Meltdown

Specter

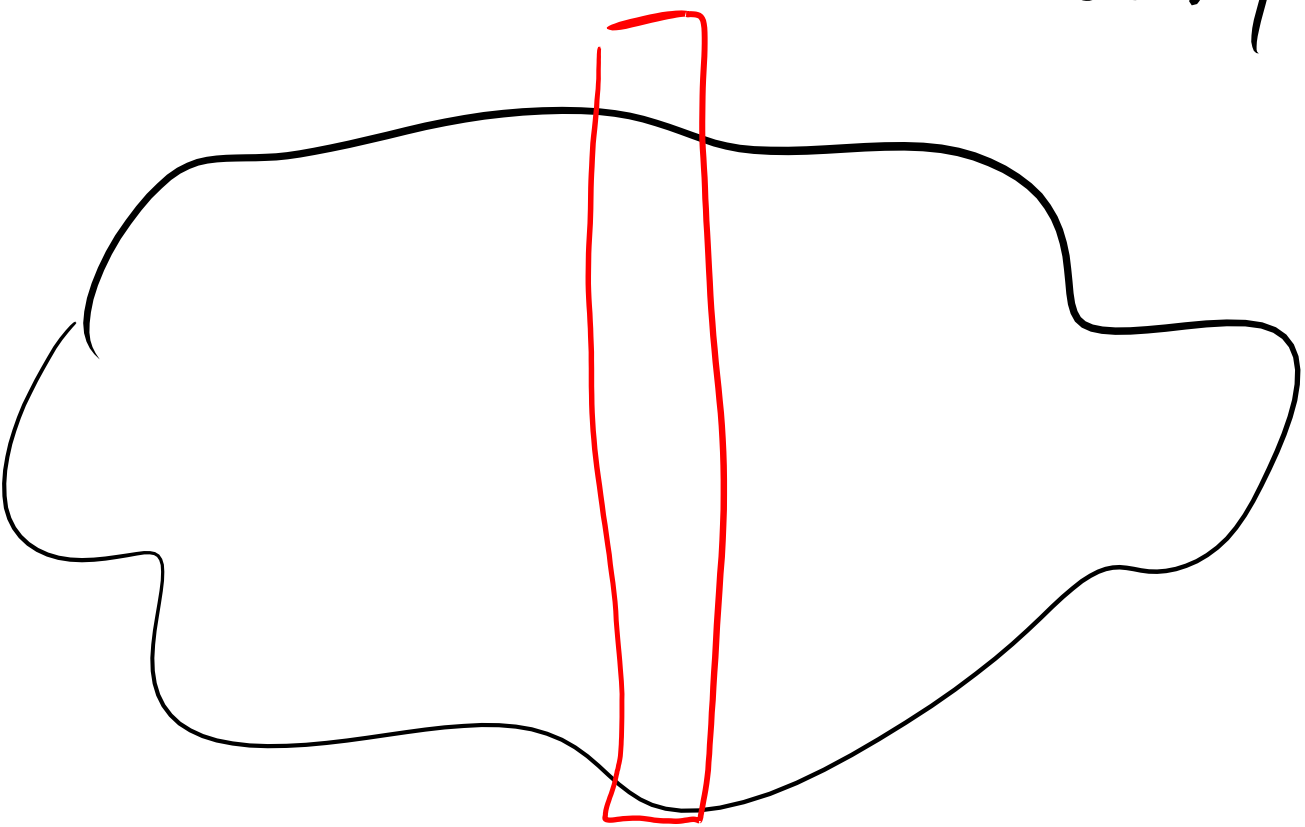
Specular

ephemeral action

Power $I \cdot V$

constant

very resistor change



MD: kernel ... page fault

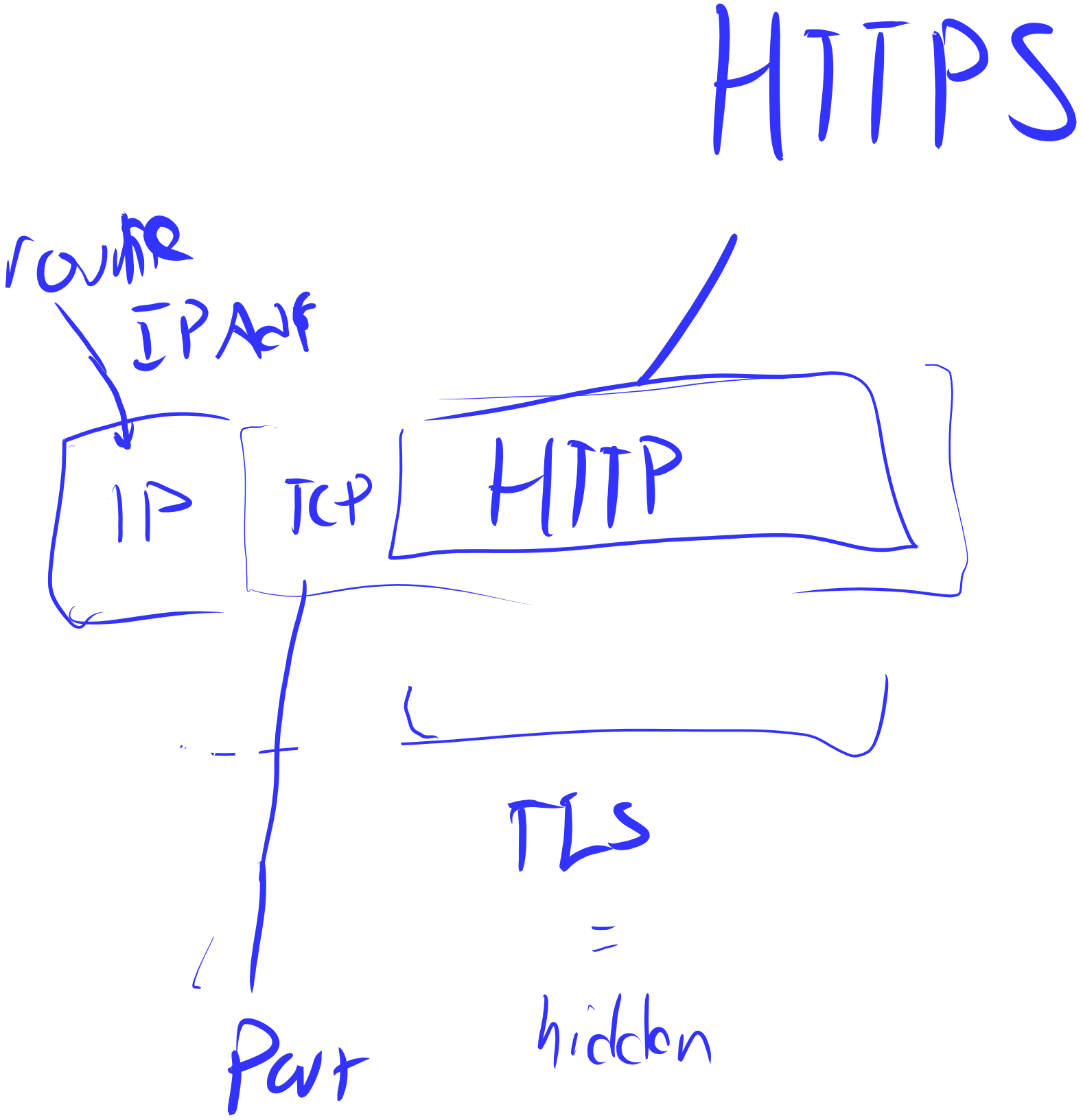
Spec rem read

!

cache

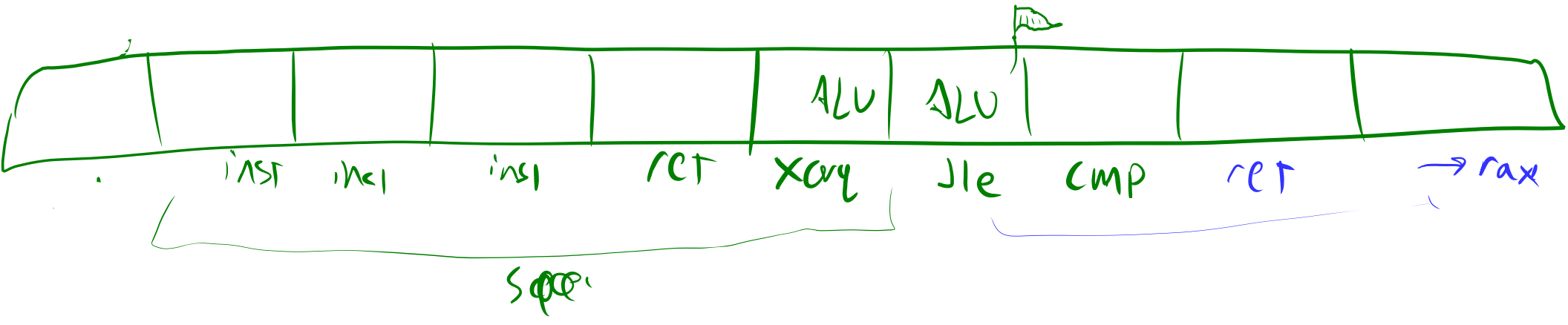
Sp: sw prefetch : hf

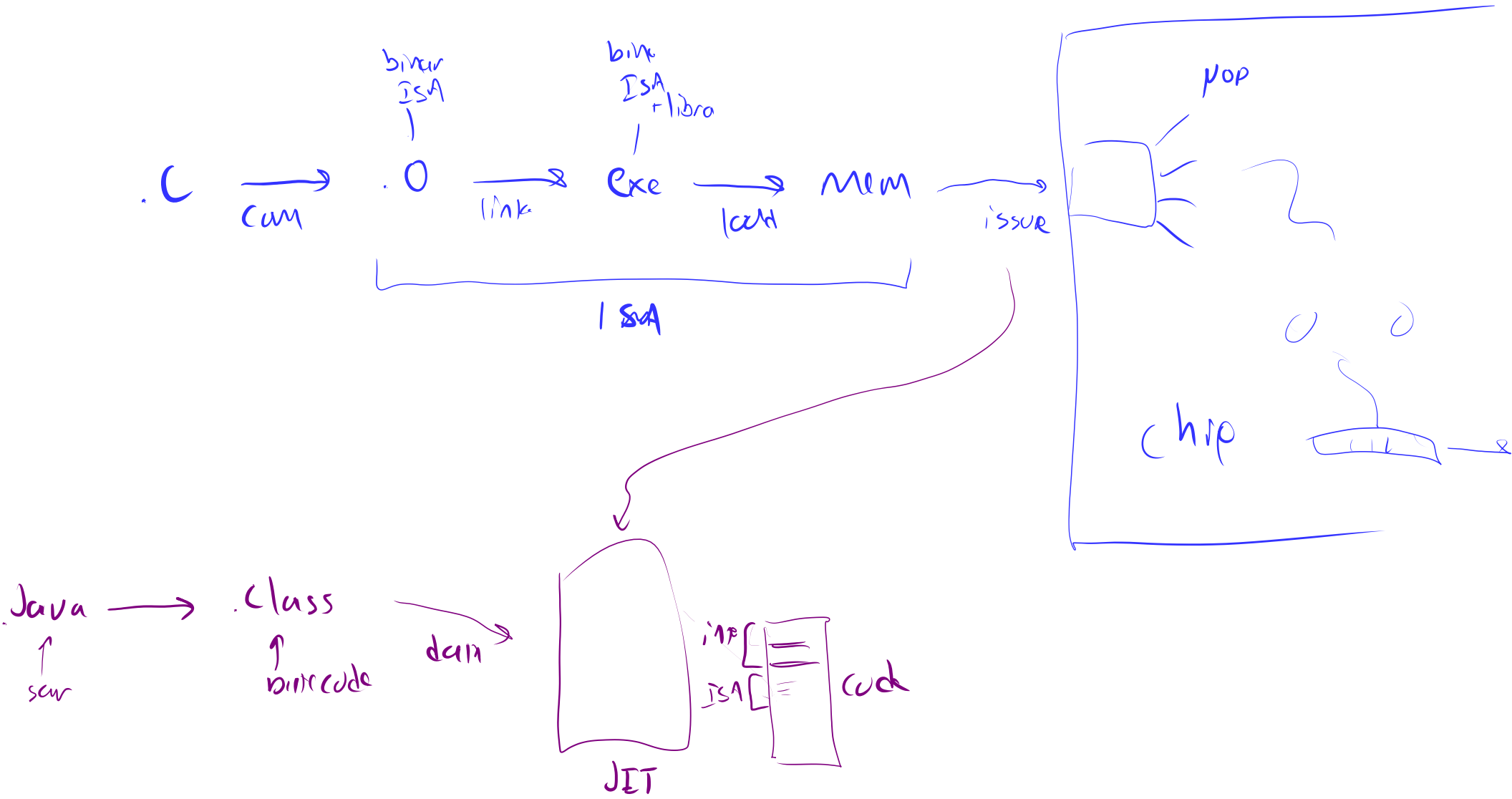
Branch predict


HTTPS
IP
TCP
HTTP
TLS
=
hidden

#Pragma

```
        .
        .
        .
callq   baz
cmp     %rax, %rdx
jle     foo
xaq     %rax, %rax
ret
foo:
ret
```



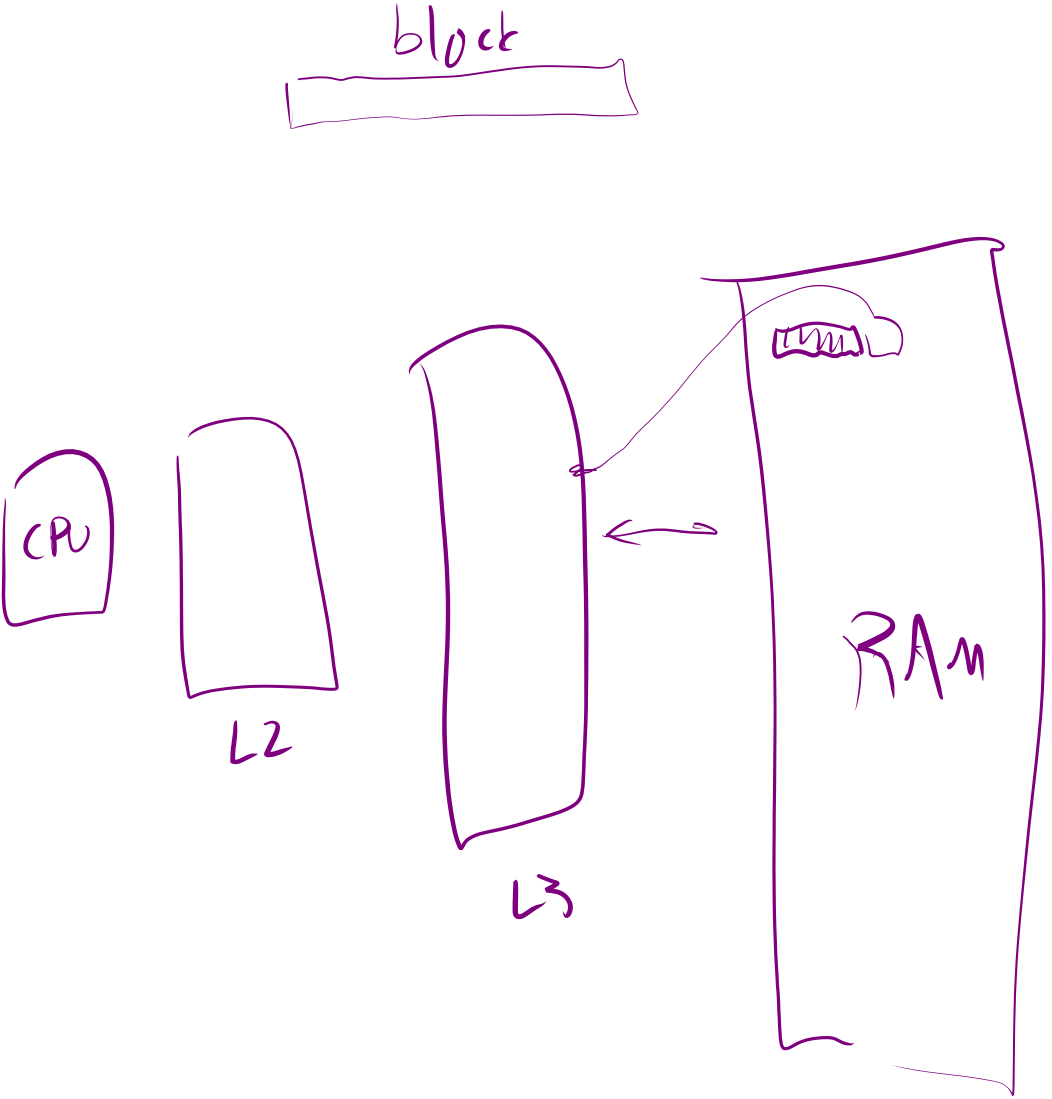

.C
.O
.exe
.mem
compile
binary ISA
link
binary ISA + libraries
load
issue
μop
chip
Java
.class
bytecode
scan
data
JIT
info
ISA
code

```
movq    %rax, %rdx
movq    (%rax), %rdx
movq    12345(%rax, %rcx, 8), %rdx
```

alu

4086

Prefetching



increase

for(i 0 ... n)

for(i n ... 0)