COMPUTER MEMORY
PART II

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(MOS) SRAM

- Static RAM (IBM - 1965)
- Alternative to magnetic core memory
- Expensive, 4-6 transistors per flip-flop
- Fast
- Still relevant
(MOS) DRAM & SDRAM

- **Dynamic RAM** (Intel - 1970)
  - A lot cheaper and smaller
  - Slow, needs to be recharged periodically
- **Synchronous Dynamic RAM** (Samsung - 1993)
  - Increased performance by using a clock

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RDRAM

- **Rambus DRAM** (Rambus - 1996)
  - Implemented double data rate technology, allowing operations on both rising and falling edges of clock.
  - Increased latency, heat, complexity and cost, making it hardly worth it...
**_DDR SDRAM**

- Double Data Rate SDRAM (Samsung – 1998, 2003, 2007 & 2014)
  - Uses both rising and falling edge of clock to achieve higher efficiency
  - Each iteration improved various aspects, such as power efficiency, bus clock rate and prefetch bit count.
We're skipping it

READ-ONLY MEMORY (ROM)
MROM
- Mask ROM
- First iteration of ROM
- Inexpensive
- Pre-programmed at manufacture

PROM - 1956
- Programmable ROM
- Can be written to once by the user
- Fuses
- Requires “burner”
**EPROM - 1971**

- Erasable PROM
- Programmable by the user
- Erased using UV light.
- Slow
- Limited writes

**EEPROM - 1978**

- Electrically Erasable PROM
- Eli Harari at Hughes Aircraft
- Electrical reprogramming
- Faster, but slow
- Two-transistor structure
- Lots of writes!
FLASH MEMORY - 1984

- Modern EEPROM
- Fujio Masuoka at Toshiba
- SSDs, SD cards, FLASH drives, Game cartridges
- Millions of writes

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- 64 picture: https://en.wikipedia.org/wiki/Nintendo_64
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Images:
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