

CS 208

Mon, 6 March 2023

Data representation

Here's some bits

What do they mean?

Depends on context

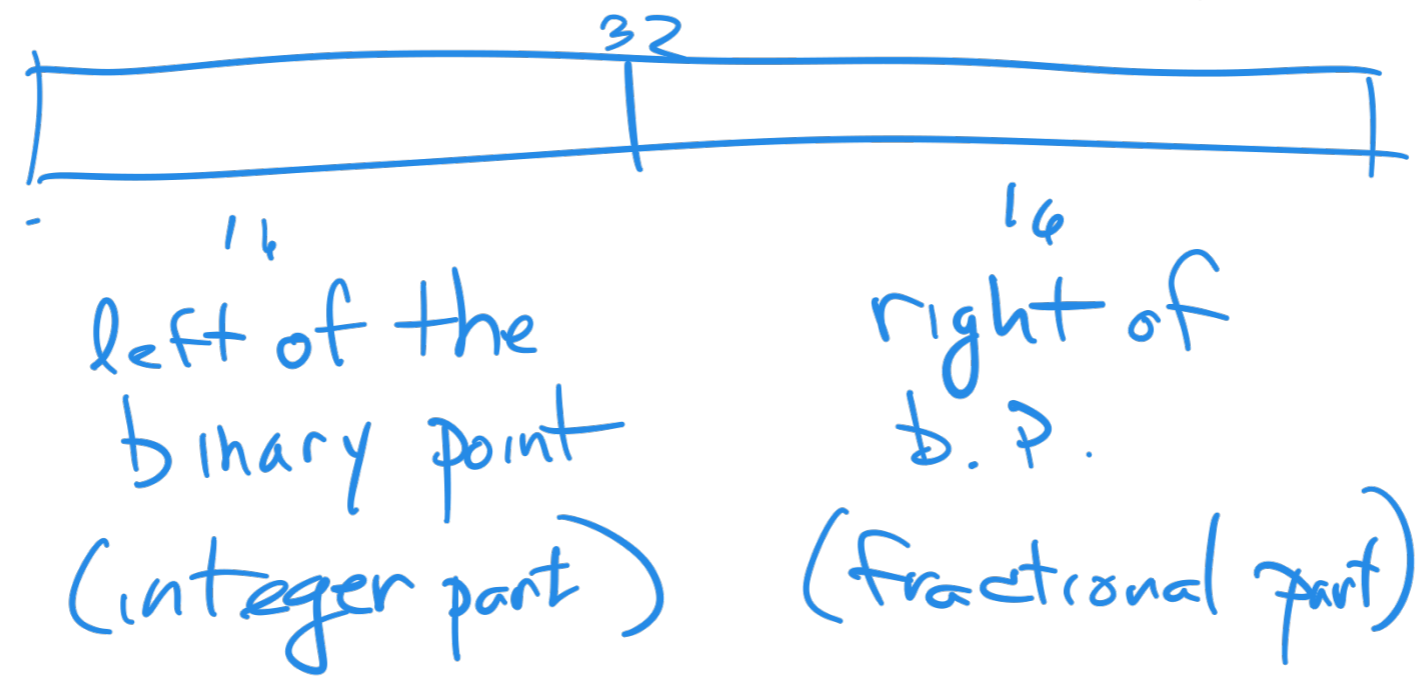
Here's a character; how do

I store it as bits?

Same: integers

Real numbers

Candidate #1: Fixed point



😊
- simple
- easier to prove stuff about

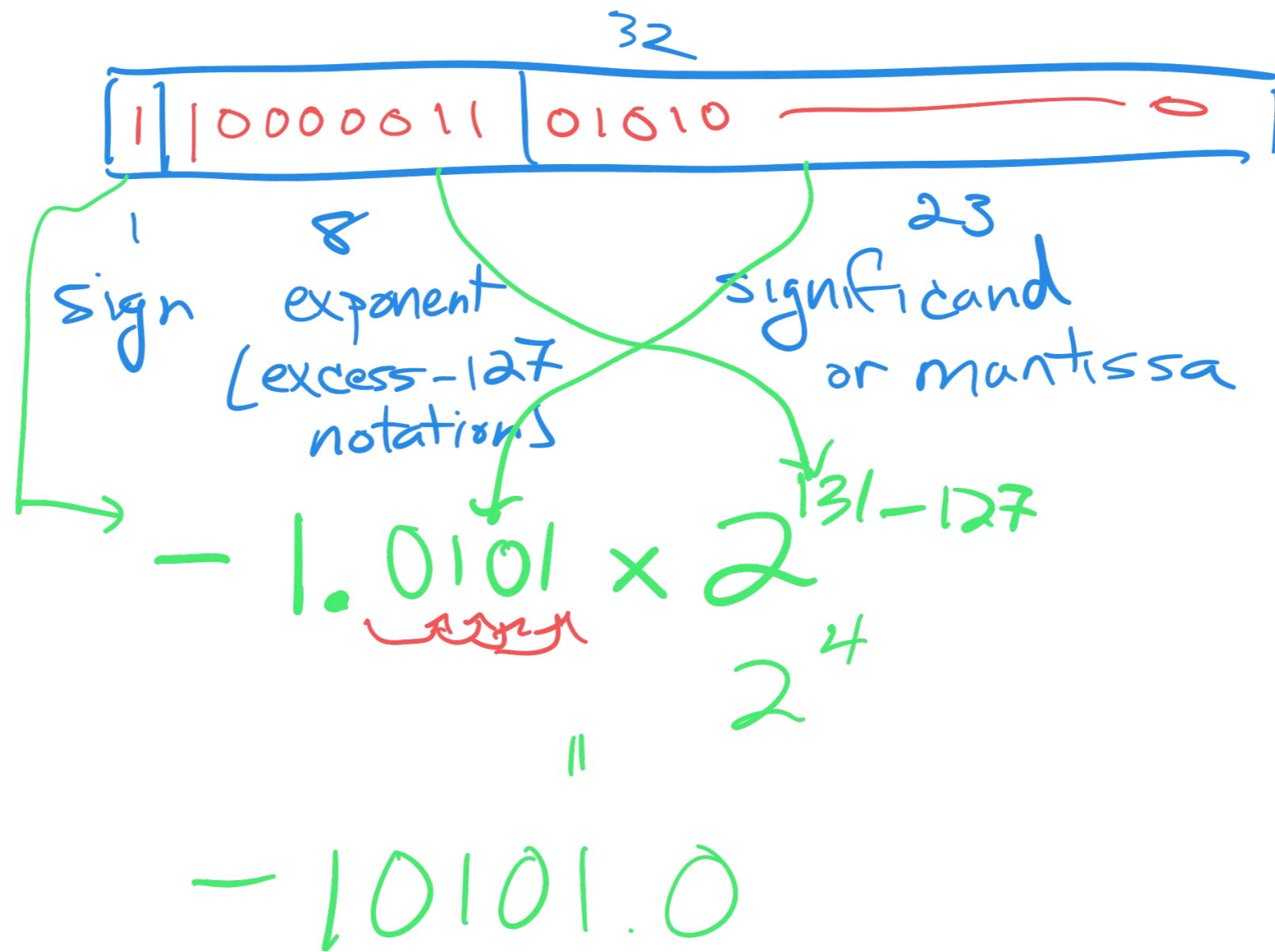
😞 110.011 $6 + \frac{0}{2} + \frac{1}{4} + \frac{1}{8}$

Doesn't go very high (2^{16} -ish)
Small fractions only 2^{-16} -ish } gotta waste space.

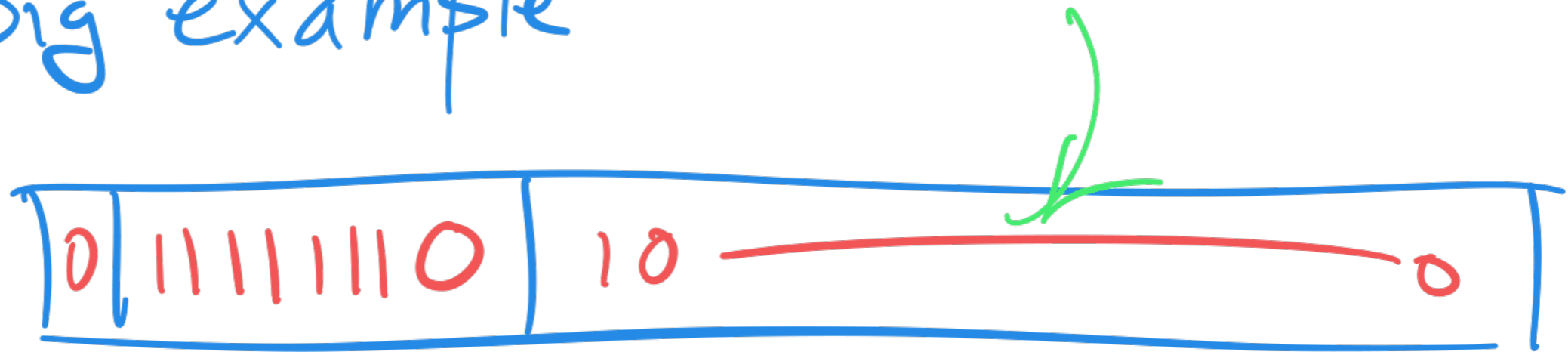
John von Neumann

in favor of
fixed point

Candidate #2: Floating point
 (this candidate won)
 (IEEE 754 standard)

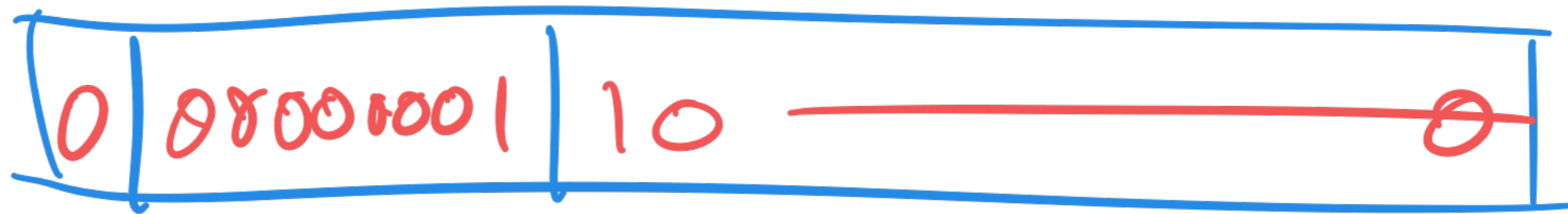


Big example



$$\begin{aligned} &= 1.1 \times 2^{254-127} \\ &= 1.1 \times 2^{127} \\ &= 110 \underbrace{\hspace{15em}}_0 \\ &\hspace{10em} \underbrace{\hspace{15em}}_{126 \text{ 0's}} \end{aligned}$$

Little example



$$1.1 \times 2^{1-127}$$

$$= 0.0 \text{ --- } 011$$

125 0's

Recap

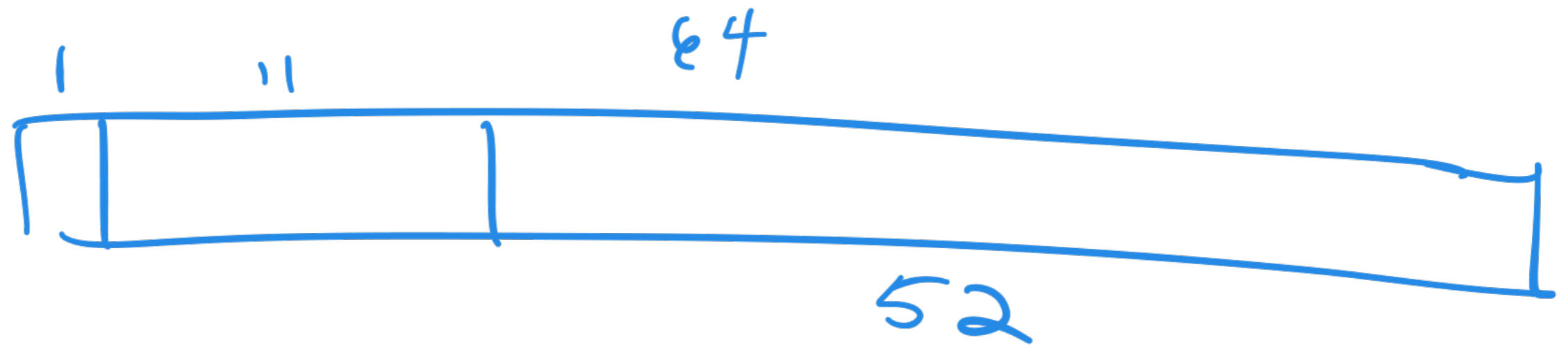


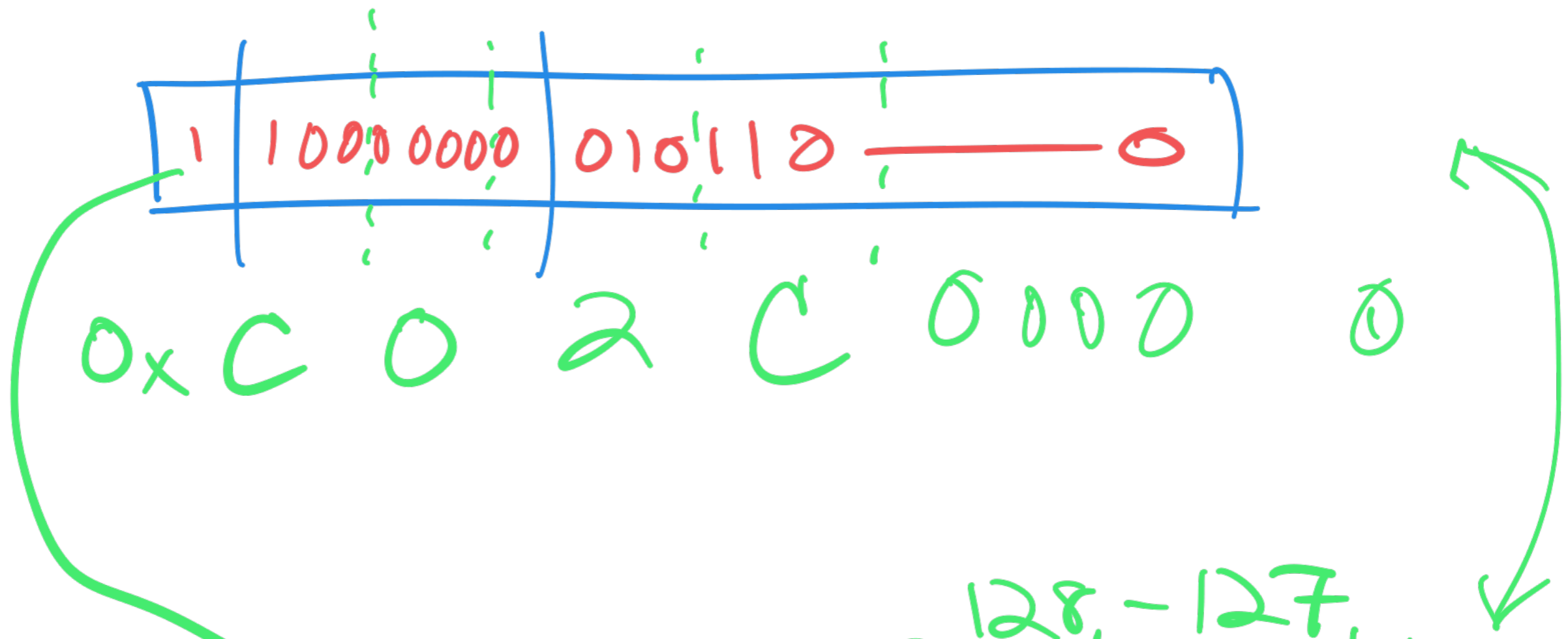
$$1.5 \times 2^{e-127}$$

$e = 0 \rightarrow 0$ or denormalized
depending on s

$e = 255 \rightarrow \text{Inf}$ or NaN

Double





$$-1.01011 \times 2^{128_{\text{ten}} - 127_{\text{ten}}}$$

$$= -10.1011_{\text{two}} = -2 + \frac{1}{2} + \frac{1}{8} + \frac{1}{16} = -2 \frac{7}{16}$$

~~Networking~~

What ops can you perform
on a file?

open

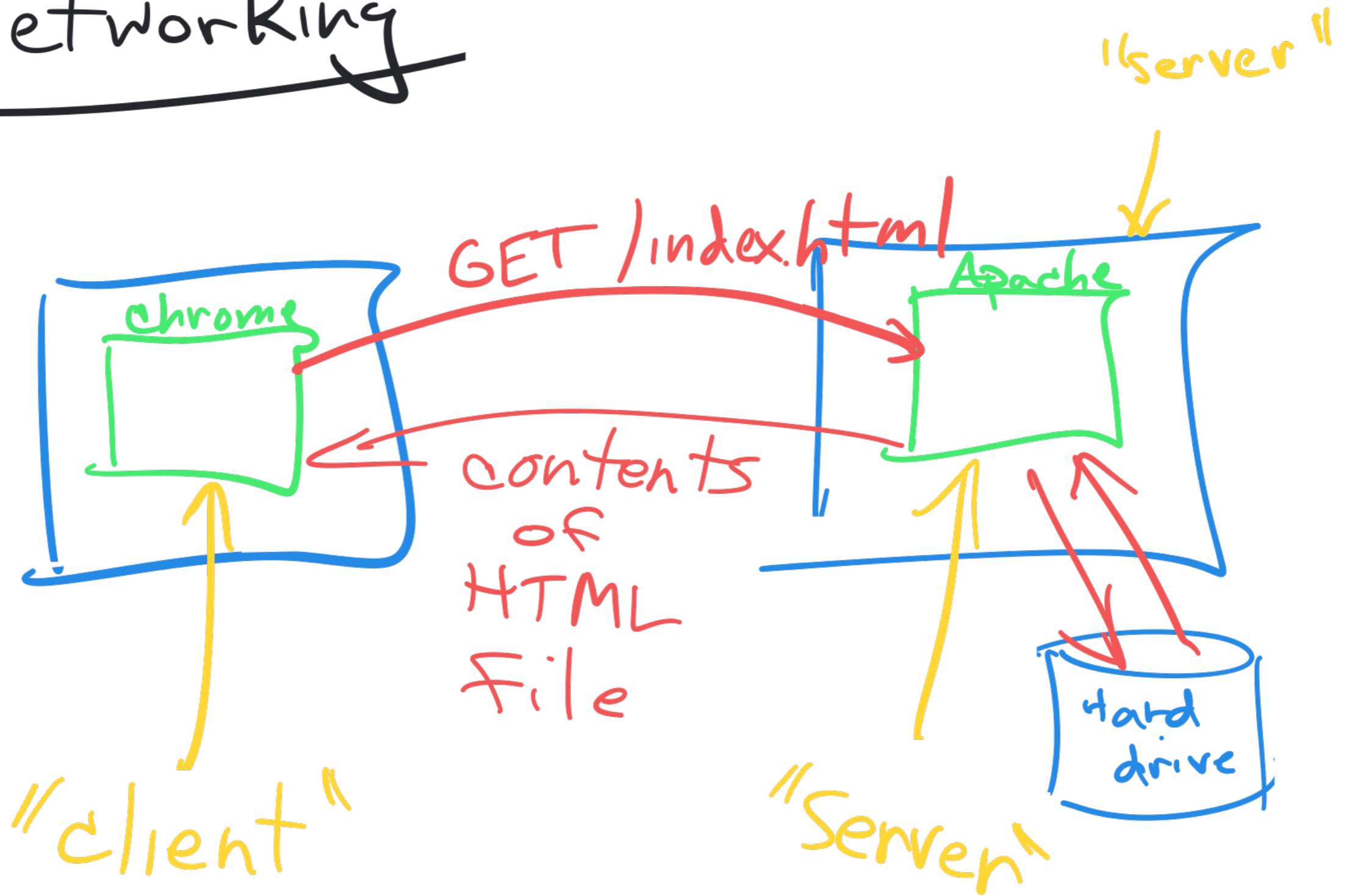
read

write

close

change permissions

Networking



Server

while(1) {

open-ish



wait for connection

read



read request

write



respond to request

close



close connection



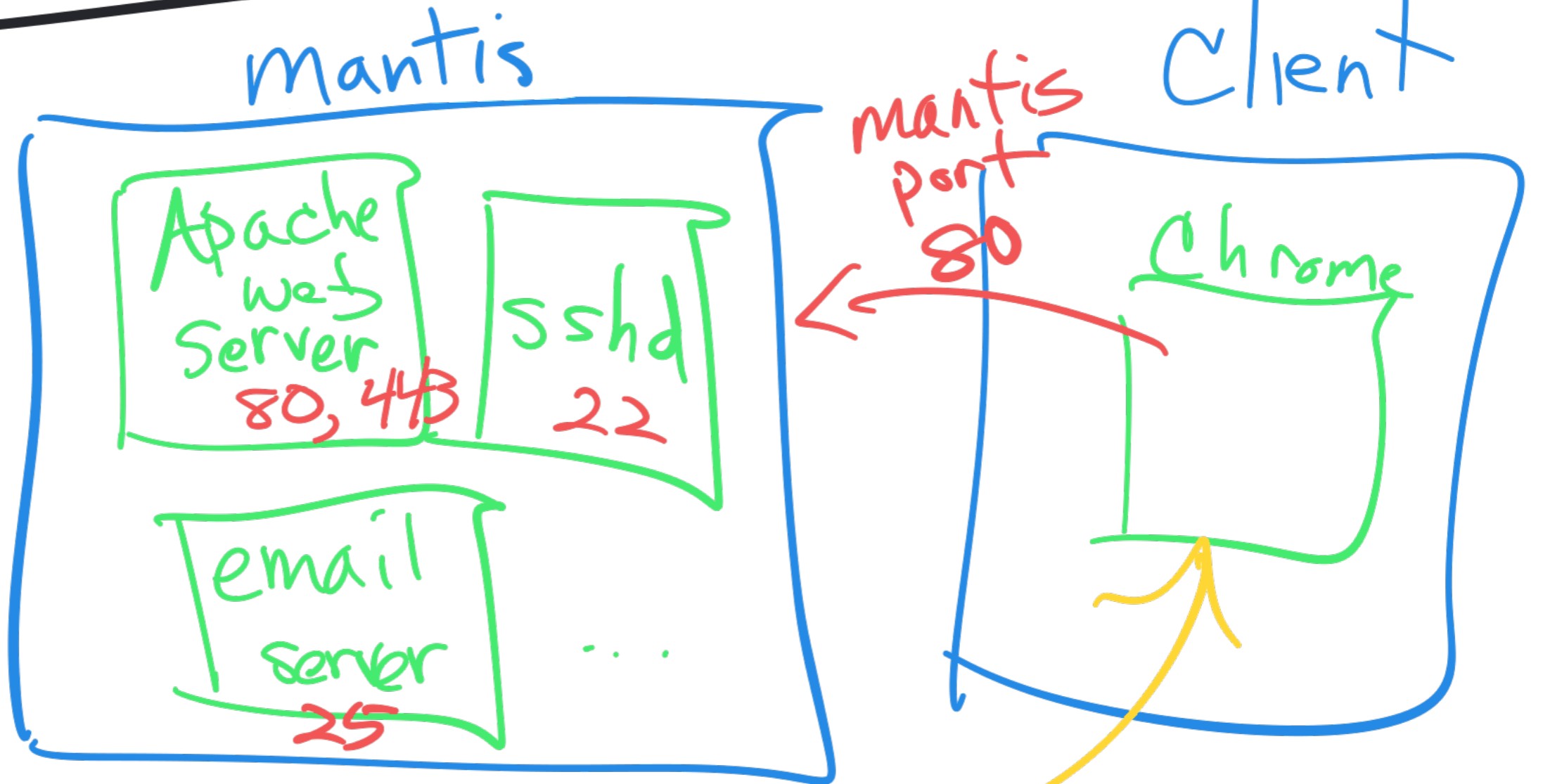
Programming

Client

- ① Open connection to server
- ② Send request
- ③ Read response
- ④ Close

Use "socket" to make
this happen

TCP "port"



wants to talk to the web server