
node
JS

Threads in Node

Cześć!

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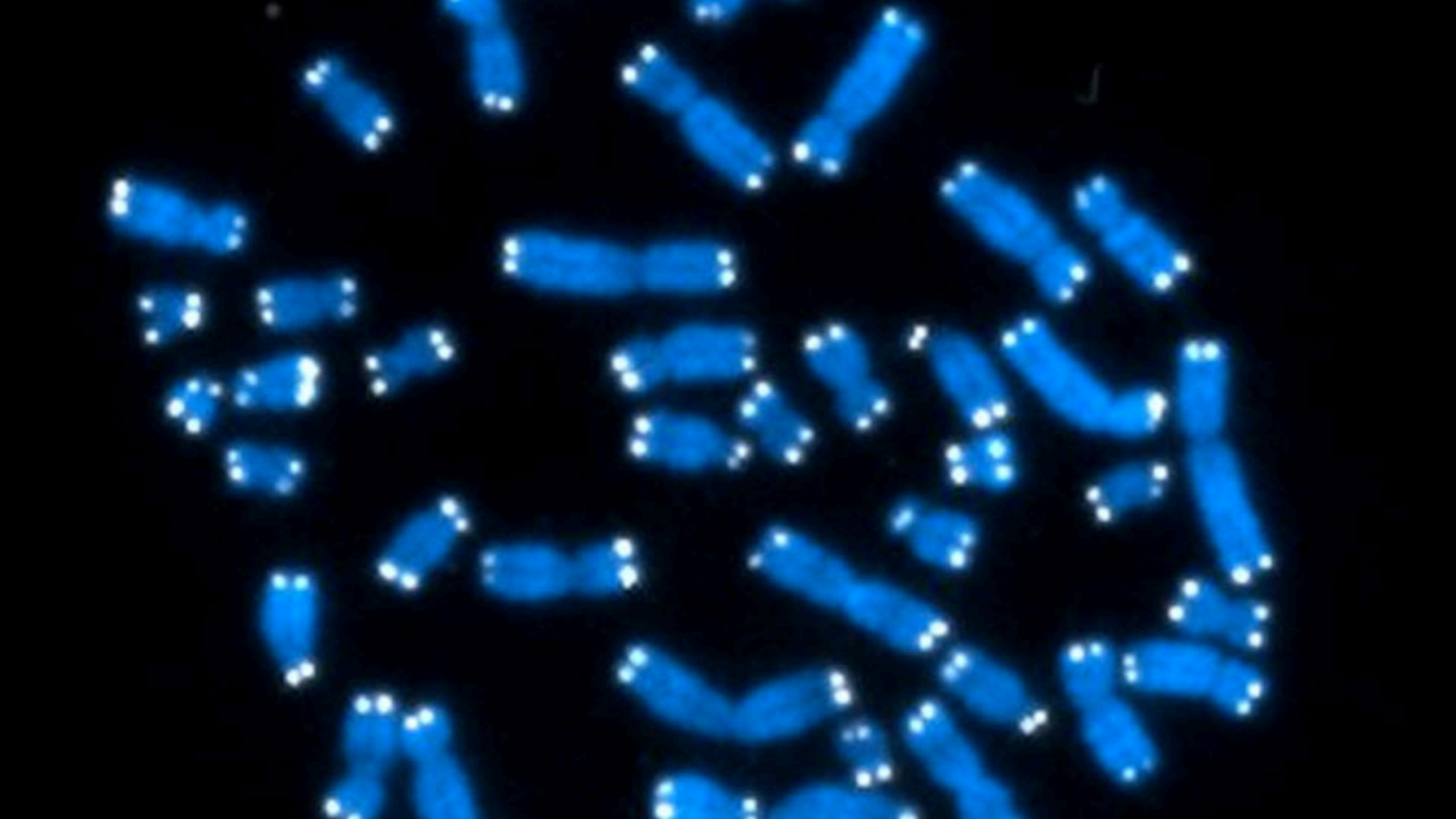
TRYSHCHENKO.COM
OTRY.EU




397-387


MiSeq™
MiSeq Reporter 2.1.43
illumina

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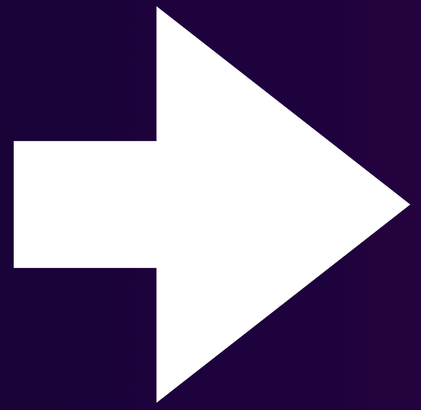
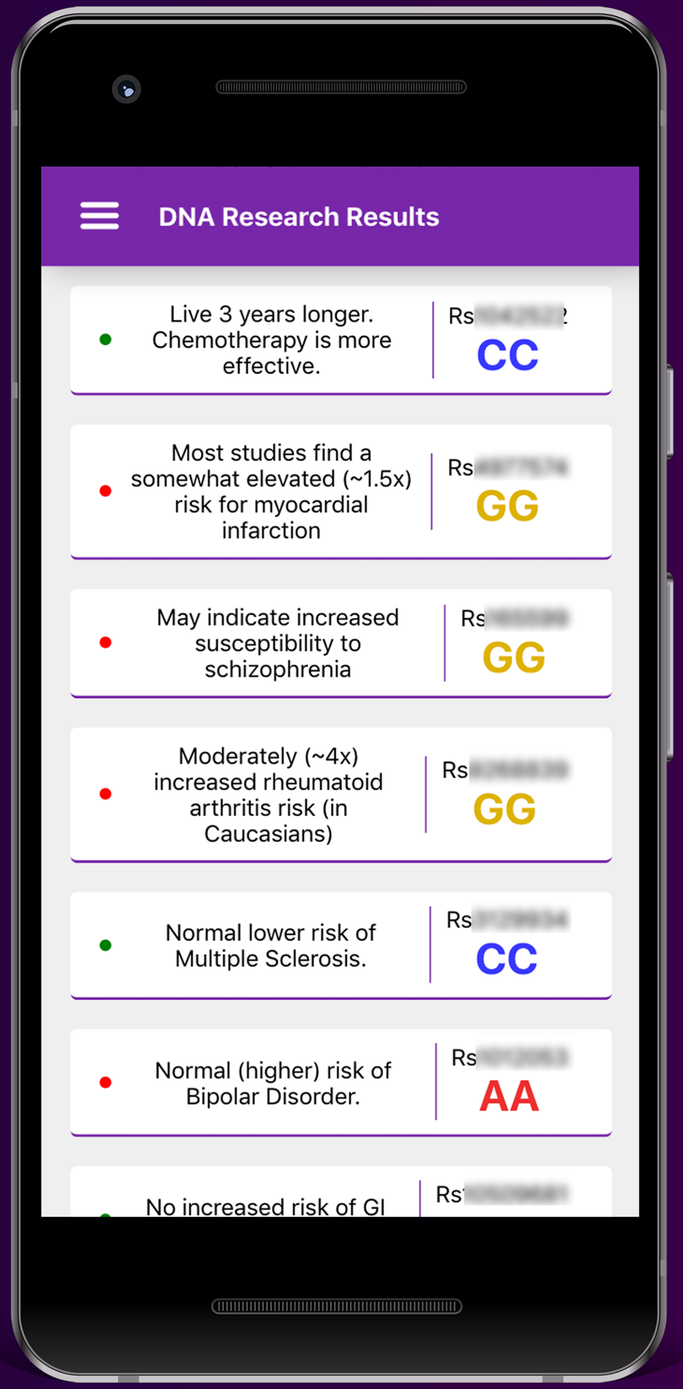
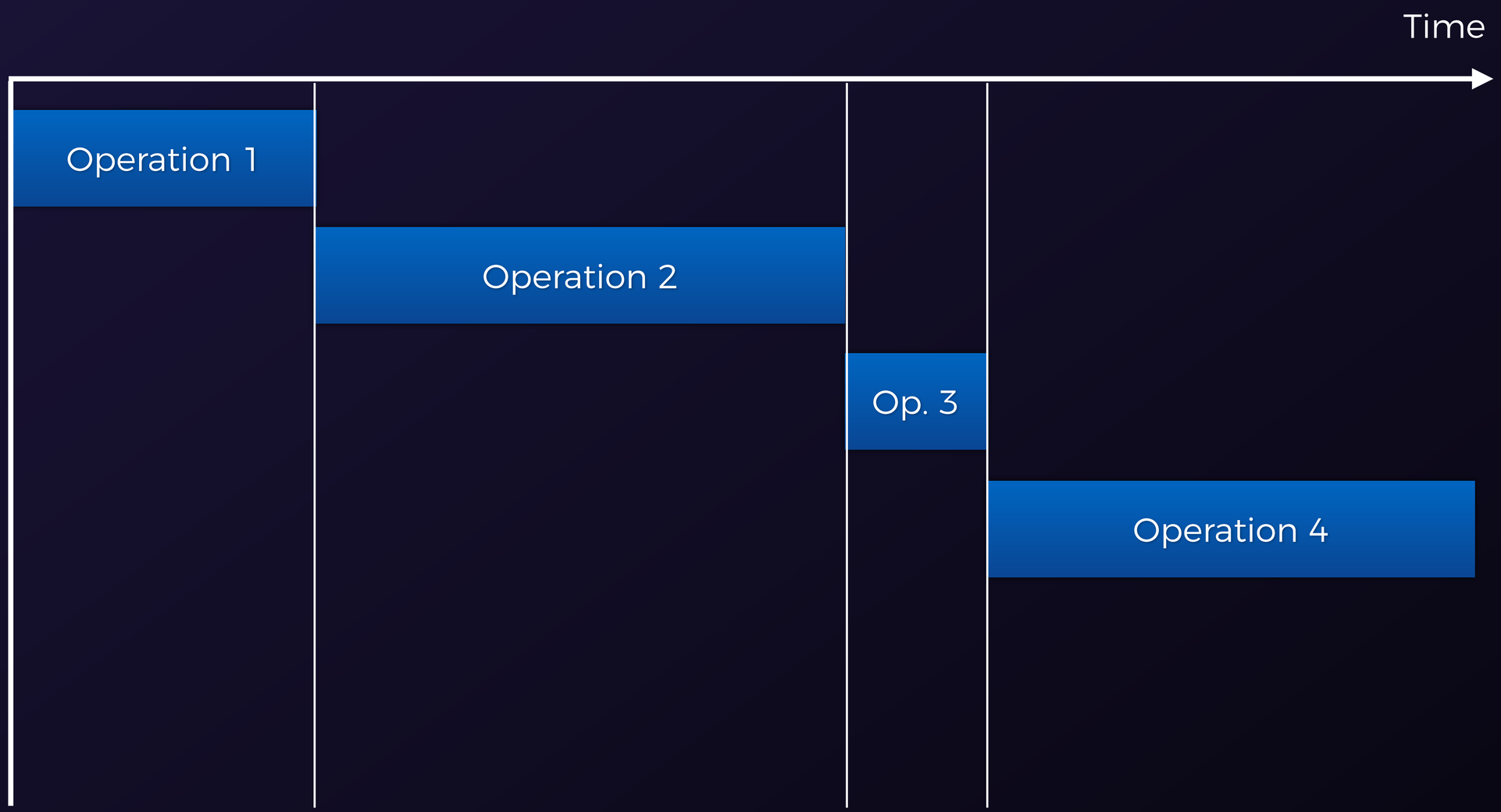




What are threads?

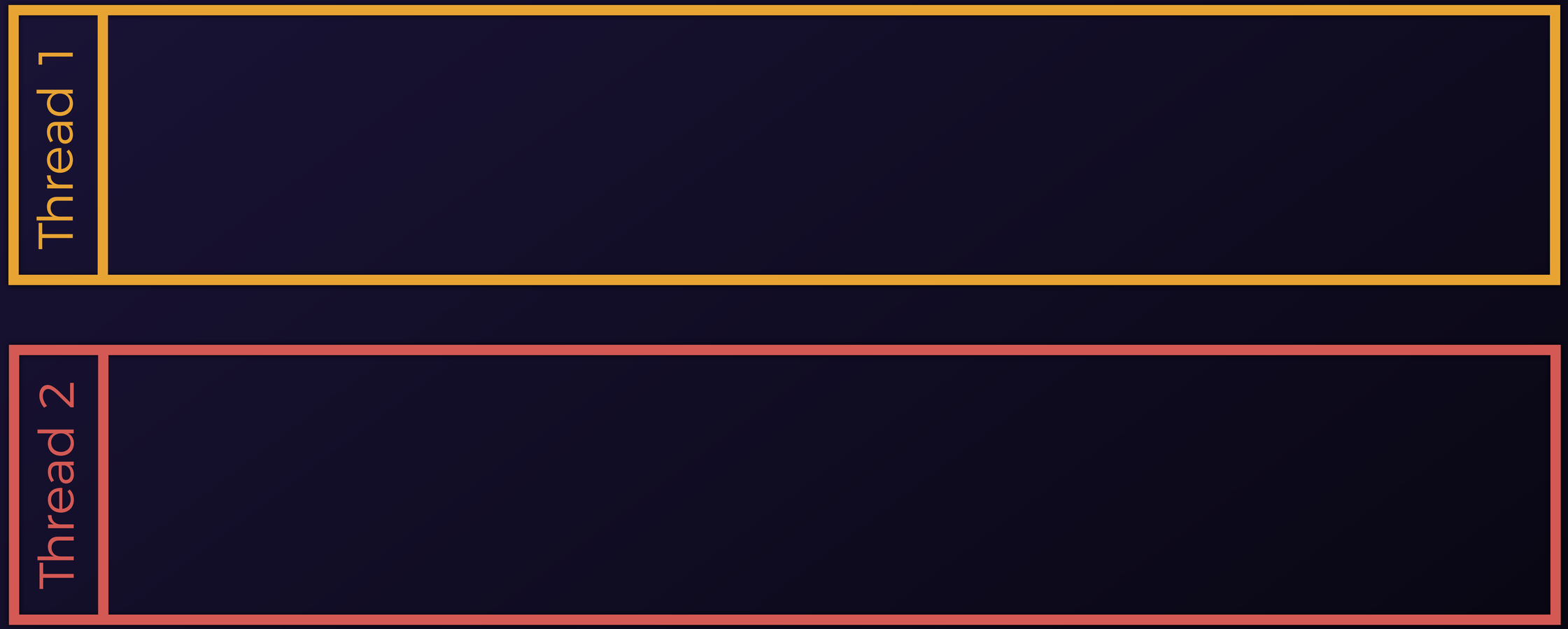
One thread



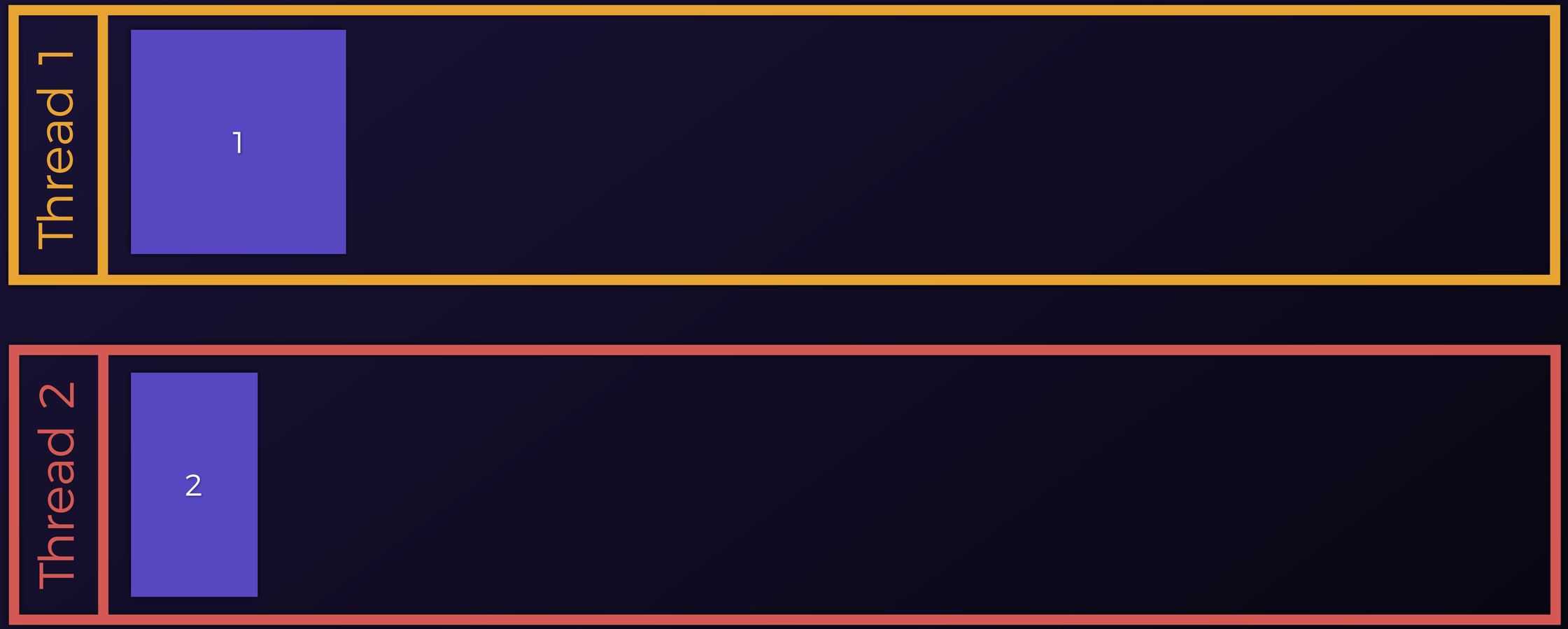
Two threads

Thread Pool

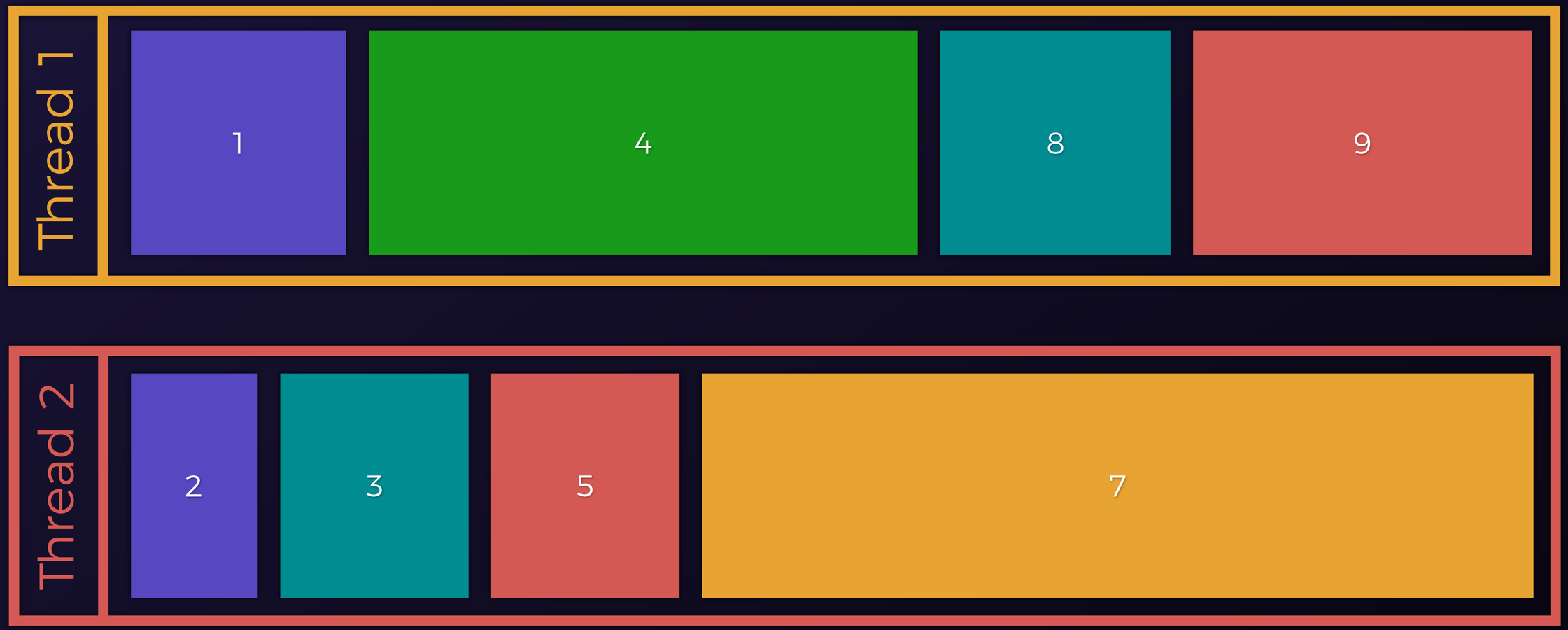
Thread pool

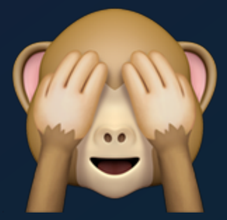


Thread pool

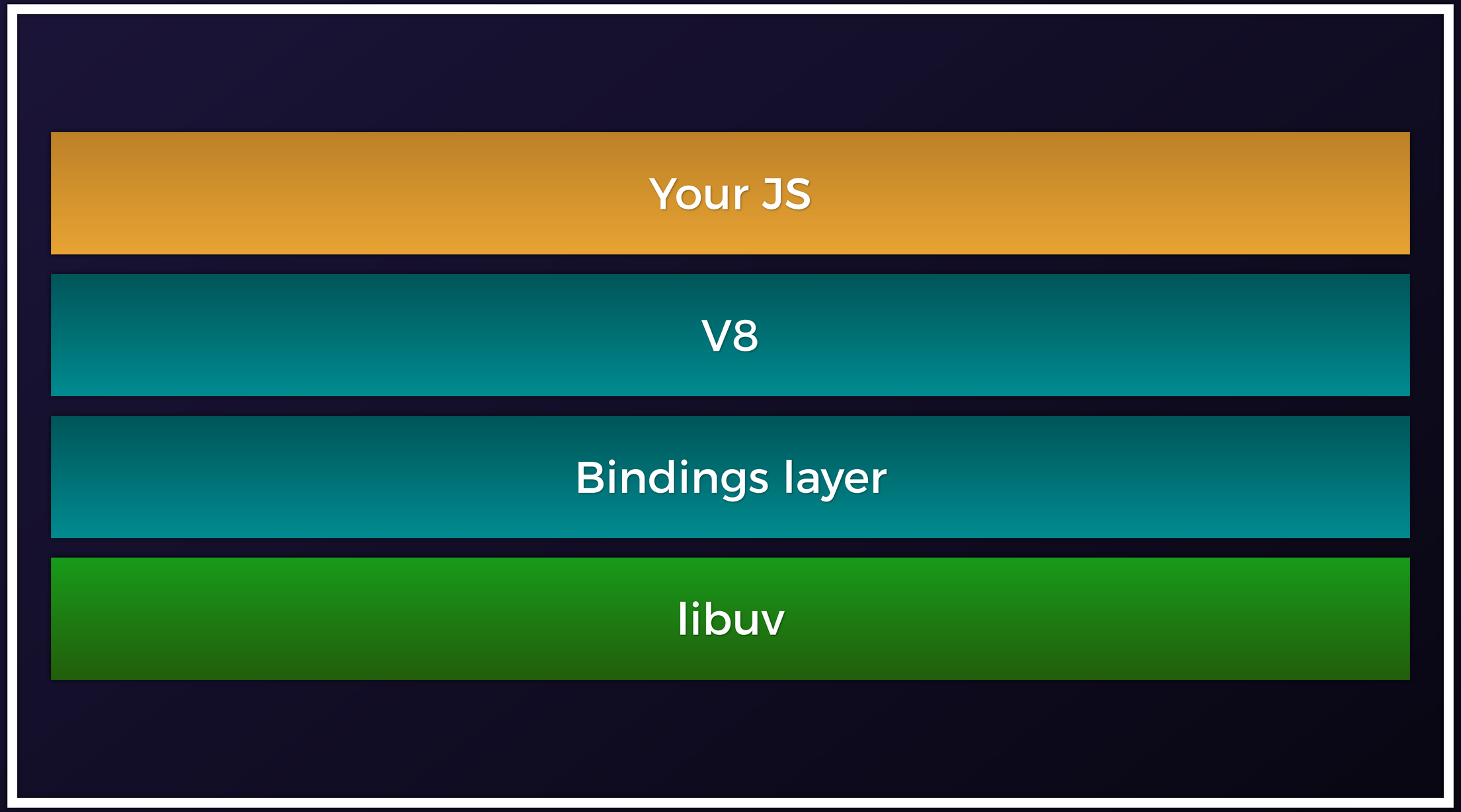


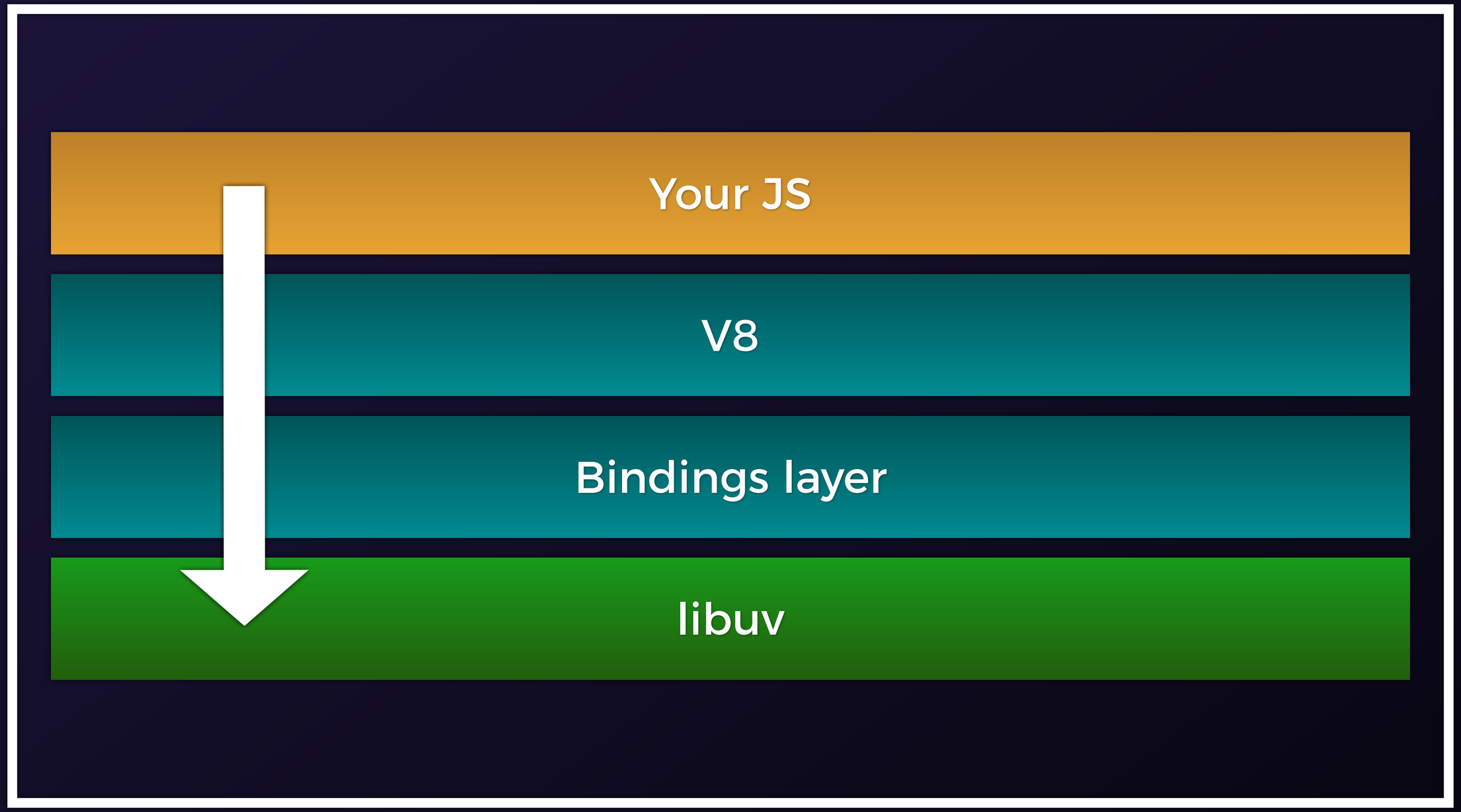
Thread pool



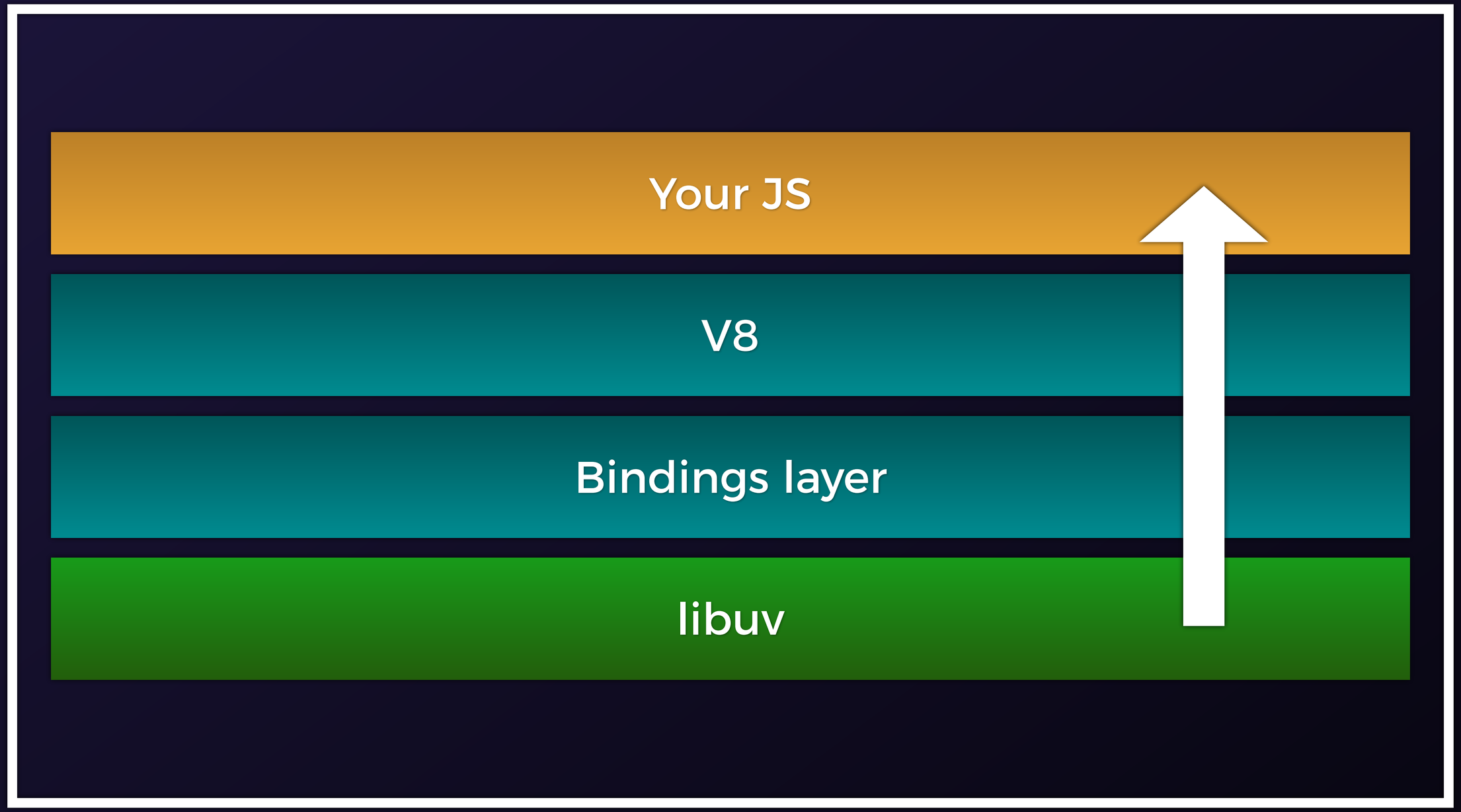


What is Node.js?


Your JS
V8
Bindings layer
libuv


Your JS
V8
Bindings layer
libuv

Your JS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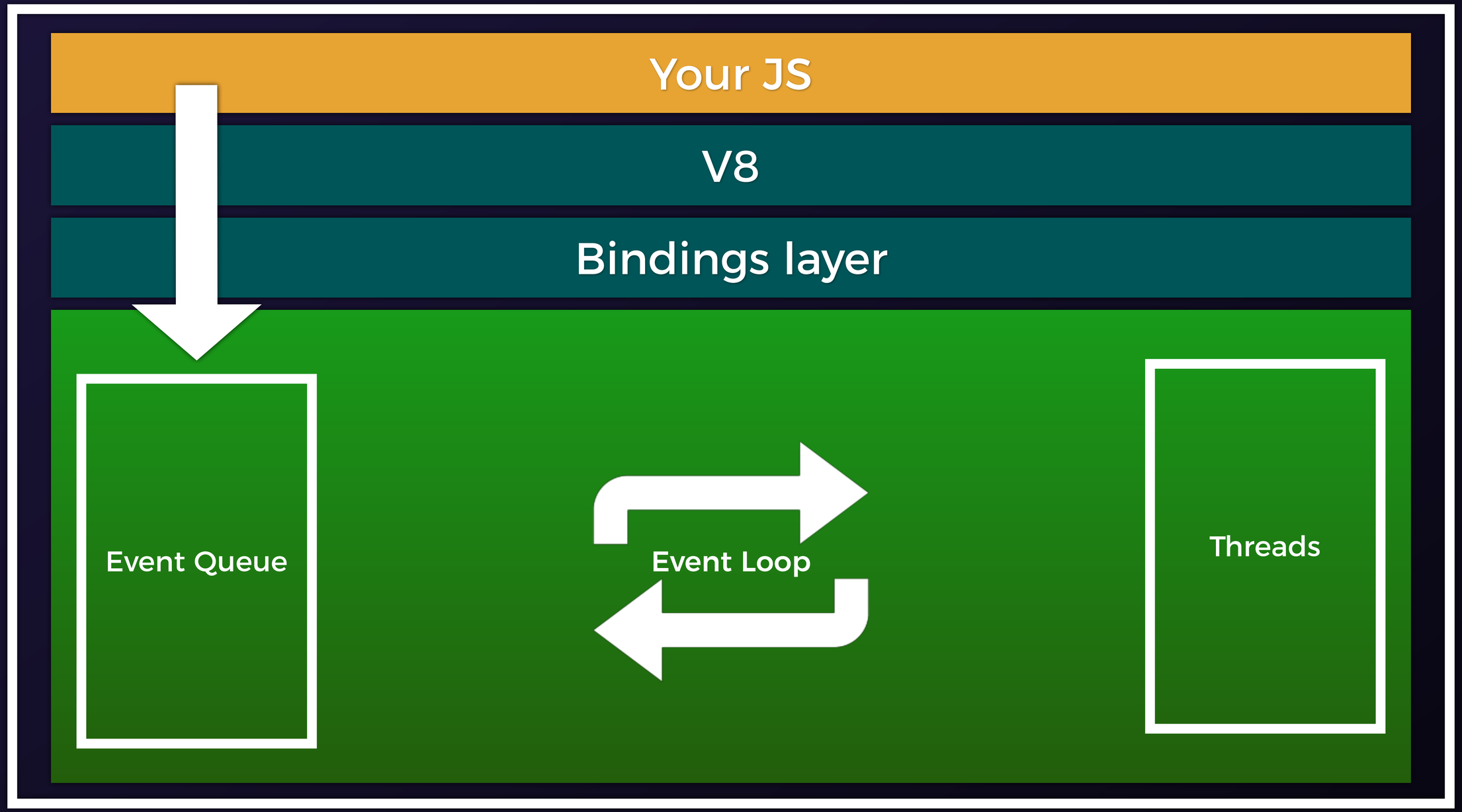
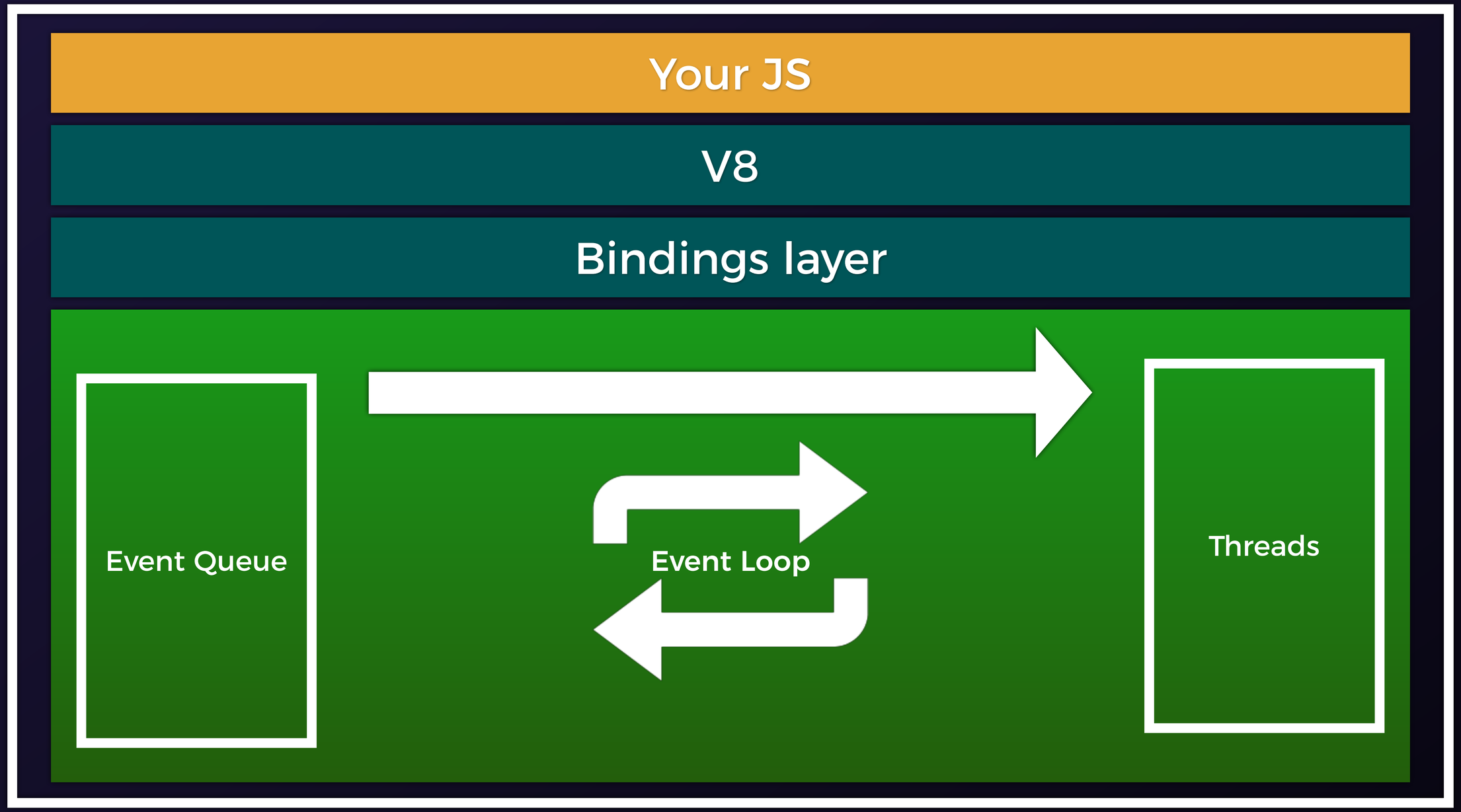
V8
Bindings layer
libuv


Your JS
V8
Bindings layer
Event Queue
Event Loop
Threads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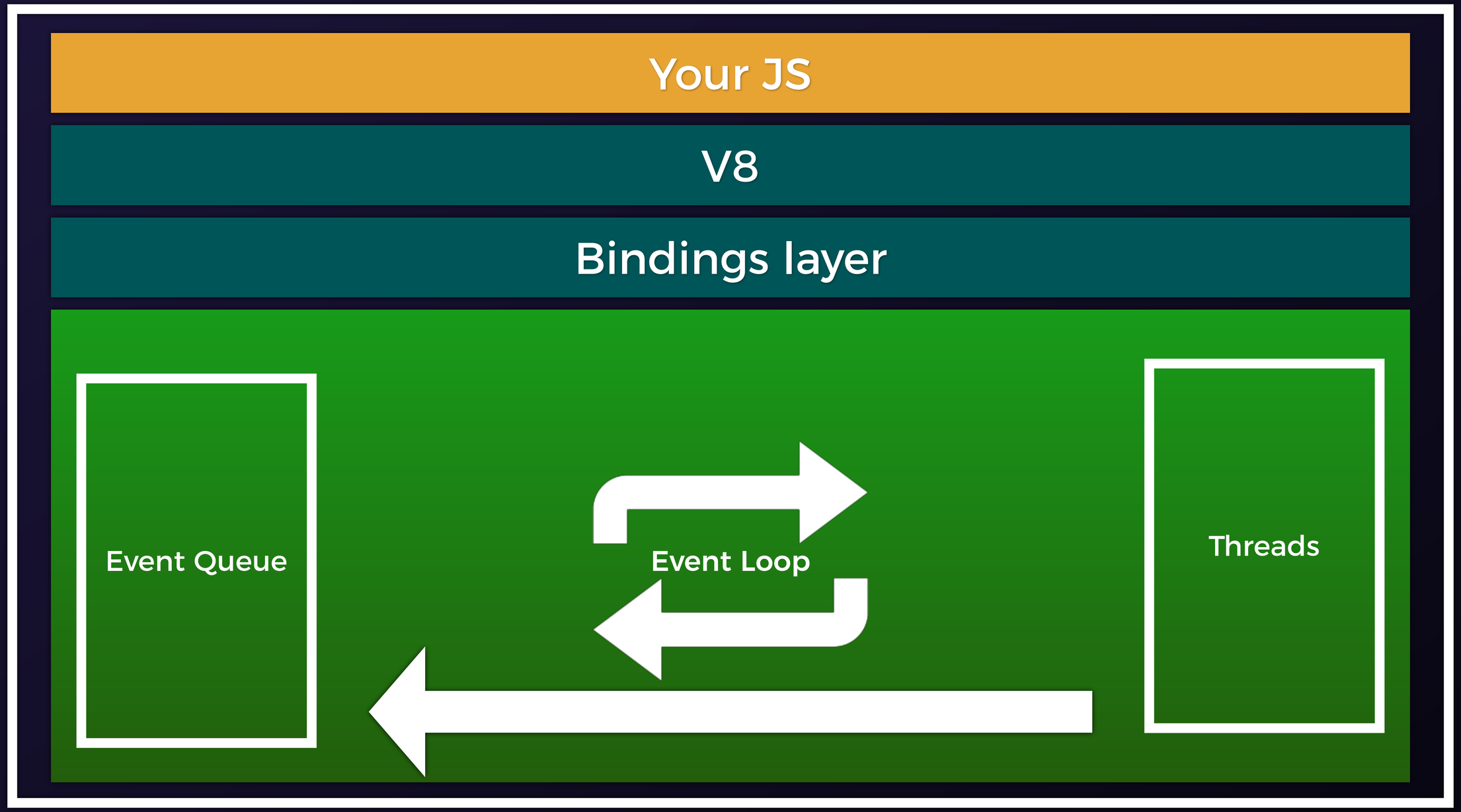
Threads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Bindings layer
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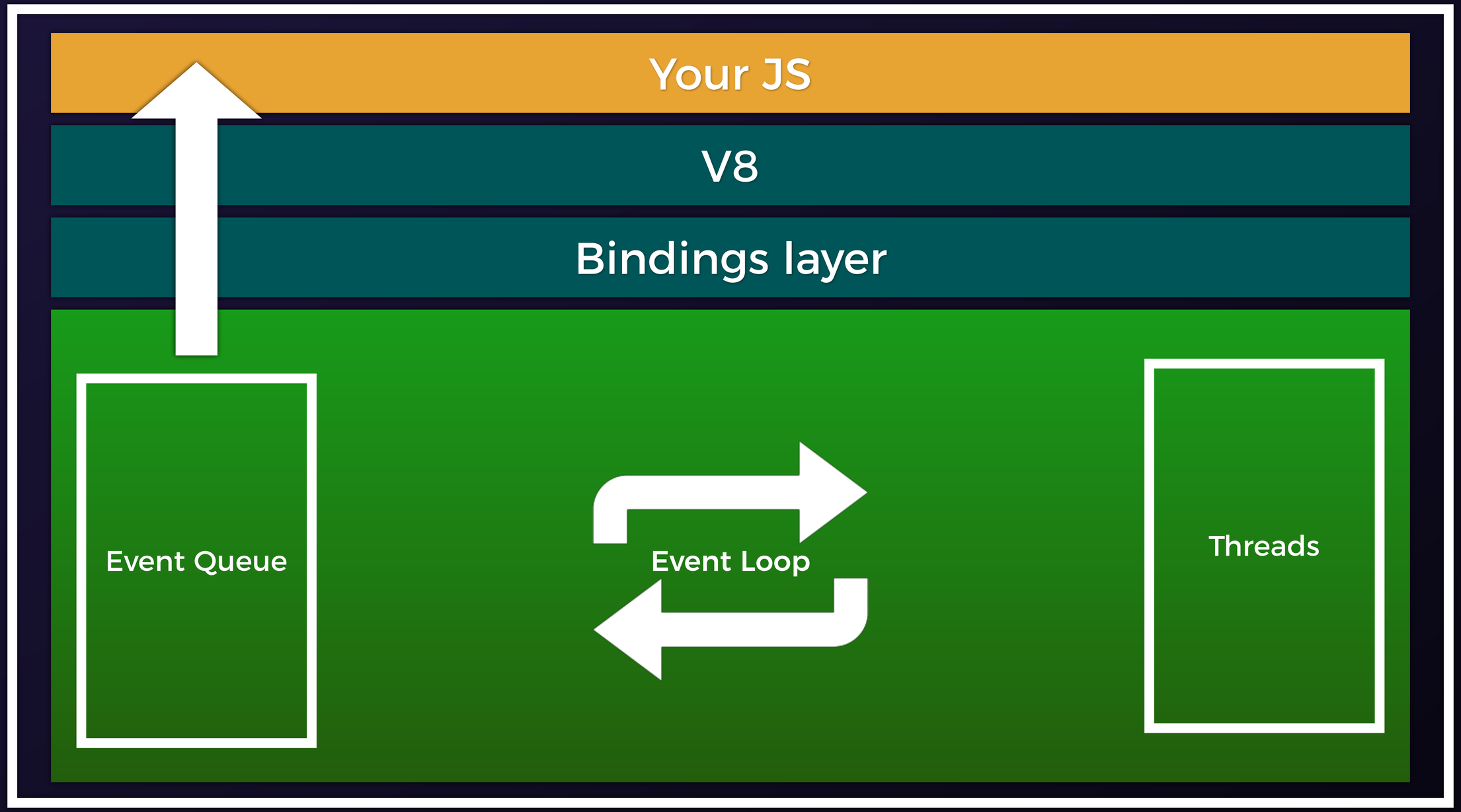
Event Loop
Threads


Your JS
V8
Bindings layer
Event Queue
Event Loop
Threads

Thread 1

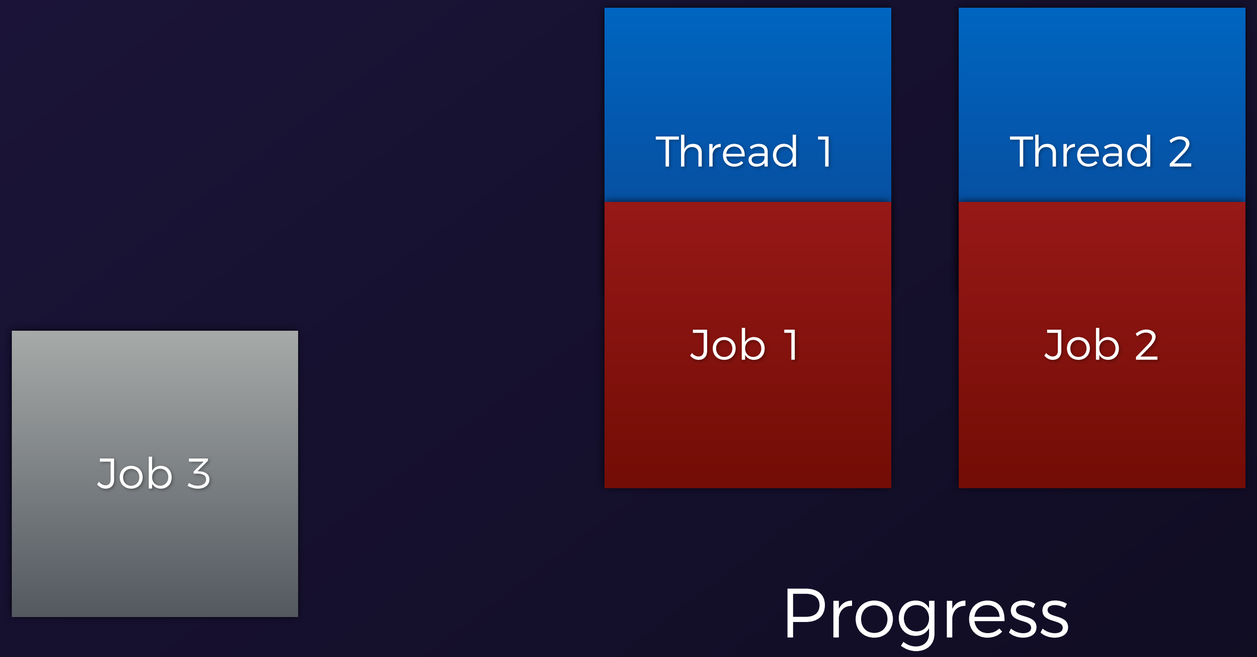
Thread 2

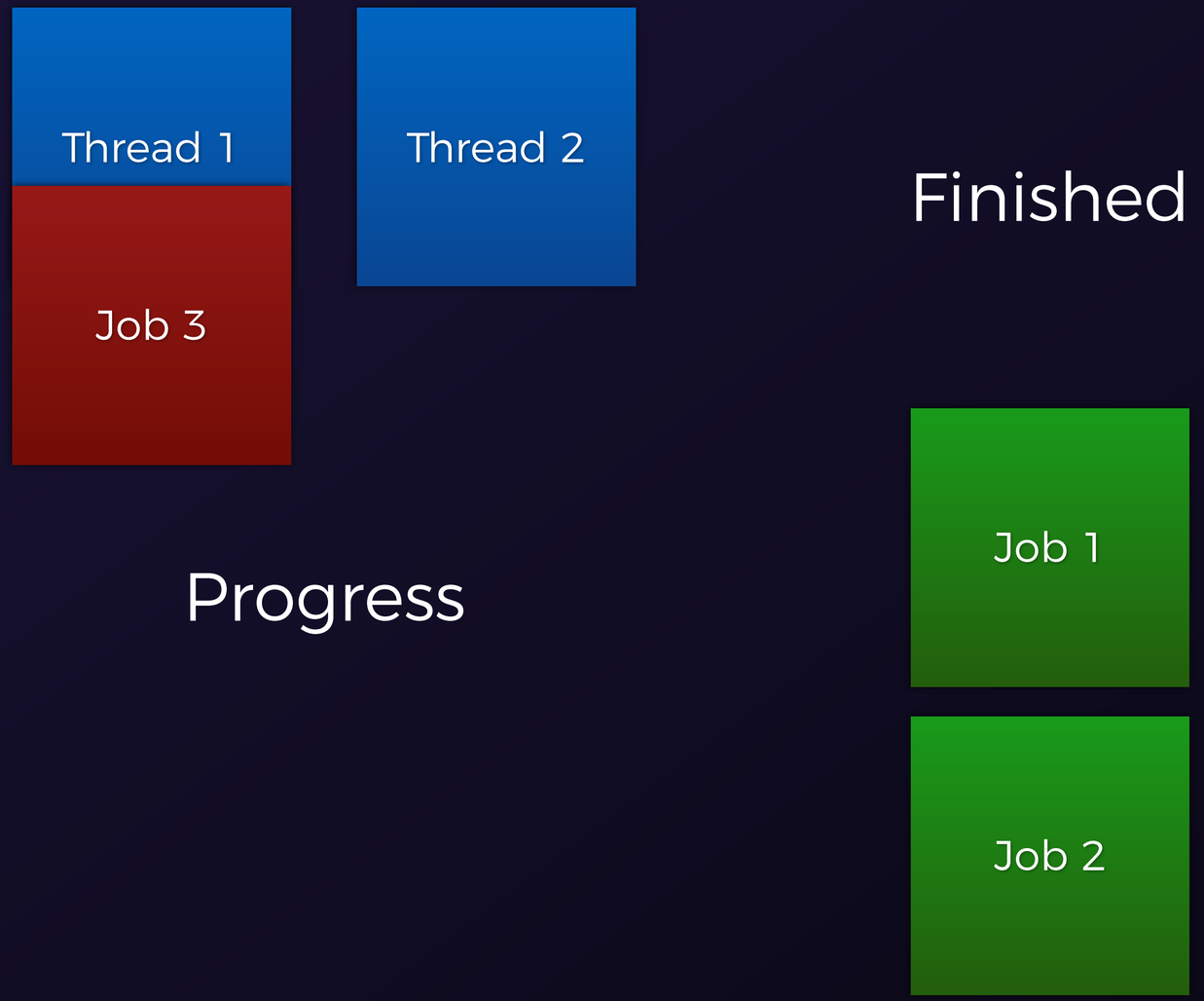
Queue

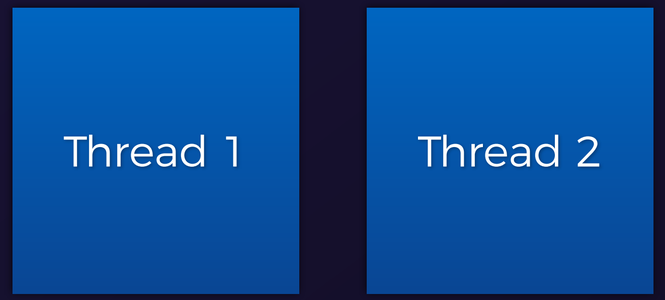
Job 1

Job 2

Job 3


Thread 1
Thread 2
Job 1
Job 2
Job 3
Progress


Thread 1
Thread 2
Job 3
Progress
Finished
Job 1
Job 2



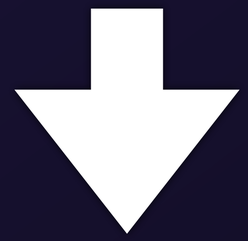
Finished

Job 1

Job 2

Job 3

Cluster

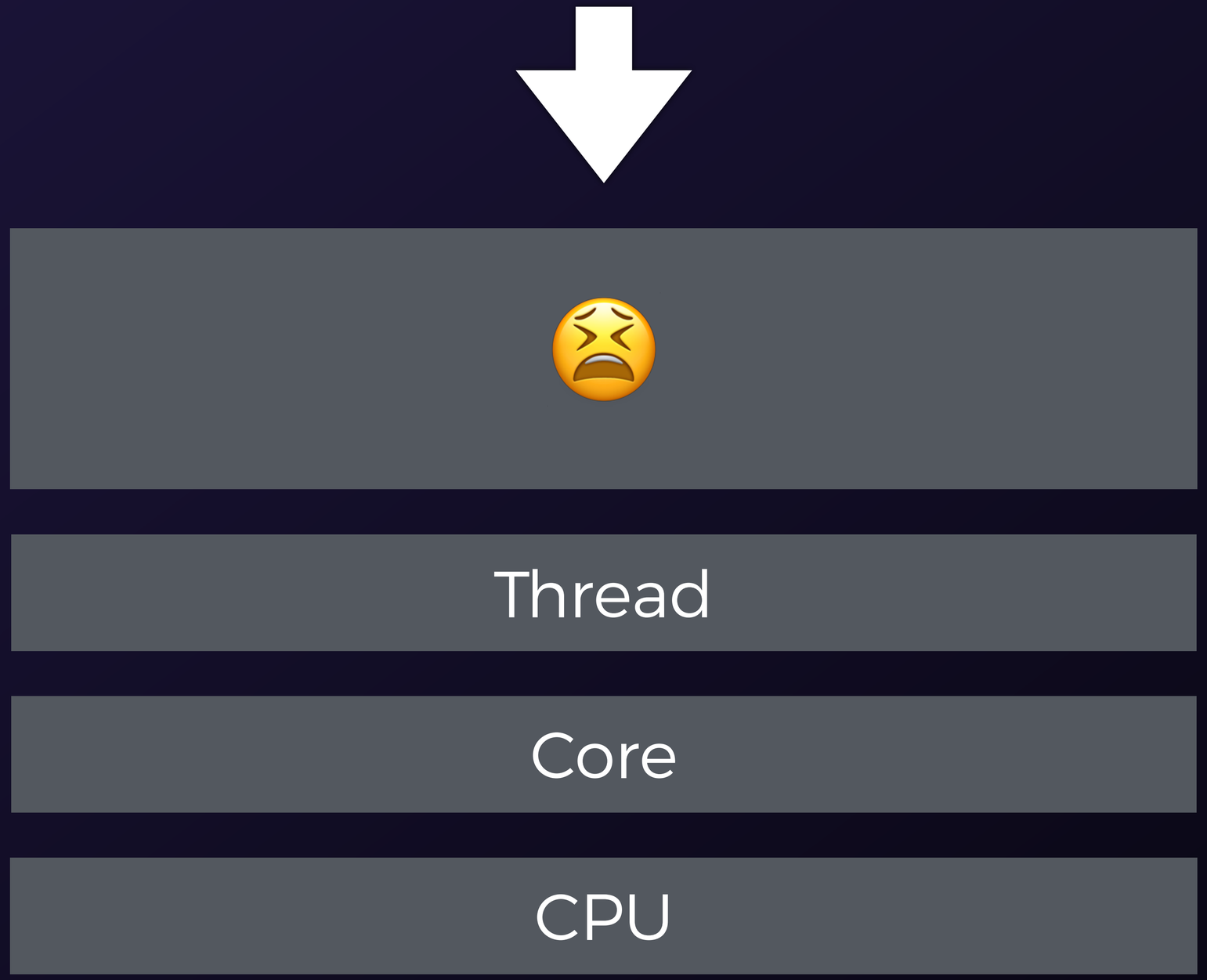


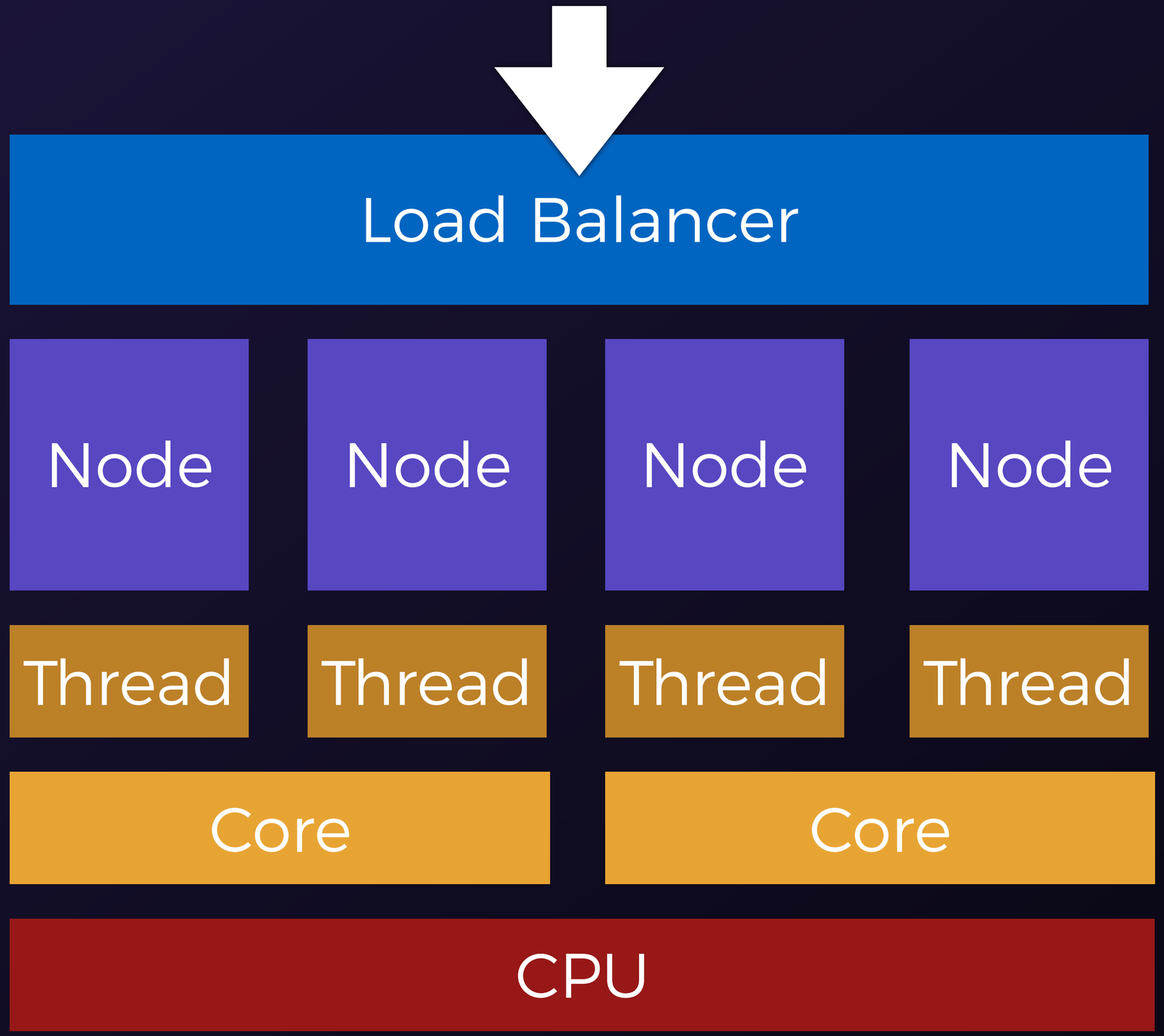
Node

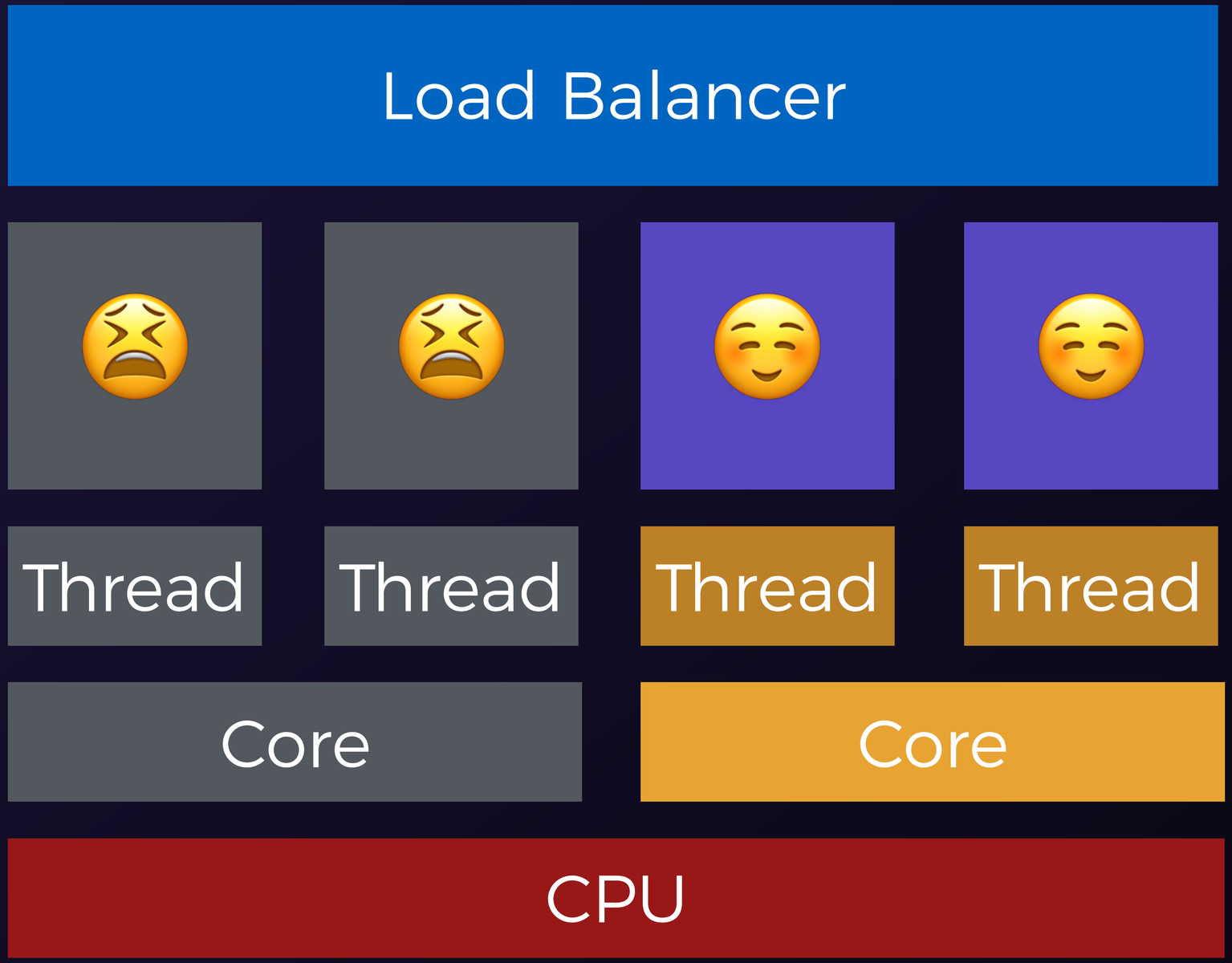
Thread

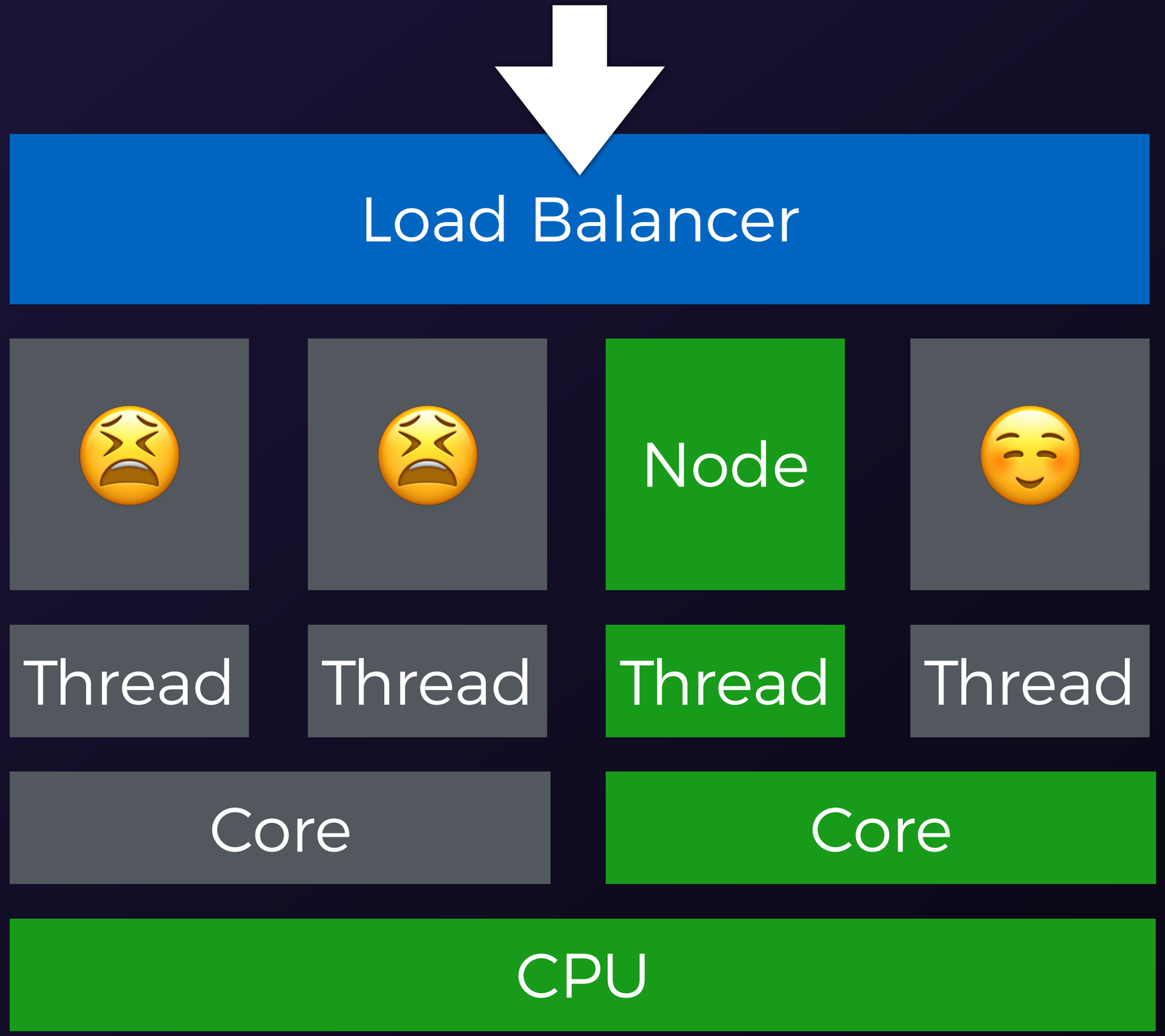
Core

CPU


😫
Thread
Core
CPU


Load Balancer
Node
Node
Node
Node
Thread
Thread
Thread
Thread
Core
Core
CPU


Load Balancer
Thread
Thread
Thread
Thread
Core
Core
CPU


Load Balancer
Node
Thread
Thread
Thread
Thread
Core
Core
CPU

PM2

```
artillery quick --count 10 -n 20
```

One Process

```
Summary report @ 22:01:45(+0100) 2018-11-25
  Scenarios launched:  10
  Scenarios completed: 10
  Requests completed:  200
  RPS sent: 13.91
  Request latency:
    min: 101.9
    max: 1272
    median: 606.4
    p95: 1229.8
    p99: 1267.5
  Scenario counts:
    0: 10 (100%)
  Codes:
    200: 200
```

Cluster with 4 processes

```
Summary report @ 22:03:05(+0100) 2018-11-25
  Scenarios launched:  10
  Scenarios completed: 10
  Requests completed:  200
  RPS sent: 25.35
  Request latency:
    min: 70.7
    max: 719.4
    median: 270.9
    p95: 557.2
    p99: 711.5
  Scenario counts:
    0: 10 (100%)
  Codes:
    200: 200
```

Worker Threads

Worker Threads are still experimental

Use with a flag:

node --experimental-worker [filename]

Worker Threads API

```
const {
    Worker,
    isMainThread,
    parentPort,
    workerData
} = require('worker_threads');
```

Limitations of WT

- You couldn't access Node API's
- You need to manager how to exchange the data between threads

- Worker per available thread may work
- Too many workers are bad
- Creating workers isn't time-free
- Exchanging data with workers isn't time free

```
~/Developmnet/playground/node-threads 41s
❯ node --experimental-worker threads-refactor.js
Finished at: 9651 ms. With 1 threads.

~/Developmnet/playground/node-threads 10s
❯ node --experimental-worker threads-refactor.js
Finished at: 9784 ms. With 1 thread(s).

~/Developmnet/playground/node-threads 10s
❯ node --experimental-worker threads-refactor.js
Finished at: 6163 ms. With 2 thread(s).

~/Developmnet/playground/node-threads 7s
❯ node --experimental-worker threads-refactor.js
Finished at: 4913 ms. With 3 thread(s).

~/Developmnet/playground/node-threads
❯ node --experimental-worker threads-refactor.js
Finished at: 4722 ms. With 4 thread(s).

~/Developmnet/playground/node-threads 6s
❯ node --experimental-worker threads-refactor.js
Finished at: 4888 ms. With 5 thread(s).

~/Developmnet/playground/node-threads
❯ node --experimental-worker threads-refactor.js
Finished at: 5133 ms. With 6 thread(s).

~/Developmnet/playground/node-threads 6s
❯ node --experimental-worker threads-refactor.js
Finished at: 5403 ms. With 7 thread(s).
```

What I can use WT for?

- Heavy data computations, ML
- Multiple file manipulations
- Compression/conversion
- Video streaming
- Bundling pipe for front-end frameworks
- ...

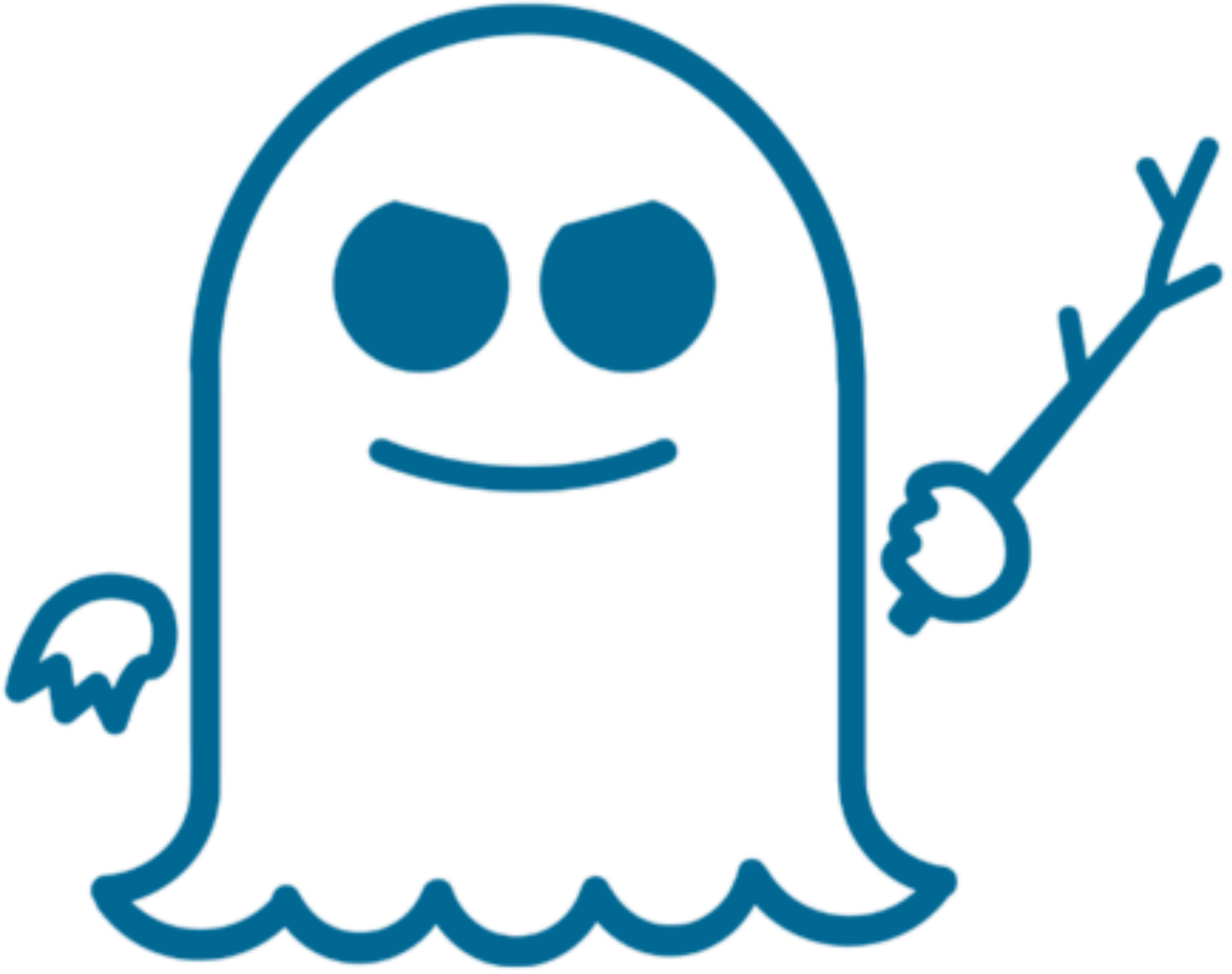
References

What should I think before using Worker Threads?

- Make sure that increased complexity of code worth it
- Calculate if performance price of workers isn't bigger than price of performance benefit
- Choose classical clustering solution if it's about API optimizations

Shared Memory


pikabu.ru



Array Buffer

- The need to specify the length in bytes
- Possibility use only strict type defined typeArray's views

Shared Array Buffer 👻🛡️

- **Was** available in Web Workers
- **Available** in Worker Threads

Atomics  

- ECMAScript 2017.
- Is supported by **some** browsers. Damaged by "Spectre" and "Meltdown"
- Global singleton for every thread
- Hides the shared memory implementation behind
-

References

- https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/SharedArrayBuffer
- https://www.udemy.com/advanced-node-for-developers
- My demos: https://github.com/tryshchenko/nodejs-worker-thread-simple-demos

Thank You!

Would you send me a pigeon?
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OTRY.EU