

## 5.4 Volatile and Non-Volatile Memory

Memory is one of the most fundamental components in computing systems. Broadly, computer memory can be divided into two types namely volatile memory and non-volatile memory. Even though both are crucial in the total functioning of the electronics, they are not interchangeable, each playing specific roles. Volatile memory deploys power in order to store data, it is fast and will only store data for the short term while on the other hand non-volatile memory will store the data even if the power is off and therefore useful where data is supposed to be stored for long term. In this article we will see difference between Volatile Memory and Non-Volatile Memory in detail.

### What is Volatile Memory?

It is the memory hardware that fetches/stores data at a high-speed. It is also referred as temporary memory. The data within the volatile memory is stored till the system is capable of, but once the system is turned off the data within the volatile memory is deleted automatically. RAM (Random Access Memory) and Cache Memory are some common examples of volatile memory. Here, data fetch/store is fast and economical.

### Advantages of Volatile Memory

- High Speed: RAM is an example of volatile memory and has much faster read/write cycles than non-volatile type of memory.
- Efficient Data Access: It facilitates fast access to data making it appropriate in situations that involve real time data processing.
- Temporary Storage: It acts as a means for temporary storage of CPU and prevents the active processes and applications from getting jumbled and complicated.

### Disadvantages of Volatile Memory

- Data Loss on Power-Off: The first is that all information stored has to be erased if the power is switched off hence they have to be provided with power constantly.
- Limited Data Retention: They are not fit for storing data that require to be archived, stored for long periods of time.

### What is Non-Volatile Memory?

It is the type of memory in which data or information is not lost within the memory even power is shut-down. ROM (Read Only Memory) is the most common example of non-volatile memory. It's not economical and slow in fetch/store as compared to volatile memory however stores higher volume of data. All such information that needs to be stored for an extended amount of time is stored in non-volatile memory. Non-volatile memory has a huge impact on a system's storage capacity.

### Advantages of Non-Volatile Memory

- Persistent Data Storage: Some types of memories are permanent, which means that they can store files and systems configurations permanently and this makes them non-volatile memories.
- Low Power Consumption: Compared to volatile memory that needs power to be supplied in order to retain data, non-volatile memory is more energy friendly.
- Wide Applications: It functions in installing devices like USB drives, SSDs, and memory cards while guaranteeing the security of data in case of power outages.

### Disadvantages of Non-Volatile Memory

- Slower Speed: NV type of memory has comparatively low read/write bandwidth compared to volatile type of memory, thus, it may have compromise on performance when used in high frequency applications.
- Limited Write Cycles: Some of them like flash memory for example they have limited write cycle and this may affect their useful life.

### Differences between Volatile and Non-Volatile Memory

Volatile Memory	Non-Volatile Memory
<u>Volatile memory</u> is the type of memory in which data is lost as it is powered-off.	<u>Non-volatile memory</u> is the type of memory in which data remains stored even if it is powered-off.
Contents of Volatile memory are stored temporarily.	Contents of Non-volatile memory are stored permanently.
It is faster than non-volatile memory.	It is slower than volatile memory.
<u>RAM(Random Access Memory)</u> is an example of volatile memory.	<u>ROM(Read Only Memory)</u> is an example of non-volatile memory.

<b>Volatile Memory</b>	<b>Non-Volatile Memory</b>
In volatile memory, data can be easily transferred in comparison to non-volatile memory.	In non-volatile memory, data can not be easily transferred in comparison to volatile memory.
In Volatile memory, process can read and write.	In Non-volatile memory, process can only read.
Volatile memory generally has less storage capacity.	Non-volatile memory generally has more storage capacity than volatile memory.
In volatile memory, the program's data are stored which are currently in process by the CPU.	In non-volatile memory, any kind of data which has to be saved permanently are stored.
Volatile memory is more costly per unit size.	Non-volatile memory is less costly per unit size.
Volatile memory has a huge impact on the system's performance.	Non-volatile memory has a huge impact on a system's storage capacity.
In volatile memory, processor has direct access to data.	In non-volatile memory, processor has no direct access to data.
Volatile memory chips are generally kept on the memory slot.	Non-volatile memory chips are embedded on the motherboard.
<b>Advantages-</b> <ul style="list-style-type: none"> <li>• Fast speed</li> <li>• Low power consumption</li> </ul>	<b>Advantages-</b> <ul style="list-style-type: none"> <li>• More reliable</li> <li>• Stores data permanently</li> <li>• Inexpensive memory</li> </ul>

Volatile Memory	Non-Volatile Memory
<ul style="list-style-type: none"><li>• Better system performance as it increases speed</li></ul>	<ul style="list-style-type: none"><li>• Helps in booting of operating system</li></ul>
<b>Disadvantages-</b> <ul style="list-style-type: none"><li>• Expensive</li><li>• Limited storage space</li><li>• Stores data temporarily</li></ul>	<b>Disadvantages-</b> <ul style="list-style-type: none"><li>• Slow speed</li><li>• Can only read data</li></ul>

