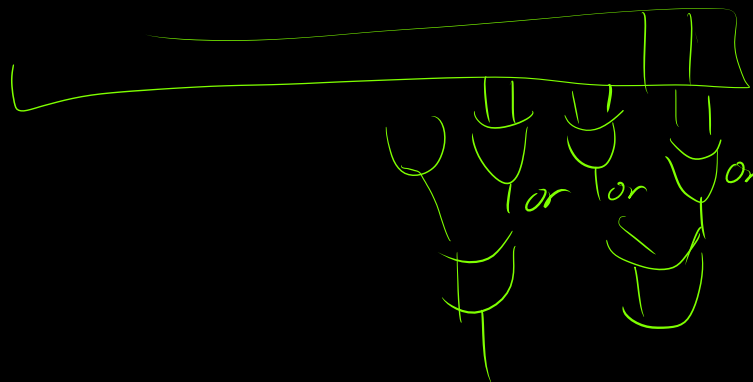
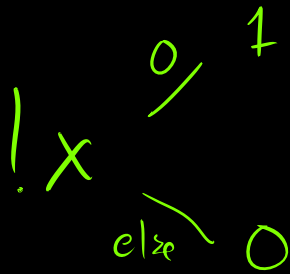


# 4- Way Set-associative cache

we don't use all bits of addresses



$$2^{10} = 1024 \approx 1000$$

$$2^{64} = 2^4 \cdot 2^{60}$$

16 exabytes

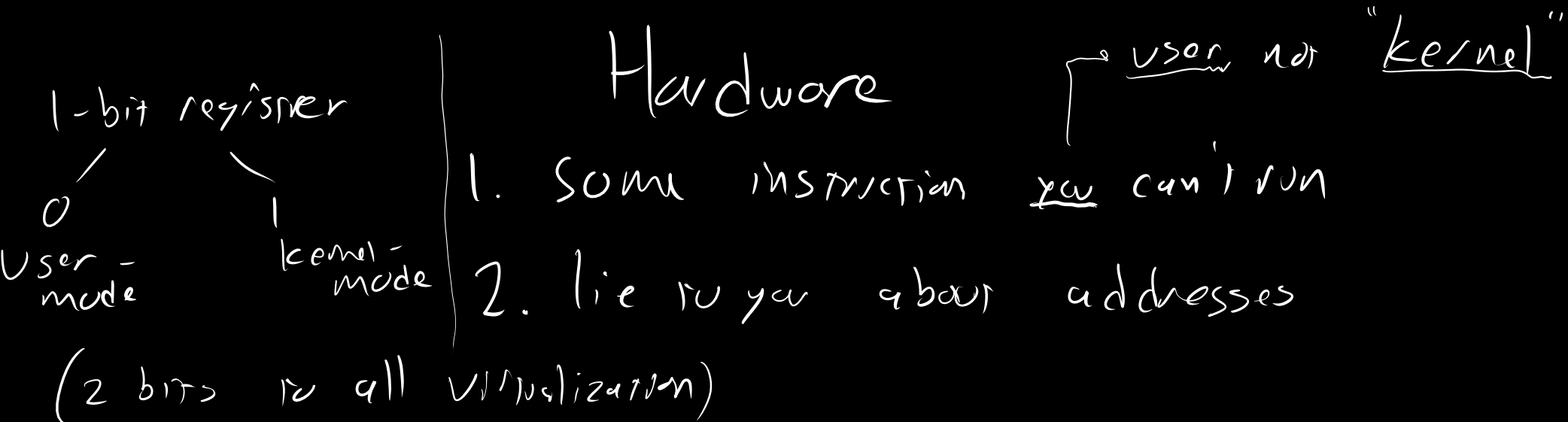
- $2^{10}$  kilo
- $2^{20}$  mega
- $2^{30}$  giga RAM
- $2^{40}$  terra Disk
- $2^{50}$  peta cloud
- $2^{60}$  exa

```
while (x < 0); }
```

}

repeat:

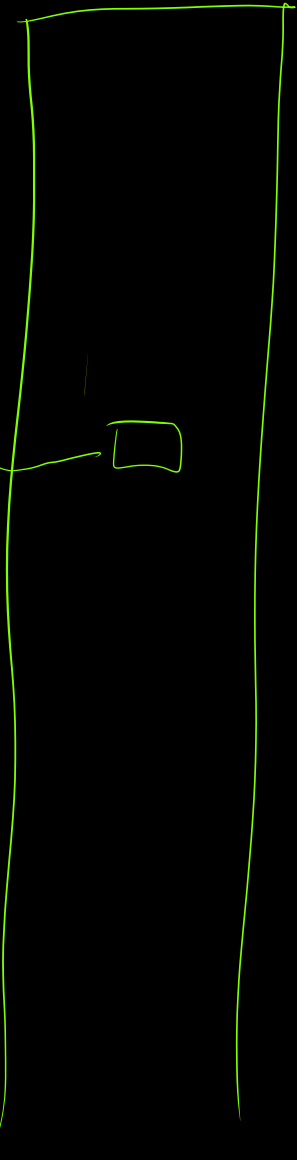
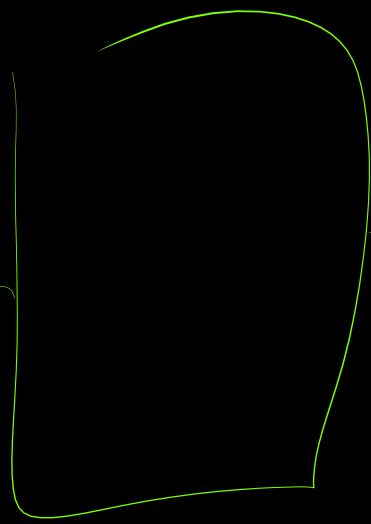
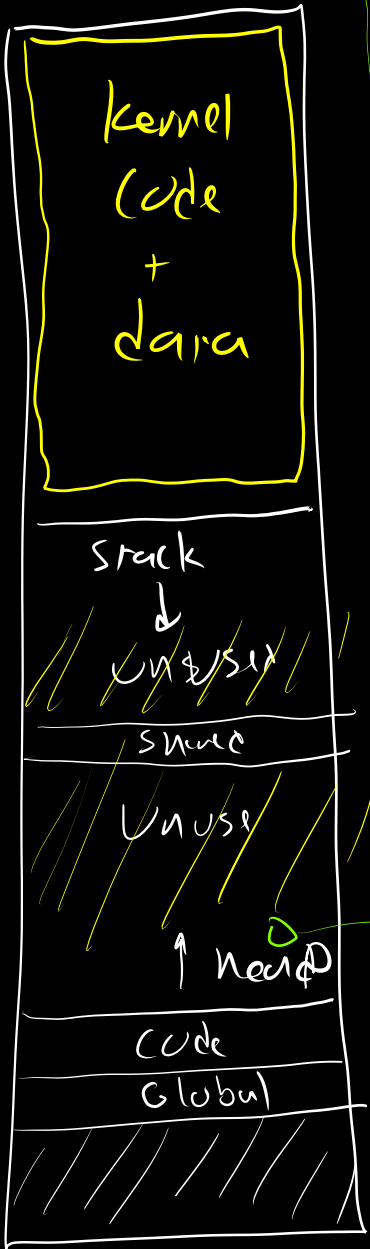
write byte to disk



# Virtual memory

# Physical memory

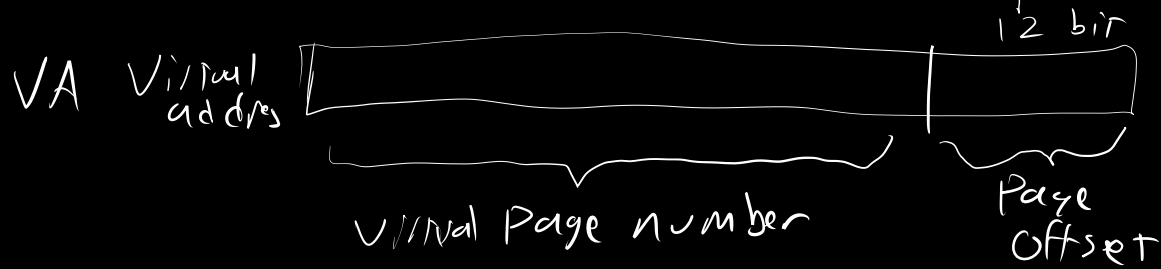
FFFF



use it all

0000

Divide memory into Pages (4KB common)



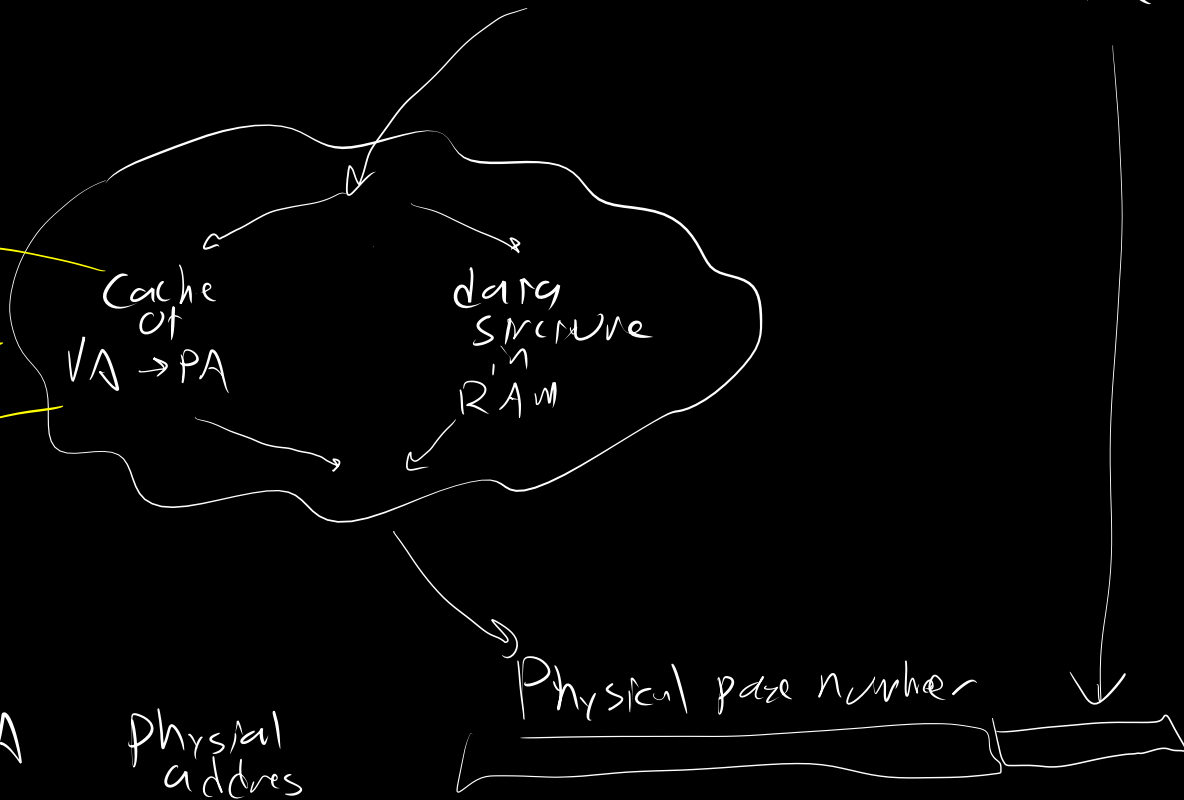
48 bit VA

246B RAM

< 326B

35 bits PA

Translation  
Lookaside  
buffer  
TLB



PA Physical address