Using Web Workers With React

By Chen Feldman
Frontend Architect

Vamos

```
self.file = None
self.fingerprints =
self.logdupes = True
self.debug = debug
self.logger = logging.
if path:
    self.file = open(os.path.
    self.file.seek(0)
    self.fingerprints.update(

@classmethod
def from_settings(cls, settings):
    debug = settings.getbool('DUPEFILTER
    return cls(job_dir(settings),

def request_seen(self, request):
    fp = self.request_fingerprint(req
    if fp in self.fingerprints:
        return True
    self.fingerprints.add(fp)
    if self.file:
        self.file.write(fp +

def request_fingerprint(
    return request
```

Vamos

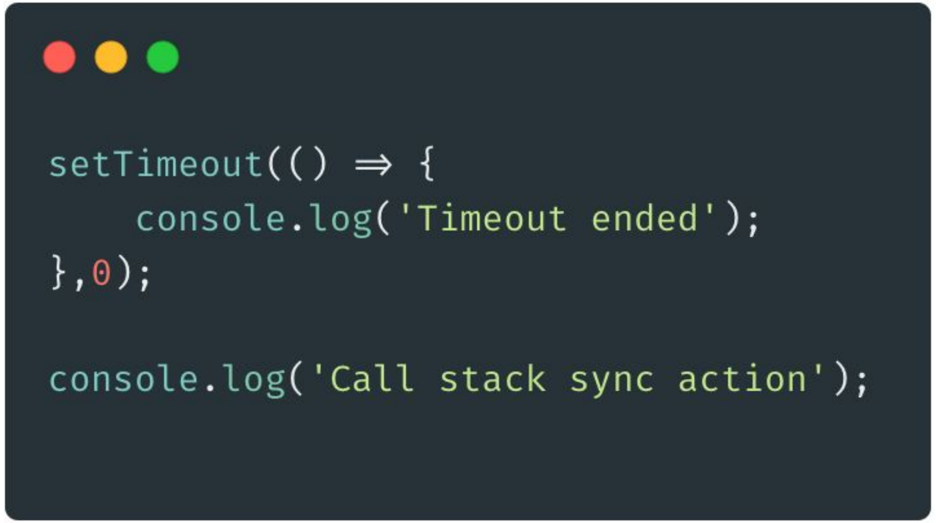
AHA!
MOMENT

{עושים תוכנה}

Lecture’s Timeline

- Asynchronous Programming != Parallel
- Service vs Web Workers
- Live Demo Web Workers

What will be the output?



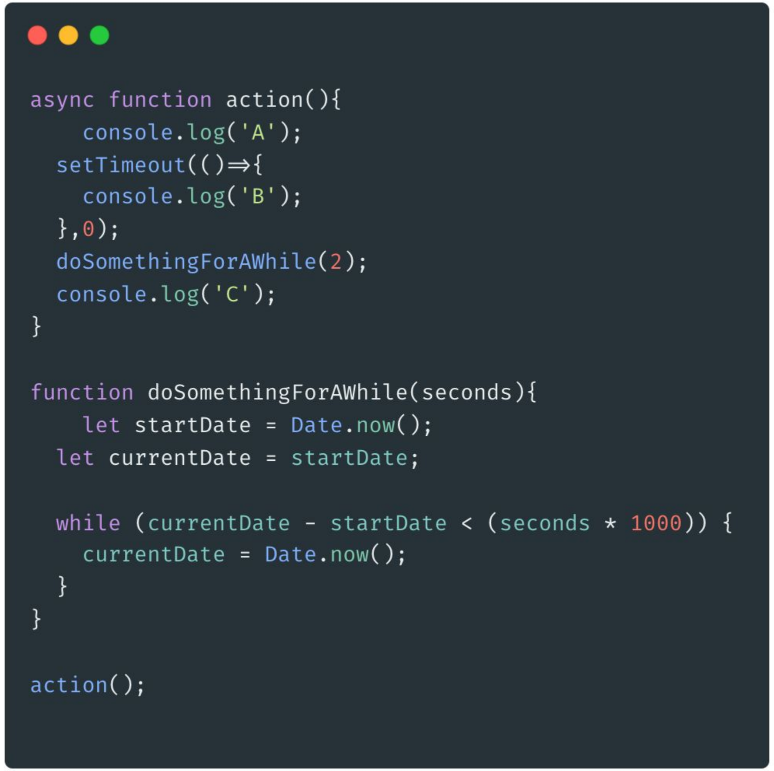
```
setTimeout(() => {
    console.log('Timeout ended');
},0);

console.log('Call stack sync action');
```

The Output

```
Call stack sync action
Timeout ended
```

So again, what will be the output?



```
async function action(){
    console.log('A');
  setTimeout(()=>{
    console.log('B');
  },0);
  doSomethingForAWhile(2);
  console.log('C');
}

function doSomethingForAWhile(seconds){
    let startDate = Date.now();
  let currentDate = startDate;

  while (currentDate - startDate < (seconds * 1000)) {
    currentDate = Date.now();
  }
}

action();
```

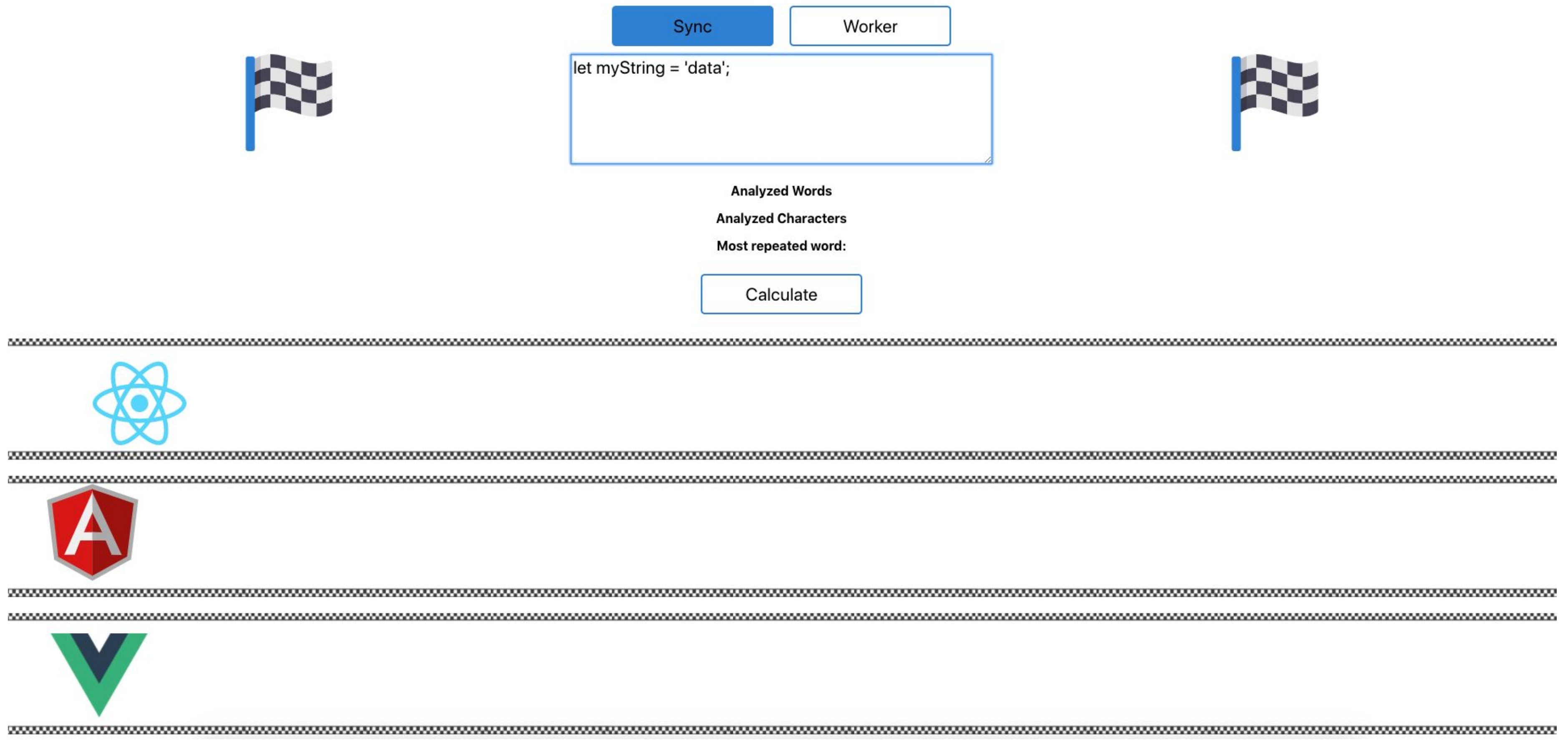
The Output

```
A

C

B
```

Live Demo - Using Async Abilities



```
let myString = 'data';
```

Live Demo

Let’s solve it using promise!!!

Recommended Using Promise

- Network calls (server, API)
- I/O operations

Promises Will Not Perform Better

- Image processing
- Heavy UI calculations & logics
- Running algorithms inside the main thread

Asynchronous Does Not Mean Parallel!

Let’s Use Workers Instead!

Workers - What Are They?

Script that runs on a thread separate to the browser’s main thread

From :https://bitsofco.de/web-workers-vs-service-workers-vs-worklets/

Represents a background task that can be created via script

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- A proxy between the browser and the network/cache
- Are able to intercept any network request from the main document
- Use case :

working offline (PWA) returning from cache instead of network

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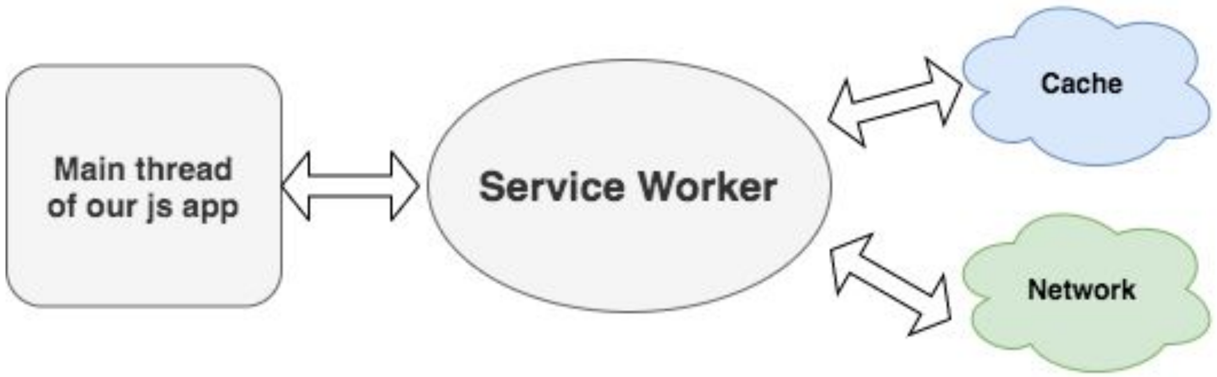

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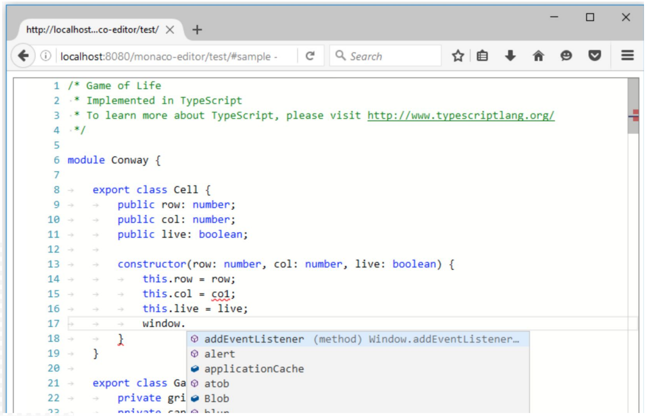
FYI - Products Who Uses Web Workers

- Monaco Editor (VS Code Online)

  https://dev.decoupled.com/docs-magic-webWorker-example-monaco

- Google Squoosh app

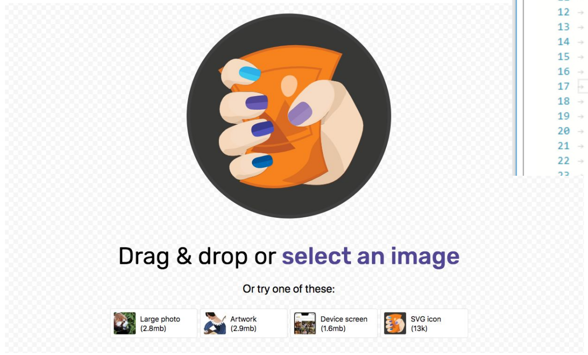
  https://squoosh.app/



http://localhost...co-editor/test/
localhost:8080/monaco-editor/test/#sample -
Search

```
/* Game of Life
 * Implemented in TypeScript
 * To learn more about TypeScript, please visit http://www.typescriptlang.org/
 */

module Conway {

    export class Cell {
        public row: number;
        public col: number;
        public live: boolean;

        constructor(row: number, col: number, live: boolean) {
            this.row = row;
            this.col = col;
            this.live = live;
            window.
        }
    }

    export class Ga
        private gri
```

addEventListener (method) Window.addEventListener…
alert
applicationCache
atob
Blob



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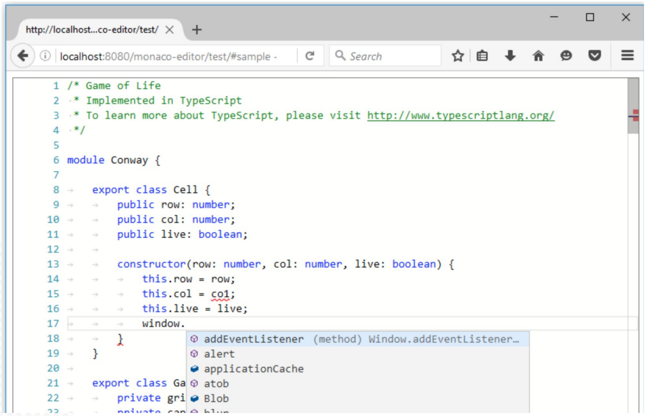
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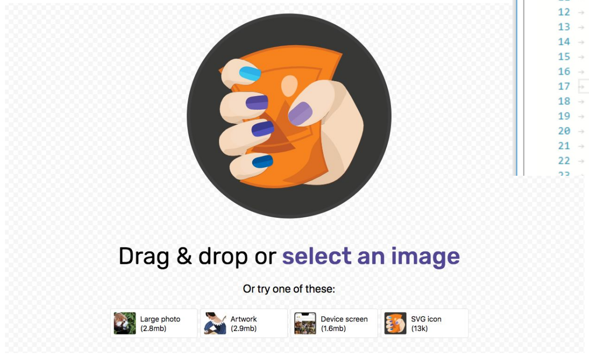
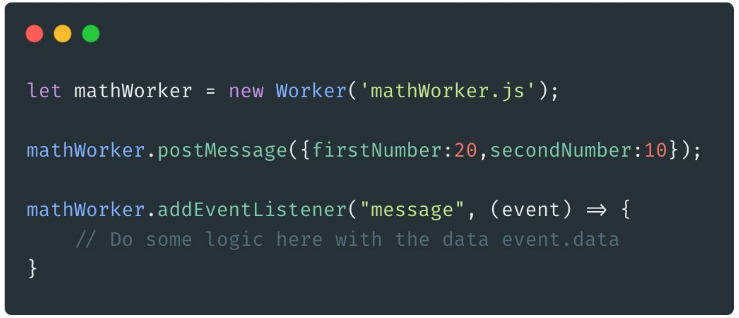


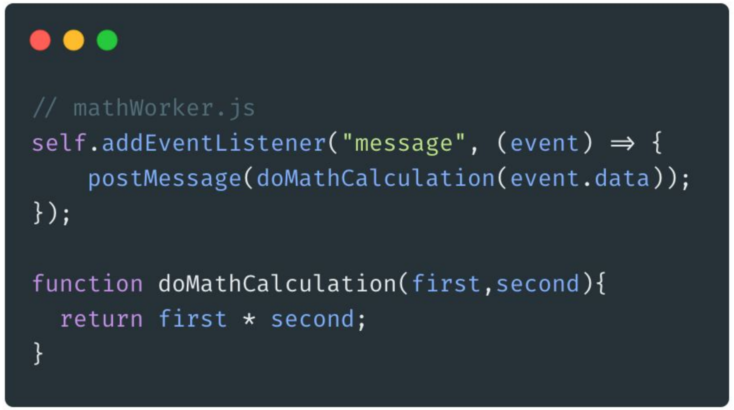
BUT I DON'T KNOW
HOW IT WORKS.

Main Thread (main.js)

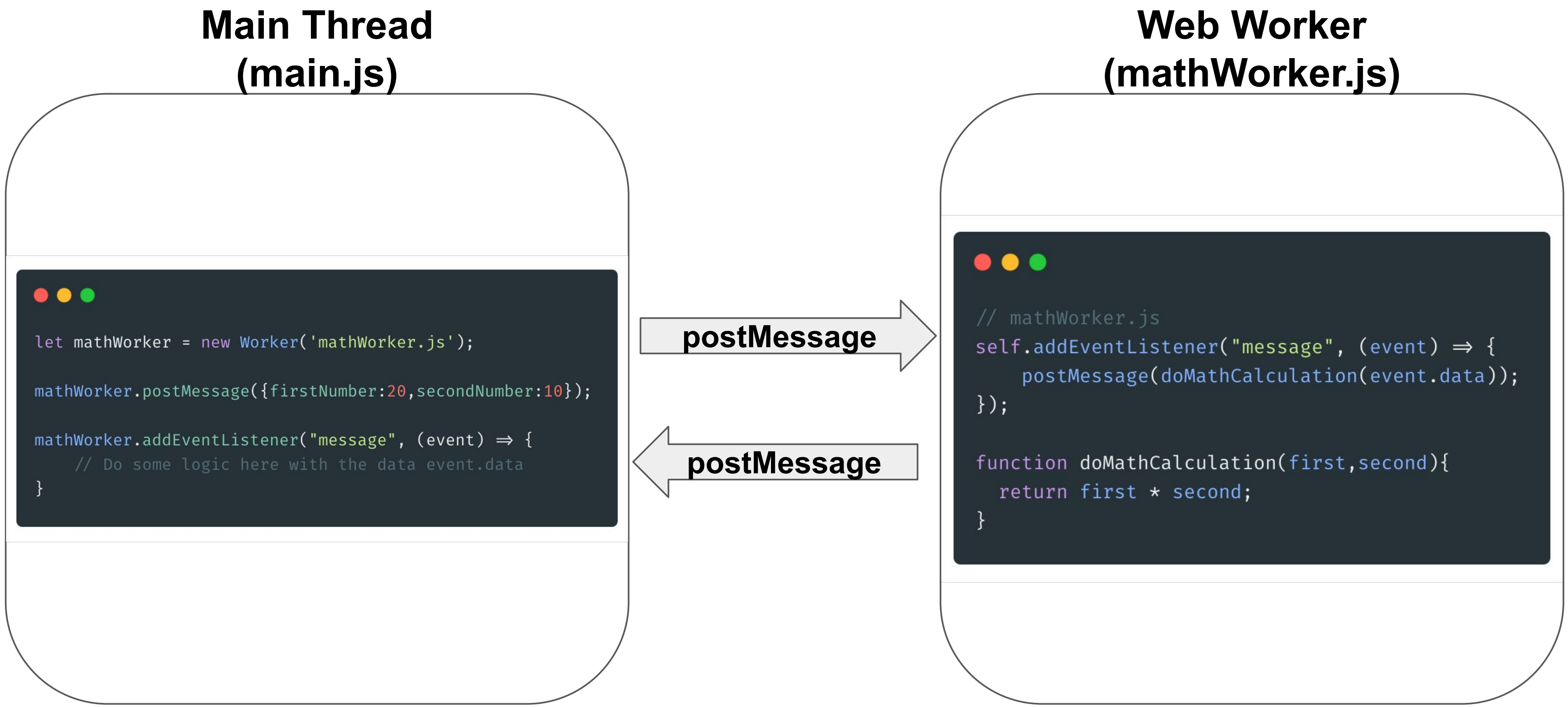


```
let mathWorker = new Worker('mathWorker.js');

mathWorker.postMessage({firstNumber:20,secondNumber:10});

mathWorker.addEventListener("message", (event) ⇒ {
    // Do some logic here with the data event.data
}
```

Web Worker (mathWorker.js)



```
// mathWorker.js
self.addEventListener("message", (event) => {
    postMessage(doMathCalculation(event.data));
});

function doMathCalculation(first,second){
  return first * second;
}
```



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How It Works - Communication

- Event-based communication
- postMessage - data is **cloned** and **not shared** between the two
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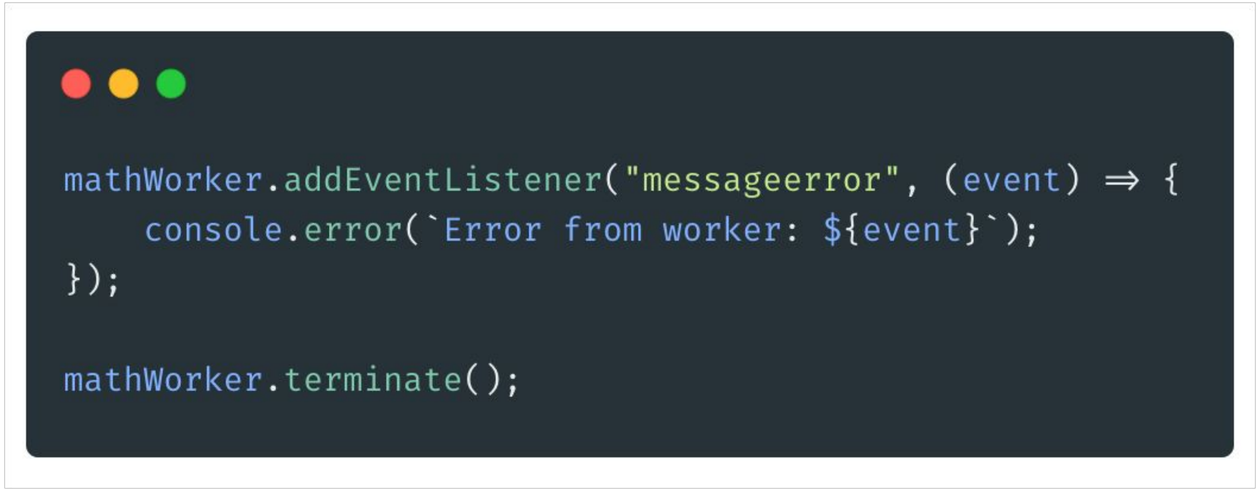

```javascript
mathWorker.addEventListener("messageerror", (event) ⇒ {
    console.error(`Error from worker: ${event}`);
});

mathWorker.terminate();
```

@LateNightSeth
WAIT, WHAT?

Live Demo - Our Demo Using Workers

```
▼<body>
  ▼<div id="app">
    ▼<todo-application>
      ▼#shadow-root (open)
          <link rel="stylesheet" type="text/css" href="//
          maxcdn.bootstrapcdn.com/bootstrap/4.0.0-beta.2/css/
          bootstrap.min.css">
        ▶<style>…</style>
        ▶<nav class="navbar navbar-expand-md navbar-dark bg-dark">…</nav>
        ▼<main class="container">
          ▼<todo-form>
            ▶<style>…</style>
            ▶<div class="card todo-form">…</div>
          </todo-form>
          <hr>
          ▼<todo-list ref="list">
            ▶<style>…</style>
             <h2>Tasks:</h2>
            ▼<ul ref="todos" class="list-group">
              ▶<todo-task ref="task-1517176192142" id="task-1517176192142">
              …</todo-task> == $0
              ▶<todo-task ref="task-1517176320397" id="task-1517176320397">
              …</todo-task>
              ▶<todo-task ref="task-1517176329096" id="task-1517176329096">
              …</todo-task>
              ▶<todo-task ref="task-1517176334849" id="task-
              …</todo-task>
            </ul>
```

```
Filter                :hov
element.style {
}
*,                    _reboot
::after,
::before {
  box-sizing: bord
    box;
}
Inherited from ul.list
ul,  user agent styl
menu
  display: block;
  list-style-type:
  -webkit-margin-be
    1em;
  -webkit-margin-af
    1em;
  -webkit-margin-sta
    0px;
  -webkit-margin-end
    0px;
  -webkit-padding-st
    40px;
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Live Demo - Debugging

Advantages

- New working thread - working on background
- Not blocking the UI
- Simple communication (event-based)
- Split responsibility between workers for even better performance
- Can communicate with server (not every library)
- Can be terminated in any given moment by main thread

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Disadvantages

- Cannot communicate with the DOM
  - Cannot load images or create canvas elements
- Limited access to functions and properties inside the window object
- Communication and passing data has some price when done too much
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Browser compatibility

Support varies for different types of workers. See each worker type's page for specifics.

Update compatibility data on GitHub

	🖥️						📱					
	Chrome	Edge	Firefox	Internet Explorer	Opera	Safari	Android webview	Chrome for Android	Firefox for Android	Opera for Android	Safari on iOS	Samsung Internet
`Worker`	4	12	3.5	10	10.6	4	4	18	4	11	5.1	1.0
`Worker()` constructor	4	12	3.5	10	10.6	4	4	18	4	11	5.1	1.0
`message` event	4	12	3.5	10	10.6	4	4	18	4	11.5	5.1	1.0
`messageerror` event	60	18	57	?	47	?	60	60	57	47	?	8.0
`onmessage`	4	12	3.5	10	10.6	4	4	18	4	11	5.1	1.0
`onmessageerror`	60	18	57	?	47	?	60	60	57	44	?	8.0
`postMessage`	Yes	12	Yes	10 *	47	Yes	Yes	Yes	Yes	44	Yes	Yes
`terminate`	4	12	3.5	10	10.6	4	4	18	4	11	5.1	1.0

Recommended Open Source - Ecosystem

- Comlink (by Google) - https://github.com/GoogleChromeLabs/comlink
- Workerize - https://github.com/developit/workeriz
- Parallel.js - https://github.com/parallel-js/parallel.js
- useWorker React hook - https://github.com/alewin/useworker

Takeaways

JS is not really working in parallel

Takeaways

Workers can be relevant for specific use case

Takeaways

Choose it
because of
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Not because
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Go Go Go!

Write Some Awesome Code!

Recommended Links

- Link to my frameworks race demo
- Open source libs to make your life easier using web workers
  - https://github.com/GoogleChromeLabs/comlink
  - https://github.com/developit/workerize
- Real-world examples that uses web workers
  - https://github.com/GoogleChromeLabs/squoosh/
  - https://microsoft.github.io/monaco-editor/
  - https://github.com/parallel-js/parallel.js - parallel js lib using web workers
- Recommended reading/video resources
  - https://www.youtube.com/watch?v=8aGhZQkoFbQ

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www.ranlevi.com/software

https://github.com/ChenFeldman

https://www.linkedin.com/in/chen-feldman-2404682a/

Credits

https://www.youtube.com/watch?v=EiPytIxrZtU

https://www.youtube.com/watch?v=pcYuOOe-kbw

https://www.newline.co/fullstack-react/articles/introduction-to-web-workers-with-react/

https://blog.logrocket.com/integrating-web-workers-in-a-react-app-with-comlink/

https://medium.com/prolanceer/optimizing-react-app-performance-using-web-workers-79266afd4a7

https://kentcdodds.com/blog/speed-up-your-app-with-web-workers

https://www.jstips.co/en/javascript/improving-your-async-functions-with-webworkers/

https://github.com/nodeca/pica?fbclid=IwAR3bvSvU4HPQyU-1VTHr24-4ZGTL-eGSLdG3tBs9TP0jxEdMXjOb-eZbHpE

https://www.freecodecamp.org/news/web-workers-in-action-2c9ff33be266/

https://blog.logrocket.com/real-time-processing-web-workers/, https://dev.to/trezy/loading-images-with-web-workers-49ap

kevinhoyt.com/2018/10/23/image-processing-in-a-web-worker/

https://developer.mozilla.org/en-US/docs/Web/API/Worker

https://www.youtube.com/watch?v=nLF0n9SACd4&feature=youtu.be

https://www.sitepoint.com/using-web-workers-to-improve-image-manipulation-performance/

https://medium.com/samsung-internet-dev/web-workers-in-the-real-world-d61387958a40

https://bitsofco.de/web-workers-vs-service-workers-vs-worklets/

https://github.com/Shopify/quilt/blob/master/packages/react-web-worker/README.md

https://medium.com/@azizhk/building-an-async-react-renderer-with-diffing-in-web-worker-f3be07f16d90