

ASYNCHRONICITY



CONCURRENCY

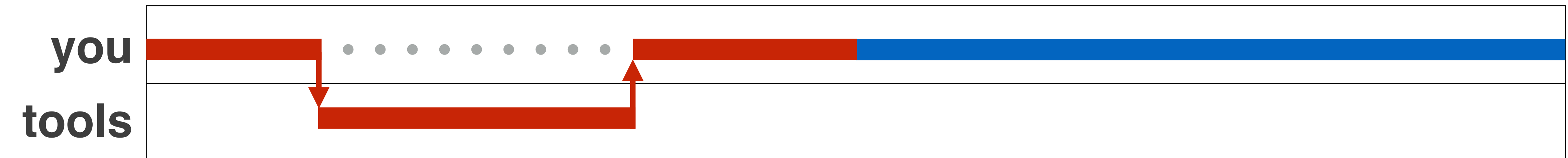
“Let’s bake a cake”

1. You only make the icing after the cake comes out of the oven
2. You make the icing while the cake is in the oven
3. I only make the icing and you only make the cake



CONCURRENCY

Blocking...

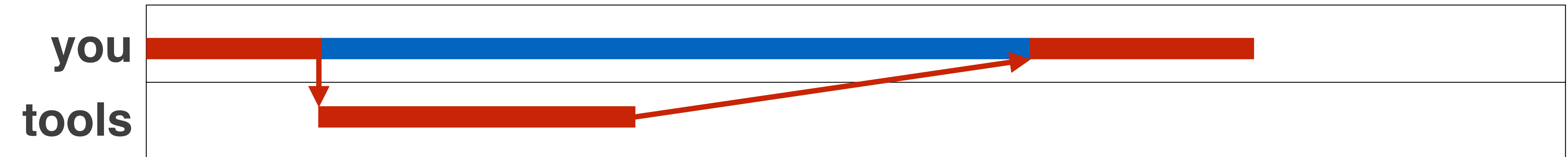


1. You only make the icing after the cake comes out of the oven



CONCURRENCY

Non-blocking...

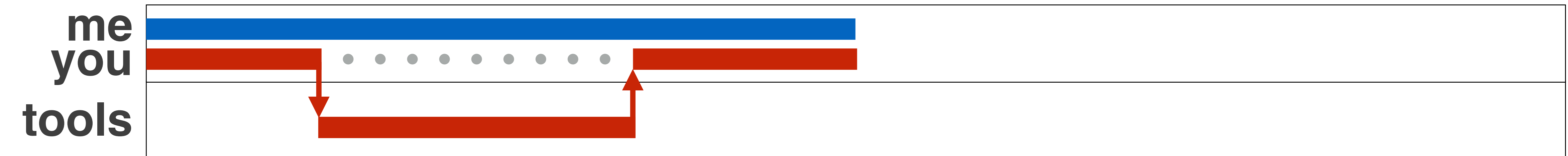


2. You make the icing while the cake is in the oven



CONCURRENCY

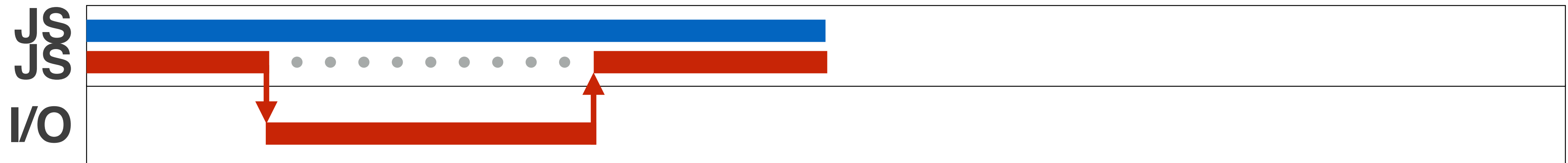
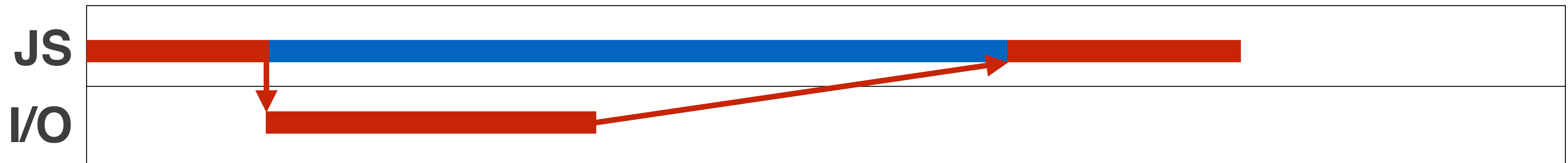
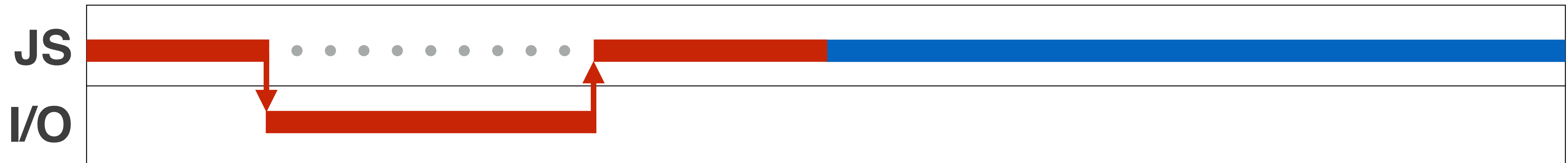
Parallel...



3. I only make the icing and you only make the cake



WHICH DESCRIBES JAVASCRIPT?



“JavaScript is single-threaded” ...arguably yes

– OTHER PEOPLE ON THE INTERNET



ASYNC

(Code is asynchronous if) the execution order is not dependent upon the command order



WHAT HAPPENS?

➔ `console.log('Some callbacks');`
`setTimeout(function() {`
 `console.log('you');`
`}, 3000);`
`console.log('love');`

Some callbacks
love
(3000ms elapse)
you



EVENT BASED

A function that executes asynchronously...

1. Kicks off some external process
2. Registers an event handler for when that process finishes (callback)



WHAT HAPPENS?

```
var start = new Date;  
setTimeout(function() {  
    var end = new Date;  
    console.log('Time elapsed:', end - start, 'ms');  
}, 500);  
  
while (new Date - start < 1000) {};
```

=> Time elapsed: 1000 ms



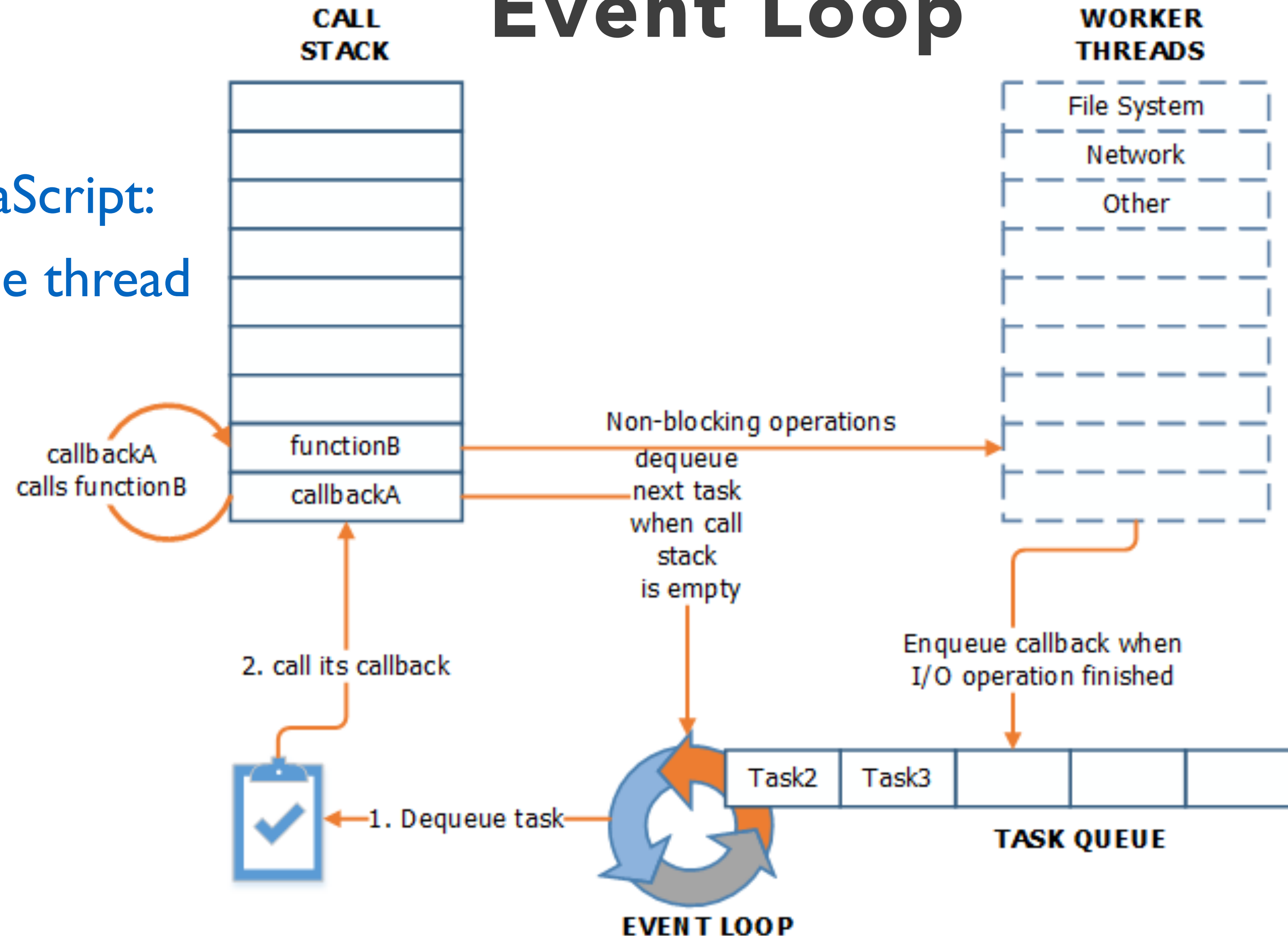
WHY?

```
var start = new Date;
setTimeout(function() { // starts a timer and holds onto
    var end = new Date; // the callback
    console.log('Time elapsed:', end - start, 'ms');
}, 500);

while (new Date - start < 1000) {}; // idles for 1000 ms
// meanwhile, halfway through, the timer finishes
// but while loops are blocking
// and js does not interrupt blocking commands
// after the while it has no other commands
// so it will execute the queued callback
```

Event Loop

JavaScript:
One thread



Thread pool (libeio):
Slow stuff, multiple threads

Event loop (libuv):
One thread

**How do I know if a function
is asynchronous?**

That doesn't help

**If you want to be
sure, you have to
look it up**

...Wait really?

**Well, async operations often have the
following callback pattern:**
`asyncThing(function(err,data){...})`



SUMMARY

- **JavaScript is single-threaded but its runtime environment is not**
- **A callback executes when its async event finishes**
- **Anything you wish to do *after* the async event completes *must* happen in the callback**