**KALYANI GOVERNMENT ENGINEERING COLLLEGE**

Department of Computer Application

|  |  |
| --- | --- |
| **Name:** | Rajendra Kumar Shaw |
| **Roll No.:** | KGEC/MCA/22/23 |
| **Stream:** | MCA 1st year 1st sem |
| **Subject:** | Computer Organisation and Architecture [MCAN-103] |

Title : Static Ram and Dynamic Ram

Table of Content:

|  |  |
| --- | --- |
| Pg no |  |
| 2 | introduction |
| 3-7 | content |
| 7 | conclusion |
| 8 | summary |
| 8 | references |

**Introduction** :

* **Static Random Access Memory (SRAM):** Data is stored in transistors and requires a constant power flow. Because of the continuous power, SRAM doesn’t need to be refreshed to remember the data being stored. SRAM is called static as no change or action i.e. refreshing is not needed to keep the data intact. It is used in cache memories.
* **Dynamic Random Access Memory (DRAM):** Data is stored in capacitors. Capacitors that store data in DRAM gradually discharge energy, no energy means the data has been lost. So, a periodic refresh of power is required in order to function. DRAM is called dynamic as constant change or action(change is continuously happening) i.e. refreshing is needed to keep the data intact. It is used to implement main memory.

**Content** :

1. Static Ram :- History, Characterstics, Advantages, Disadvantages
2. Dynamic Ram :- Types, Characterstics, Advantages, Disadvantages
3. Comparision Chart
4. **Static Ram :** 
   * **History:** Engineer John Schmidt invented the SRAM in 1964 at Fairchild Semiconductors. The first SRAM is 64-bit and uses p-channel MOS. Intel released its first 256-bit Intel 1101 SRAM chip in 1969, five years after its invention. But it uses Schottky TTL (Transistor-Transistor-Logic) architecture for its build. Early SRAMs were manufactured using ceramic plastic. But nowadays, SRAMs are integrated directly to the CPU for faster and better processing.[2]
   * **Characteristics :**
     + **The data is held statically:** The data is stored statically in SRAM and it doesn’t need to be refreshed unlike DRAMs.
     + **It is a type of Random Access Memory:** The SRAM is a type of Random Access Memory. Random Access Memories are those from which the data can be accessed (read/write) randomly (means any memory location can be accessed), regardless of the memory location that was accessed earlier.
     + **It uses flip flop for storing data:** It uses flip flops to store bits. Each flip flop is made up of 4-6 transistors.
     + **It is used as a Cache Memory in CPU:** SRAM is used as cache memory for CPUs as they are faster and stores data statically.[1]
   * **Advantages :**

* It is faster to access and perform operations like read & write.
* The data can be accessed randomly.
* It is used as a cache memory.
* It doesn’t need to be refreshed as it stored data statically.
* It has medium power consumption. It requires less power as compared to DRAM.[1]
  + **Disadvantages :**
* It is expensive.
* It is volatile in nature i.e., data is lost when the memory is not powered.
* It has a low storage capacity.
* It is not possible to refresh the program.
* It has a more complex design and they are bigger in size as well when compared to DRAM.
* It reduces the memory density.[1]

1. **Dynamic Ram** :
   * All RAM types, including DRAM, are a volatile memory that stores bits of data in transistors. This memory is located closer to your processor, too, so your computer can easily and quickly access it for all the processes you do.

As you use your computer, it needs to recall data and programming code for the CPU to process. RAM provides a way for the computer to use, rewrite, and temporarily save this data and code in real-time. Because the transistors need electricity to work, however, anything stored here disappears when you turn your PC off. That's why it's considered volatile.[3]

* + **Types of DRAM** : DRAM memory is just one kind of RAM and within the DRAM category, there are a few types to know.[4]

### SDRAM :

Synchronous DRAM, or SDRAM, improves performance through its pins, which sync up with data connection between the main memory and the microprocessor. Computers have used this syncing feature since the mid-1990s.[4]

### DDR SDRAM:

DDR SDRAM has the features of SDRAM, but with twice the data transmission frequency. That’s why it’s called “double data rate SDRAM.”[4]

### ECC DRAM :

This type of DRAM can find corrupted data and sometimes even fix it, thanks to its error-correcting code (ECC).[4]

### DDR2, DDR3, and DDR4 :

Many HP computers use the DDR series of DRAM chips. The technology improves from one generation to the next, which is indicated by the number series. DDR4, for example, is faster and more efficient than DDR2 or DDR3.[4]

If you purchase a new RAM stick to upgrade your computer today, it’s likely that it’ll be a DDR4 chip product. It’s also very easy to install DDR4 RAM in a standard desktop computer, making it popular among hobbyists and pros alike.[4]

* + **Characteristics of DRAM :**
* It has short data lifetime.
* It is less expensive.
* It is smaller in size.
* It is slower as compared to SRAM.
* less power consumption.[1]
  + **Advantage of DRAM :**
* DRAM memory can be deleted and refreshed while running the program.
* It is Cheaper as compare to SRAM.
* It has higher storage capacity. Hence it is used to create larger RAM space system.
* It is simple in structure than SRAM.[1]
  + **Disadvantage of DRAM :**

|  |  |  |
| --- | --- | --- |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

* It is comparatively slower than SRAM. Hence it takes more time for accessing data or information.
* It loses data when power is OFF.
* It has higher power consumption compare to SRAM[1]

### 

### Comparison Chart[3]

| **Basis-for-comparison** | **SRAM** | **DRAM** |
| --- | --- | --- |
| Speed | Faster | Slower |
| Size | Small | Large |
| Cost | Expensive | Cheap |
| Used in | Cache memory | Main memory |
| Density | Less dense | Highly dense |
| Construction | Complex and uses transistors and latches. | Simple and uses capacitors and very few transistors. |

**Conclusion** : DRAM is descendent of SRAM. DRAM is devised to overcome the disadvantages of SRAM, designers have reduced the memory elements used in one bit of memory which significantly reduced the DRAM cost and increased the storage area. But, DRAM is slow and consumes more power than SRAM, it needs to be refreshed frequently in few milliseconds to retain the charges.[3]

## Summary :

It may seem like we’ve given you a lot of information. Fortunately, we can sum everything up in a handful of easy-to-remember points:

* DRAM is a form of RAM, and it has several types within its category.
* DRAM is volatile, like all RAM, so it can’t hold data without power.
* DRAM is fast and comes in different speeds and latency options. Look for a higher speed (MHz) number and a lower latency (CL) number for the best results.
* Most DRAM is found in DDR4 products, like those featured in [HP desktop PCs](https://store.hp.com/us/en/plp/desktops) and [laptops](https://store.hp.com/us/en/vwa/laptops). Look for the most updated generation of DDR memory; it’s reliable and affordable.[4]

**References :**

1. <https://geeksforgeeks.org>
2. <https://technipages.com>
3. <https://techdifferences.com>
4. <https://wikipedia.com>
5. <https://techtarget.com>
6. Sergei Skorobogatov (June 2002). ["Low temperature data remanence in static RAM"](http://www.cl.cam.ac.uk/techreports/UCAM-CL-TR-536.html). University of Cambridge, Computer Laboratory. [doi](https://en.wikipedia.org/wiki/Doi_(identifier)):[10.48456/tr-536](https://doi.org/10.48456%2Ftr-536). Retrieved 2008-02-27.
7. Null, Linda; Lobur, Julia (2006). [The Essentials of Computer Organization and Architecture](https://www.google.com/books/edition/The_Essentials_of_Computer_Organization/QGPHAl9GE-IC). Jones and Bartlett Publishers. p. 282. [ISBN](https://en.wikipedia.org/wiki/ISBN_(identifier)) [978-0763737696](https://en.wikipedia.org/wiki/Special:BookSources/978-0763737696). Retrieved 2021-09-14.
8. Fahad Arif (Apr 5, 2014). ["Microsoft Says Xbox One's ESRAM is a "Huge Win" – Explains How it Allows Reaching 1080p/60 FPS"](https://wccftech.com/microsoft-xbox-esram-huge-win-explains-reaching-1080p60-fps/). Retrieved 2020-03-24.