the Master Course

{CODENATION}

Intermediate JavaScript

JavaScript Engines

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Learning Objectives

To discover how a JavaScript engine operates

To be familiar with the JavaScript execution context

To explore JavaScript engine call stack, memory heap, event loop and callback queue

JavaScript Engines

...are typically developed by **web browser** vendors

= V8 Engine

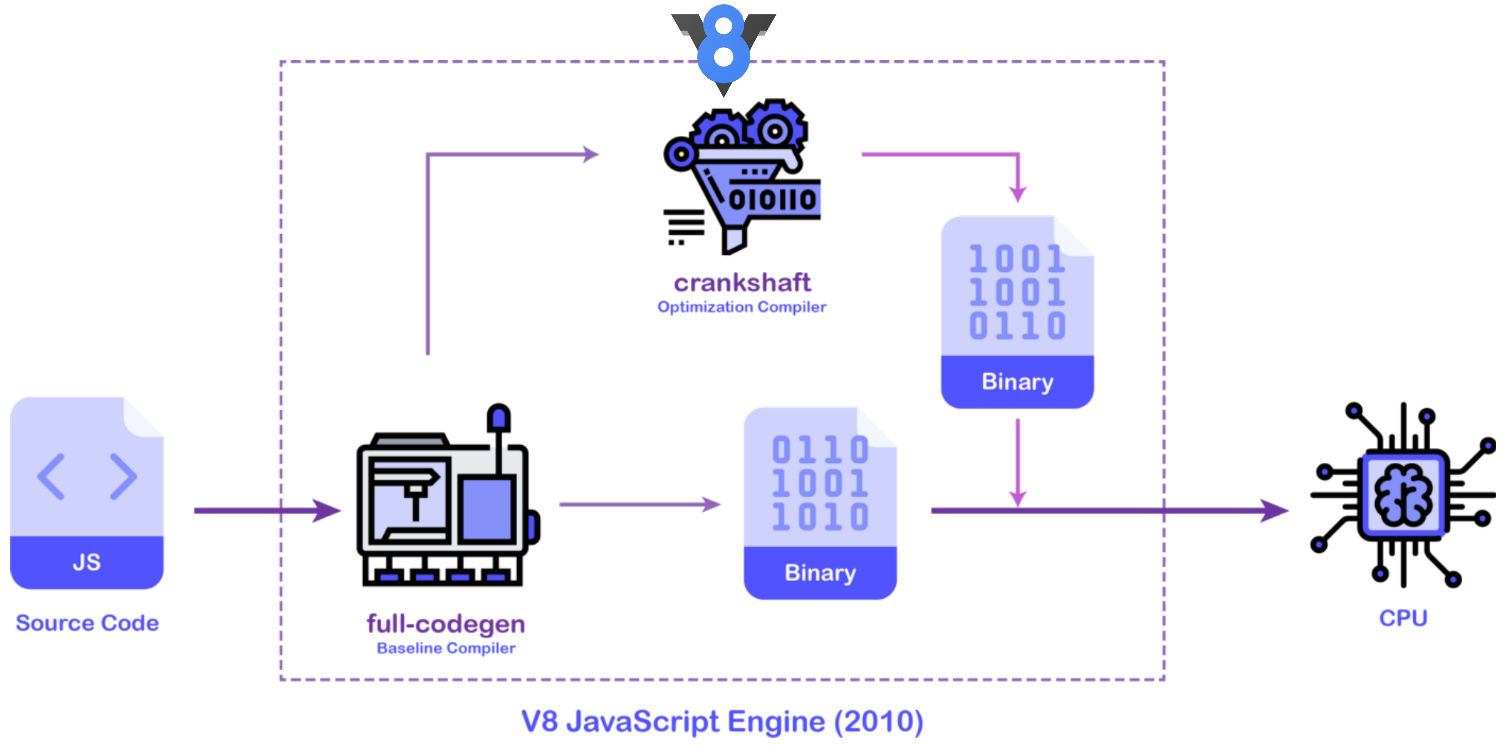
= Chakra

= SpiderMonkey

= JavaScriptCore

Chrome V8

A JavaScript engine **executes** JavaScript code



Let's take a look

at JavaScript **runtime execution**
inside the browser

Execution Context

Everything in JavaScript happens inside an execution context

Three fundamental parts of the JavaScript engine...

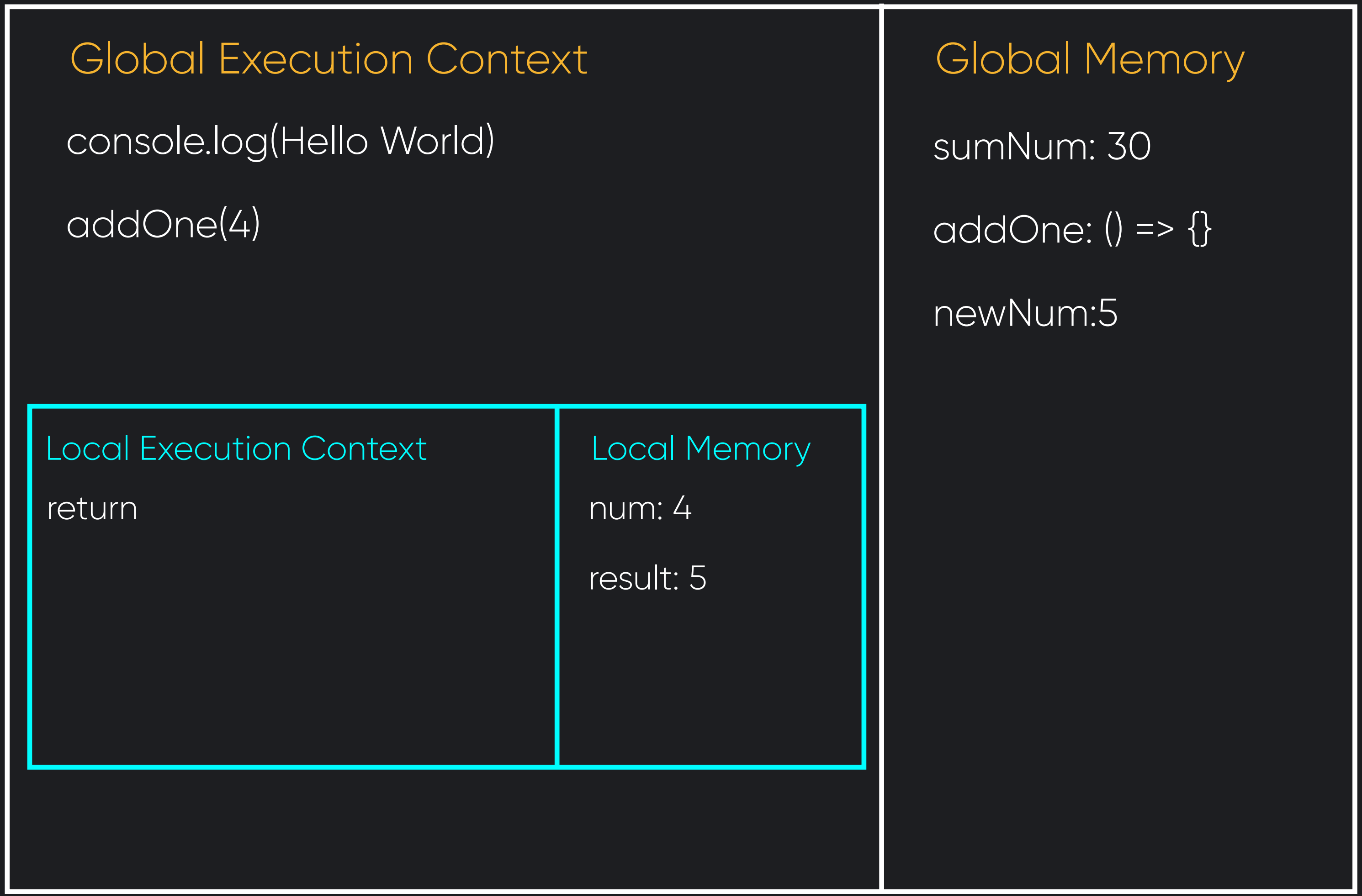
- Execution context
- Memory environment
- Thread of execution

Javascript execution context video

What about functions...

...in the execution context?

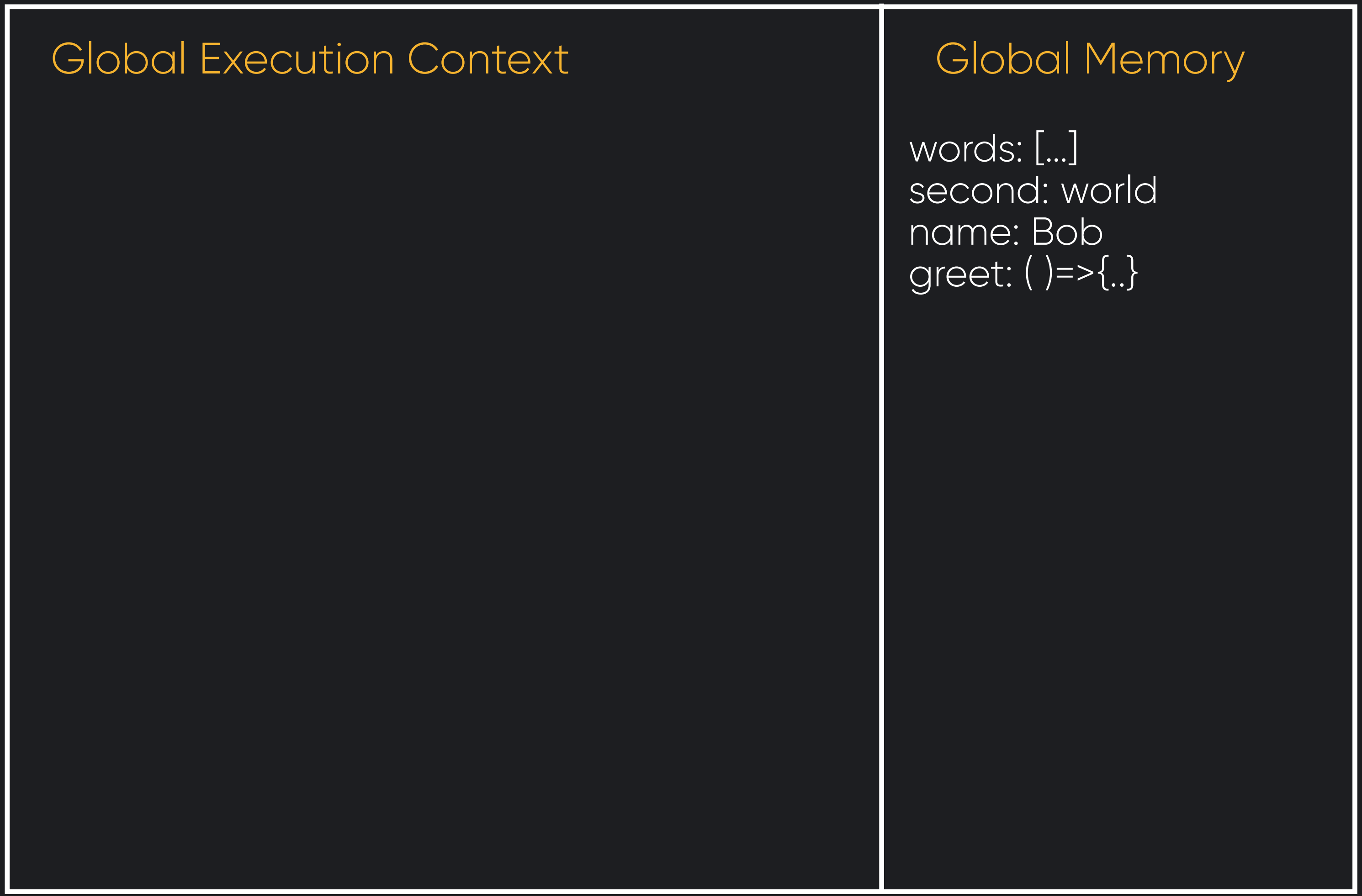
```javascript
const sumNum = 30;

const addOne = (num) => {
    const result = num + 1;
    return result;
};

console.log('Hello World');
const newNum = addOne(4);
```



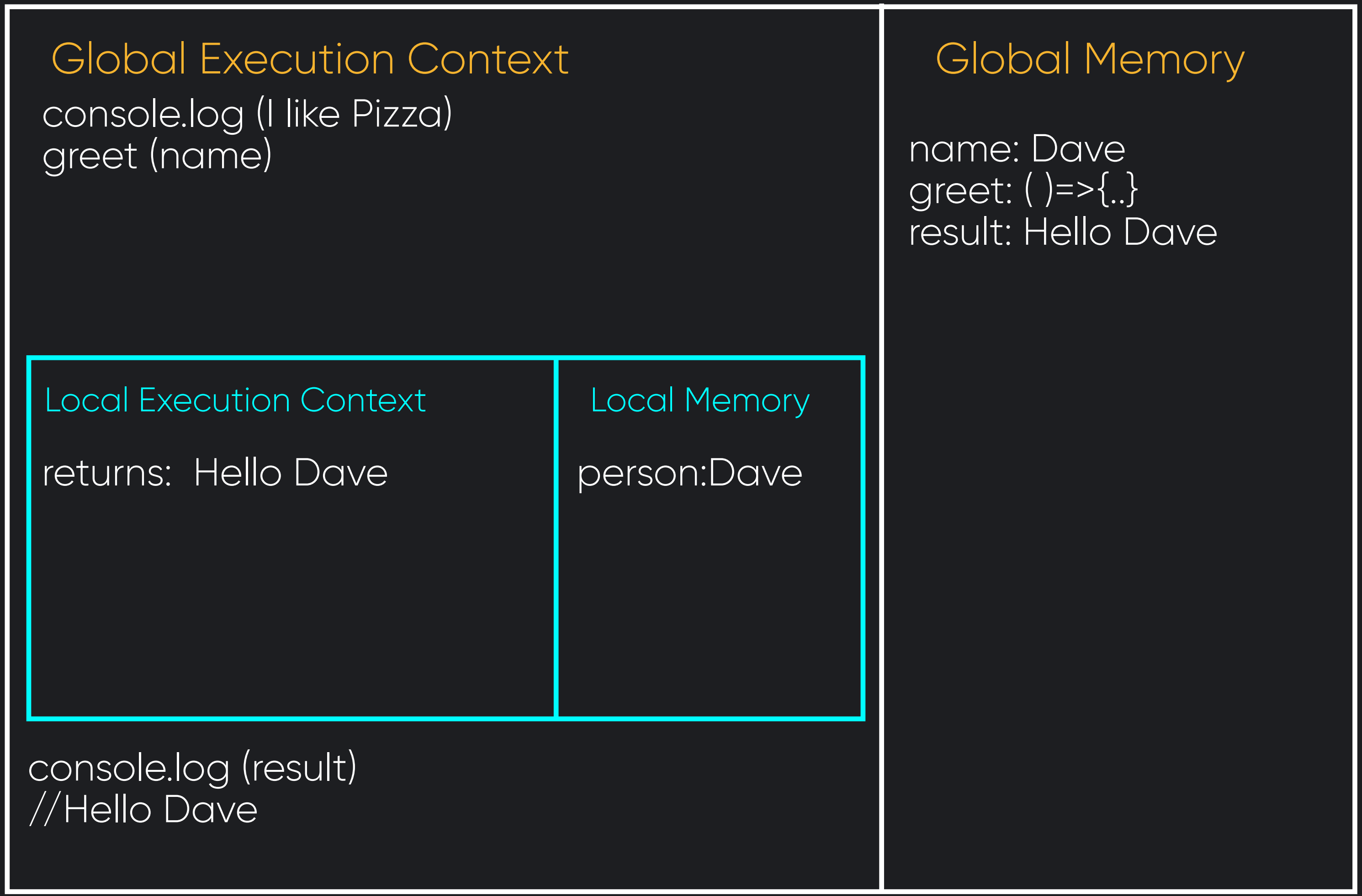
```
const first = 'Hello';
const second = 'Dave';
const allTogether = `${first} ${second}`;


console.log(allTogether);
```

Global Execution Context	Global Memory
console.log(allTogether) //Hello Dave	first: Hello second:Dave allTogether: Hello Dave

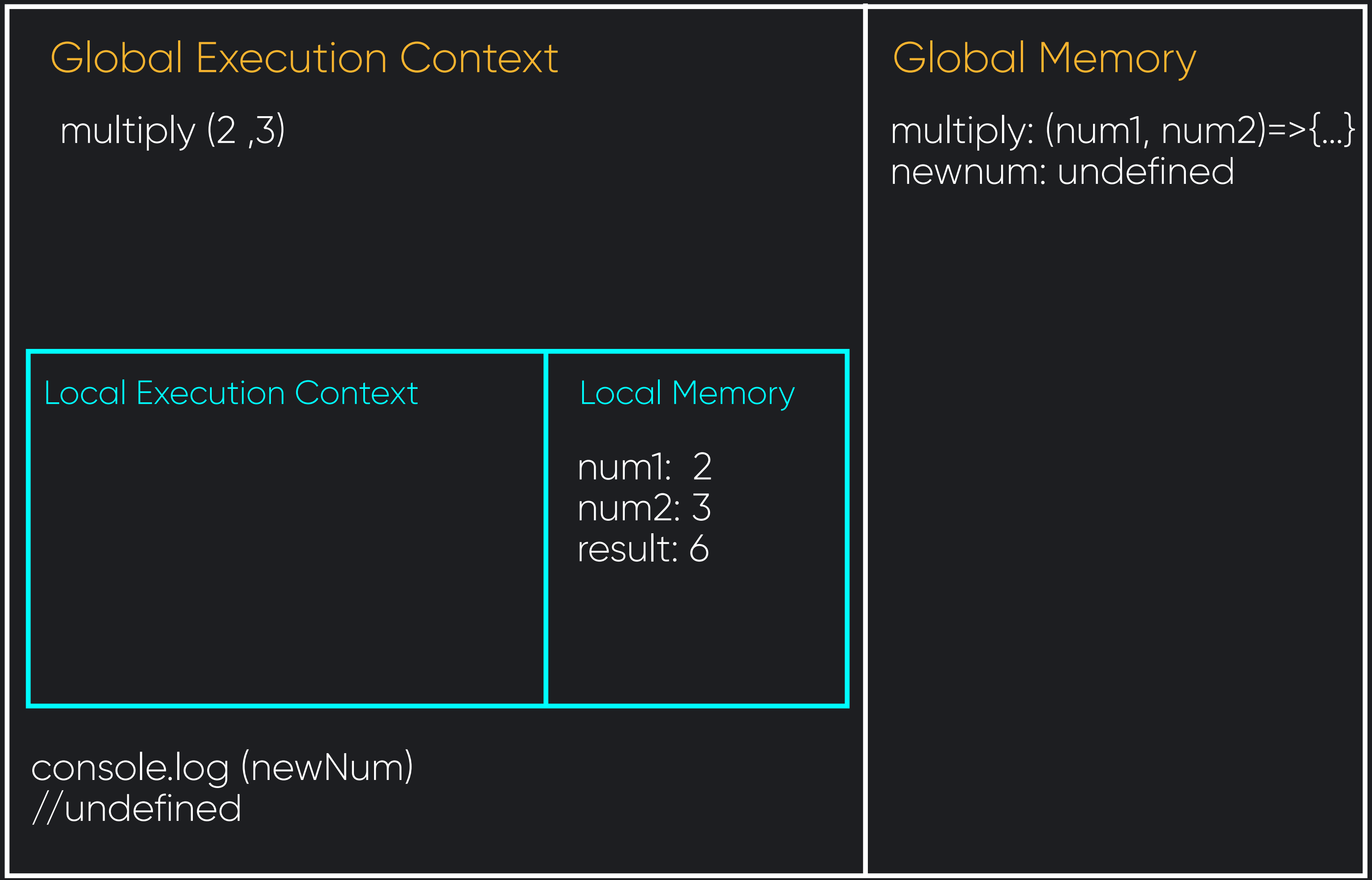
```
const words = ['hello', 'world'];

const second = words[1];

let name = 'Dave';
name = 'Bob';

const greet = () => {
    return 'Hello';
};
```



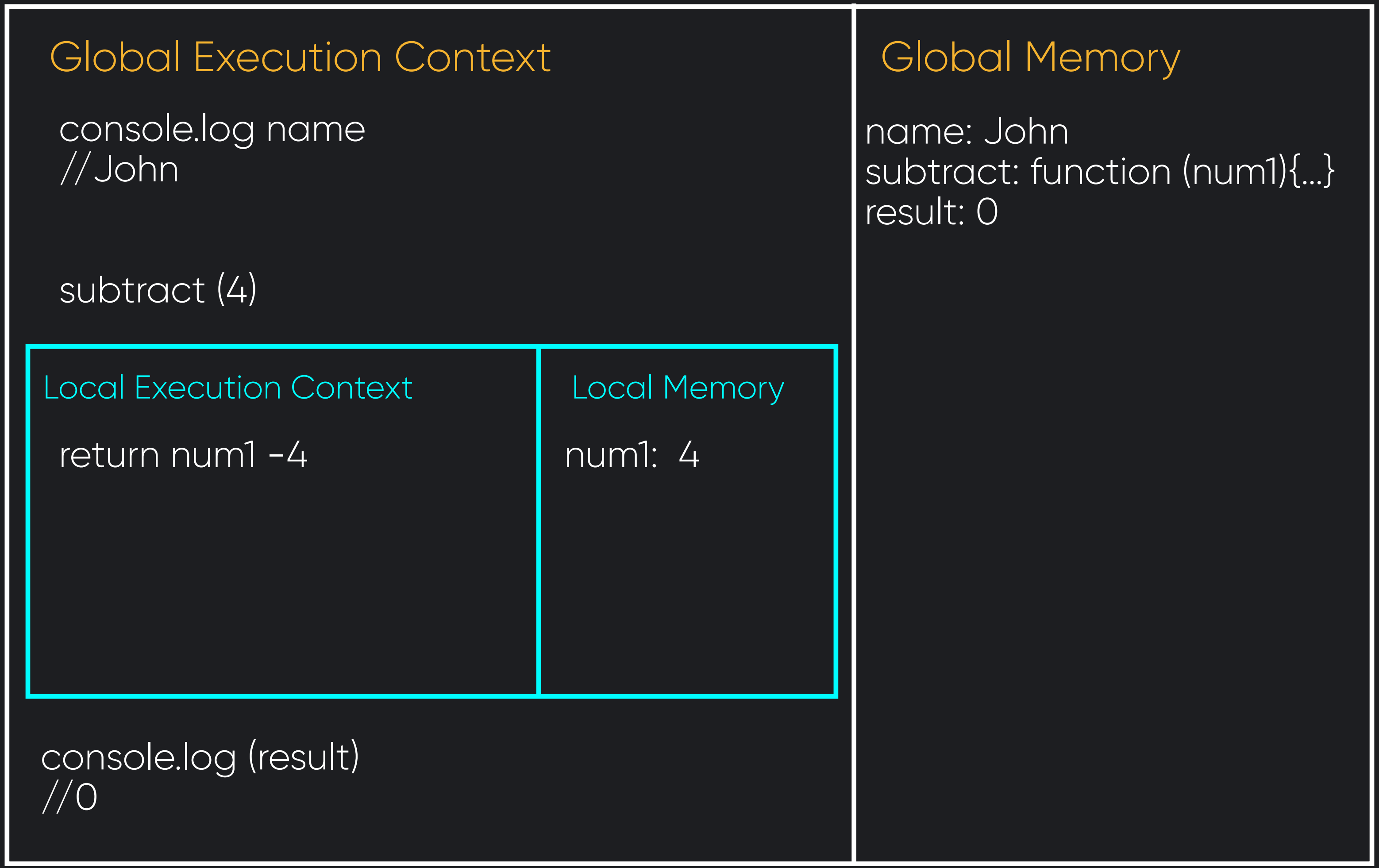
```
let name = 'Dave';

const greet = (person) => {
    return `Hello ${person}`;
};

console.log('I like pizza');
const result = greet(name);

console.log(result);
```



```
const multiply = (num1, num2) => {
    const result = num1 * num2;
};

const newNum = multiply(2, 3);

console.log(newNum);
```

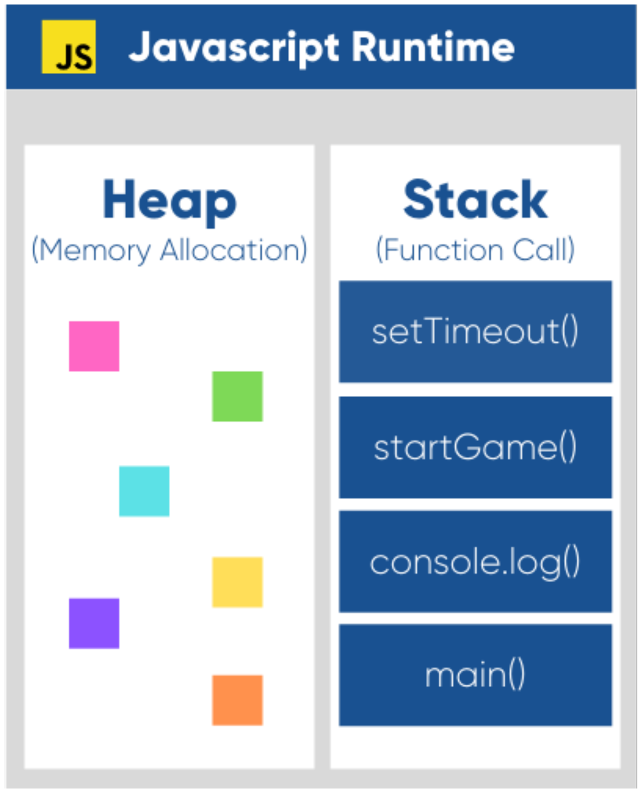


```javascript
let name = 'John';

function subtract(num1) {
     return num1 - 4;
}

console.log(name);
const result = subtract(4);

console.log(result);
```



The Memory Heap and Call Stack

Intermediate JS



The call **stack** is **responsible for keeping the flow of execution** for our application. Without it, JavaScript wouldn't know what to call or when.

The **heap** is responsible for storing our data. This is where the **memory allocation** happens.

...Let's take a close look at what happens in the browser

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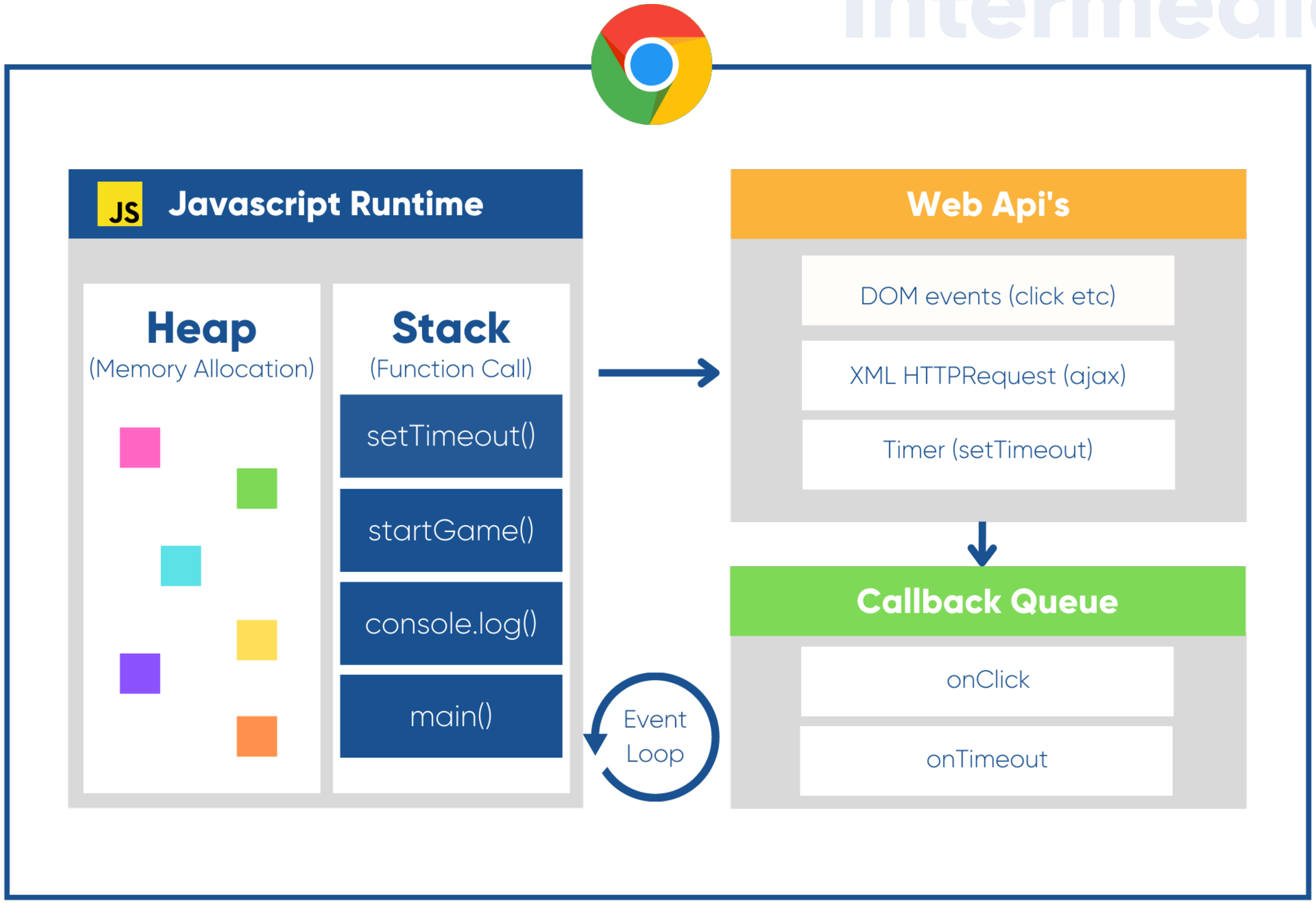
Javascript Runtime
Heap
(Memory Allocation)
Stack
(Function Call)
setTimeout()
startGame()
console.log()
main()
Web Api's
DOM events (click etc)
XML HTTPRequest (ajax)
Timer (setTimeout)
Callback Queue
onClick
onTimeout
Event
Loop

JavaScript...

...is always synchronous and
single-threaded

...but what about pieces of code that take time to execute?

Asynchronous functions

… such as setTimeout() are provided by browser webAPI's

… we'll look at asynchronous functions in more detail later

[Javascript engine operation video]

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