

**103ns**



**MELTDOWN: STASHAWAY - SLEDGEHAMMER**

3

2















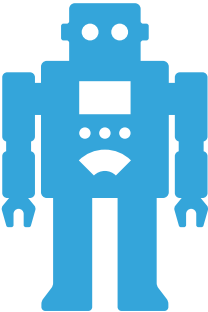












CRUCORE

VALUE

**Read**

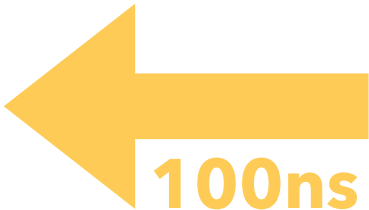
**Cache**



**Read**



**RAM**



VALUE (IN CACHE)

Gamechangers



RAM

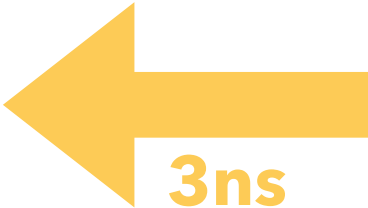
- ▶ Reading one byte stalls the CPU for hundreds of  $\mu$ OPs
- ▶ CPU caches considerably speed this up
- ▶ E.g. reading cached takes 3ns, reading uncached 103ns



**Not in cache**



**In cache**



**3ns**

Then we ask up *“what is the value at address X?”* This is called *“address X is cache”*

# MELTDOWN: STASHING AWAY – SIDECCHANNEL



- ▶ Reading one byte stalls the CPU for hundreds of  $\mu$ OPs
- ▶ CPU caches considerably speed this up
- ▶ E.g. reading cached takes 3ns, reading uncached 103ns

The cache speeds up "what is the value at address X?". This is called "(address) X is cached"

## “READ” INSTRUCTION

For a CPU the “READ value from memory at 4711” instruction looks like this (μOPs):

1. Check that program may read from address 1
2. Store the value at address in register<sup>1</sup> 2

If 1 fails the program is aborted.

This can be handled by the program.

<sup>1</sup> Register: The CPU's scratchpad