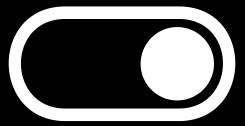
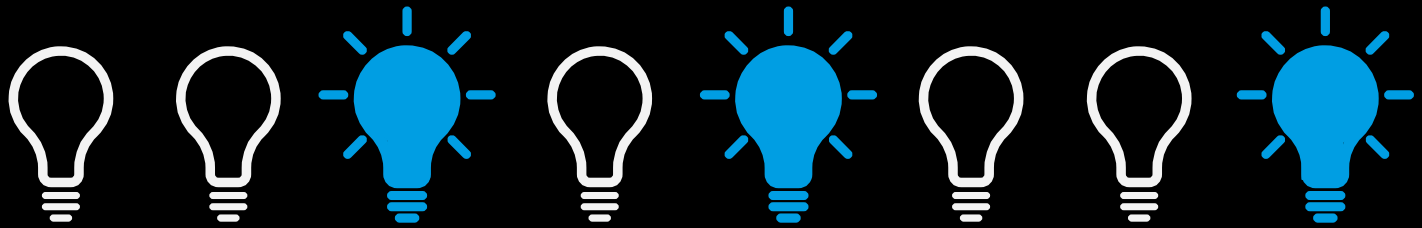
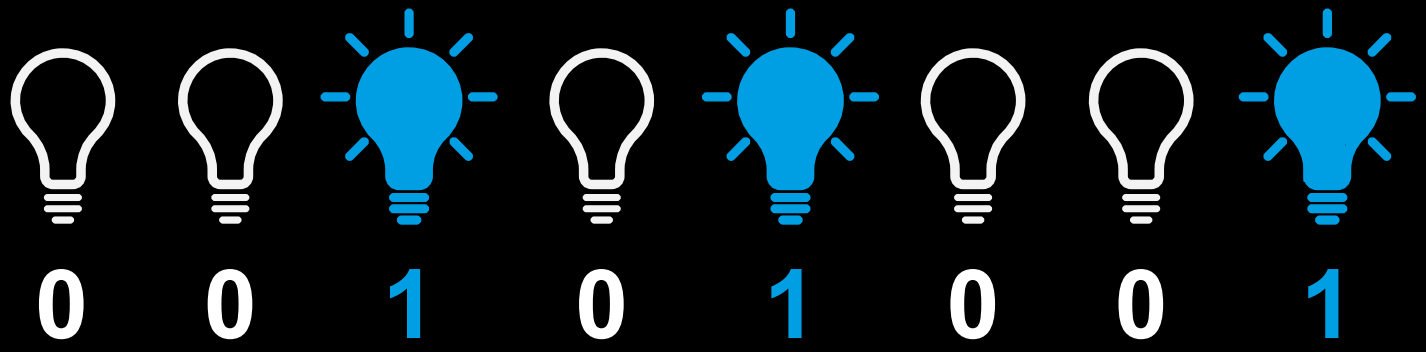
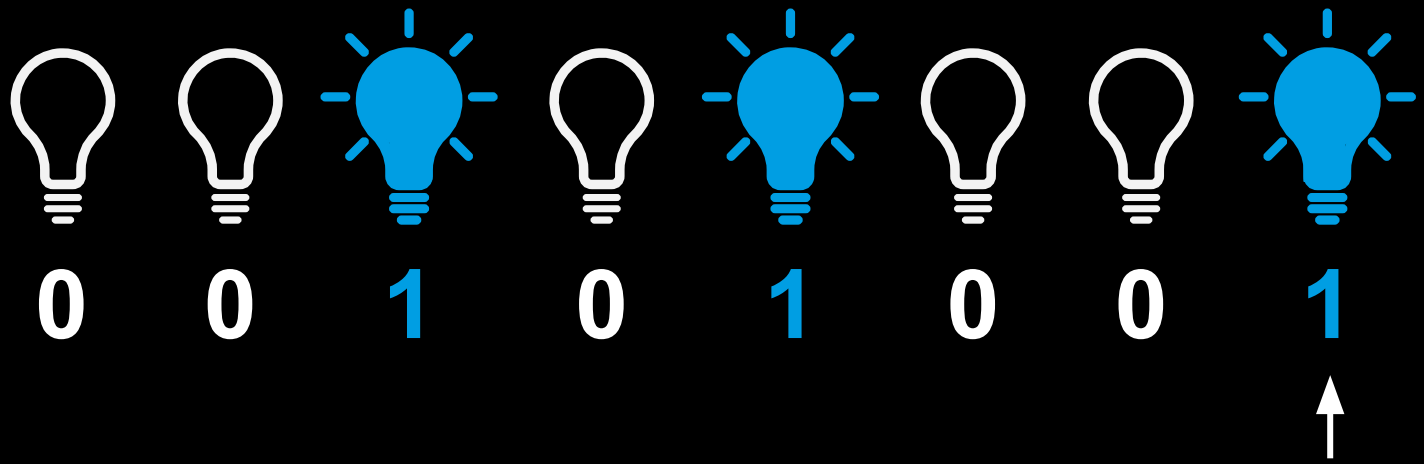
# BITS

# why do computers think binary?

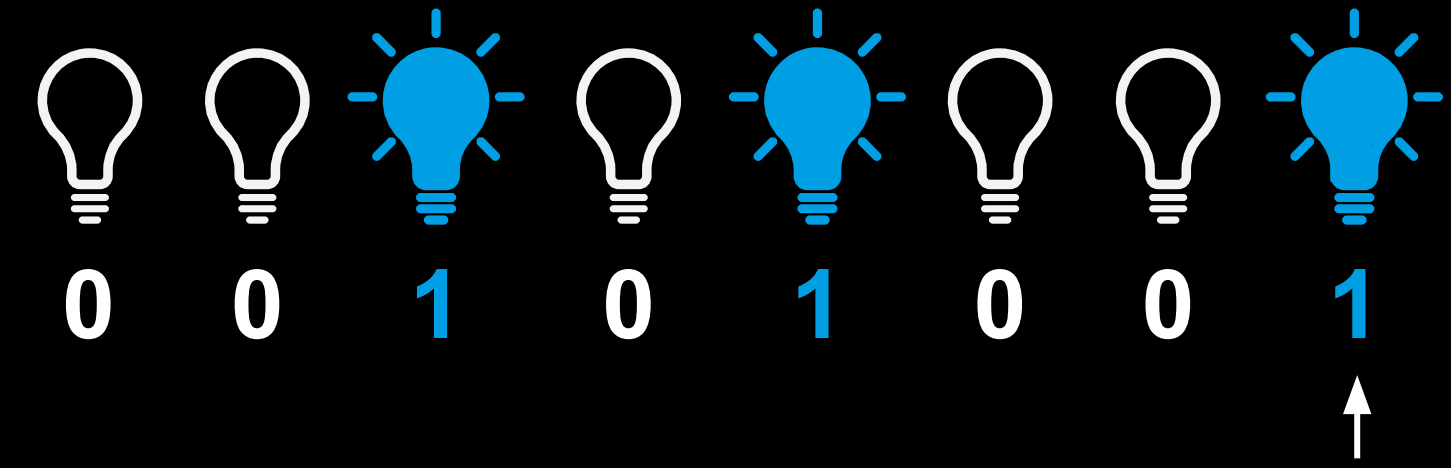


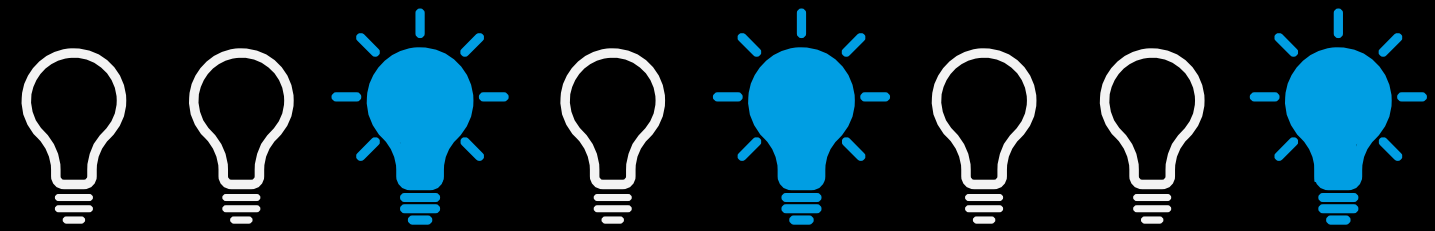



0 0 1 0 1 0 0 1

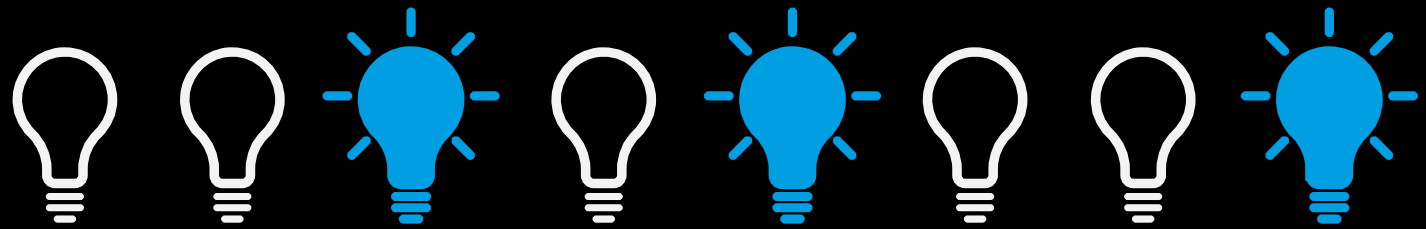



a **bit** (binary digit)


0 0 1 0 1 0 0 1
a bit (binary digit)
a byte (8 bits)

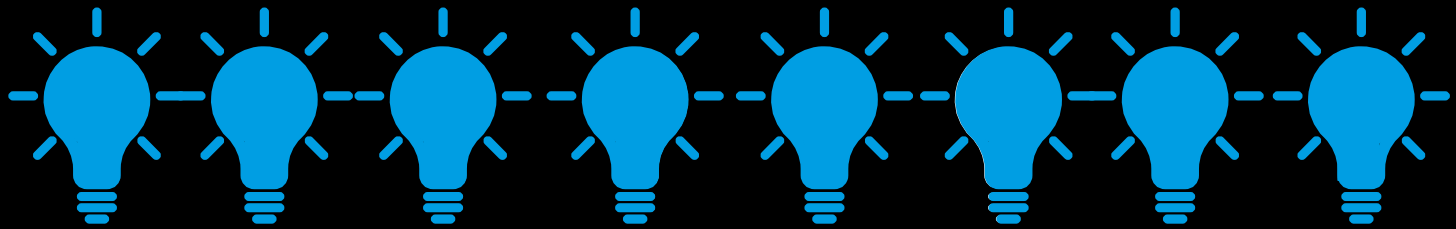


| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
|---|---|---|---|---|---|---|---|
| $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |



| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
|---|---|---|---|---|---|---|---|

| $2^7$ | $2^6$ | $2^5$ | $2^4$ | $2^3$ | $2^2$ | $2^1$ | $2^0$ |
|---|---|---|---|---|---|---|---|
| 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |



what can we store in one byte?

what comes after the byte?

$2^{10}$ bytes = 1.024 bytes = 1 Kibibyte (KiB)

$2^{20}$ bytes = 1.048.576 bytes = 1 Mebibyte (MiB)

$2^{30}$ bytes = 1.073.741.824 bytes = 1 Gibibyte (GiB)

$10^3$ bytes = 1.000 bytes = 1 Kilobyte (KB)

$10^6$ bytes = 1.000.000 bytes = 1 Megabyte (MB)

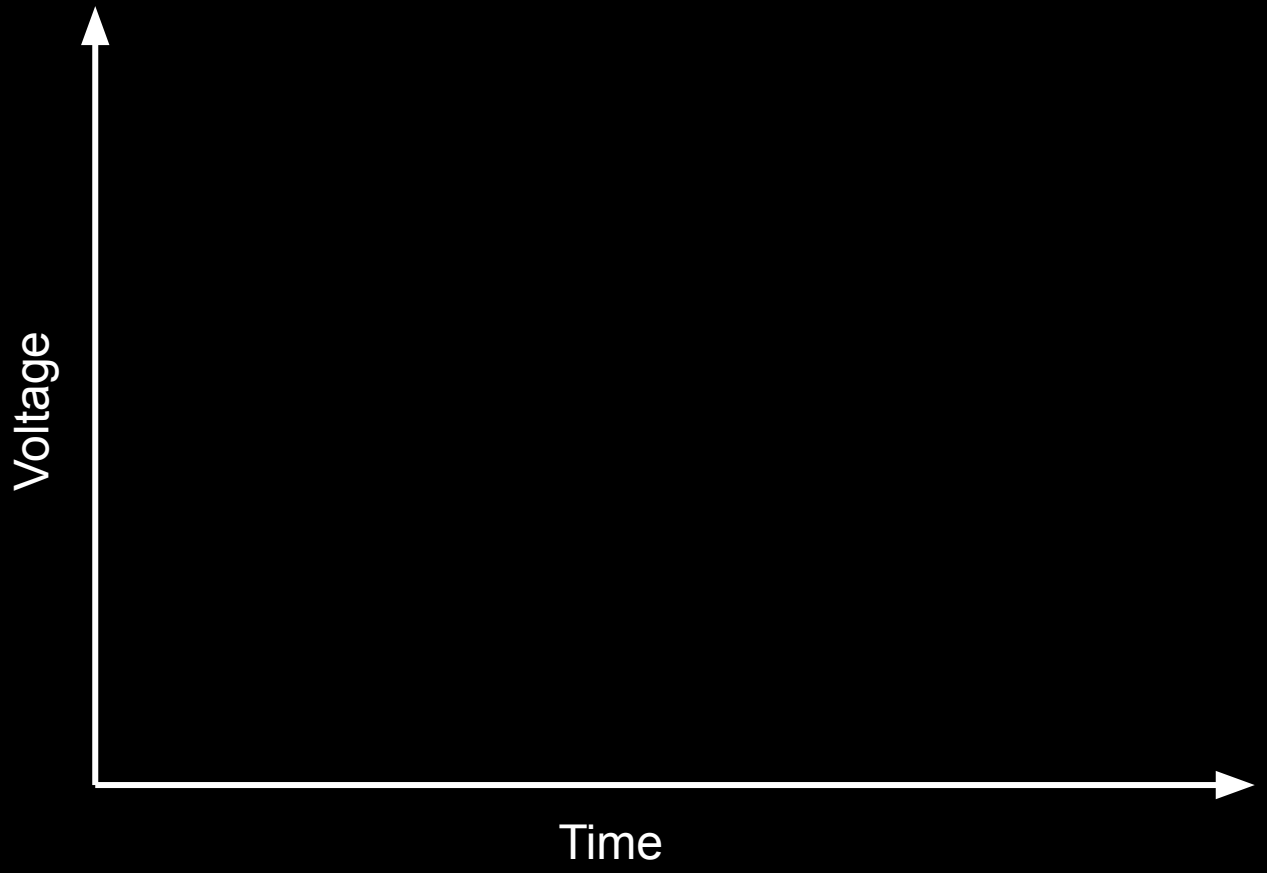
$10^9$ bytes = 1.000.000.000 bytes = 1 Gigabyte (GB)

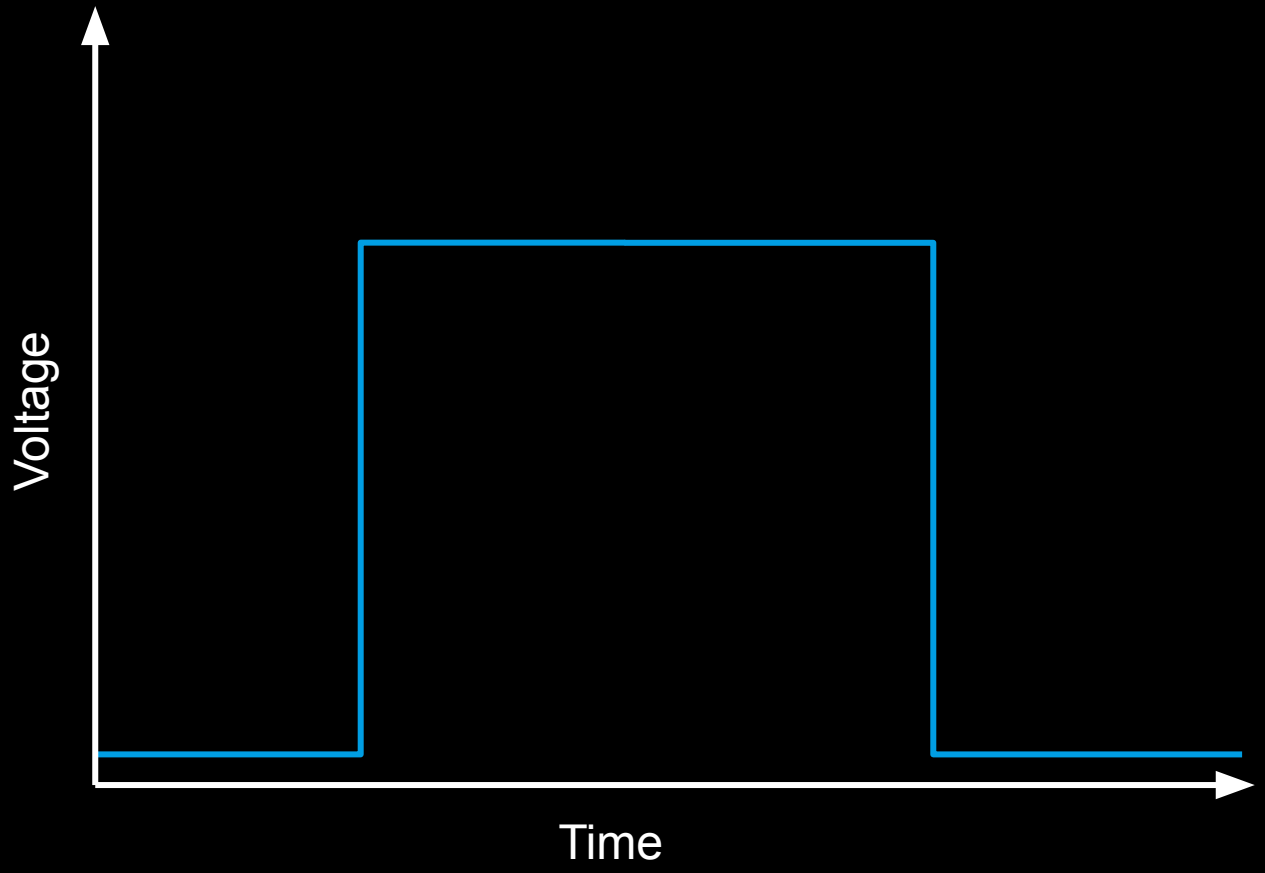
$10^{12}$ bytes = ?

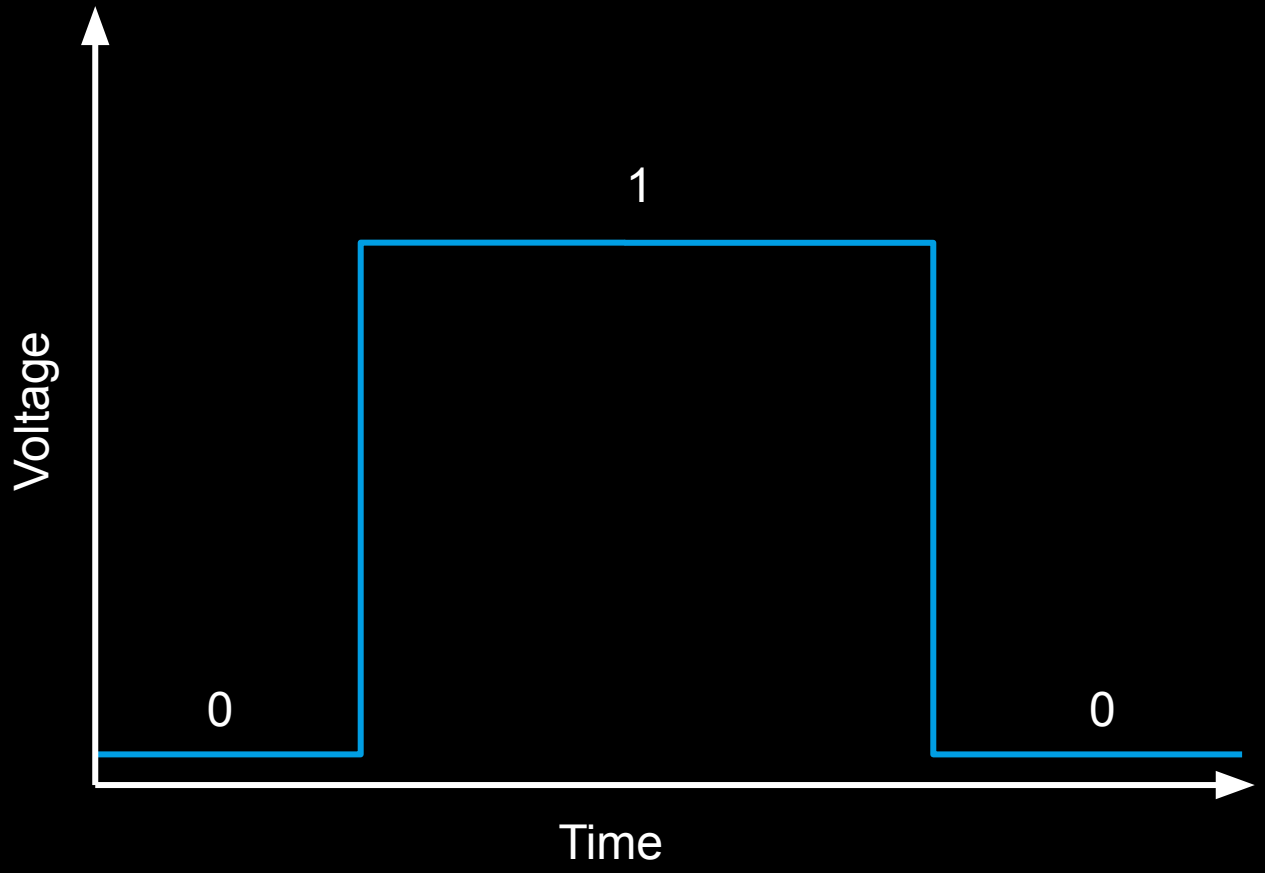
https://www.matheretter.de/wiki/zehnerpotenzen-namen

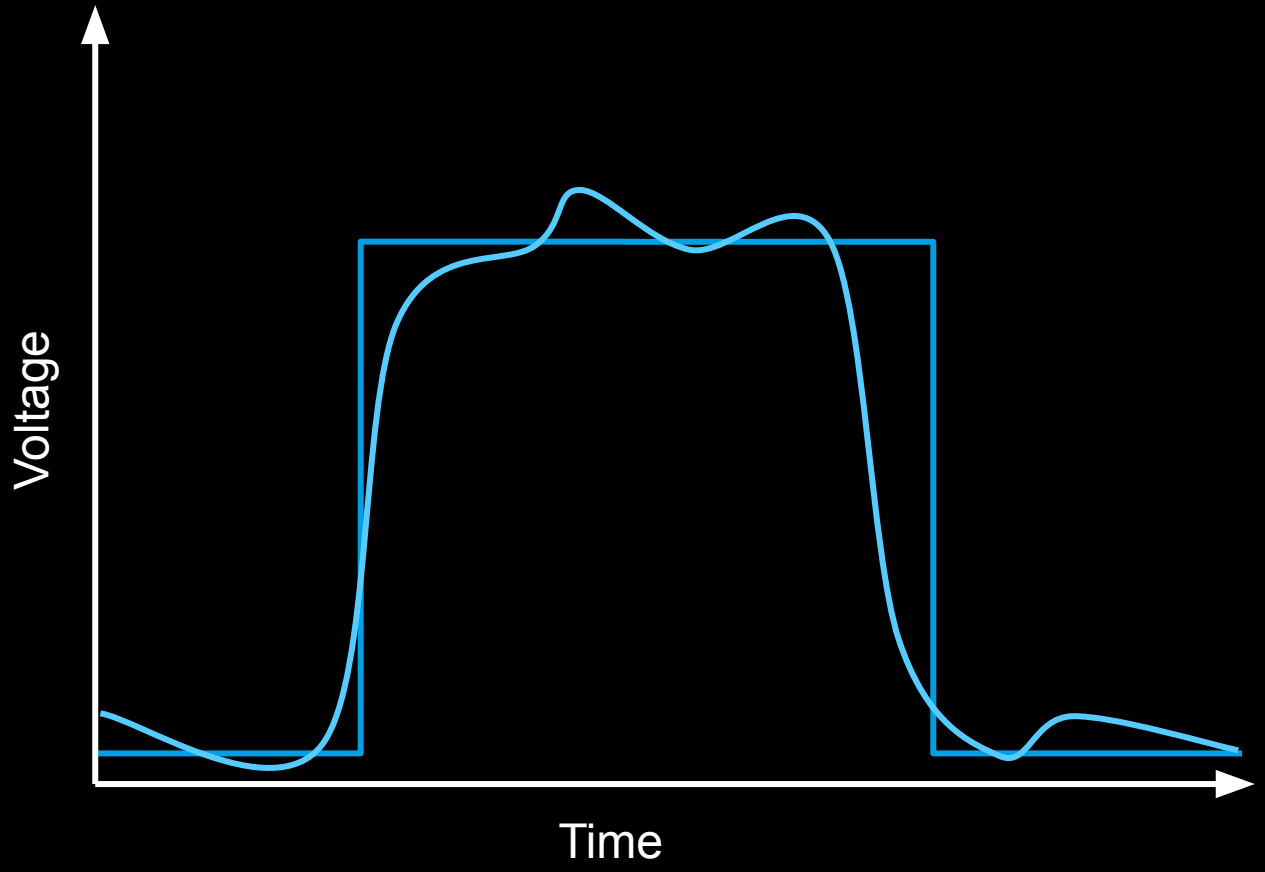
how many bits are on a DVD with 4.7 GB capacity?

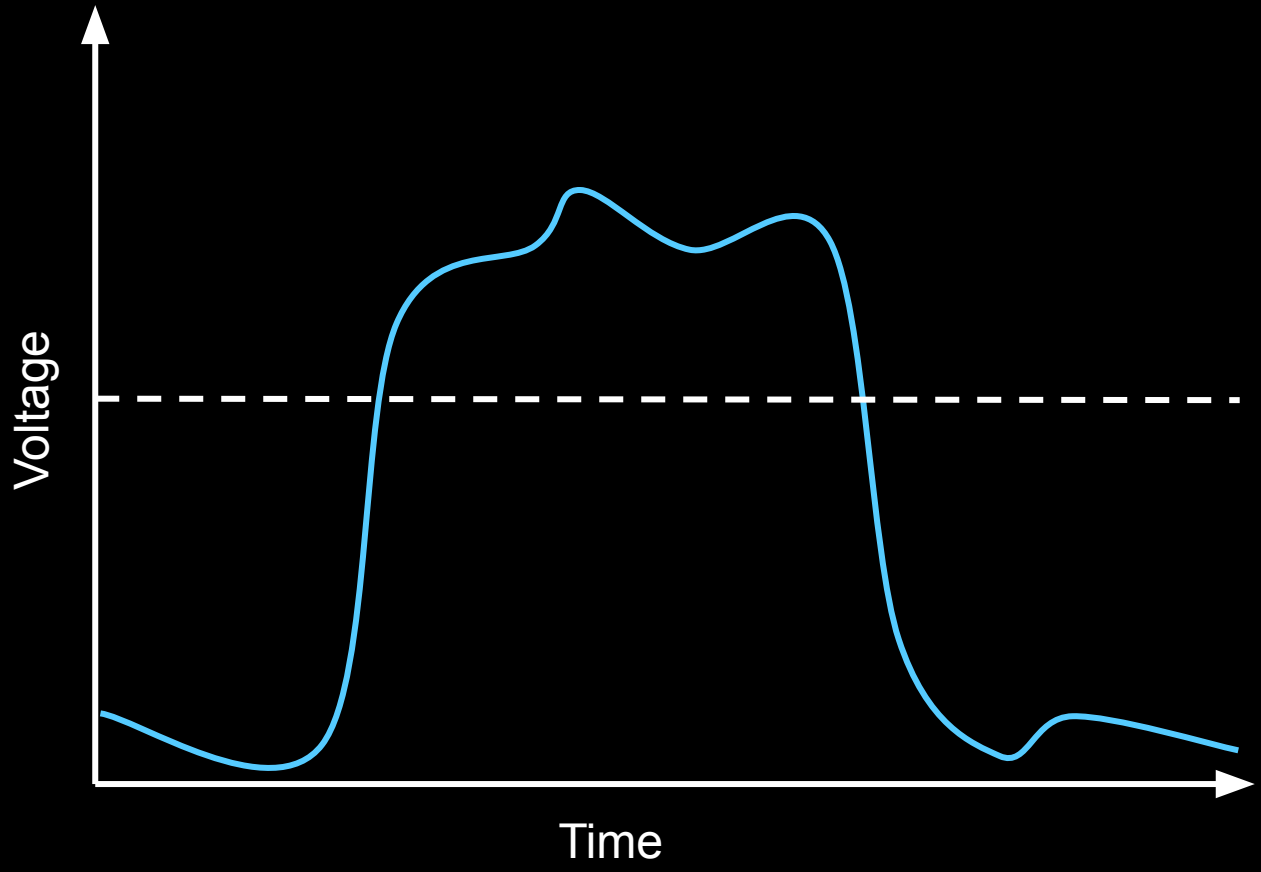
# are we stuck with binary?

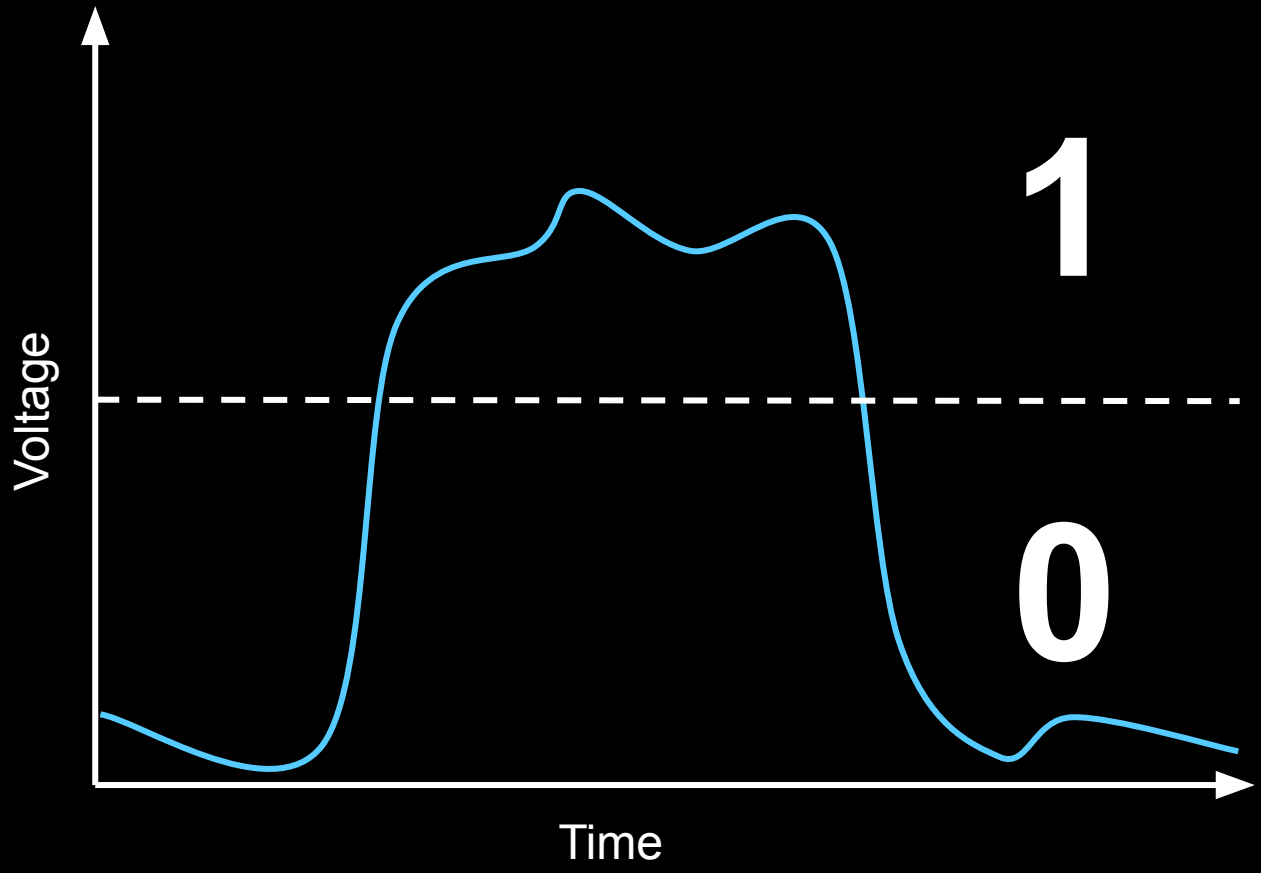

Voltage
Time

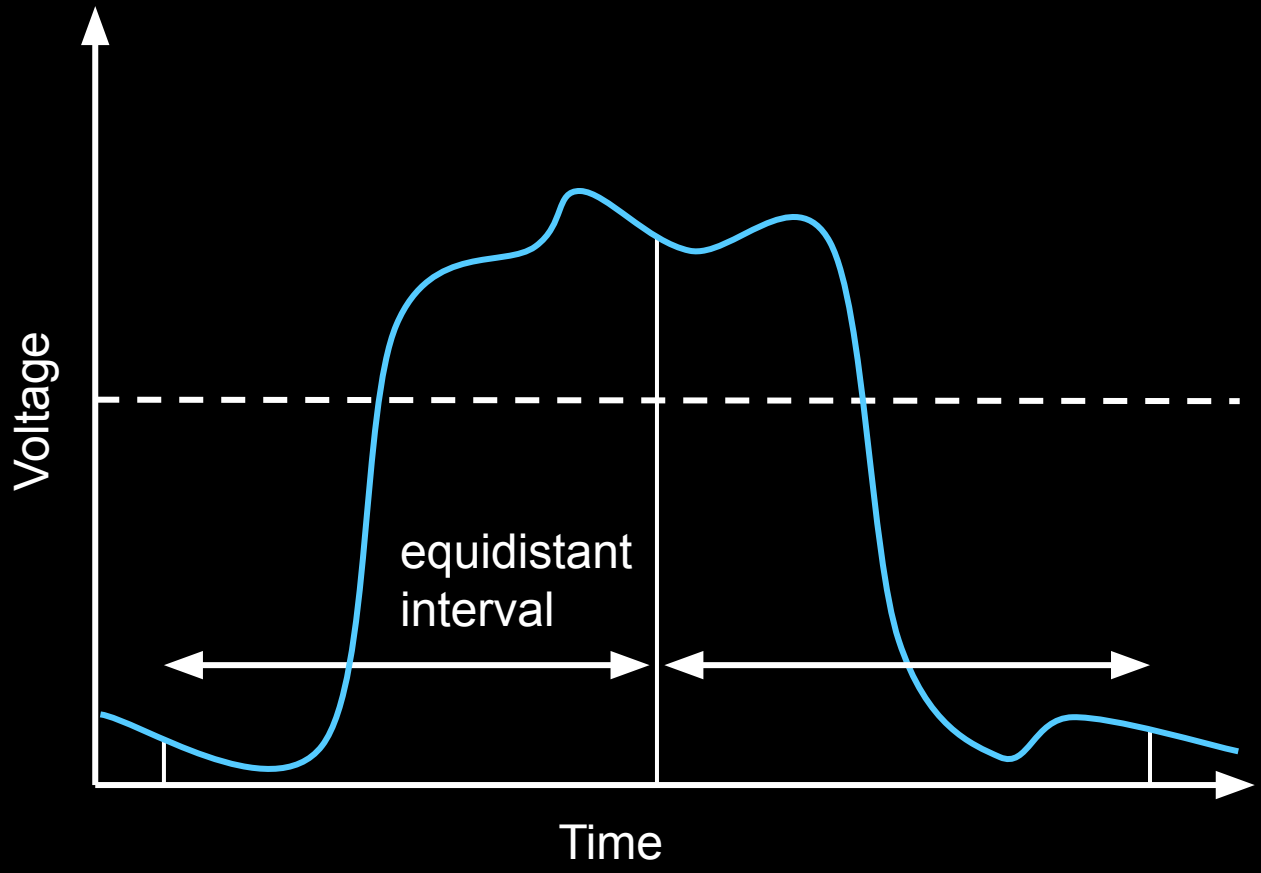

Voltage
Time

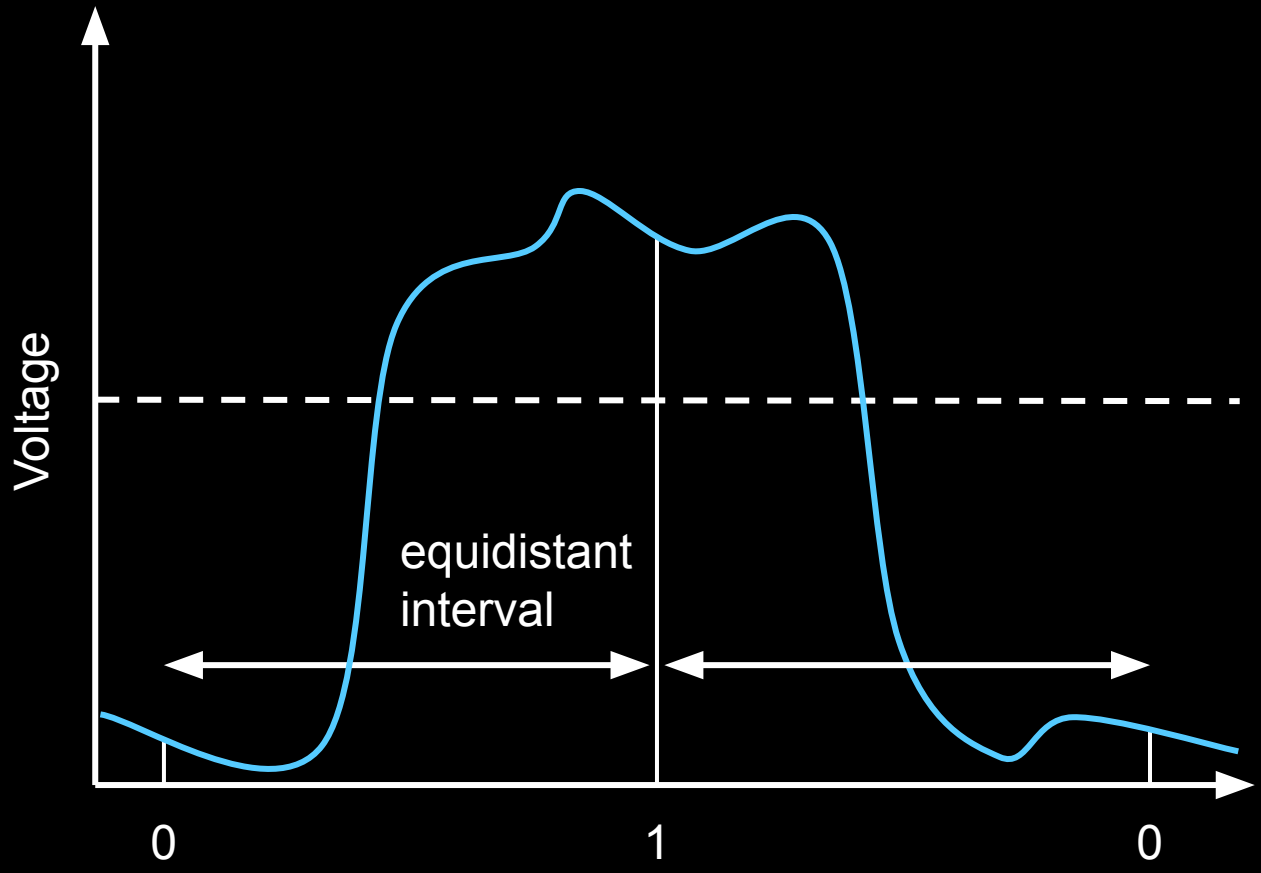

1
Voltage
0
0
Time

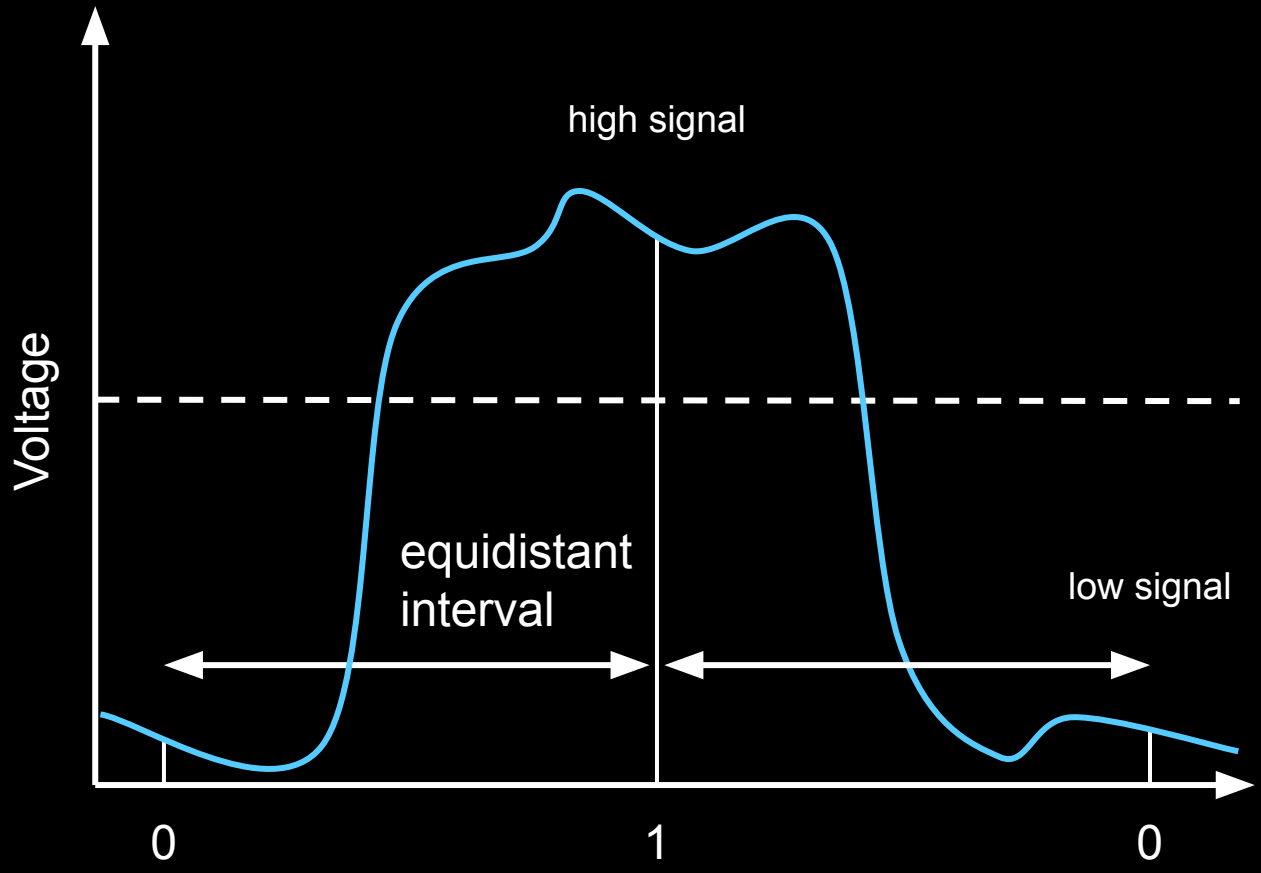

Voltage
Time


Voltage
Time


Voltage
Time
1
0

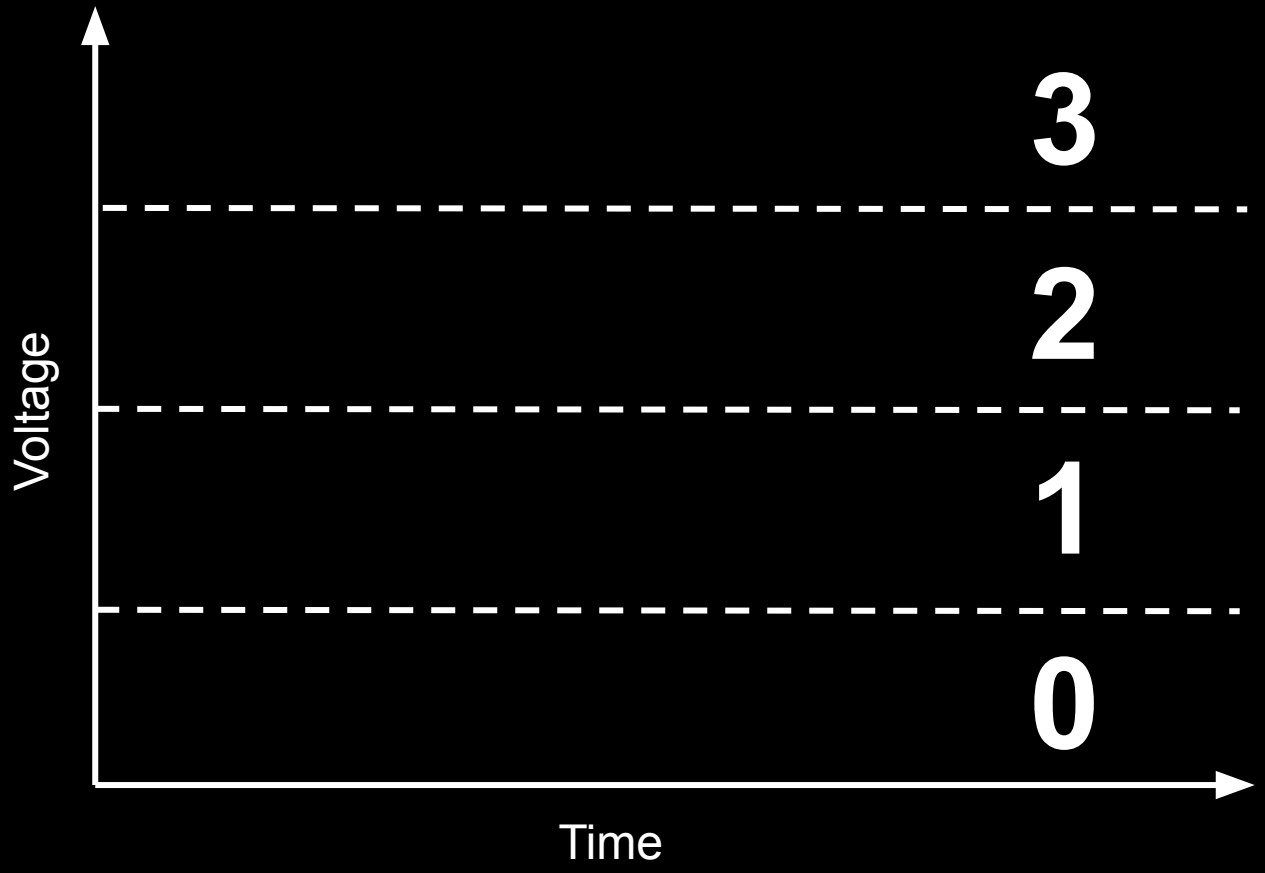

Voltage
equidistant
interval
Time

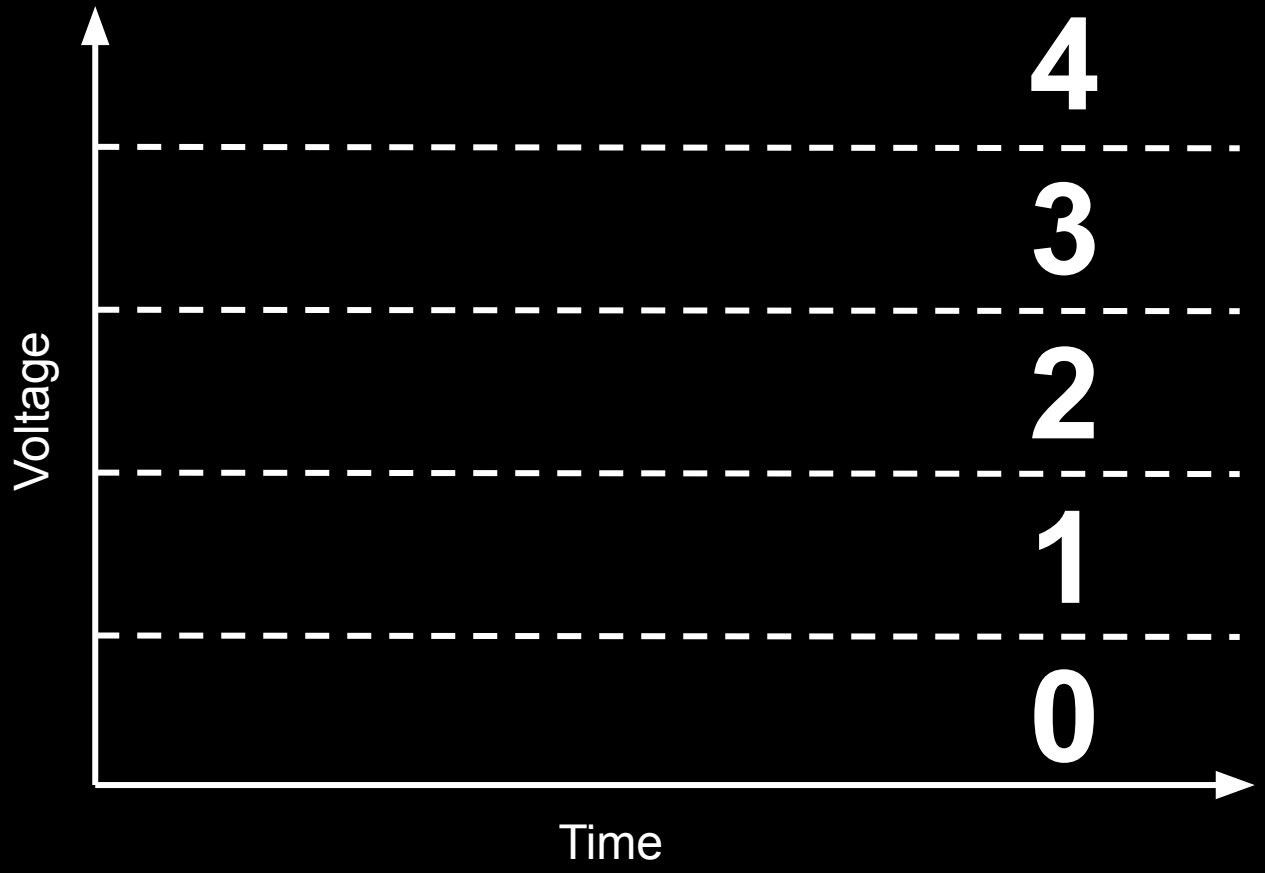

Voltage
equidistant
interval
0
1
0

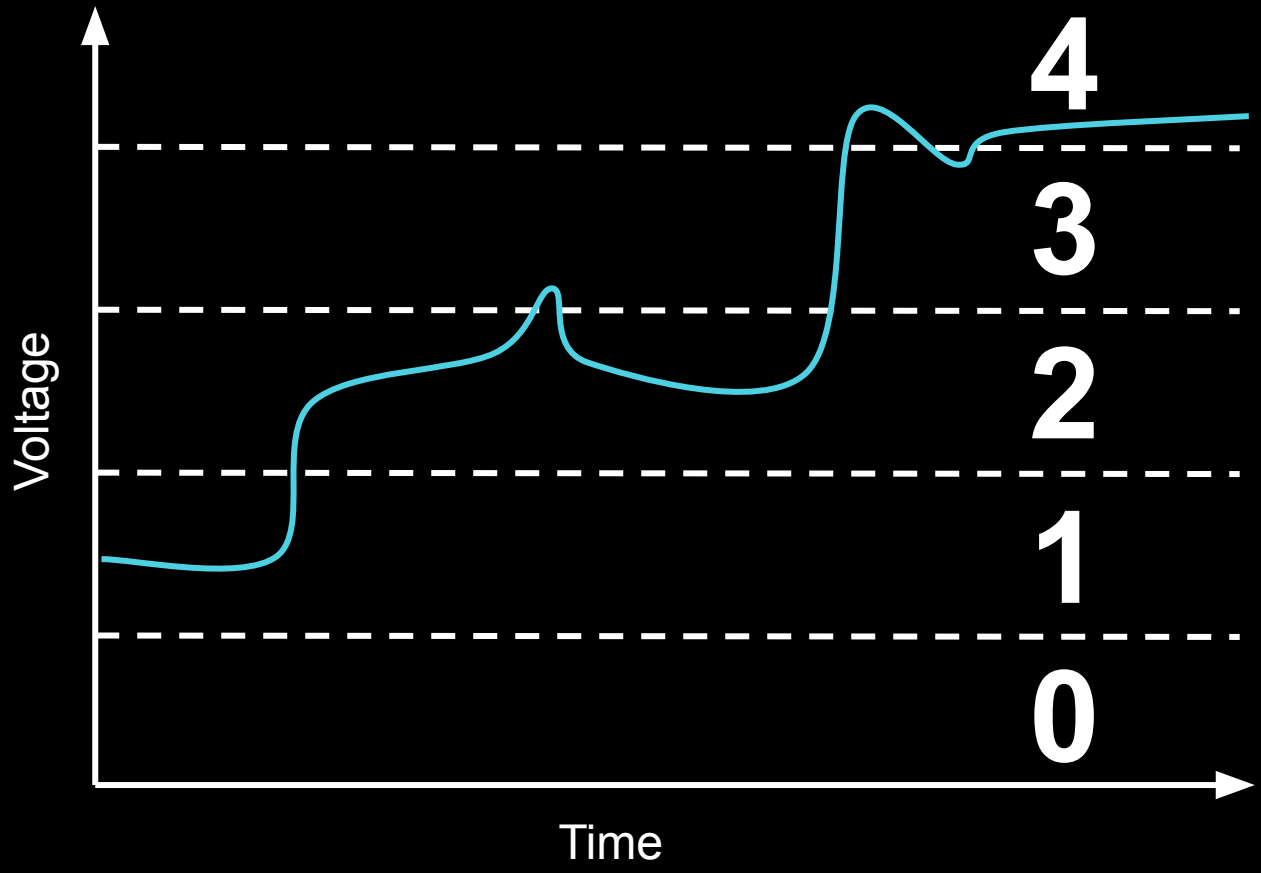

high signal
Voltage
equidistant
interval
low signal
0
1
0

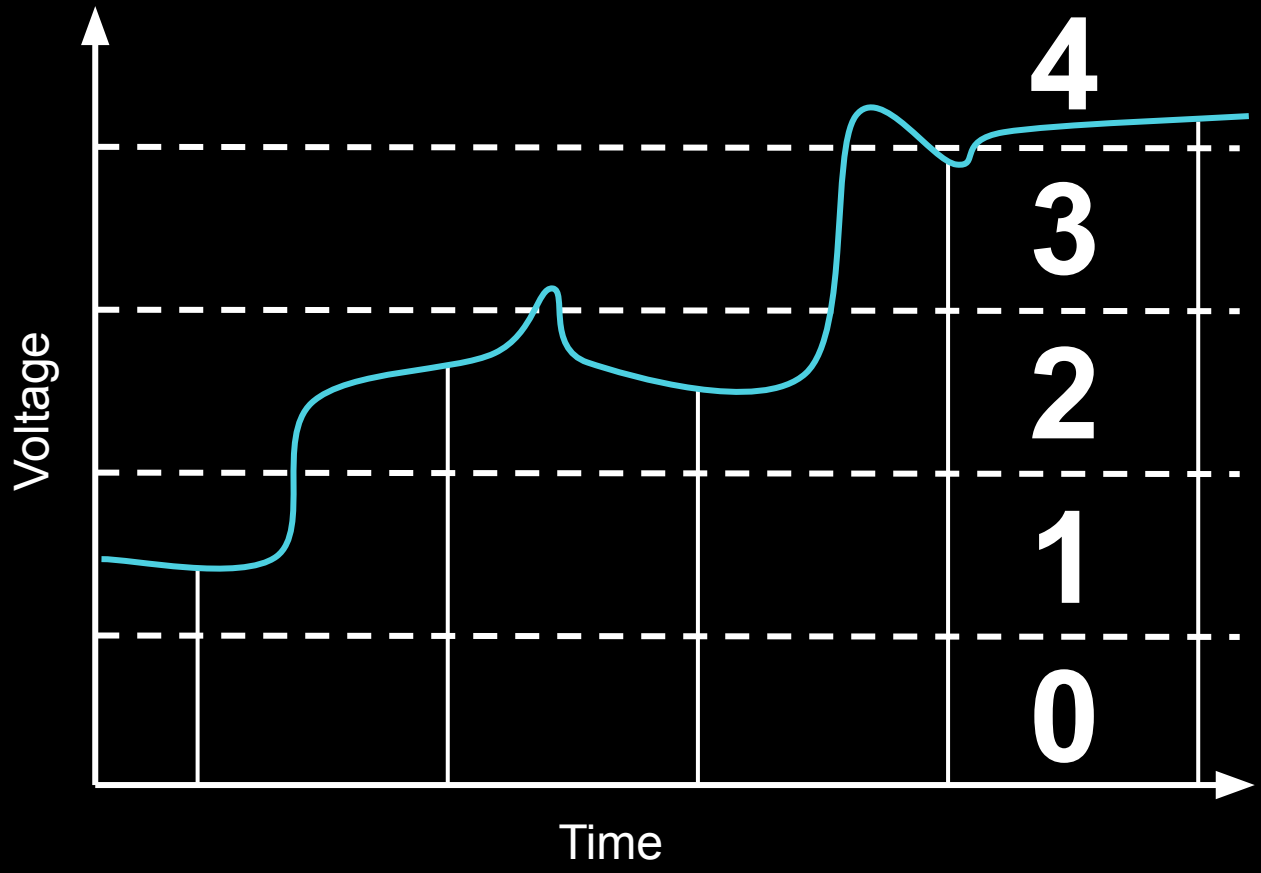
what about R > 2?

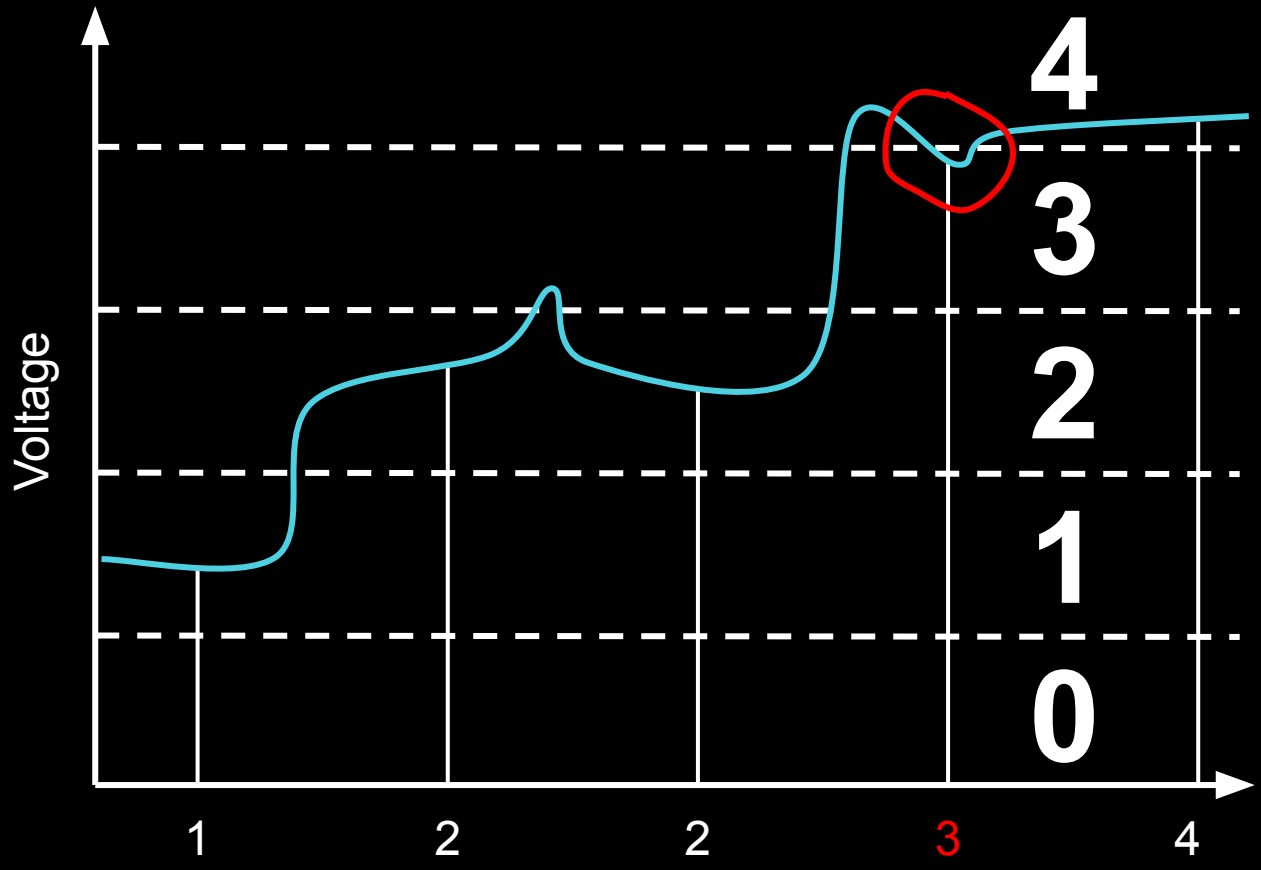
2
1
0
Voltage
Time


3
2
1
0
Voltage
Time


4
3
2
1
0
Voltage
Time


4
3
2
1
0
Voltage
Time


4
3
2
1
0
Voltage
Time


Voltage
4
3
2
1
0
1
2
2
3
4

a higher base means less hardware

a higher base means less hardware

but more complex devices

a higher base means less hardware

but more complex devices

and more errors