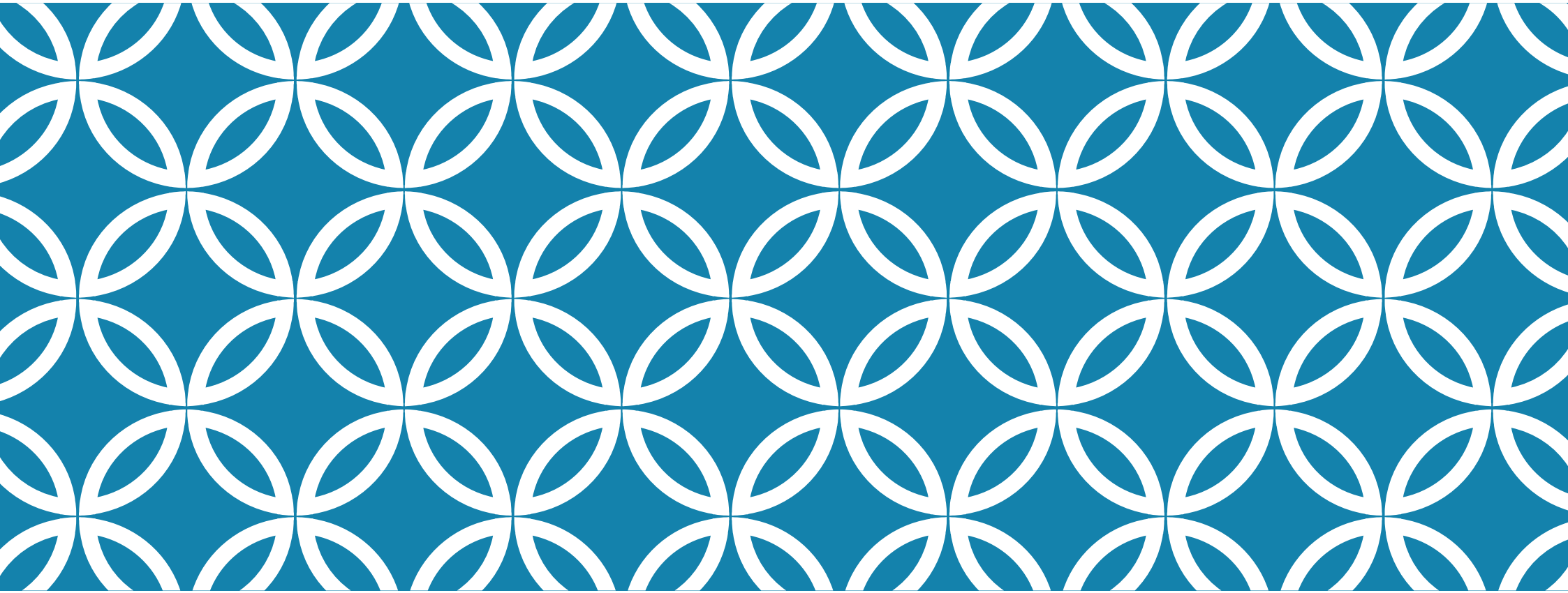


DATA STORAGE

Chapter 3-3

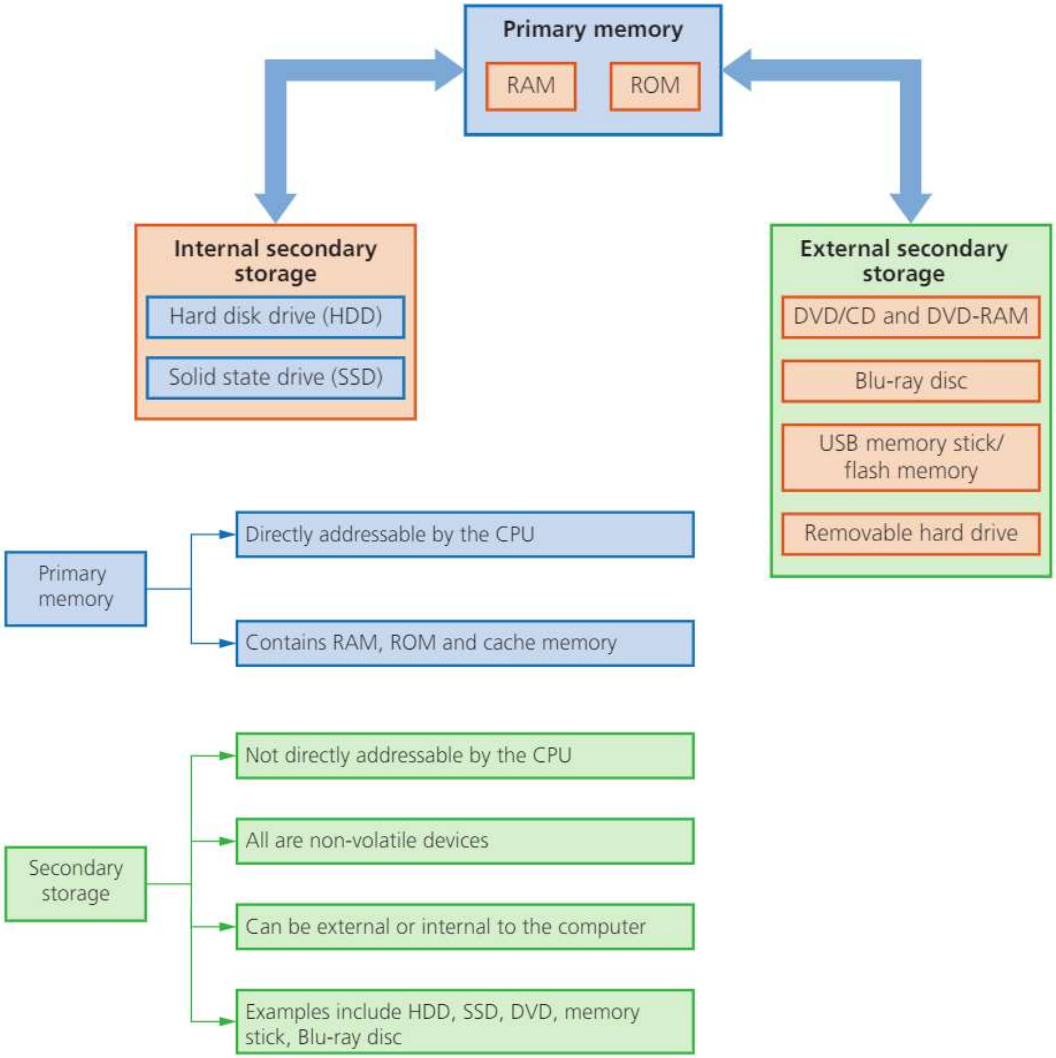
DATA STORAGE

- All data consists of bits 1s and 0s
- Each storage medium has different storage capacity
- 1 Kilo in physics subject equals 1000 (10^3)
- 1 Kilo in computer science equals 1024 (2^{10})

Unit	Symbol	Decimal prefix	Size	Binary prefix	Size
kilobyte	KB	10^3 bytes	1,000 bytes	2^{10} bytes	1,024 bytes
megabyte	MB	10^6 bytes	1,000 kilobytes	2^{20} bytes	1,024 kilobytes
gigabyte	GB	10^9 bytes	1,000 megabytes	2^{30} bytes	1,024 megabytes
terabyte	TB	10^{12} bytes	1,000 gigabytes	2^{40} bytes	1,024 gigabytes

MEMORY AND STORAGE

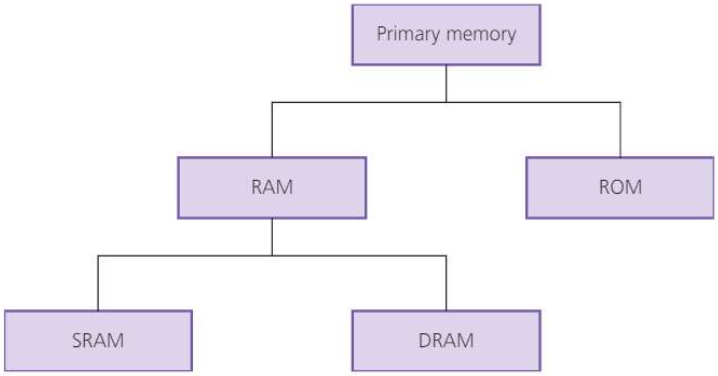
- Primary memory
  - RAM
  - ROM
- Internal secondary memory
  - Hard disk drive
  - Solid state drive
- External secondary storage
  - DVD/CD
  - Blu-ray
  - USB stick/flash card




CORSAIR
MP500
msi
AERO

PRIMARY MEMORY

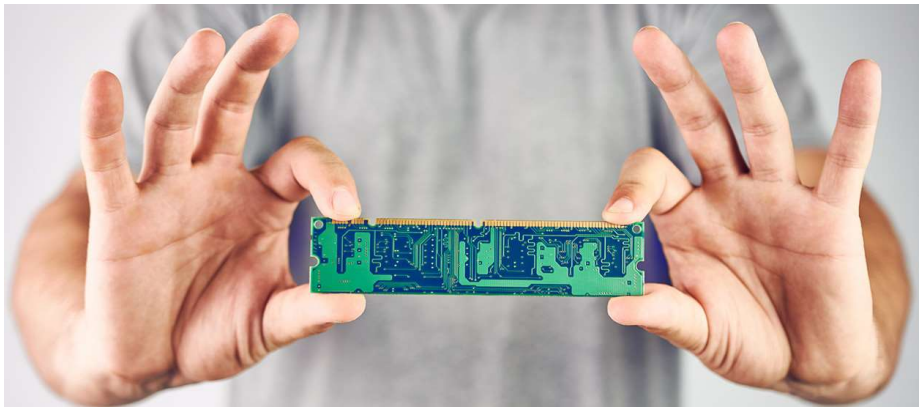
- Random Access Memory (RAM)
  - volatile memory : memory contents are lost when powering off the computer
  - it is used to store data, file and OS currently in use
  - it is directly accessed by a CPU
  - it can be written to or read from, and the data can be changed by the user or the computer



▲ **Figure 3.59** Primary memory

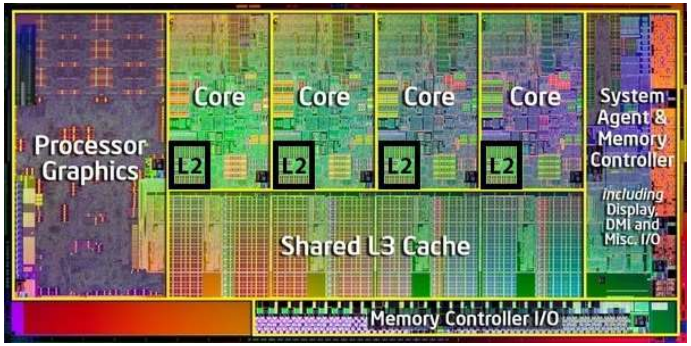
PRIMARY MEMORY

- Dynamic RAM (DRAM) : the capacitor needs to be re-charged every 15 microseconds otherwise it would lose its value
  - cheaper than SRAM
  - consume less power than SRAM
  - higher storage capacity than SRAM (4/8/16/32 GB)



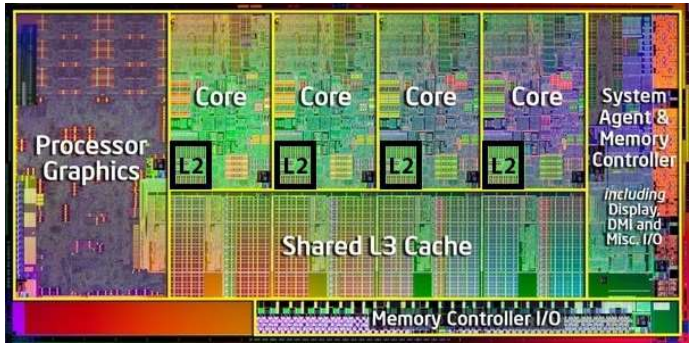
PRIMARY MEMORY

- Static RAM (SRAM) : it doesn't need to be refreshed same as DRAM
  - access time is faster than DRAM
  - used as cache in CPUs
  - less capacity than DRAM (<= 16 MB)



PRIMARY MEMORY

	Dynamic random-access memory	Static random-access memory
Introduction (from Wikipedia)	Dynamic random-access memory is a type of random-access memory that stores each bit of data in a separate capacitor within an integrated circuit.	Static random-access memory is a type of semiconductor memory that uses bistable latching circuitry to store each bit. The term static differentiates it from dynamic RAM (DRAM) which must be periodically refreshed.
Typical applications	Main memory in a computer (e.g. DDR3). Not for long-term storage.	L2 and L3 cache in a CPU
Typical sizes	1GB to 2GB in smartphones and tablets; 4GB to 16GB in laptops	1MB to 16MB
Place Where Present	Present on motherboard.	Present on Processors or between Processor and Main Memory.



PRIMARY MEMORY

- Read Only Memory (ROM)
  - non-volatile memory
  - it is used to store the start-up instructions when a computer is turned on (BIOS)
  - not rewritable
  - it is directly accessed by a CPU
  - it is used to store program in programmable devices e.g. washing machine, microwave

RAM	ROM
temporary memory device	permanent memory device
volatile memory	non-volatile memory device
can be written to and read from	data stored cannot be altered
used to store data, files, programs, part of OS **currently** in use	always used to store BIOS and other data needed at start up
can be increased in size to improve operational speed of a computer	