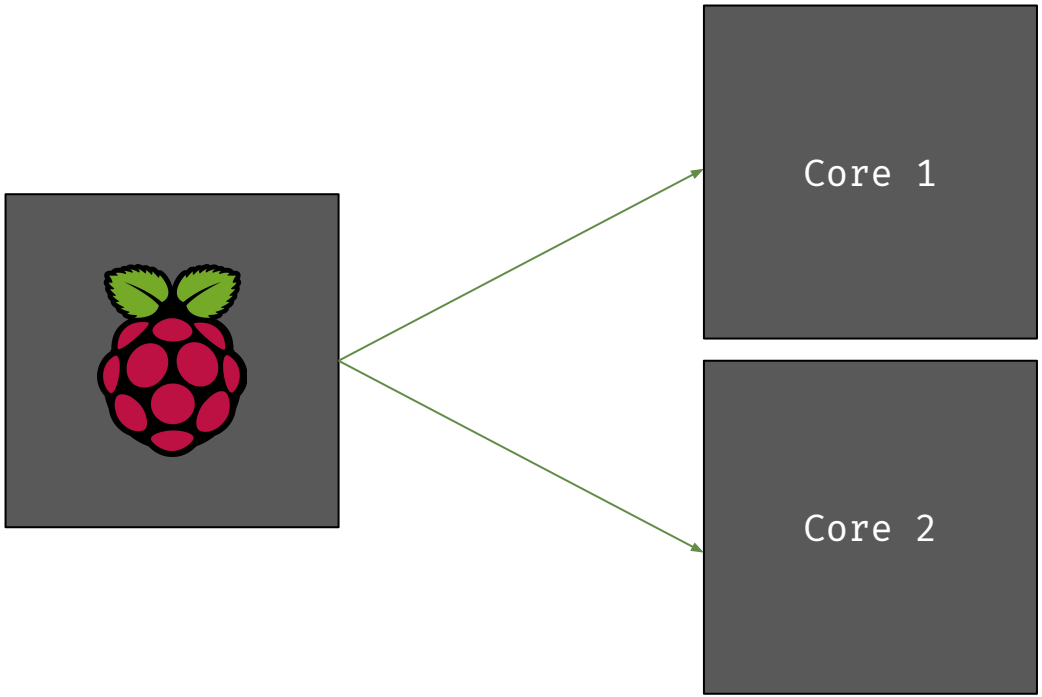
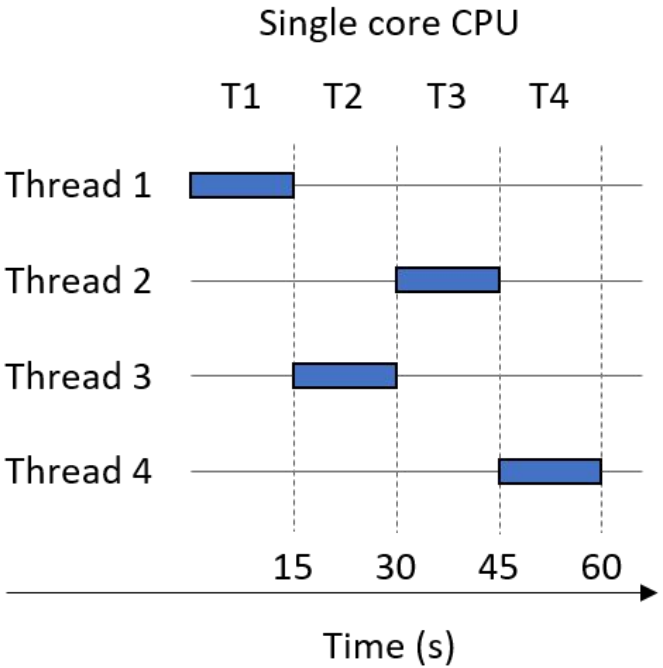

0X BARE
CMPSC 0XC8 ALLEGHENY COLLEGE 0X7E7
C8 METAL

Cortex M0+



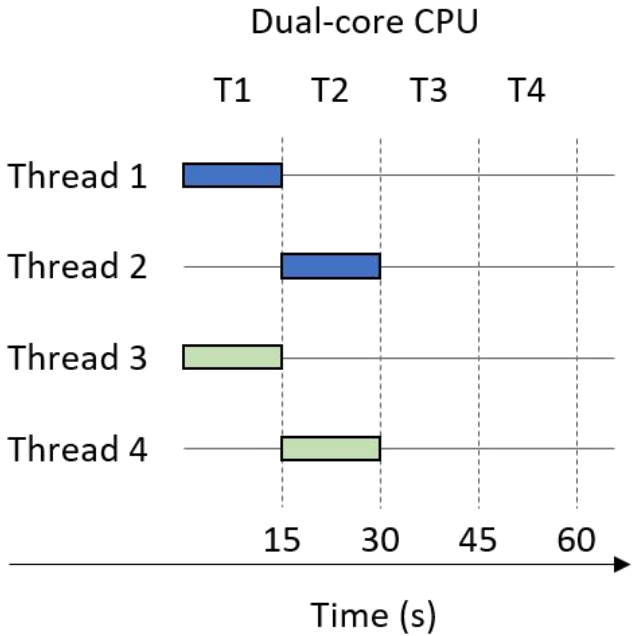
- Both have equal compute power
- Both run simultaneously
- So far, we've only used 1



“Synchronous”

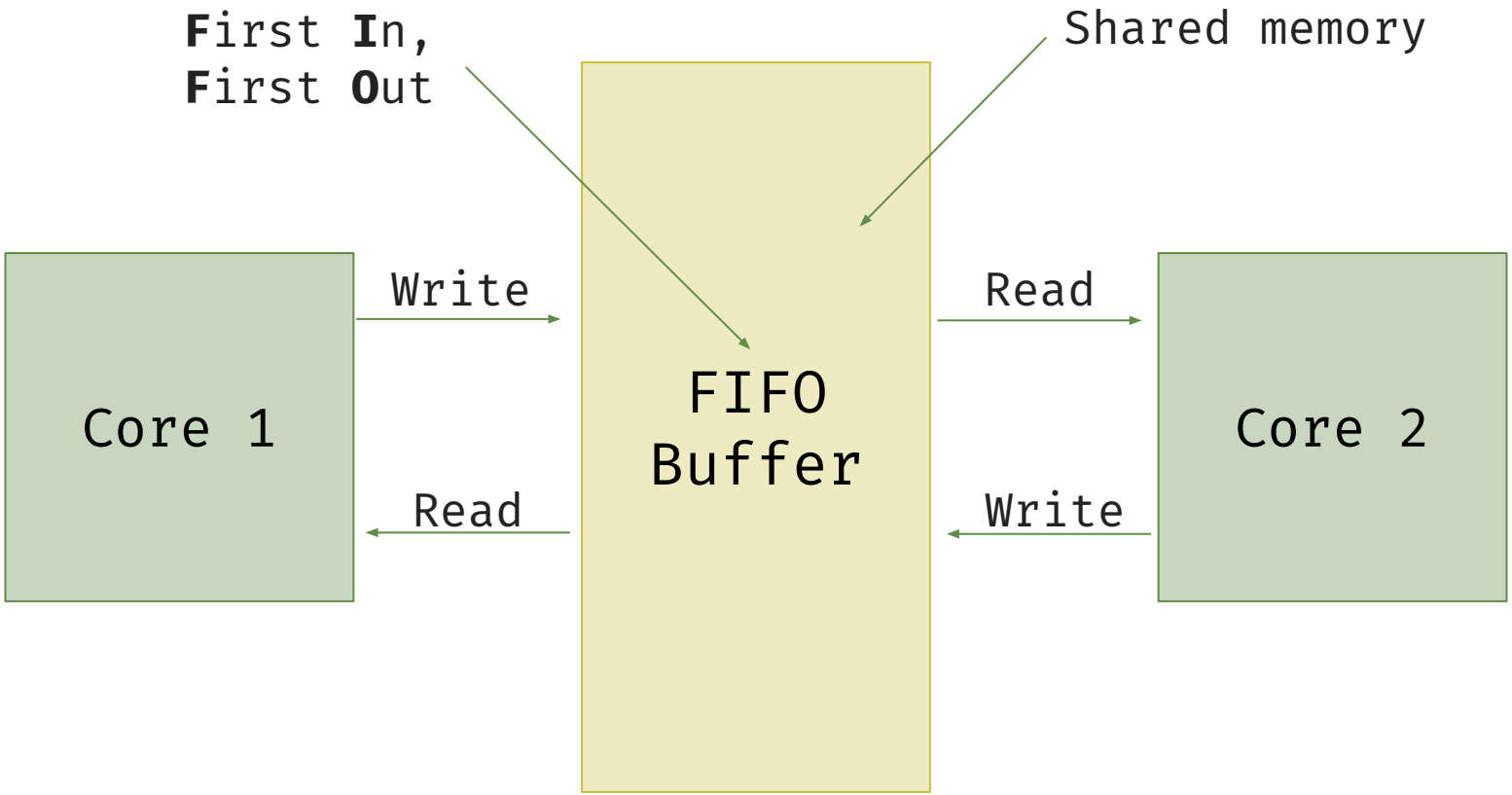
Each process has to finish before another can begin

Compute time distributed on a single-core processor



Each core is **synchronous** in itself, but performance is effectively *asynchronous.*

Compute time distributed on a two-core processor


First In,
First Out
Shared memory
Core 1
Write
Read
FIFO
Buffer
Read
Write
Core 2

FIFO Buffer

“Buffer”

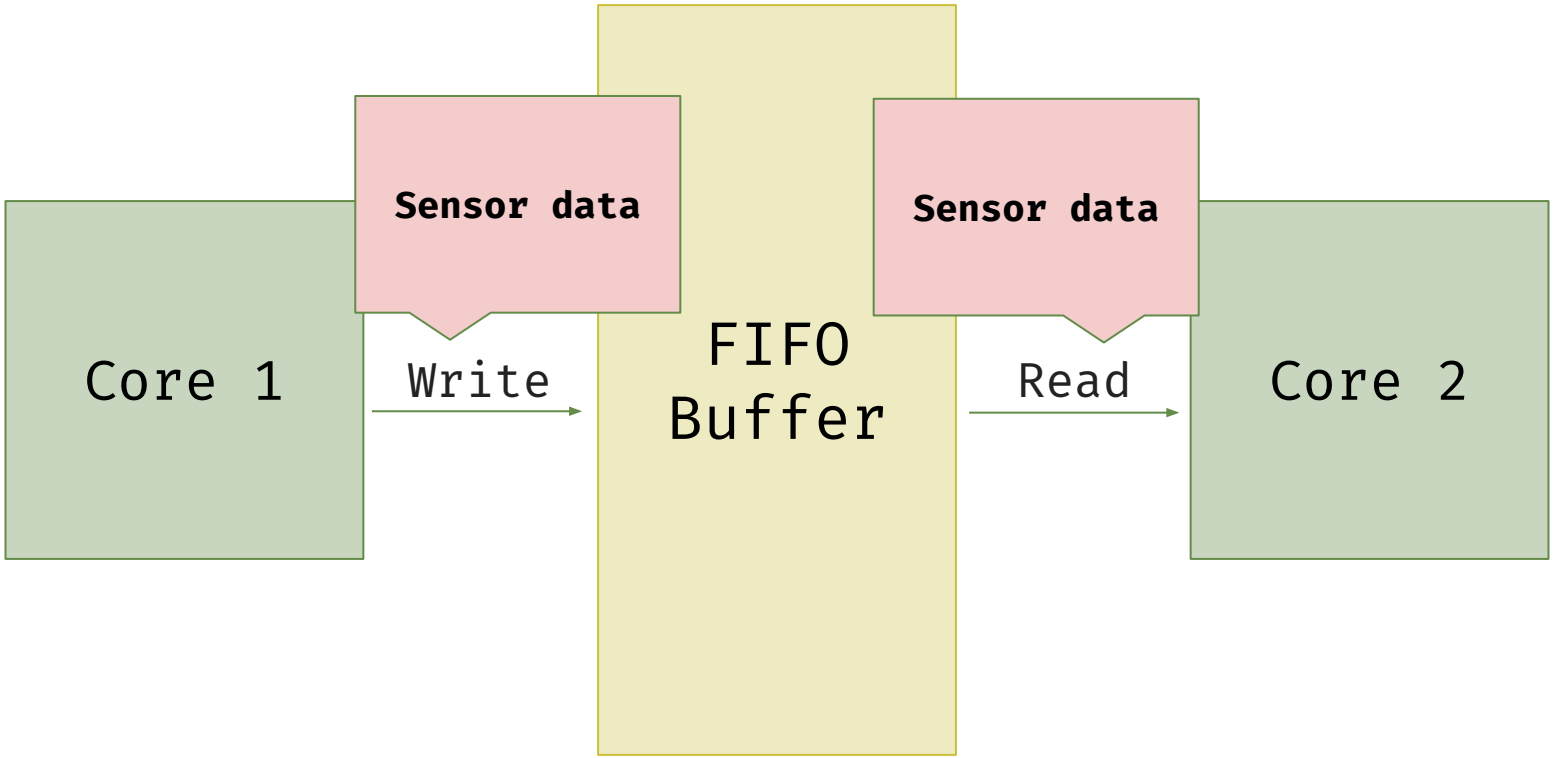
Location that temporarily stores data in transit from one place to another

- This buffer can only hold **integers**

Becomes important later

All in the timing

Cores	Approach	Speed Up	Efficiency
1	Synchronous		


Sensor data
Sensor data
Core 1
Write
FIFO
Buffer
Read
Core 2

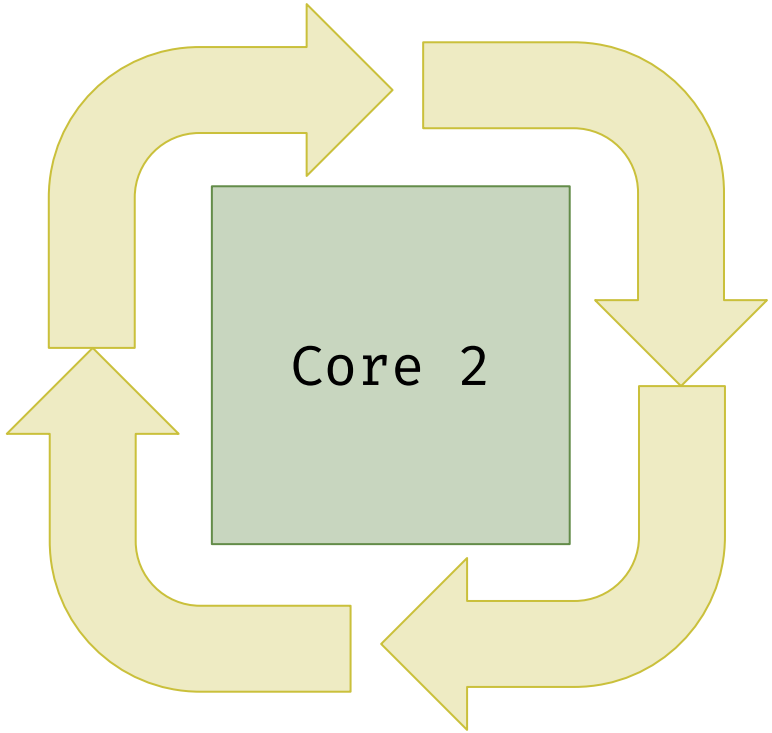
Time on 1 core

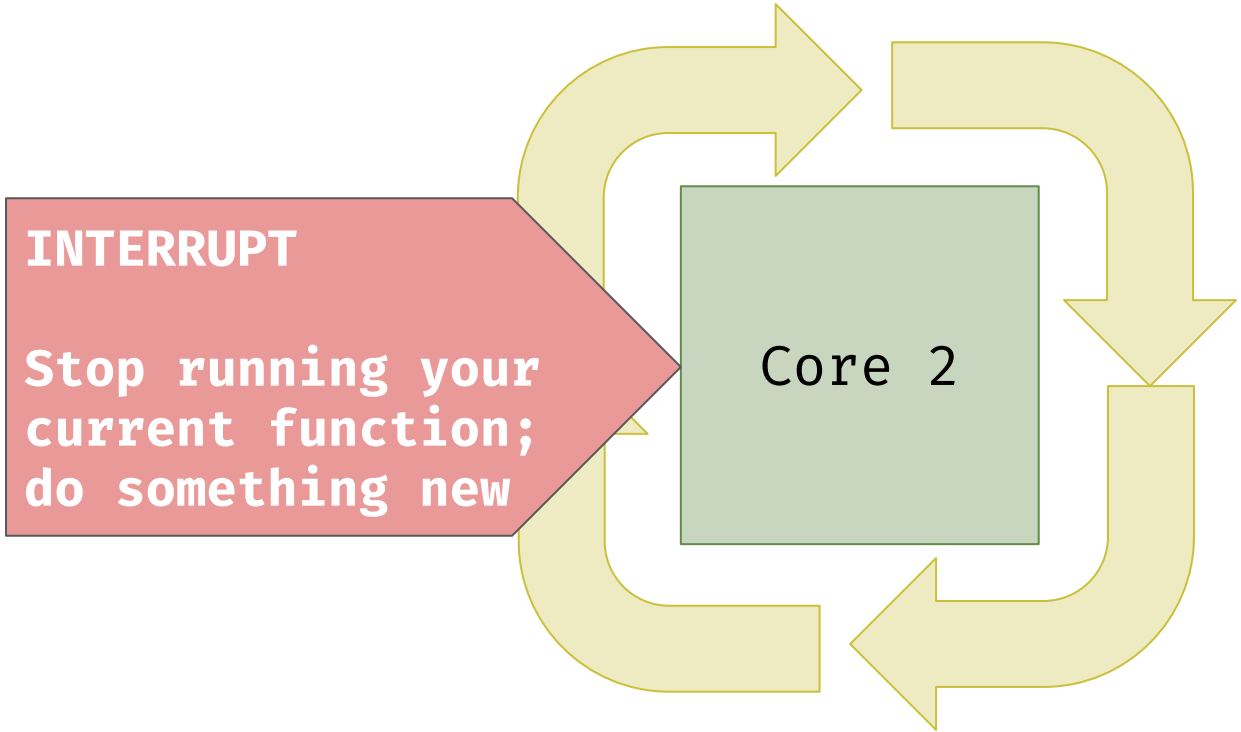
$$Speedup_c = \frac{T_1}{T_c}$$

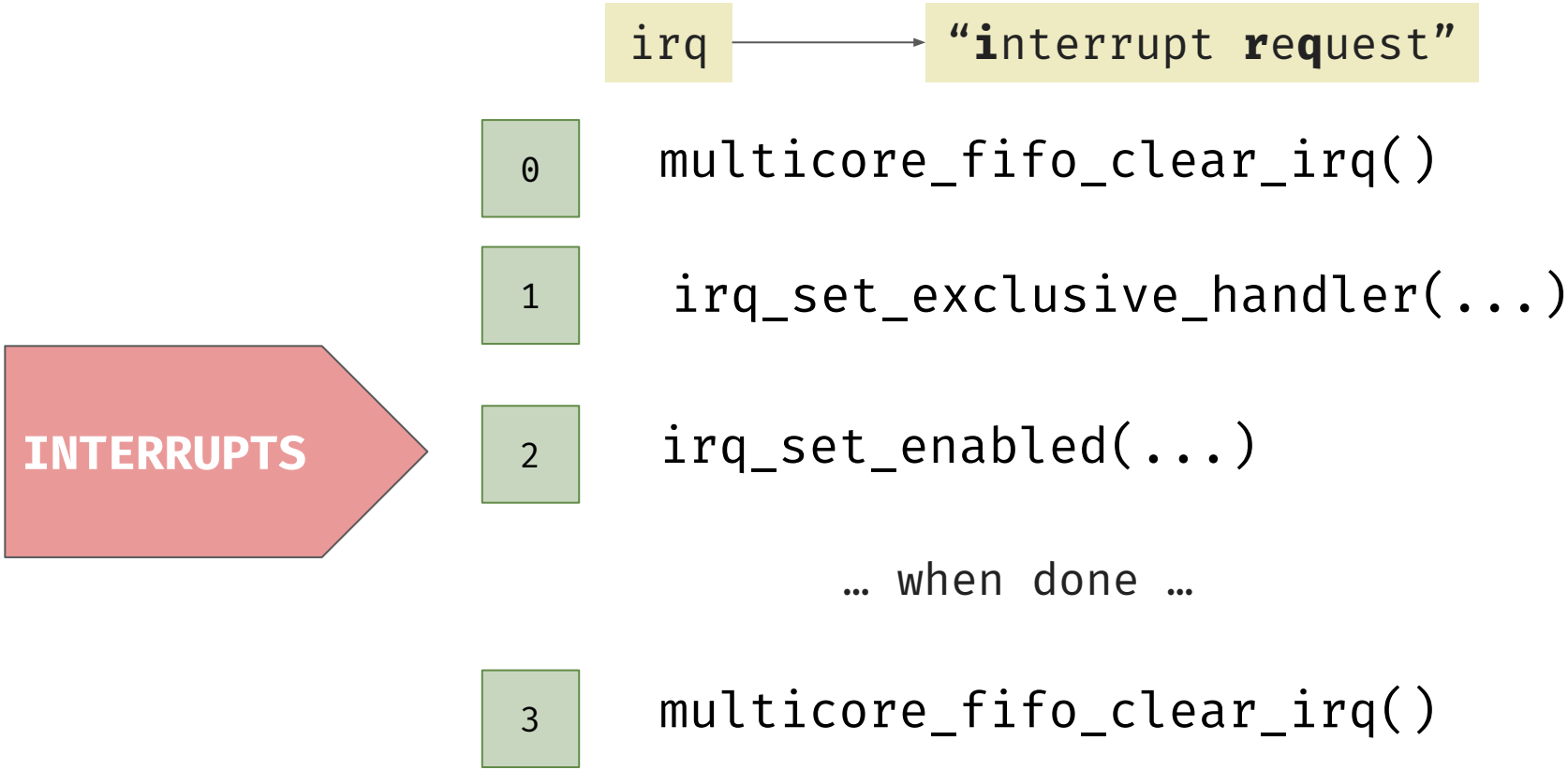
Time on n cores

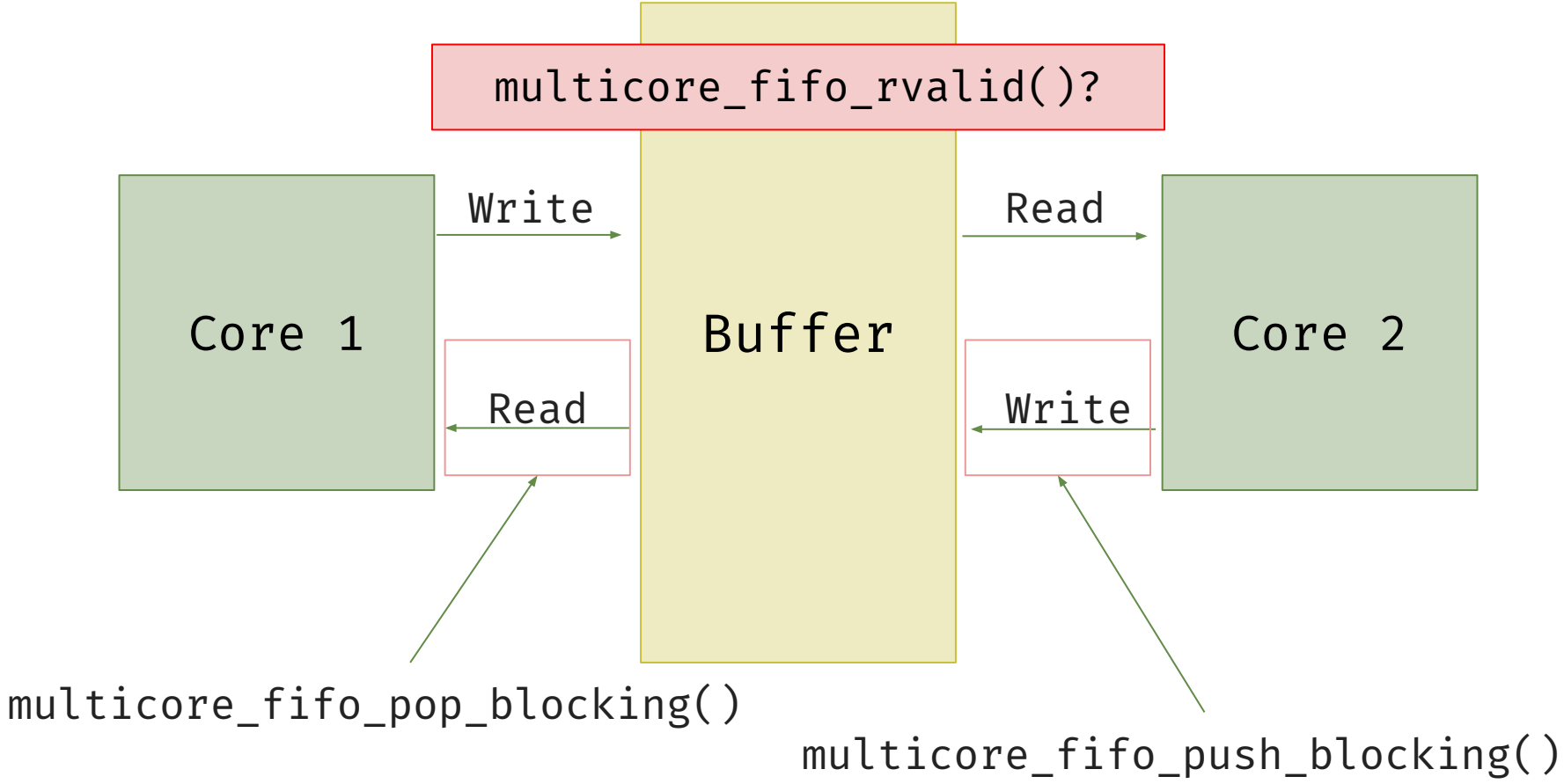
$$Efficiency_c = \frac{T_1}{T_c \times c} = \frac{Speedup_c}{c}$$

The core is otherwise occupied until we...



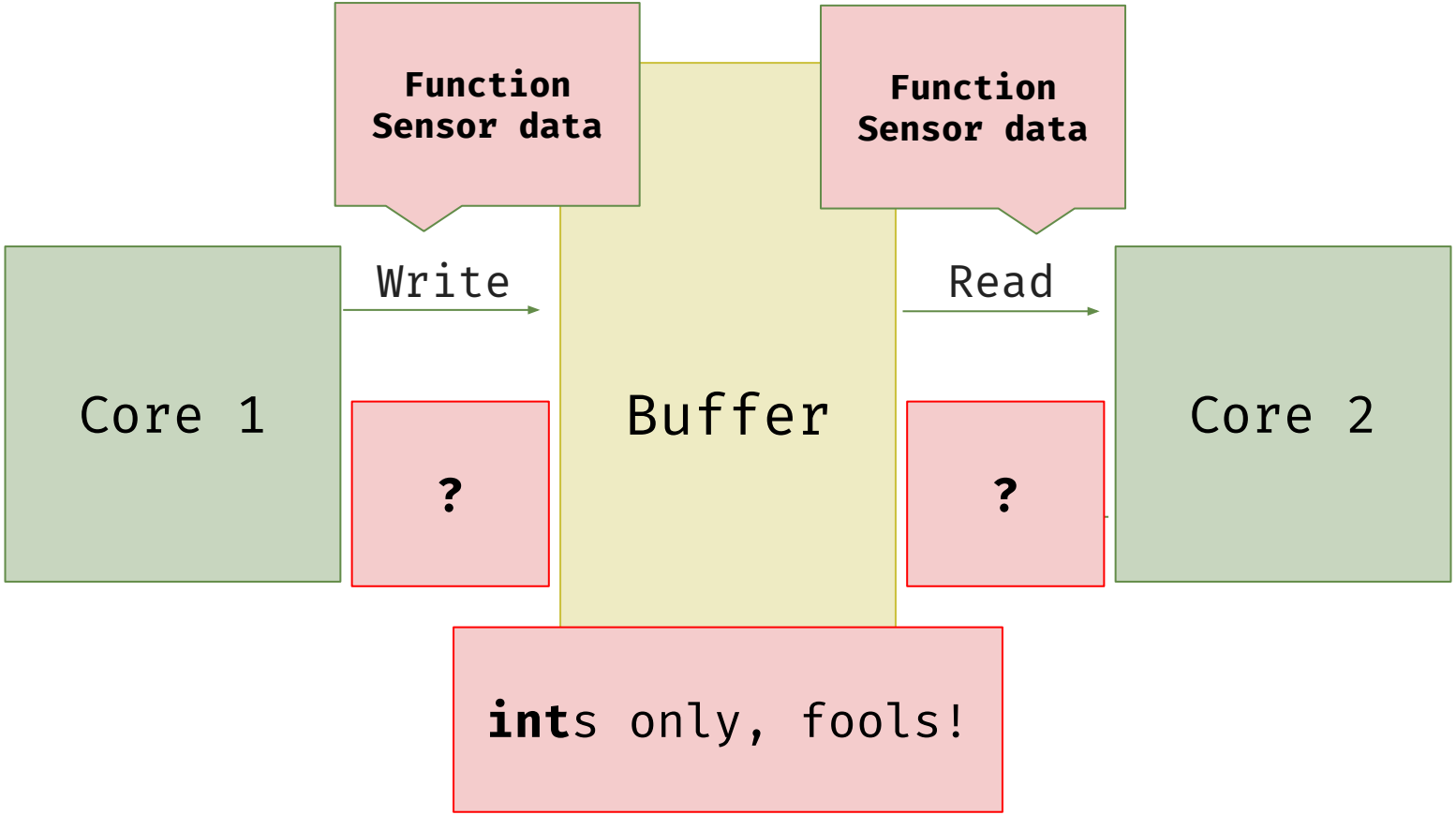

INTERRUPT
Stop running your current function; do something new
Core 2

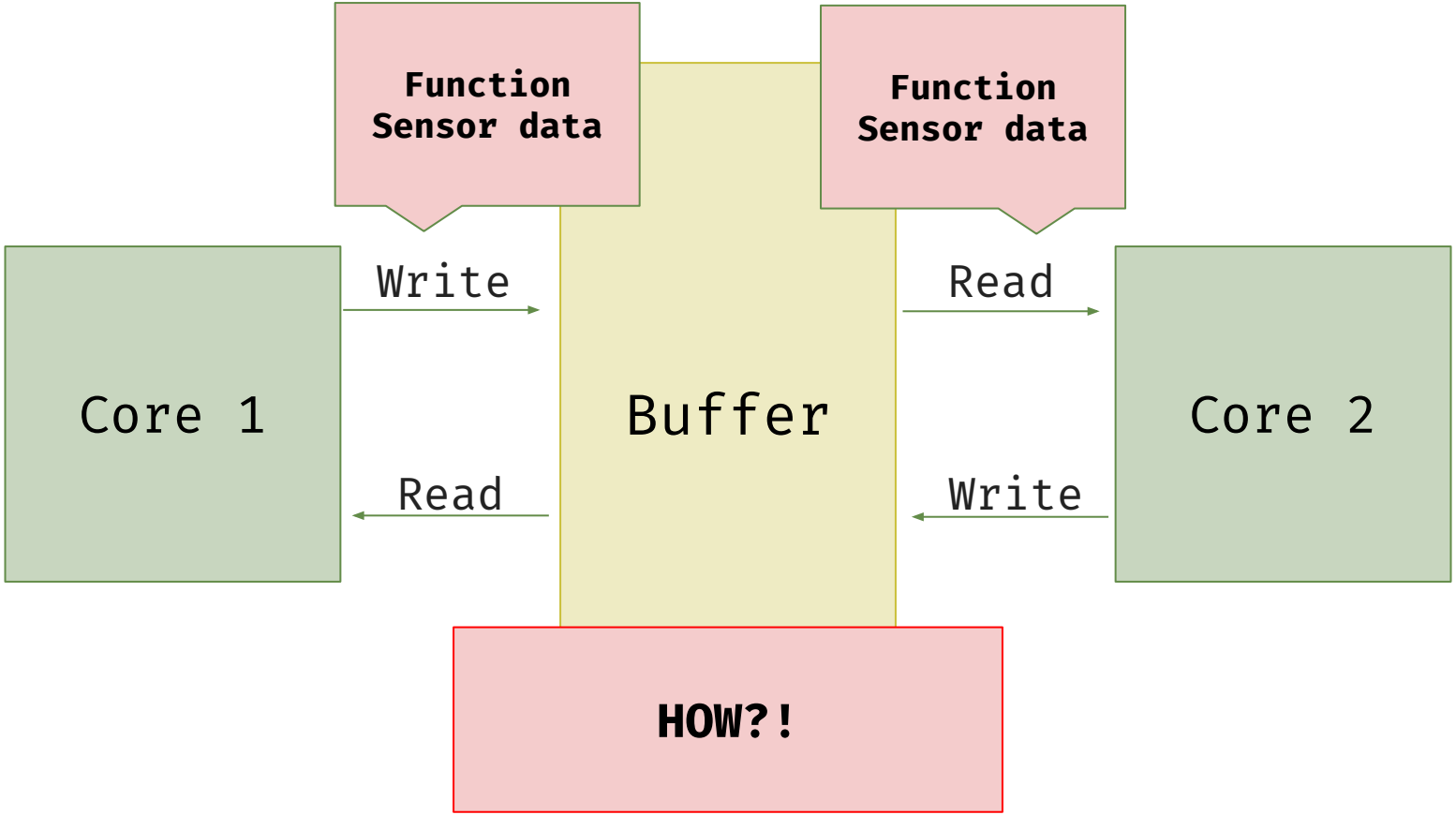

irq
“interrupt request”
0
multicore_fifo_clear_irq()
1
irq_set_exclusive_handler(...)
INTERRUPTS
2
irq_set_enabled(...)
… when done …
3
multicore_fifo_clear_irq()


multicore_fifo_rvalid()?
Core 1
Write
Read
Buffer
Read
Write
Core 2
multicore_fifo_pop_blocking()
multicore_fifo_push_blocking()

All in the timing

Cores	Approach	Speed Up	Efficiency
1	Synchronous		
2	FIFO by value	+780%	+390%


Function
Sensor data
Function
Sensor data
Write
Read
Core 1
Buffer
Core 2
?
?
ints only, fools!


Function
Sensor data
Function
Sensor data
Write
Read
Core 1
Buffer
Core 2
Read
Write
HOW?!

Casting in C

```
float decimal = -1.302;
/*
    Some GCCs have uint, all will have
    unsigned int; ours has uint
*/
uint int_value = (uint) decimal;
printf("%u", int_value);

>> 4294967295
```

All in the timing

Cores	Approach	Speed Up	Efficiency
1	Synchronous		
2	FIFO by value	+780%	+390%
2	FIFO by function	-87%	-43.5%