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React Router SPA Flow

Async Code Execution Order

React State Change Flow

Open Close Expander Console

Debouncing React Re-renders

Explain how the code execution will work if we put below case with a real-world async example:
1. setTime outside and inside setInterval,
2. setImmediat outside and inside setTime and setInterval both

To explain how `setTimeout`, `setInterval`, `setImmediate`, and their nesting/ordering affect code execution, we need to understand the JavaScript Event Loop and its task queues.

Task Queues Recap

Type	Queue	Runs After
Macrotasks	<code>setTimeout</code> , <code>setInterval</code> , <code>setImmediate</code>	Each event loop tick
Special Note	<code>setImmediate</code> is Node.js-only (not in browsers), and runs after I/O callbacks, similar to <code>setTimeout(fn, 0)</code> but slightly different	

Scenario Setup: What Happens When You Nest These?

We'll simulate the nesting like this:

```
console.log("Start");

setTimeout(() => {
  console.log("setTimeout - 1");

  setImmediate(() => {
    console.log("setImmediate inside setTimeout");
  });

  setInterval(() => {
    console.log("setInterval inside setTimeout");
  }, 100);
}, 0);
```

```
console.log("setImmediate - 1");

setTimeout(() => {
  console.log("setTimeout inside setImmediate");
}, 0);

setInterval(() => {
  console.log("setInterval inside setImmediate");
}, 100);
});

setInterval(() => {
  console.log("setInterval - 1");
}, 100);
```

Breakdown of Execution Flow (Node.js):

Tick 0:

```
javascript
console.log("Start");
// Synchronously
→ queue setTimeout (after 0ms)
→ queue setImmediate

Ask anything
```

✓ Event Loop starts:

- 1. Check microtasks: none → go to macrotasks

👤 Next Macrotask Queue: `setTimeout` and `setImmediate`

- In Node.js, `setImmediate` usually fires before `setTimeout(fn, 0)` if both are scheduled from the top level (but not guaranteed every time).

```
Ask anything
1 setImmediate - 1 runs first
```

```
javascript
console.log("setImmediate - 1");
→ queues setTimeout (inside setImmediate)
→ queues setInterval (inside setImmediate)
```

2 setTimeout - 1 runs next

```
javascript
console.log("setTimeout - 1");
→ queues setImmediate (inside setTimeout)

Ask anything
```

🕒 Now, after some time ($\geq 100\text{ms}$), `setInterval`s start firing:

- `setInterval - 1`
- `setInterval` inside `setImmediate`
- `setInterval` inside `setTimeout`

These will continue firing every 100ms until manually cleared.

```
Ask anything
```

```
cpp
console.log("setImmediate inside setTimeout");
```

And `setTimeout` from inside `setImmediate`:

```
cpp
console.log("setTimeout inside setImmediate");
```

```
Ask anything
```

Imagine you're running a restaurant kitchen:

- `setTimeout`: A timer to start making tea after X minutes.
- `setInterval`: Every 10 mins, check the oven.
- `setImmediate`: As soon as you're done with the current task, check inventory.

- `microtasks` : Notes scribbled by the chef on what to do **after this step** but before taking next dish.

Summary Execution Order

Assuming typical Node.js behavior

Ask anything

```
Start
End
setImmediate - 1
setTimeout - 1
setImmediate inside setTimeout
setTimeout inside setImmediate
setInterval - 1
setInterval inside setImmediate
setInterval inside setTimeout
(repeating intervals every 100ms)
```

Ask anything

Want to simulate this in browser?

You can use `setTimeout` and `queueMicrotask` (no `setImmediate`) like this:

js

```
console.log("Start");

setTimeout(() => {
  console.log("setTimeout");

  queueMicrotask(() => {
    console.log("microtask inside setTimeout");
  });
});
```

Ask anything

```
queueMicrotask(() => {
  console.log("microtask outside");
});

console.log("End");
```

Output:

arduino

```
Start
End
microtask outside
```

Ask anything

✓ Ask Yourself:

- Are you running this in **Node.js** or **browser**?
- Do you want **precise control** over async order? → use `queueMicrotask` or `Promise.then`
- Do you need a **repeating task**? → use `setInterval` but clear it wisely.

Ask anything

Perfect — since you're running this in the browser, here's how execution changes compared to Node.js:

↓

Key Differences in the Browser:			
<code>setTimeout</code>	✓ Yes	Macrotask	Runs after current call stack & microtasks
<code>setInterval</code>	✓ Yes	Macrotask	Repeats like <code>setTimeout</code> , needs manual <code>clearInterval()</code>
<code>setImmediate</code>	✗ No	✗ Not in browser	Only available in Node.js, not in browsers
<code>queueMicrotask</code> / <code>Promise.then</code>	✓ Yes	Microtask	Runs after current call stack, before next macrotask

↓

Ask anything

js

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```

console.log("Start");

setTimeout(() => {
  console.log("setTimeout - 1");

  queueMicrotask(() => {
    console.log("microtask inside setTimeout");
  });

  setInterval(() => {
    console.log("setInterval inside setTimeout");
  }, 100);
}, 100);

console.log("End");

```

↓

Ask anything

```

queueMicrotask(() => {
  console.log("microtask - top level");
});

setInterval(() => {
  console.log("setInterval - 1");
}, 100);

console.log("End");

```

↓

Ask anything

◆ Sync Phase:

scss

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```

console.log("Start");           // → Start
setTimeout(...)               // → Queued to macrotask queue
setInterval(...)              // → Queued as repeating macrotask
queueMicrotask(...)           // → Queued to microtask queue
console.log("End");           // → End

```

↓

Ask anything

Immediately after call stack clears:

css

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microtask - top level

🕒 After 0ms (first macrotask fires):

→ `setTimeout - 1` callback runs:

Ask anything

`setTimeout - 1`

→ queues microtask: "microtask inside setTimeout"

→ queues repeating interval

🔗 Microtask inside `setTimeout` runs:

arduino

microtask inside setTimeout

Ask anything

🕒 After 100ms: All intervals fire:

- `setInterval - 1`
- `setInterval inside setTimeout`

This repeats every 100ms.

📄 Final Console Output Order (Browser):

javascript

Ask anything

End

microtask - top level

`setTimeout - 1`

microtask inside setTimeout

`setInterval - 1`

`setInterval inside setTimeout`

// repeating every 100ms

👤 Want to Simulate `setImmediate` in Browser?

Ask anything

```
function setImmediatePolyfill(cb) {  
  setTimeout(cb, 0); // similar effect in browser  
}
```

Or better, use `MessageChannel` for closer precision:

js

```
const immediate = (fn) => {  
  const channel = new MessageChannel();  
  channel.port1.onmessage = fn;  
  channel.port2.postMessage(null);  
}
```

Ask anything

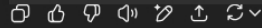
💡 TL;DR

- `setImmediate` does not work in the browser.
- Replace with `setTimeout(fn, 0)` or `MessageChannel` if needed.
- Use `queueMicrotask()` to run logic right after sync, before timeouts.



Want me to convert your full case into a visual diagram or animation? Or simulate this in a

Ask anything



visual diagram or animation?

Great — let's walk through a visual animation-style diagram that simulates how the browser event loop handles:

- `setTimeout`
- `setInterval`
- `queueMicrotask`



Ask anything



📄 Example Code You Gave (Browser-Compatible)

js

Copy Edit

```
console.log("Start");

setTimeout(() => {
  console.log("setTimeout - 1");
}, 0);

queueMicrotask(() => {
```



Ask anything



```
setInterval(() => {
  console.log("setInterval inside setTimeout");
}, 100);
}, 0);

queueMicrotask(() => {
  console.log("microtask - top level");
});
```

```
setInterval(() => {
  console.log("setInterval - 1");
}, 100);
```



Ask anything



🧠 Visual Timeline: Event Loop Phases

markdown

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Call Stack



Ask anything



🕒 Event Loop Timeline (Frame-by-Frame):

css

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🟢 Frame 1: Synchronous Execution

Ask anything



```
console.log('Start') // logs: Start
setTimeout(...)     => scheduled
setInterval(...)     => scheduled
queueMicrotask(...)  => queued to Microtask Queue
console.log('End')    => logs: End
```

Microtask Queue:

- "microtask - top level"

Macrotask Queue:

- setTimeout(..., 0) → "setTimeout - 1"
- setInterval(..., 100ms)

Ask anything



🟡 Frame 2: Microtask Phase

Microtask Queue runs:

- logs: microtask - top level

markdown

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🟠 Frame 3 (~0ms): Macrotask Phase (setTimeout fires)

Macrotask runs: setTimeout

- logs: setTimeout - 1
- queueMicrotask → "microtask inside setTime" ↓
- setInterval → scheduled

Ask anything



markdown

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🟢 Frame 4: Microtask Phase

Microtask runs:

- logs: microtask inside setTimeout

javascript

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📧 Frame 5 (~100ms): Interval Phase

Ask anything



🕒 Then both intervals repeat every 100ms.

📄 Final Output Order in Console

javascript

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```
Start
End
microtask - top level
setTimeout - 1
```

Ask anything



```
setInterval inside setTimeout  
(repeats...)
```



Want This as an Actual Animation or CodeSandbox?

Choose one:

1. SVG/animated GIF diagram simulation (I'll generate it as a graphic)
2. Live CodeSandbox/JSFiddle to step through code interactively
3. React or Canvas-based animation you can embed into docs or a blog post

Let me know your preferred format and use case (e.g



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+ Tools



Atul Awasthi
Free

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