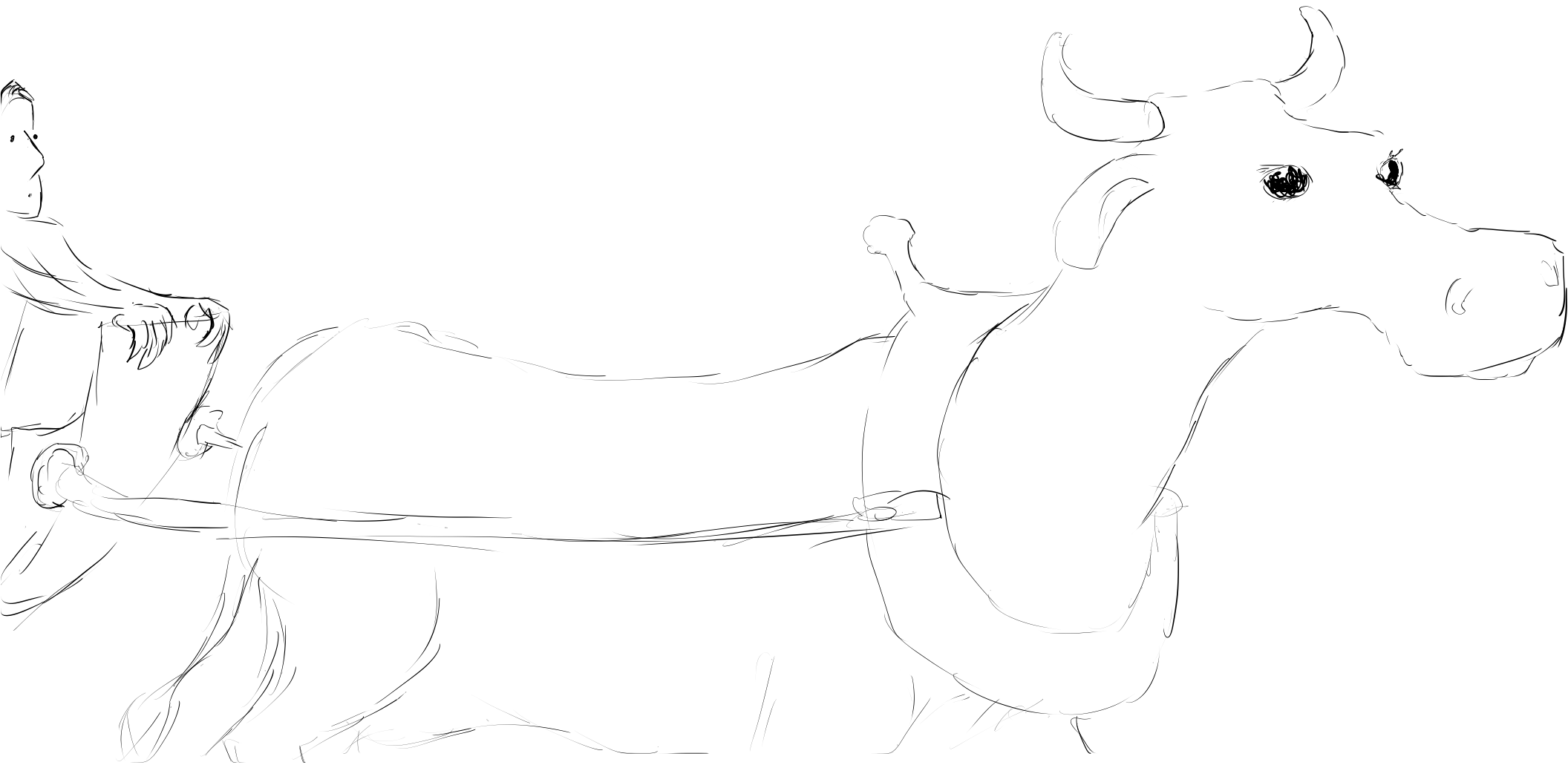
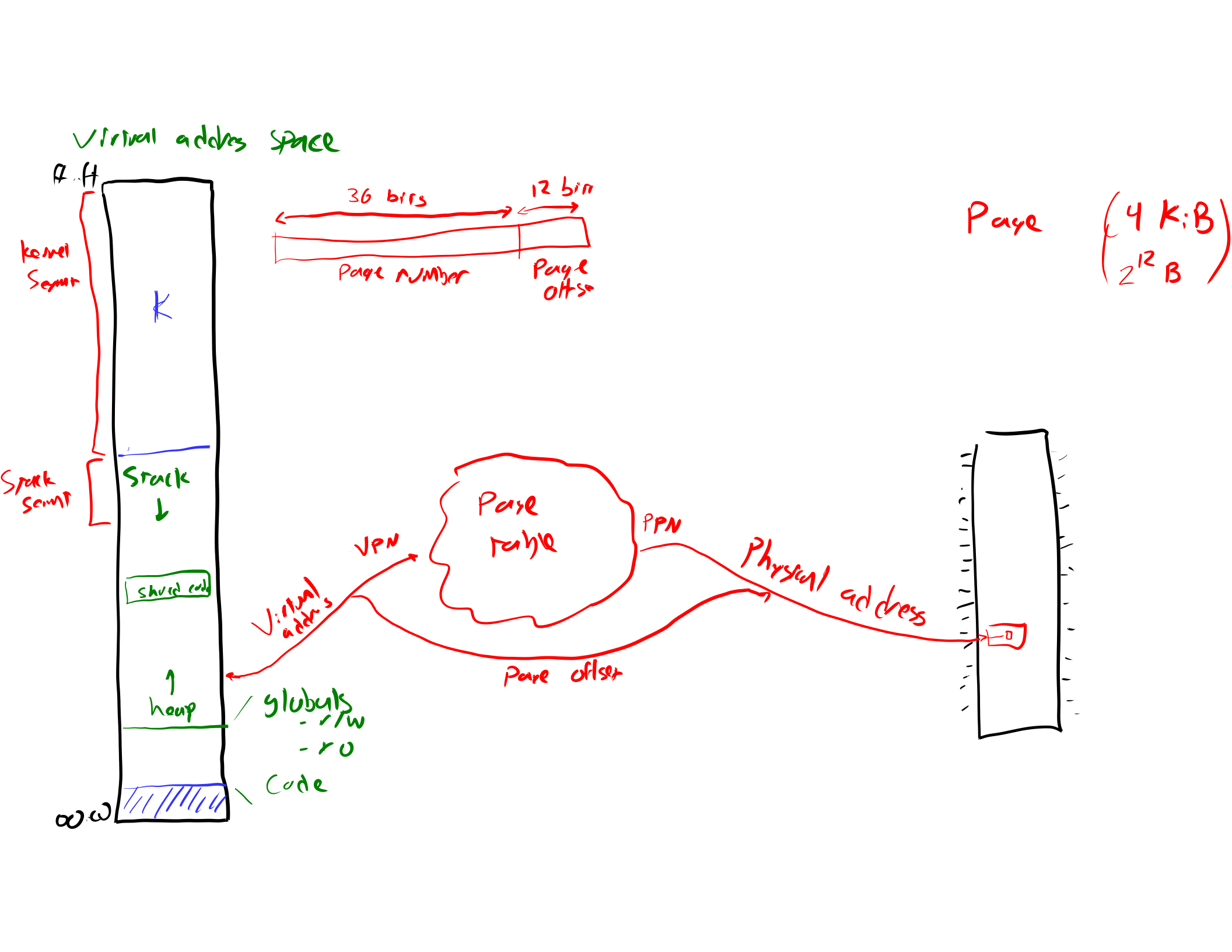
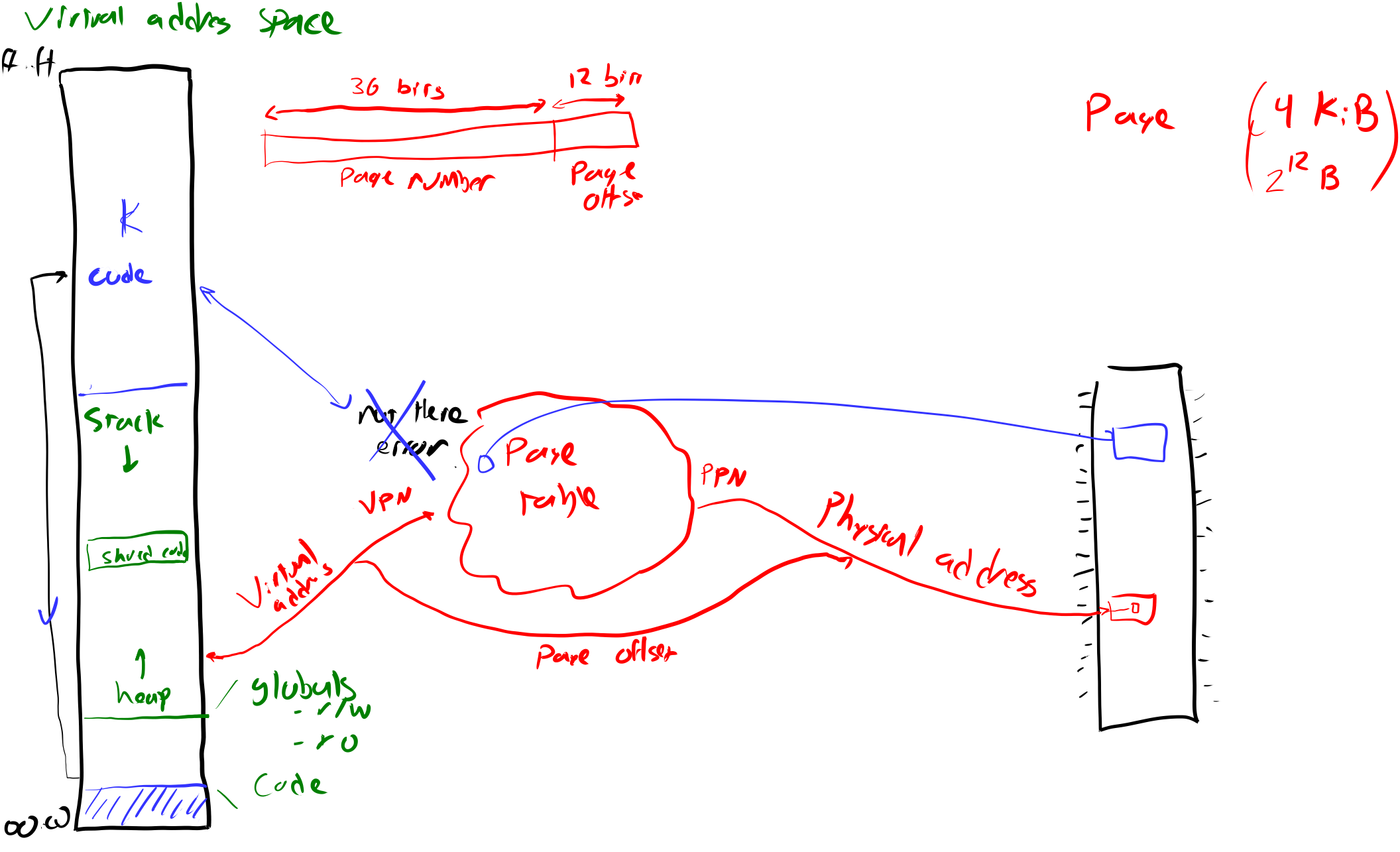
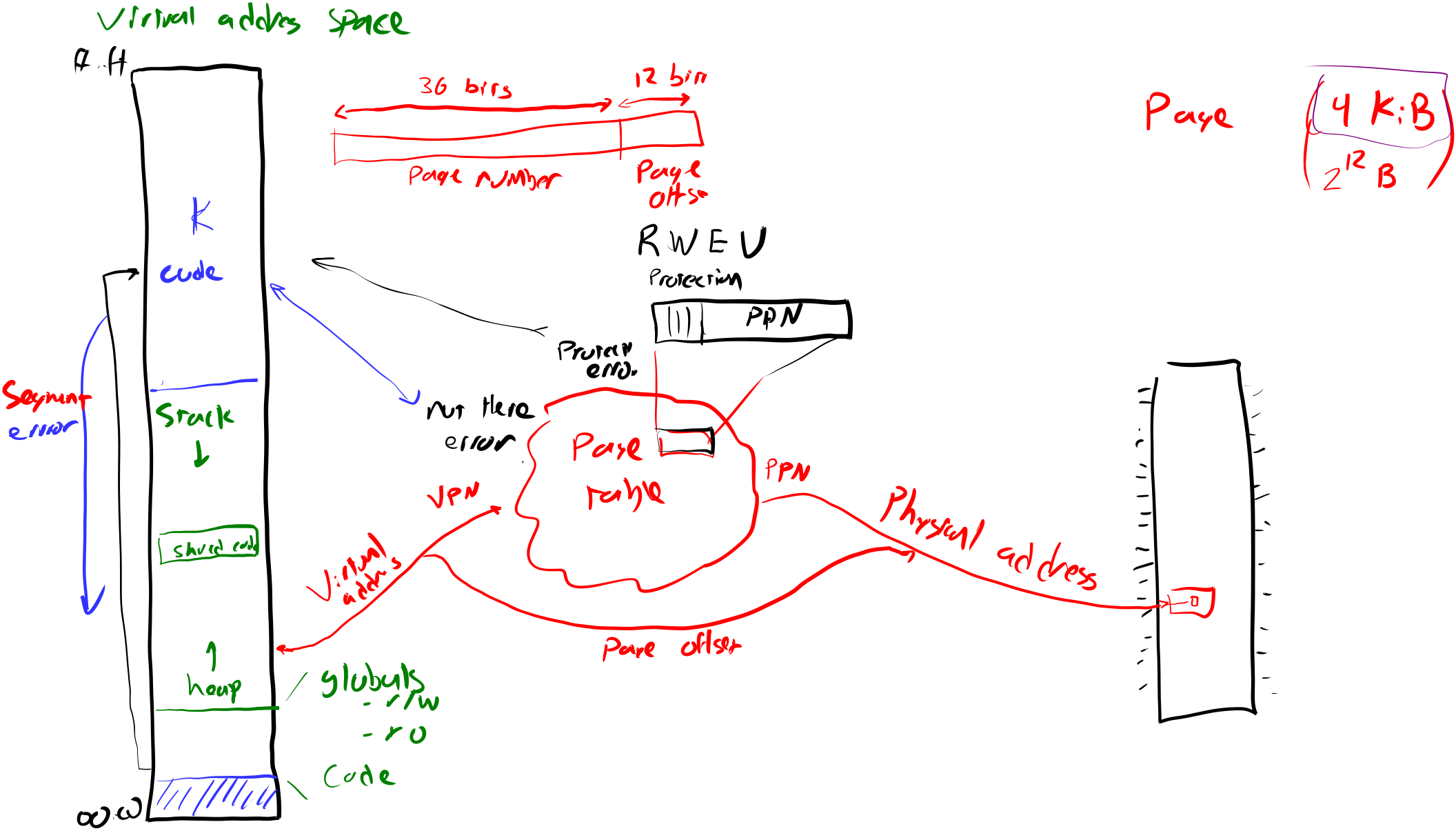
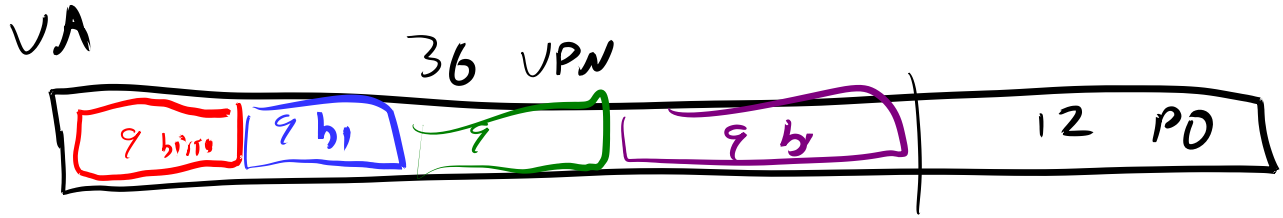



Virtual addres space
FFFF
kernel Segment
K
Stack Segment
Stack
shared code
heap
globals
- rw
- ro
Code
0000
36 bits
12 bits
Page number
Page offset
Page table
VPN
PPN
Virtual address
Physical address
Page offset
Page (4 KiB / 2^12 B)


Virtual address space
FFFF
36 bits
12 bits
Page number
Page offset
Page (4 KiB / 2^12 B)
K
code
Stack
shared code
heap
globals
- r/w
- ro
Code
0000
not there error
Page table
VPN
PPN
Physical address
Virtual address
Page offset

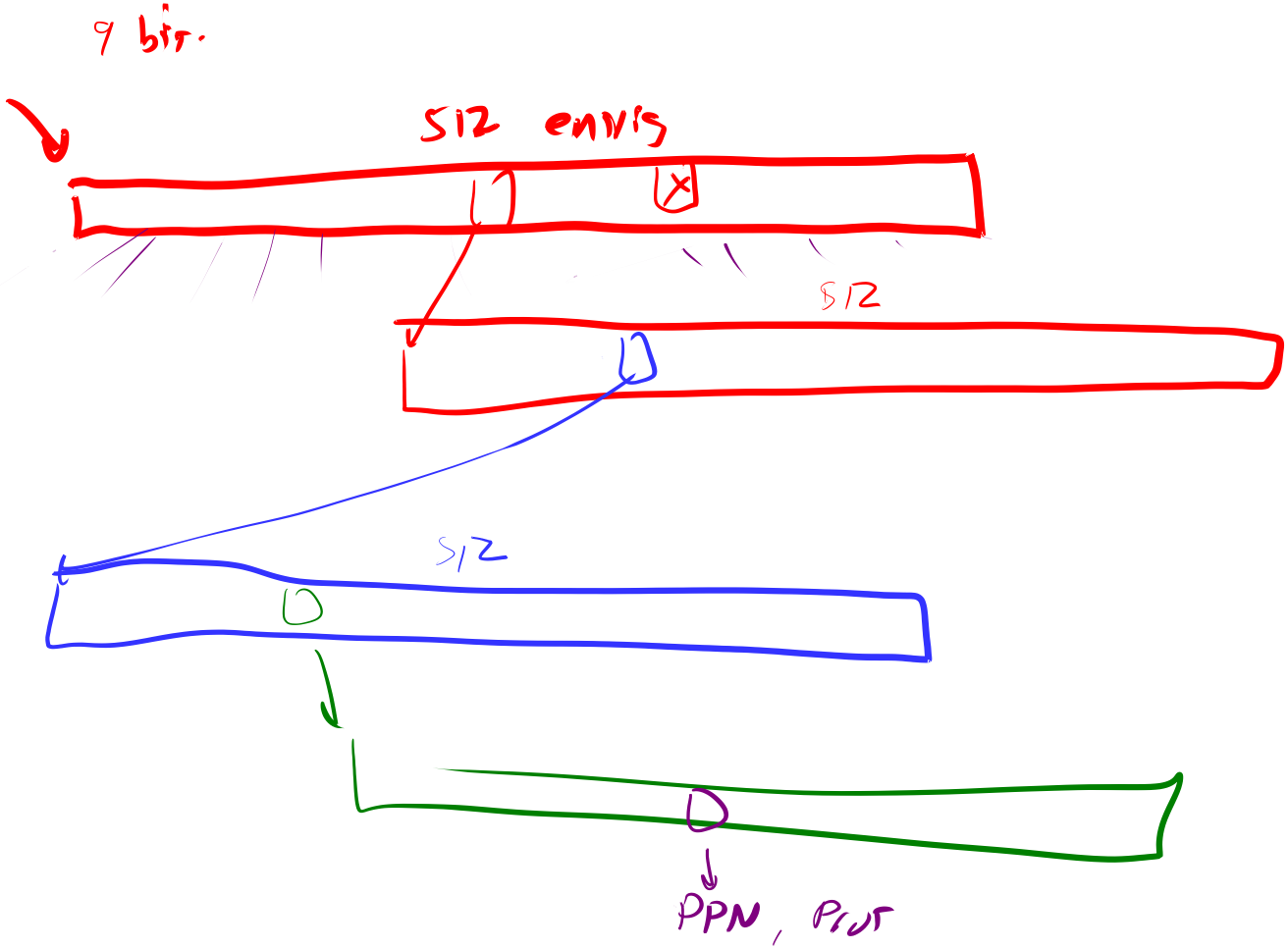

Virtual address space
FFFF
36 bits
12 bits
Page number
Page offset
Page
4 KiB
2^12 B
K
code
Stack
shared code
heap
globals
- r/w
- ro
Code
0000
RWEU
Protection
PPN
Protection error
Segment error
not here error
Page table
VPN
PPN
Virtual address
Physical address
Page offset




512 entr / 8 bytes

= 4096 bit

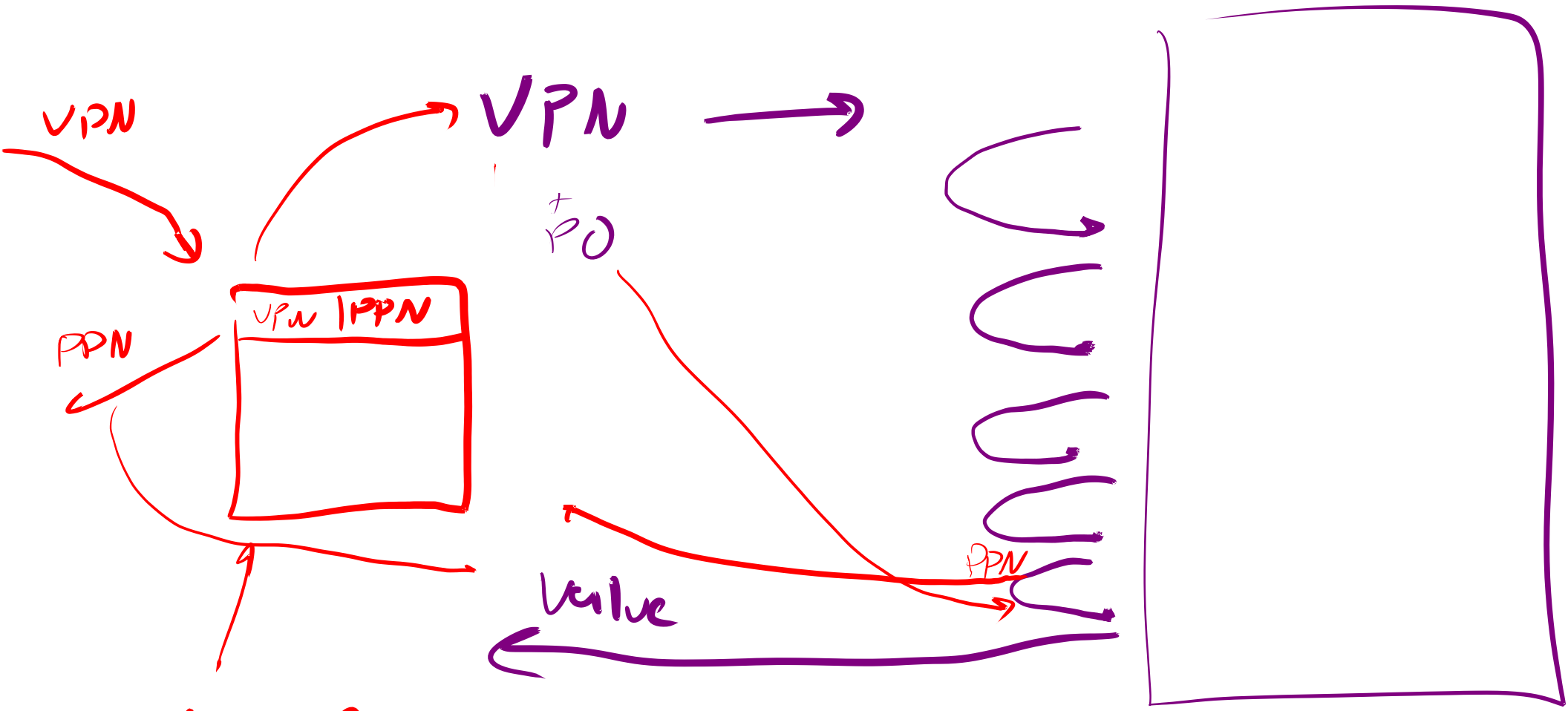
4 KiB



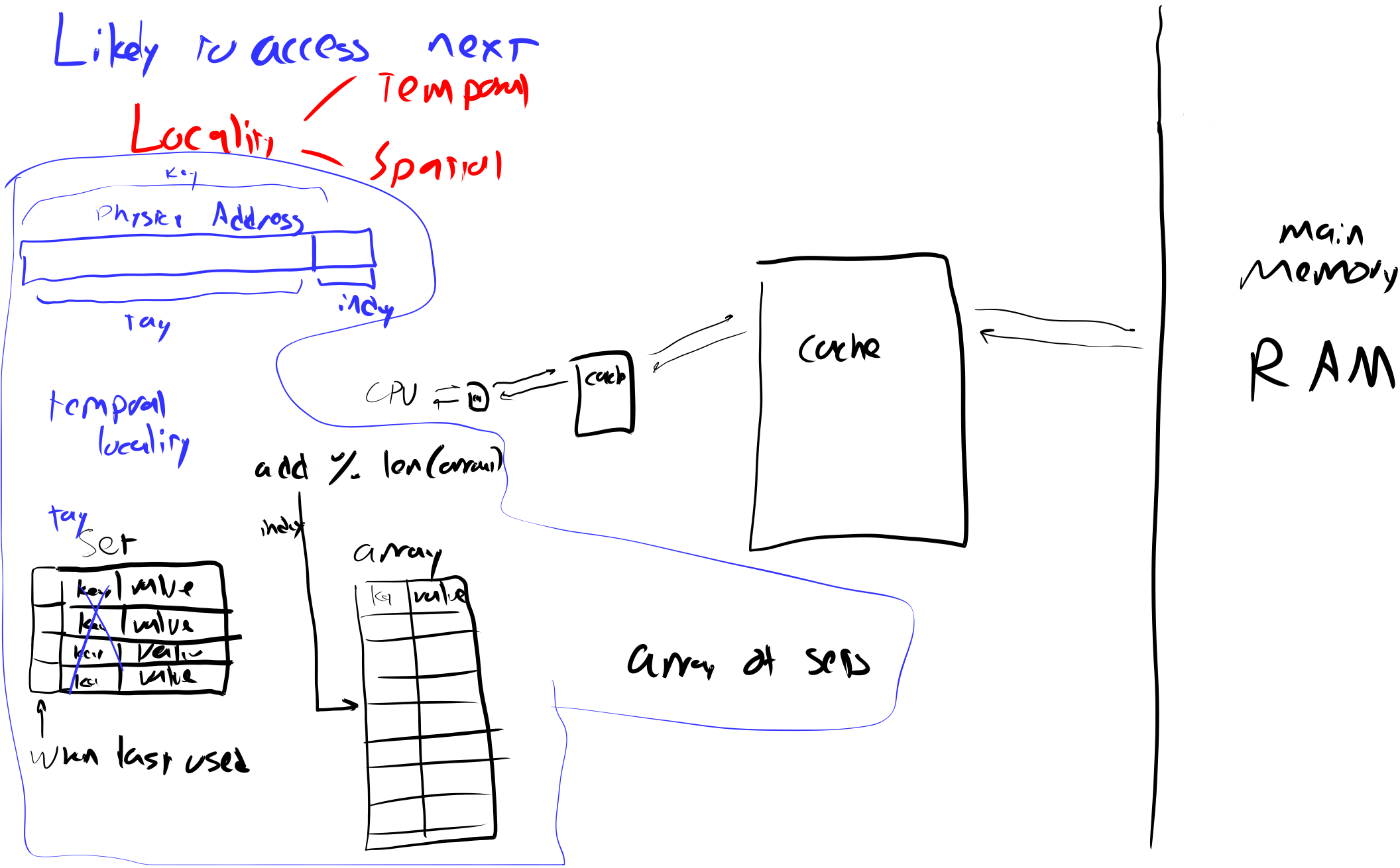
# Other kernel stuff

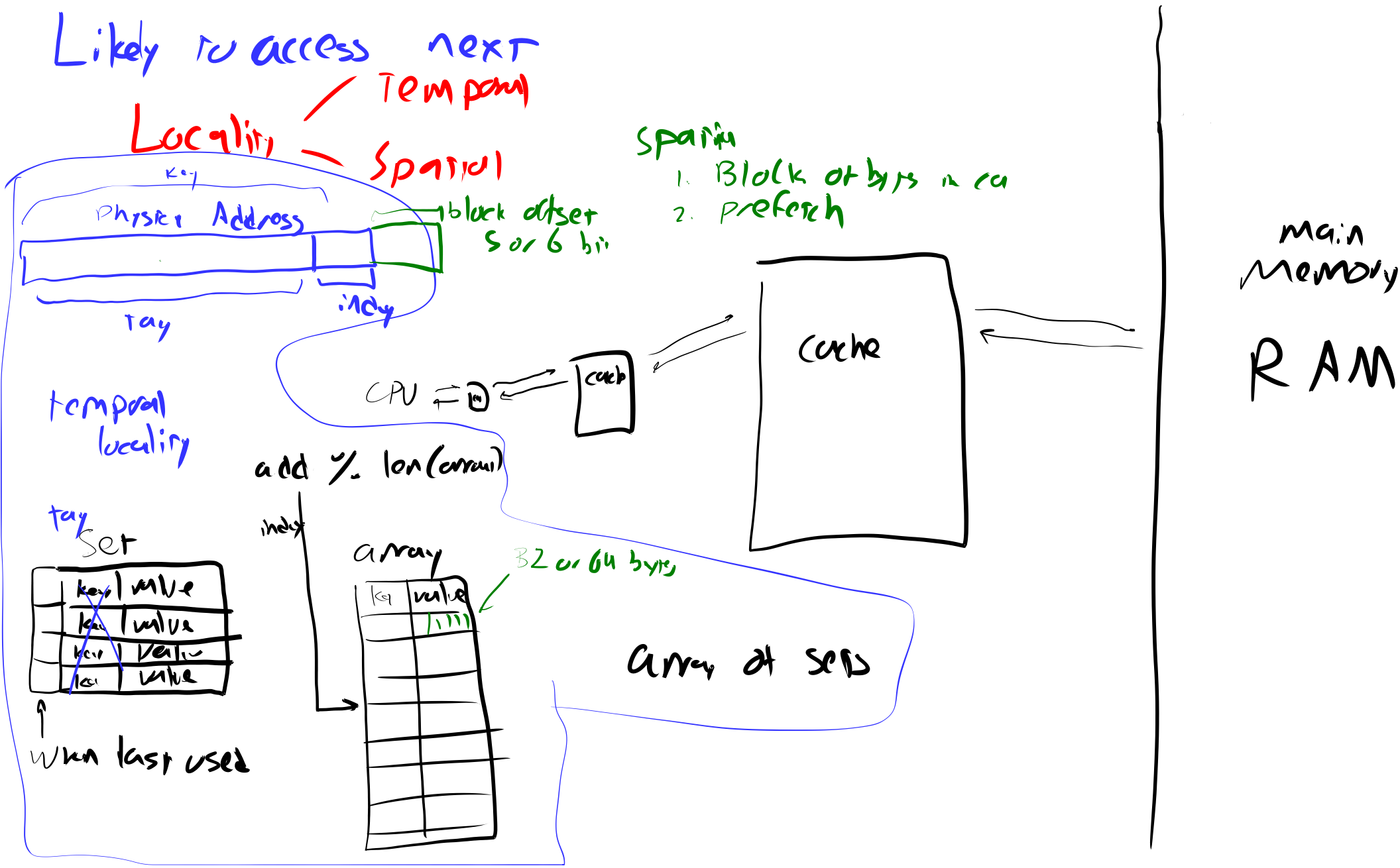
- Virt Mem changes
- Process (make, end, communicate)
  - any not - Processor mem-mem hardware

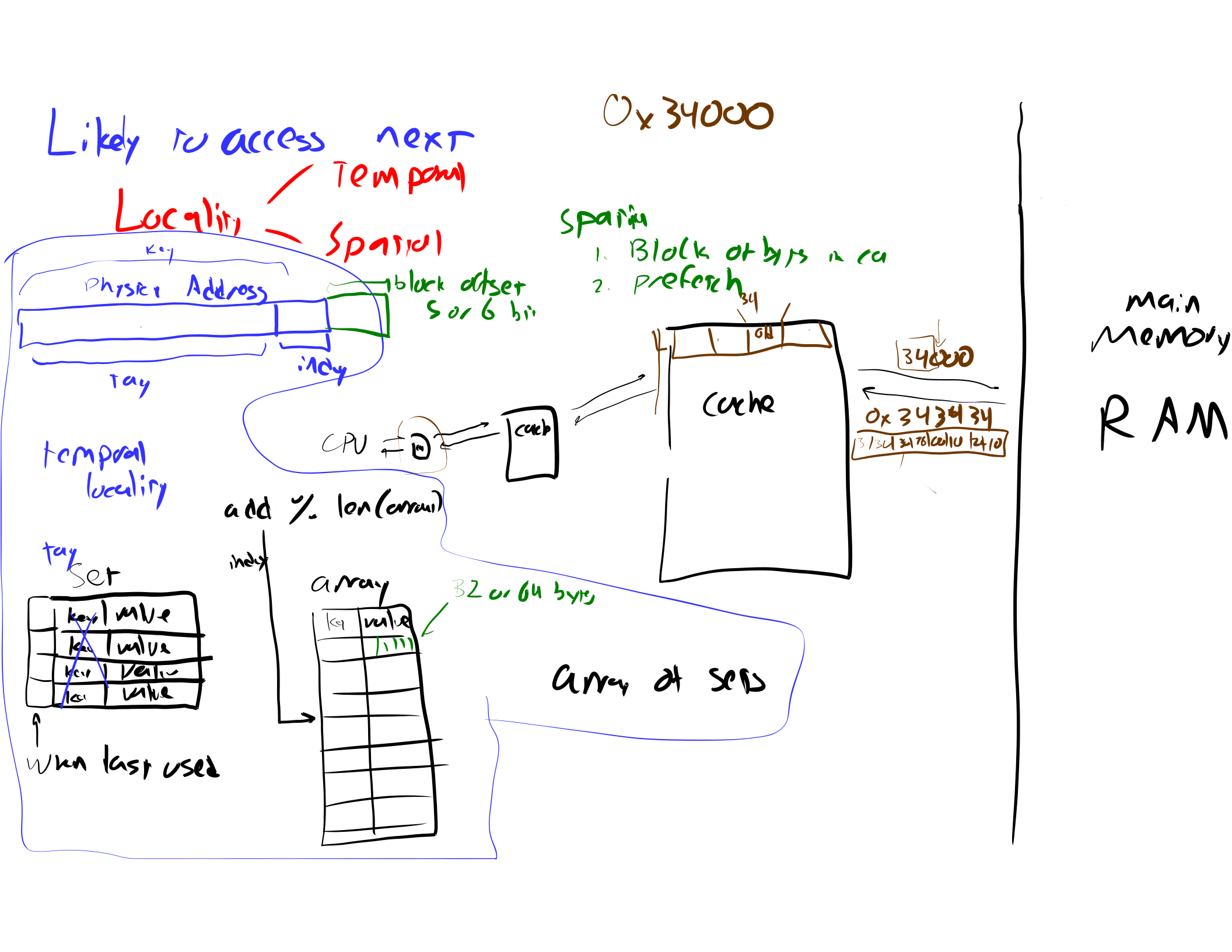
# Cache




Most recent
few
transactions


Likely to access next
Temporal
Locality
Spatial
key
Physical Address
tag
index
temporal locality
CPU
cache
Cache
main memory
RAM
add % len(array)
tag
Set
index
array
key
value
When last used
array of sets


Likely to access next
Temporal
Locality
Spatial
key
Physical Address
block offset
5 or 6 bit
index
tag
Spatial
1. Block of bytes in ca
2. prefetch
main
memory
RAM
Cache
CPU
cache
temporal
locality
add % len(array)
tag
Set
index
array
32 or 64 bytes
key
value
When last used
Array of sets


Likely to access next
Temporal
Locality
Spatial
Key
Physical Address
block offset
5 or 6 bit
index
tag
Spatial
1. Block of bytes in ca
2. prefetch
0x34000
main
Memory
RAM
CPU
cache
cache
0x343434
temporal
locality
add % len(array)
tag
Set
index
array
32 or 64 bytes
key
value
When last used
array of sets

Which has better locality:

hashmap

tree map

| | | |
|---|---|---|
| Spatial: | hash | tree |
| Temporal: | hash | tree |