Girl Day at UT Austin

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SCIENCE CHEERLEADERS

All About Binary

February 19, 2022

Computers work just like our bodies

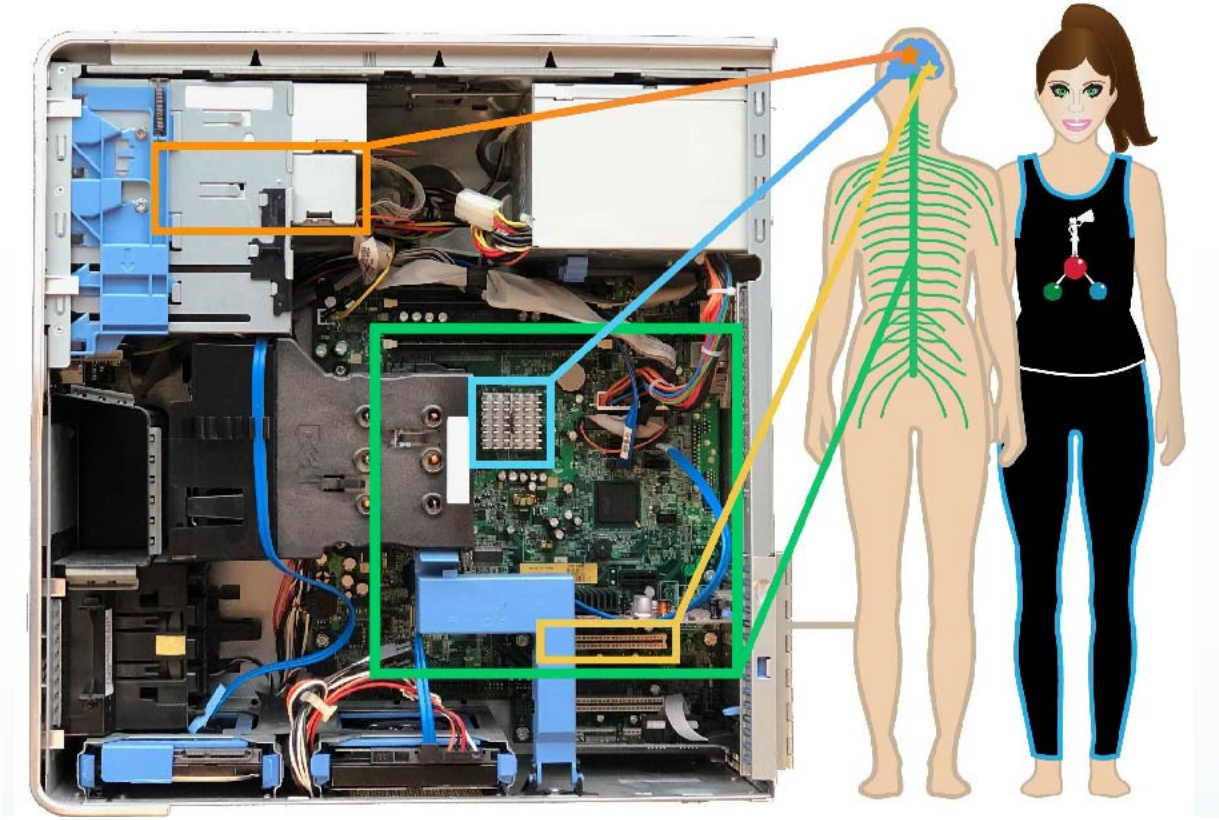
Housing: the outer case that protects all the computer parts inside, just like our skin

Motherboard: a circuit board that wires everything together, like our nervous system

Central processing unit (CPU): the brain of the computer that makes everything function

Hard drive: works like your long-term memory to store information, like pictures from a fun vacation you took

Random access memory (RAM): works like your short-term memory (like remembering what you ate for breakfast) for real-time computer functions, like playing music



What Language do computers speak?

- Computers use **binary**
- Binary has an alphabet like other languages – each letter is called a **bit**
- There are only two bits: **0 and 1**
- Words in binary are called **bytes** and are always 8 bits long
- Today, most hard drives can store terabytes of data

Nibble - 4 bits (1/2 a byte)

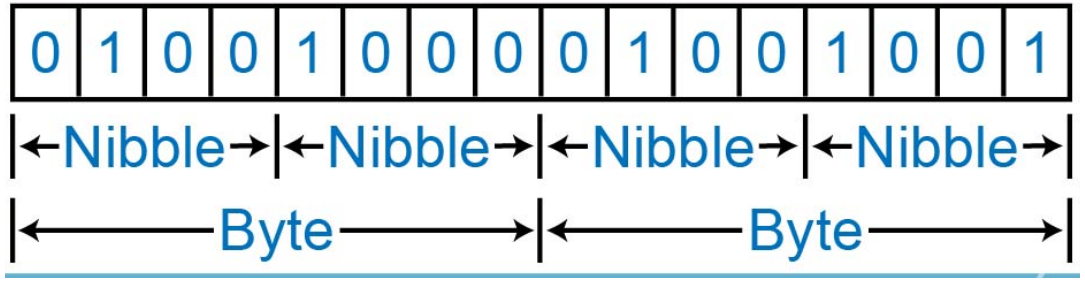
Byte - 8 bits

Kilobyte (KB) – 1 thousand bytes

Megabyte (MB) – 1 million bytes

Gigabyte (GB) – 1 billion bytes

Terabyte (TB) – 1 trillion bytes

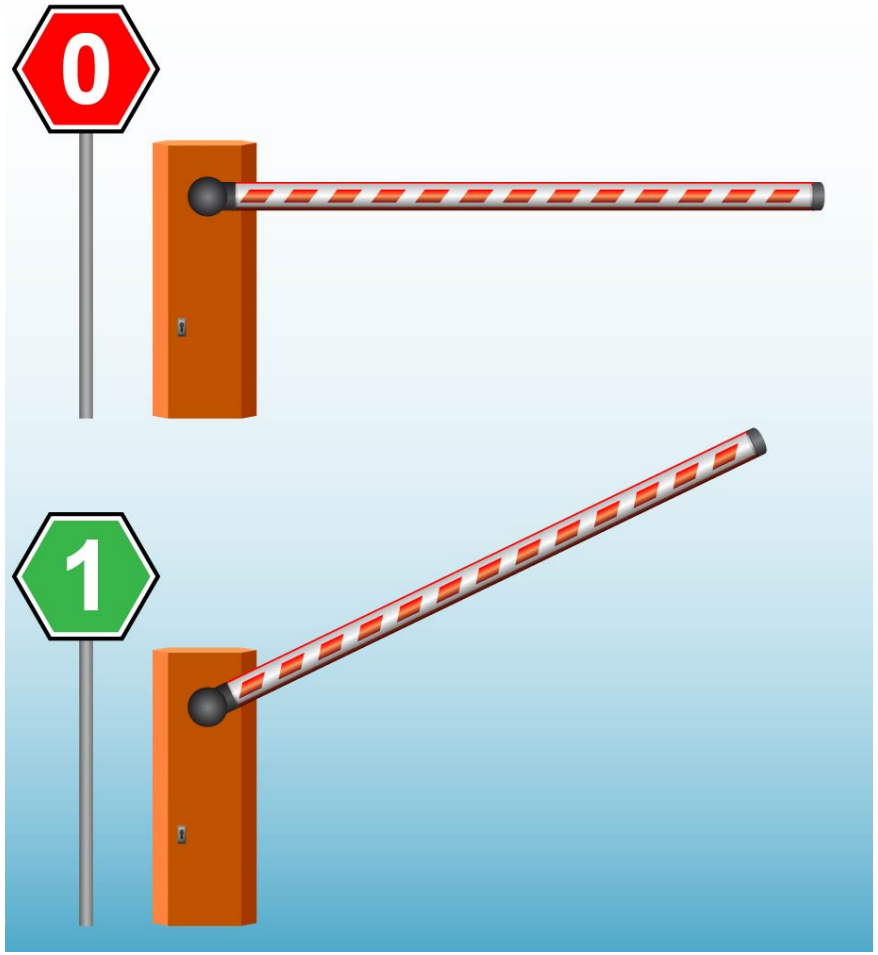


Binary Alphabet

A	0	1	0	0	0	0	0	1
B	0	1	0	0	0	0	1	0
C	0	1	0	0	0	0	1	1
D	0	1	0	0	0	1	0	0
E	0	1	0	0	0	1	0	1
F	0	1	0	0	0	1	1	0
G	0	1	0	0	0	1	1	1
H	0	1	0	0	1	0	0	0
I	0	1	0	0	1	0	0	1
J	0	1	0	0	1	0	1	0
K	0	1	0	0	1	0	1	1
L	0	1	0	0	1	1	0	0
M	0	1	0	0	1	1	0	1
N	0	1	0	0	1	1	1	0
O	0	1	0	0	1	1	1	1
P	0	1	0	1	0	0	0	0
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
S	0	1	0	1	0	0	1	1
T	0	1	0	1	0	1	0	0
U	0	1	0	1	0	1	0	1
V	0	1	0	1	0	1	1	0
W	0	1	0	0	0	1	1	1
X	0	1	0	1	1	0	0	0
Y	0	1	0	1	1	0	0	1
Z	0	1	0	1	1	0	1	0

How do computers read?

- Just like the cells inside your brain, there are billions of **transistors** inside the CPU of the computer
- Transistors are tiny switches that act like gates
- These gates open and close to let electrical signals pass based on the binary code
- A transistor is closed or off when it reads a 0
- A transistor is open or on when it reads a 1



Let's make binary necklaces!

- Materials needed: pencil, paper, colored beads, string
- Write your first name
- Below each letter, write the matching binary byte
- Lay out beads to match the binary
  - Red: 0
  - White: 1
- String all the beads on the string, starting with the first letter

Binary Alphabet

A	0	1	0	0	0	0	0	1
B	0	1	0	0	0	0	1	0
C	0	1	0	0	0	0	1	1
D	0	1	0	0	0	1	0	0
E	0	1	0	0	0	1	0	1
F	0	1	0	0	0	1	1	0
G	0	1	0	0	0	1	1	1
H	0	1	0	0	1	0	0	0
I	0	1	0	0	1	0	0	1
J	0	1	0	0	1	0	1	0
K	0	1	0	0	1	0	1	1
L	0	1	0	0	1	1	0	0
M	0	1	0	0	1	1	0	1
N	0	1	0	0	1	1	1	0
O	0	1	0	0	1	1	1	1
P	0	1	0	1	0	0	0	0
Q	0	1	0	1	0	0	0	1
R	0	1	0	1	0	0	1	0
S	0	1	0	1	0	0	1	1
T	0	1	0	1	0	1	0	0
U	0	1	0	1	0	1	0	1
V	0	1	0	1	0	1	1	0
W	0	1	0	0	0	1	1	1
X	0	1	0	1	1	0	0	0
Y	0	1	0	1	1	0	0	1
Z	0	1	0	1	1	0	1	0

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