non volatile memory**

To further contrast RAM from storage devices like a hardrives you have to understand the difference between “volatile” and “non-volatile” memory. Volatile memory describes memory that when the computer’ s power source is removed any data that was stored on that memory would be erased, in contrast non-volatile memory allows data to be persistent even without a power source. RAM is a volatile memory device, where as a hardrive is non-volatile. Non-volatile storage devices are essential for having an operating system(OS), which provides link between the computers hardware to the programs you may want to run. They are also essential for saving any files or programs along side the operating system.

Why not always use non-volatile memory? Its simple non-volatile memory is significantly slower than its volatile counter part, however you can store a lot more data in non-volatile memory in less space than what the same data would take up in volatile memory. The reason for this speed redundancy is mostly to do with fact that hardrives take longer to access different places in memory depending on there position, however distance is negligible in contributing to latency in case of RAM.

**What is ram**

As mentioned before, it is a storage device that stores data in binary, a number system involving 2 digits, 1 and 0 in contrast to decimal involving 9 digits(0-9). This is a key concept as it means we can store logic(true/ false) in simple duel-state modules. Many of these modules can then come together to store commands to be sent to the CPU.

In general when I refer to RAM I am specifically speaking of DRAM(Dynamic RAM), the same RAM you can upgrade in you laptop or desktop. This stores data in individual cells each containing a capacitor( to store electricity ) which can be charged, causing the cell to output a higher voltage, to store the value “1”, and discharged, causing the cell to output a lower voltage, to store the value “0”. Because of the nature of capacitors the charge must refresh at a constant interval to retain its state( hence the volatility ).

It is helpful to think of RAM as the systems working memory, that is, the memory that is used when doing arithmetic or logical operations(calculations). For such calculations to be carried out the computer must have a way of determining what data it needs and when, this is why RAM stores data in an array of bits(1 binary digit) with a corresponding address. Via a “load” command the control unit in the CPU can call an address and operate on its corresponding data.

**Why a computer needs RAM**

When trying to understand why a computer needs ram we must understand the CPU’s “fetch-decode-execute” cycle. To put it simply a computer needs to gather/fetch data that is needed for an operation, arrange/decode the data in preparation and execute the operation with the data as the operands. So when you run a program on your computer, data telling the CPU what to do is read from your hardrive and stored in RAM for the CPU to “fetch” and operate on. This is why if you have many programs open at once, the entire systems performance is hindered as there is not enough space to store every piece of data for each programs operations.

In conclusion Main memory, mainly RAM that is, is an essential tool in the function of a computer and allows us to run programs fast and efficiently.

**Reference list**

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