Random Access Memory

DDR Memory Comparison

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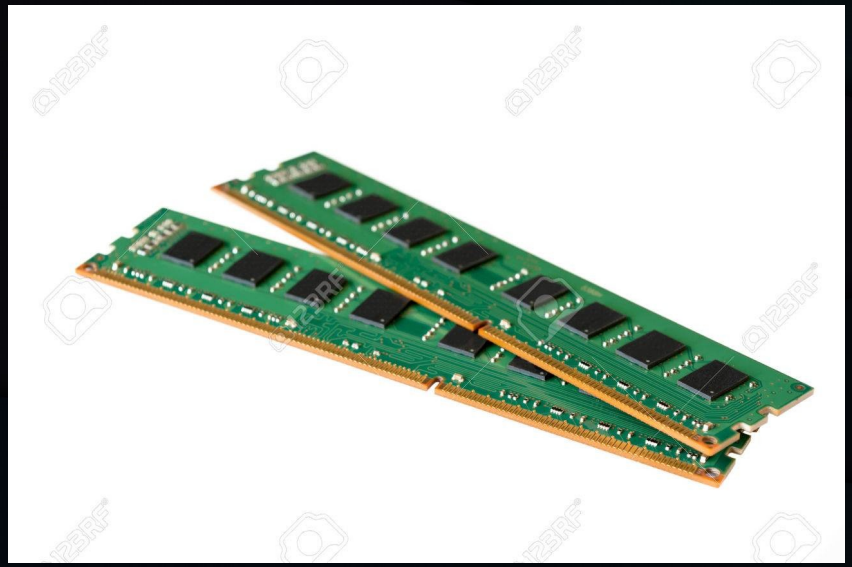
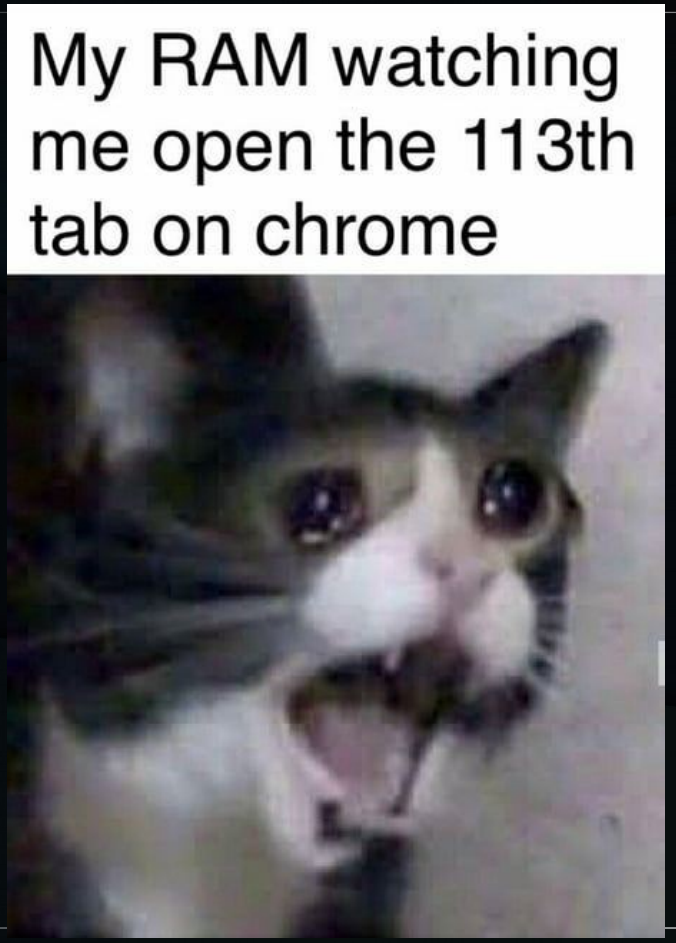
Random Access Memory





Random Access Memory

- **R**andom **A**ccess **M**emory (RAM)
- Form of computer data storage
- Data currently being used
- Volatile memory
- Random Access *

Random Access Memory

Random Access

- Fast
- Volatile
- Smaller size
- Expensive

Direct Access

- Slow
- Non-volatile
- Bigger size
- Cheaper

Random Access Memory

DDR

Random Access Memory

Double **D**ata **R**ate (DDR)

- Two transfers at clock signal
- Higher transfer rate than **S**ingle **D**ata **R**ate
- Various generations

Random Access Memory

Generation:	Release date (y):	Voltage (V):
DDR	2000	2.5/2.6
DDR2	2003	1.8
DDR3	2007	1.5/1.35
DDR4	2014	1.2/1.05
DDR5	2019 (estimated)	1.1

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Generation:	Nº pins:	Transfer Rate (MB/s)
DDR	184	1600
DDR2	240	2133.33
DDR3	240	2666.67
DDR4	288	3200
DDR5	288	Unknown

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Column **A**ccess **S**trobe (CAS/CL) Latency

- Delay time between:
  - Controller tells memory to access certain data
  - Data is available on the memory pins
- Values: 19, 18, 17, …, 14, …, 10, …
- Lower is better

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As for maintenance…

which one is better?

- 2400Mhz DDR4 with 14 CL Latency
- 3000Mhz DDR4 with 15 CL Latency
- 3200Mhz, 16 CL Latency

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Latency in seconds:

Latency in seconds = (1/(clockspeed))*(CL latency)

(1/2400000000)*14 = **5.83** nanoseconds latency. (2400Mhz DDR4 with 14 CL)

(1/3000000000)*15 = **5** nanoseconds latency. (3000Mhz DDR4 with 15 CL)

(1/3200000000)*16 = **5** nanoseconds latency. (3200Mhz, 16 CL)

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As for maintenance…

At the same price, you should go for options B and C

(5 nanoseconds)

Higher speed and CL does **not** necessary mean higher cycle latency

Random Access Memory

SPEED VS. LATENCY AS MEMORY TECHNOLOGY HAS MATURED
(INDUSTRY STANDARDS)

TECHNOLOGY	MODULE SPEED (MT/s)	CLOCK CYCLE TIME (ns)	CAS LATENCY (CL)	TRUE LATENCY (ns)
SDR	100	8.00	3	24.00
SDR	133	7.50	3	22.50
DDR	335	6.00	2.5	15.00
DDR	400	5.00	3	15.00
DDR2	667	3.00	5	15.00
DDR2	800	2.50	6	15.00
DDR3	1333	1.50	9	13.50
DDR3	1600	1.25	11	13.75
DDR4	1866	1.07	13	13.93
DDR4	2133	0.94	15	14.06
DDR4	2400	0.83	17	14.17
DDR4	2666	0.75	18	13.50

Random Access Memory

AMD Ryzen

- Infinity Fabric
  - RAM speed directly affects Ryzen performance

Random Access Memory

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