Advanced JavaScript

Introduction

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Agenda

1. Objects, Hoisting and Execution
2. Functions and IIFEs
3. Closure, Apply/Call/Bind
4. ES6 Syntax Refresher
5. Classes & Inheritance
6. Design Patterns
7. Async Programming

Section 1

Objects, Hoisting and Execution

Learning objectives of this section:

- An object in JavaScript
- What’s provided out of the box
- Execution Context
- Execution Stack
- Variable Environments
- Scope Chain
- Hoisting and Executing

What is an Object?

A collection of data in the form key/value pairs.

What is an Object?

```
name = ‘foo’
```

What is an Object?

```
{
  name: ‘foo’,
  gender: ‘male’
}
```

What is an Object?

A collection of data in the form key/value pairs.

- The key/value pairs are called properties
- The value can be some data, a function or another collection of key/value pairs
- If the value is a function then the property is called a method

What is an Object?

```
{
  name: ‘foo’,
  gender: ‘male’,
  location: {
    country: ‘Canada’,
    city: Toronto
  }
}
```

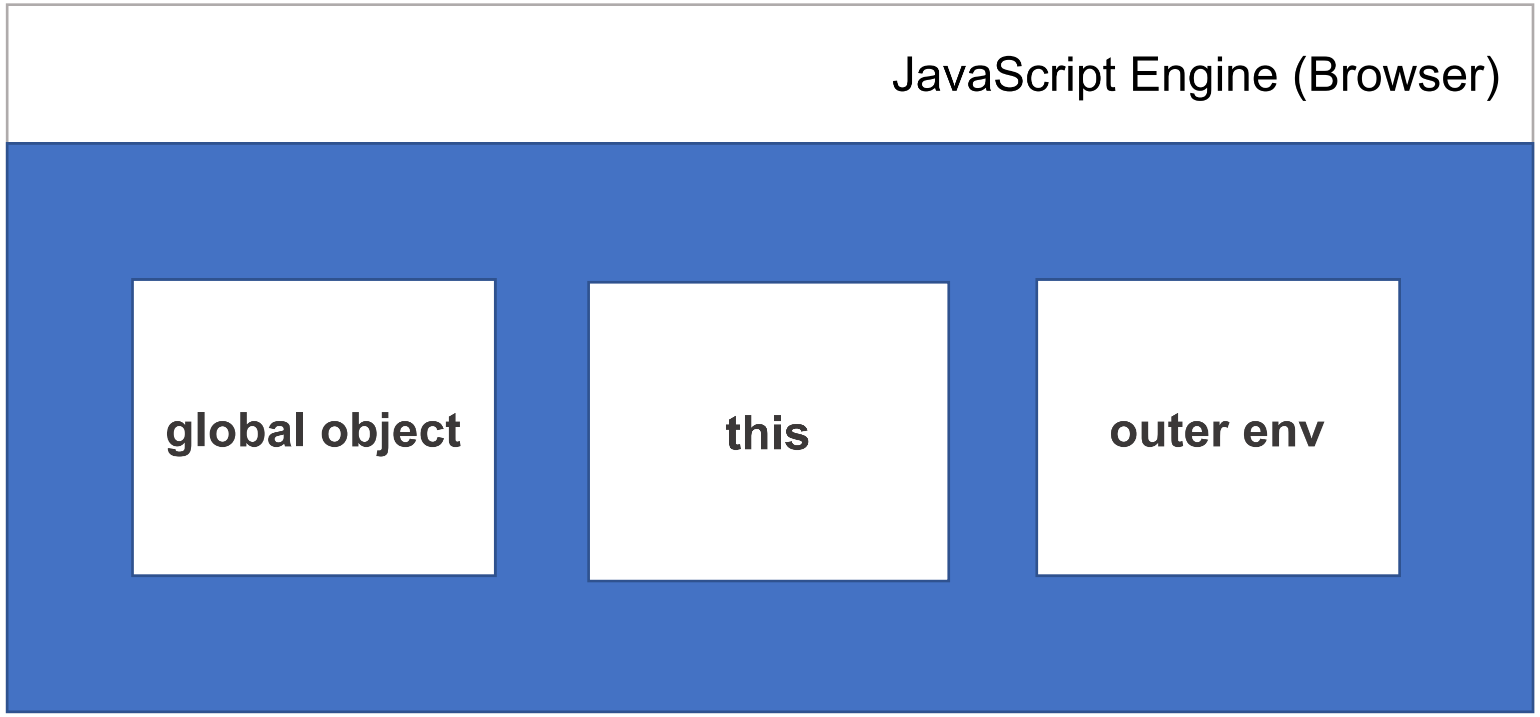
collection

What is an Object?

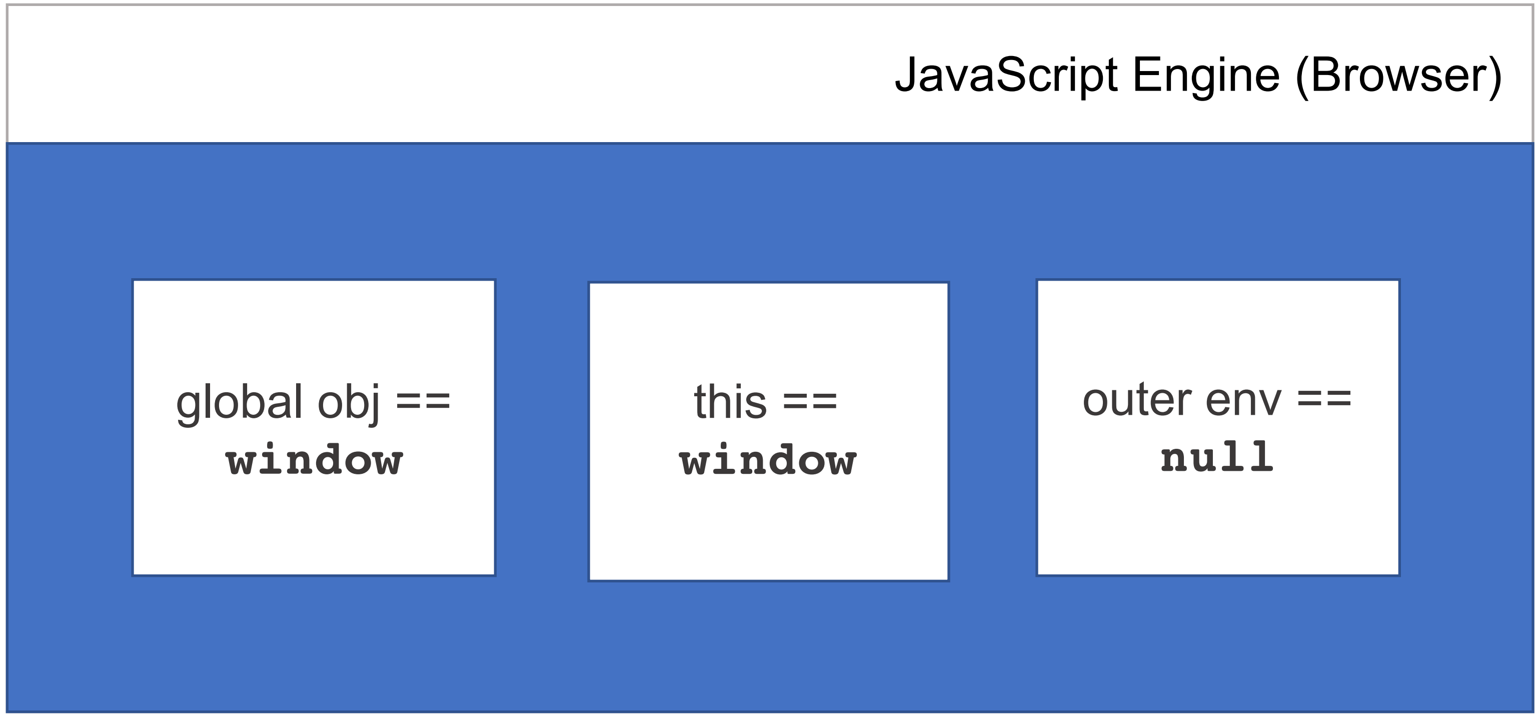
```
{
  name: ‘foo’,
  gender: ‘male’,
  logName: function() {
    console.log(this.name)
  }
}
```

method

What’s provided out of the box?



What’s provided out of the box?



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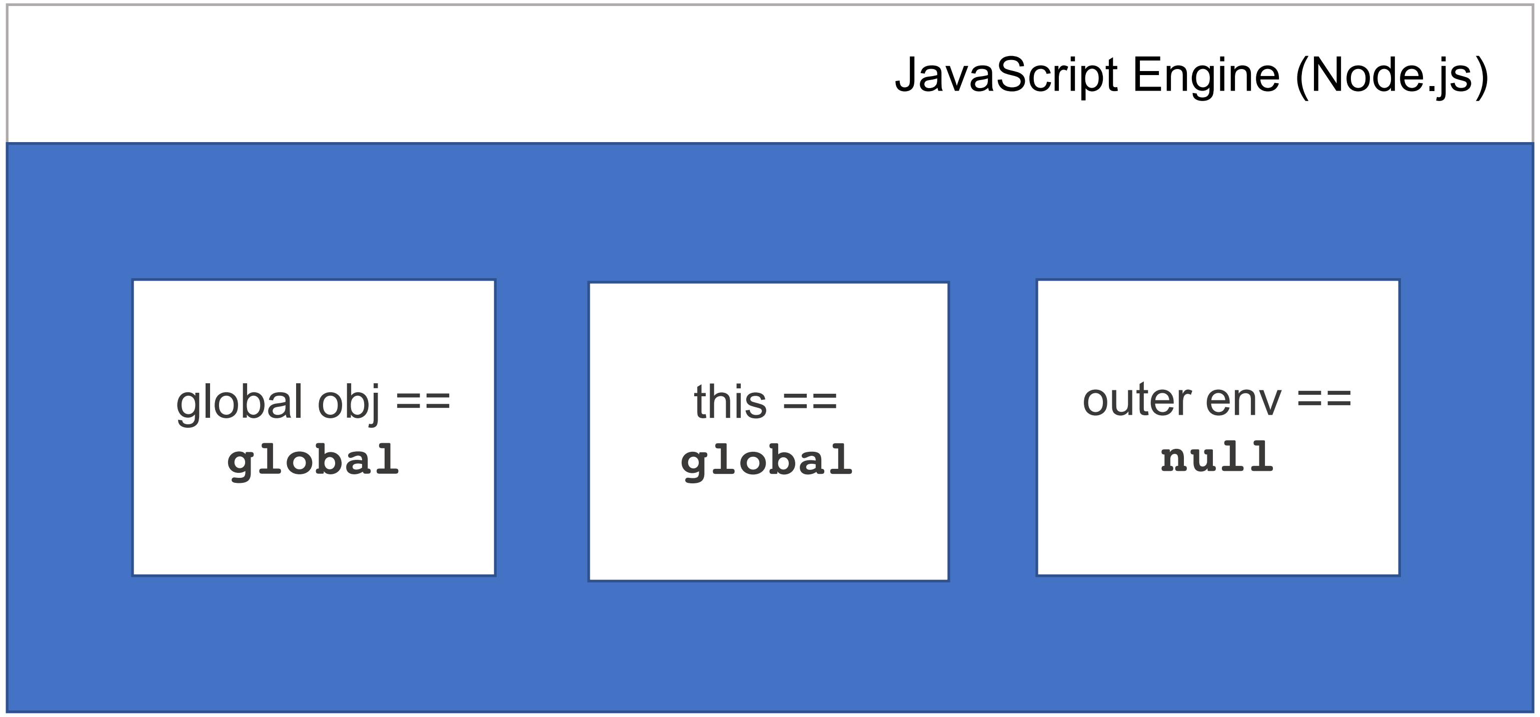


What is the Execution Context (EC)?

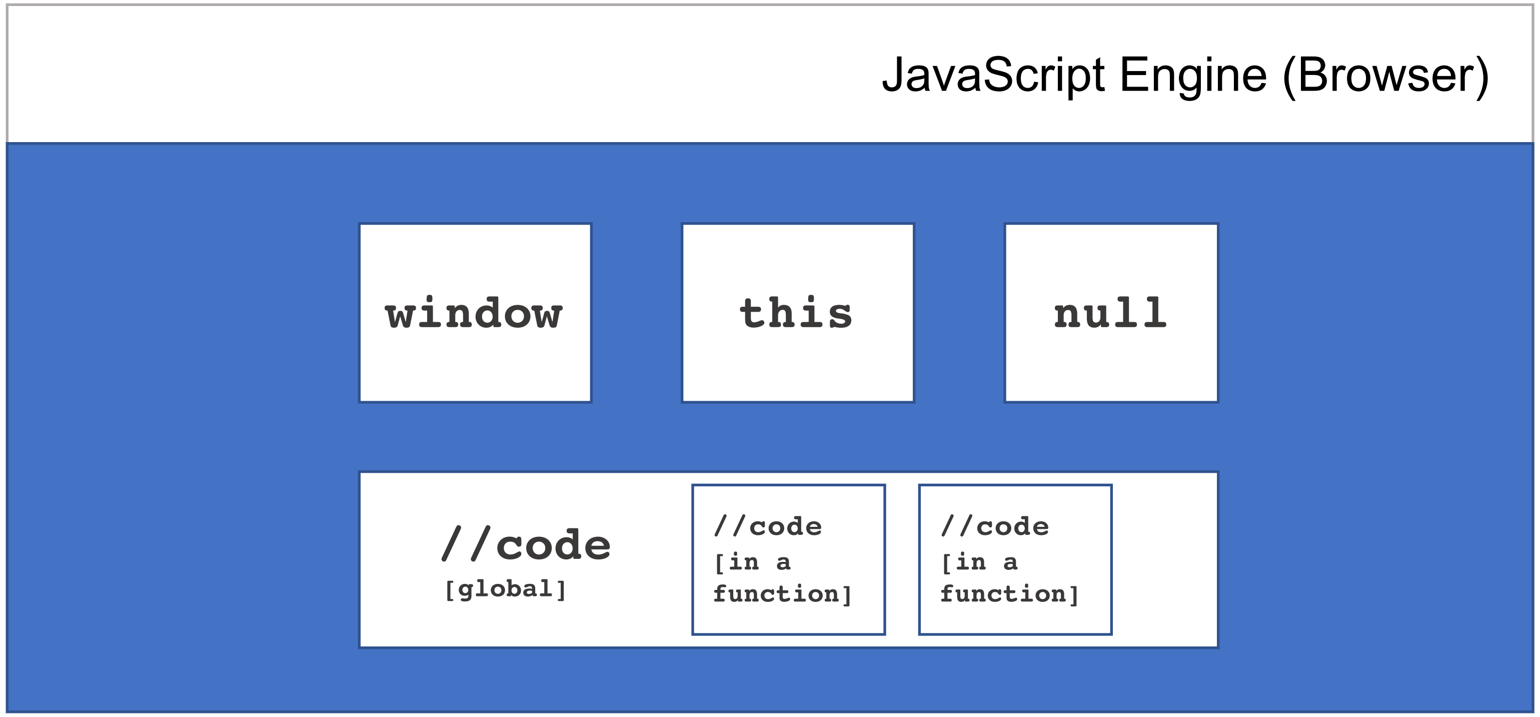
The environment in which JavaScript code is executed.

Execution Context

The environment in which JavaScript code is executed.

- This environment constitutes of variables, objects and functions available to JavaScript code being executed.
- Two important contexts:
  - Global Execution Context (default)
  - Functional Execution Context

Execution Context



What is the Execution Stack?

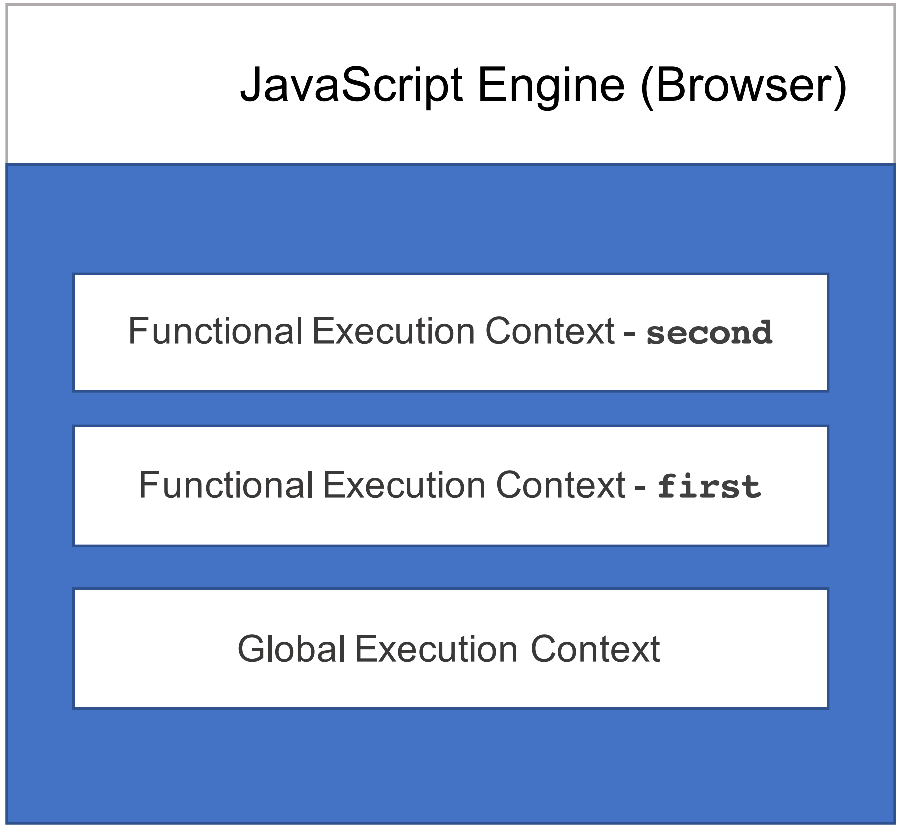
A stack with a LIFO (Last in, First out) structure, used to store all the execution context created during the code execution.

Execution Stack

```
function second() {
  // code
}

function first() {
  second();
}

first();
```

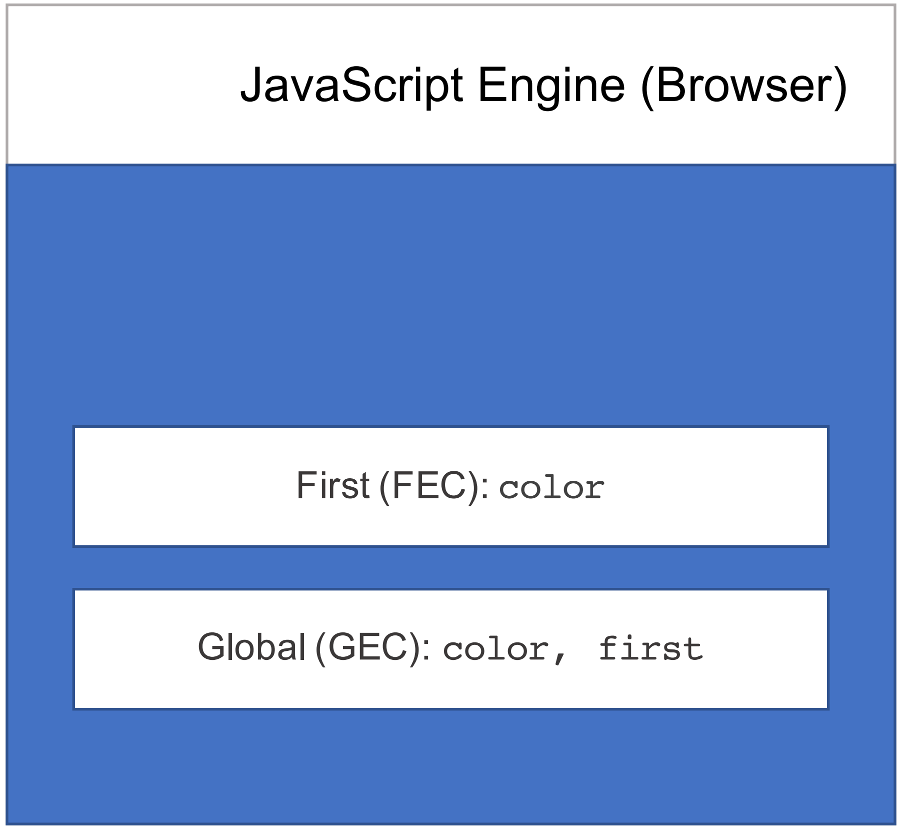

JavaScript Engine (Browser)
Functional Execution Context - second
Functional Execution Context - first
Global Execution Context

Execution Stack / Variable Environments

```
var color = 'red';

function first() {
  var color = 'green';
  console.log(color);
}

first();
console.log(color);
```

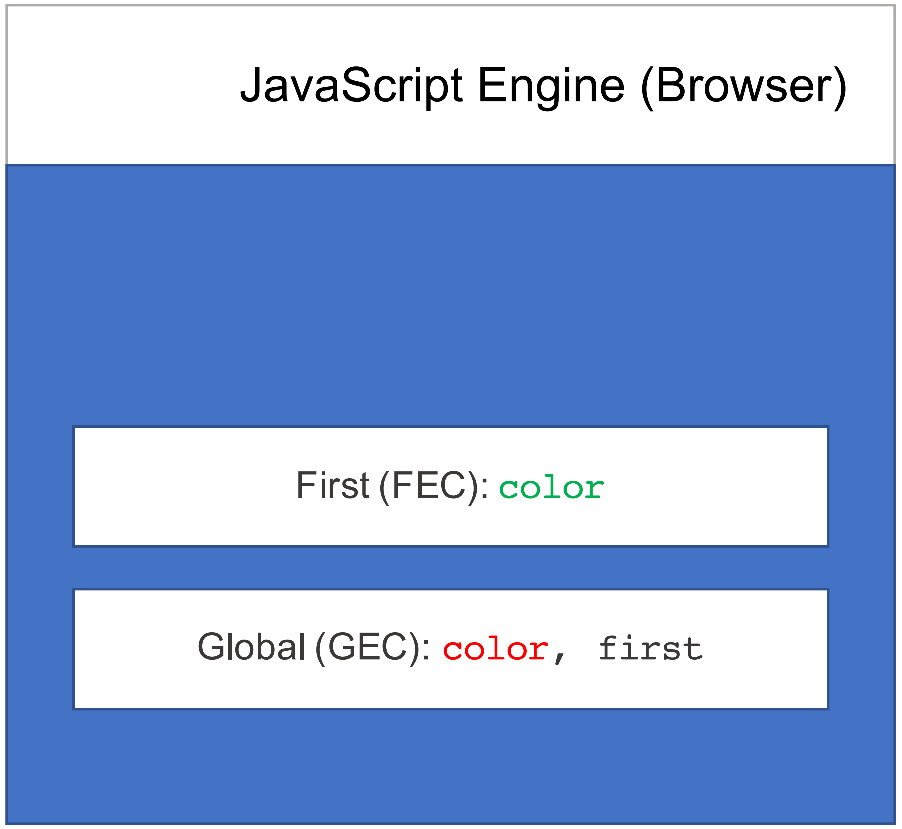


Execution Stack / Variable Environments

```
var color = ‘red’;

function first() {
  var color = ‘green’;
  console.log(color);
}

first();
console.log(color);
```

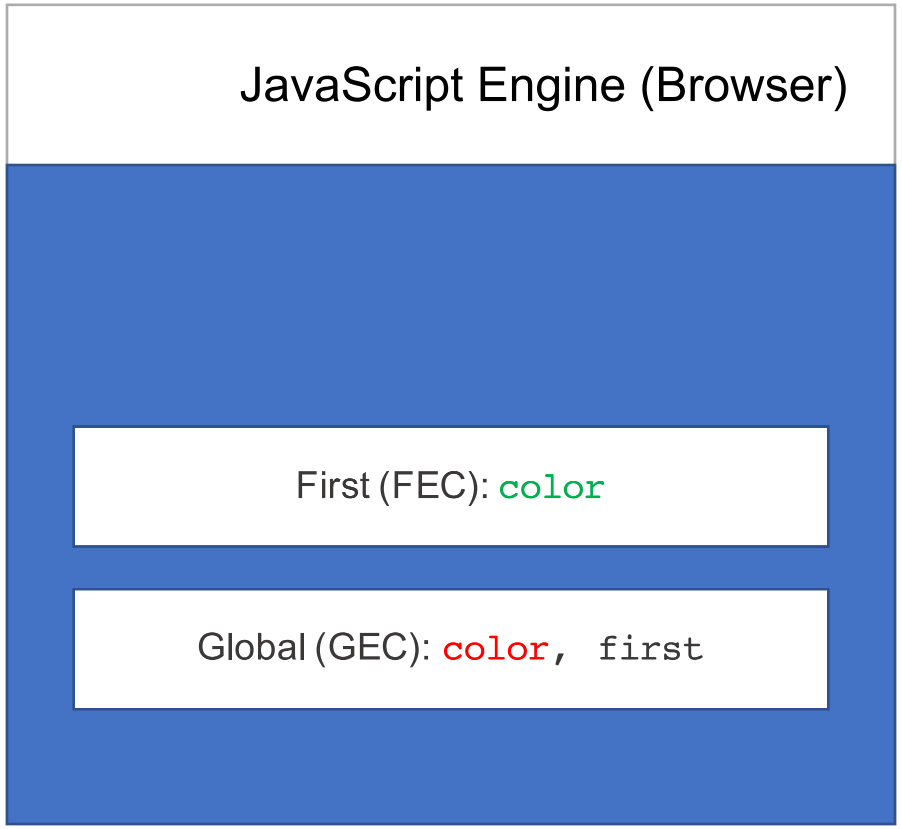


Execution Stack / Variable Environments

```
var color = ‘red’;

function first() {
  var color = ‘green’;
  console.log(color);  //green
}

first();
console.log(color);  //red
```



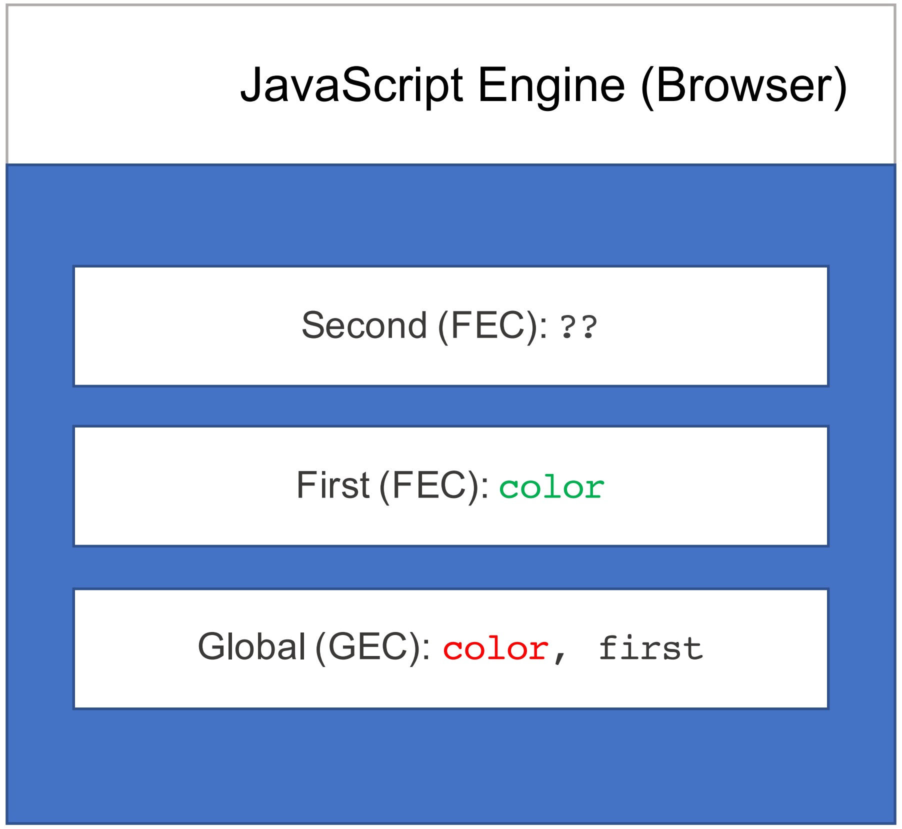
Execution Stack / Variable Environments

```
var color = 'red';

function first() {
  var color = 'green';
  console.log(color);
  second();
}

function second() {
  console.log(color);
}

first();
console.log(color);
```



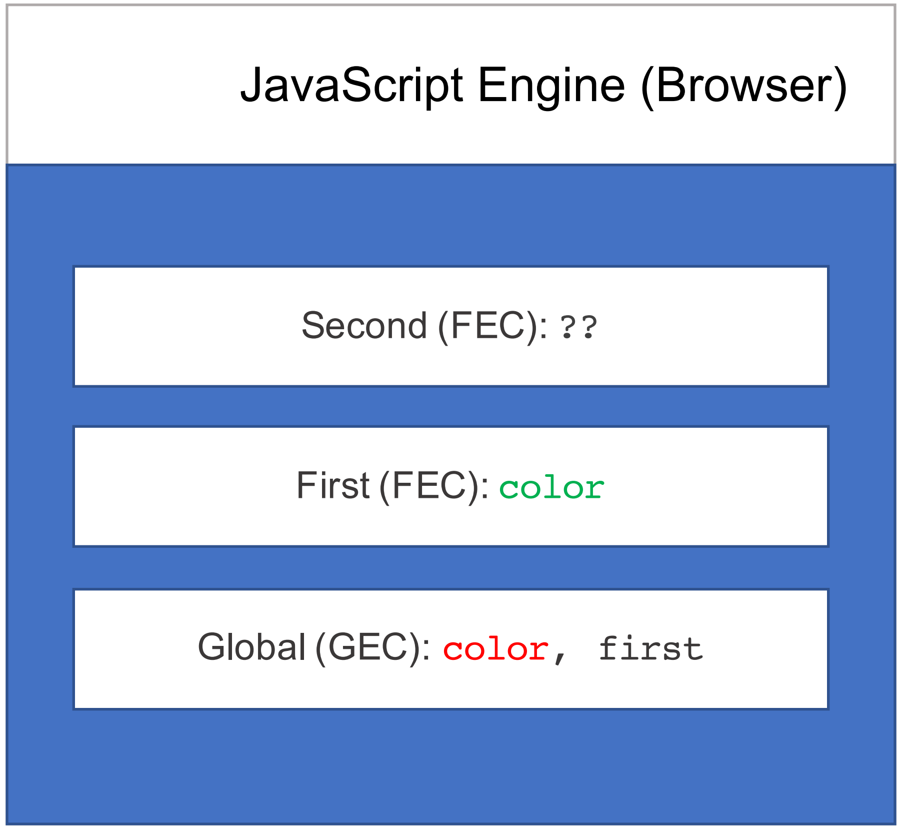
Execution Stack / Variable Environments

```
var color = ‘red’;

function first() {
  var color = ‘green’;
  console.log(color); //green
  second();
}

function second() {
  console.log(color);
}

first();
console.log(color); //red
```



Outer Environment

Environment where the code is sitting, not where it's invoked from.

Scope Chain

The scope chain is a way to link to all variables and functions that the current execution context has access to.

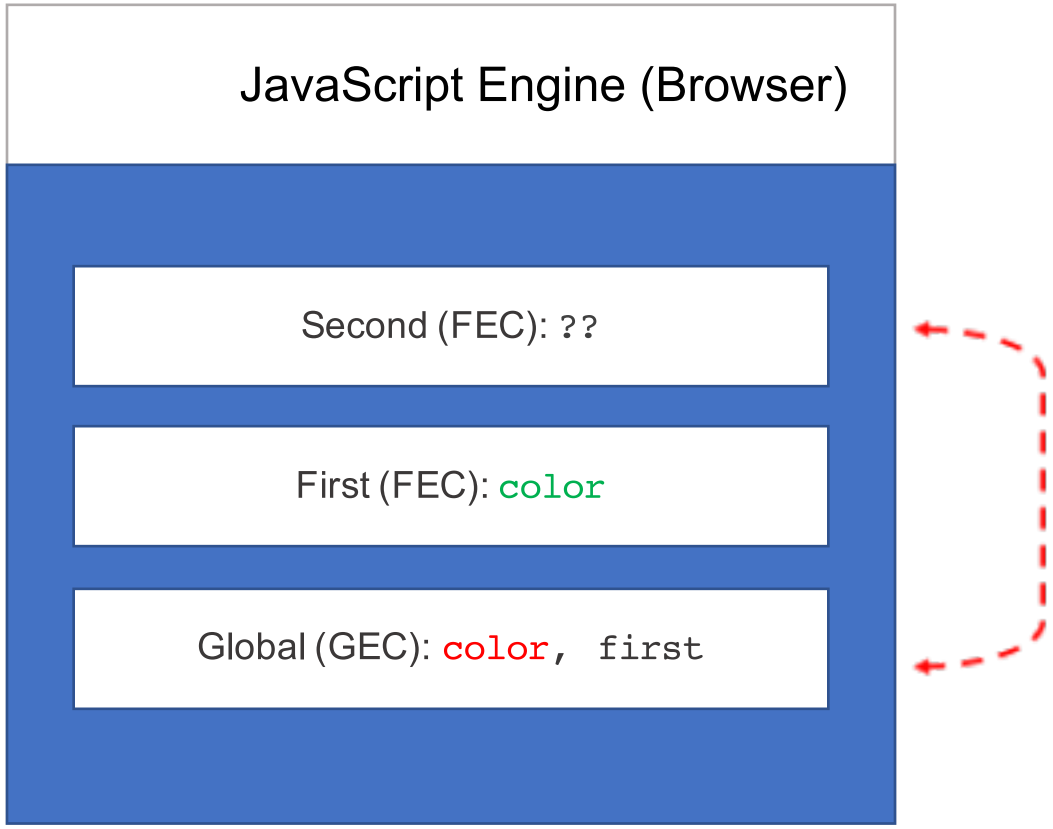
Variable Environments

```
var color = ‘red’;

function first() {
  var color = ‘green’;
  console.log(color); //green
  second();
}

function second() {
  console.log(color); //red
}

first();
console.log(color); //red
```



Hoisting vs. Execution

Hoisting is nothing but the “setup” phase, required before the code is executed.

Hoisting vs. Execution

```
var name = 'foo';

function getName() {
  console.log(name);
}

getName();
```

Hoisting Phase	Execution Phase
Allocate space for variable called **name** in memory	Assign value of **foo** to variable called **name**
Load **getName** function in memory	
// no-op	Invoke **getName** function.

Section 2

Functions and IIFEs

Learning objectives of this section:

- What are functions?
- Difference between objects and functions
- Different ways to create a function
- IIFEs and their execution context

JavaScript Functions

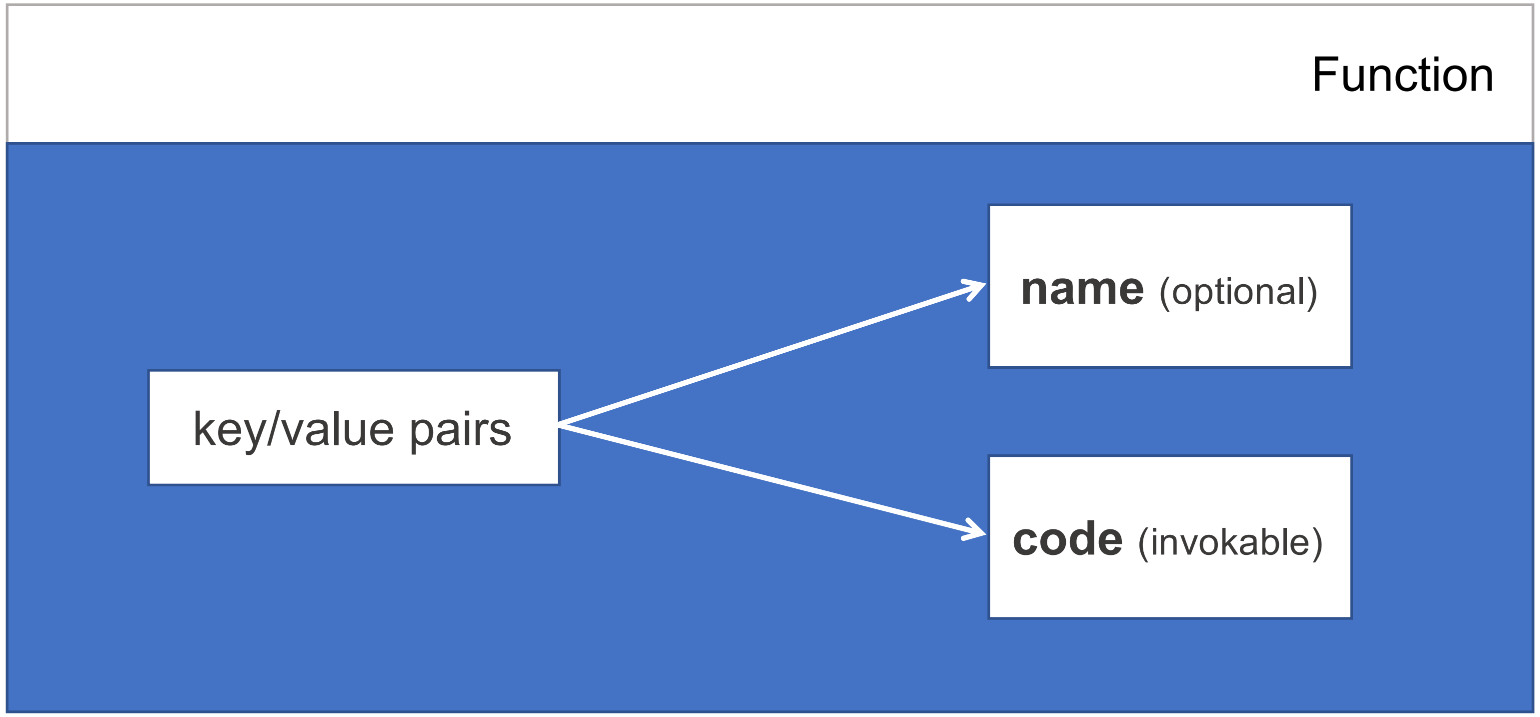
In JavaScript, functions are first-class objects.

JavaScript Functions

In JavaScript, functions are first-class objects.

- They can have properties and methods just like other objects.
- They have additional properties such as their name and code (which can be invoked)
- Can be assigned or passed around just like variables and objects

JavaScript Functions



Functions – Declaration vs. Expression

Declaration

```
function sayHi() {
  // code
}
```

Expression

```
var sayHello = function() {
  // code
}
```

IIFEs

Immediately **I**nvoked **F**unction **E**xpressions

Regular Function

```
function startGame() {
  // init()
  console.log(‘started…’);
}

startGame();
```

IIFE Example

```
(function startGame() {
  // init()
  console.log(‘started…’);
})();
```

IIFE Advantages

Immediately Invoked Function Expressions

- Prevent the global namespace from polluting in case a function is not required again
- Keep the variables required by the function to stay enclosed within the ()

Section 3

Closure + Apply, Call & Bind

Learning objectives of this section:

- How is ‘this’ decided
- Understand closure in JavaScript
- How IIFEs come to the rescue
- Using Apply, Call & Bind

JavaScript ‘this’

this

- Each function has access to a **`this`** variable.
  - It points the environment where the function is sitting
- If function is in the global execution context, then **`this`** points to the **`window`** object
- If function is within an object, then **`this`** points to that **`object`**

Closure

Anytime you create a function within an another function, you have created a closure.

Closure

Anytime you create a function within an another function, you have created a closure.

- Closure has access to the variables it needs from the enclosing function even after the enclosing function has finished executing.
- The inner function along with the variables stored in memory for a later used form the ”closure”

Apply, Call & Bind

```
var obj = {target: ‘div’}

function logTarget() {
  console.log(this.target)
}

logTarget()
```

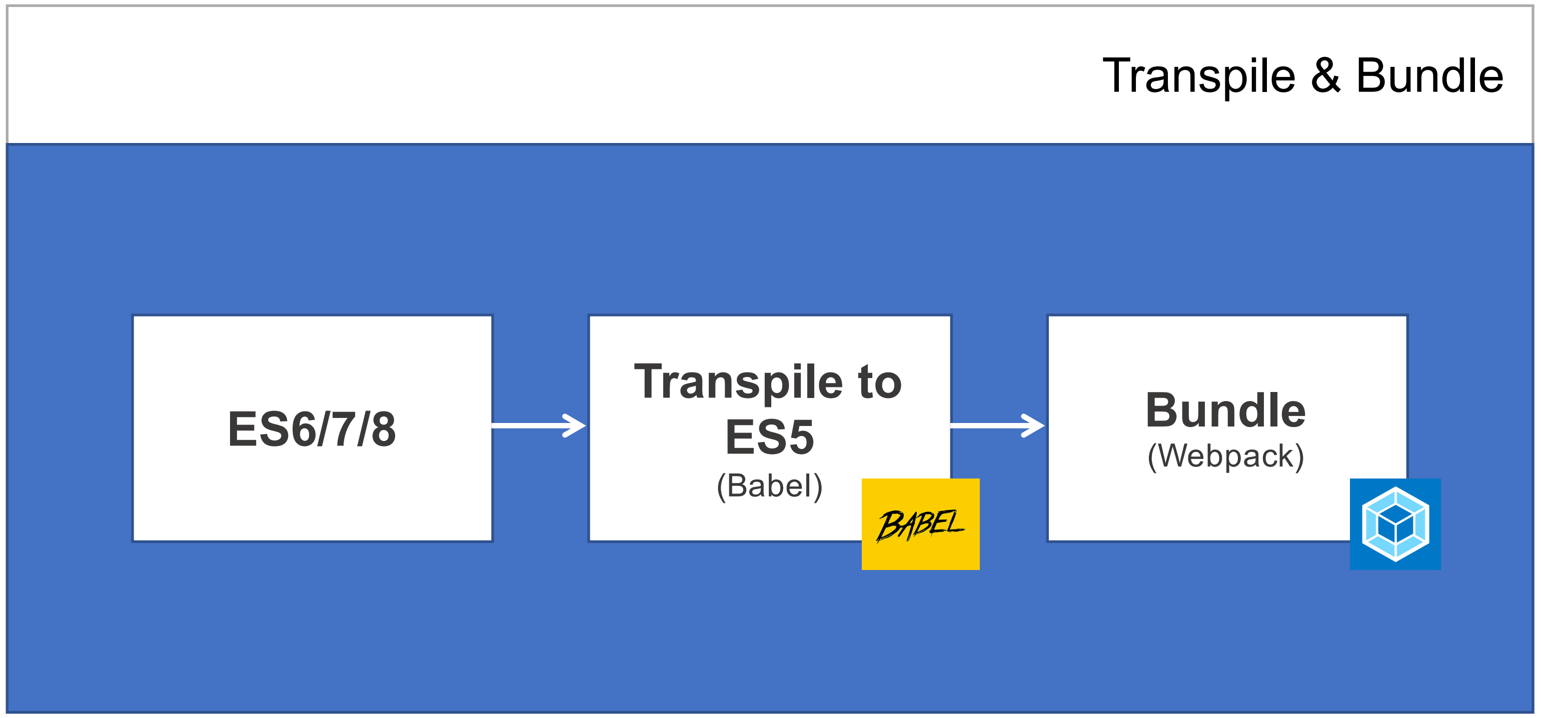
Section 4

ES6 Syntax Refresher

Learning objectives of this section:

- Const/Let
- Template Strings
- Object Literals
- Arrow Functions
- Spread Syntax
- Destructuring
- ES6 Array Methods

Setup


Transpile & Bundle
ES6/7/8
Transpile to ES5
(Babel)
BABEL
Bundle
(Webpack)

Let’s code…

4

Section 5

Classes & Inheritance

Learning objectives of this section:

- Prototype and Prototype Chain
- Prototypical Inheritance
  - ES5 Classes (old)
  - ES6 Classes (new)

What is a prototype?

5.1a

What is a prototype?

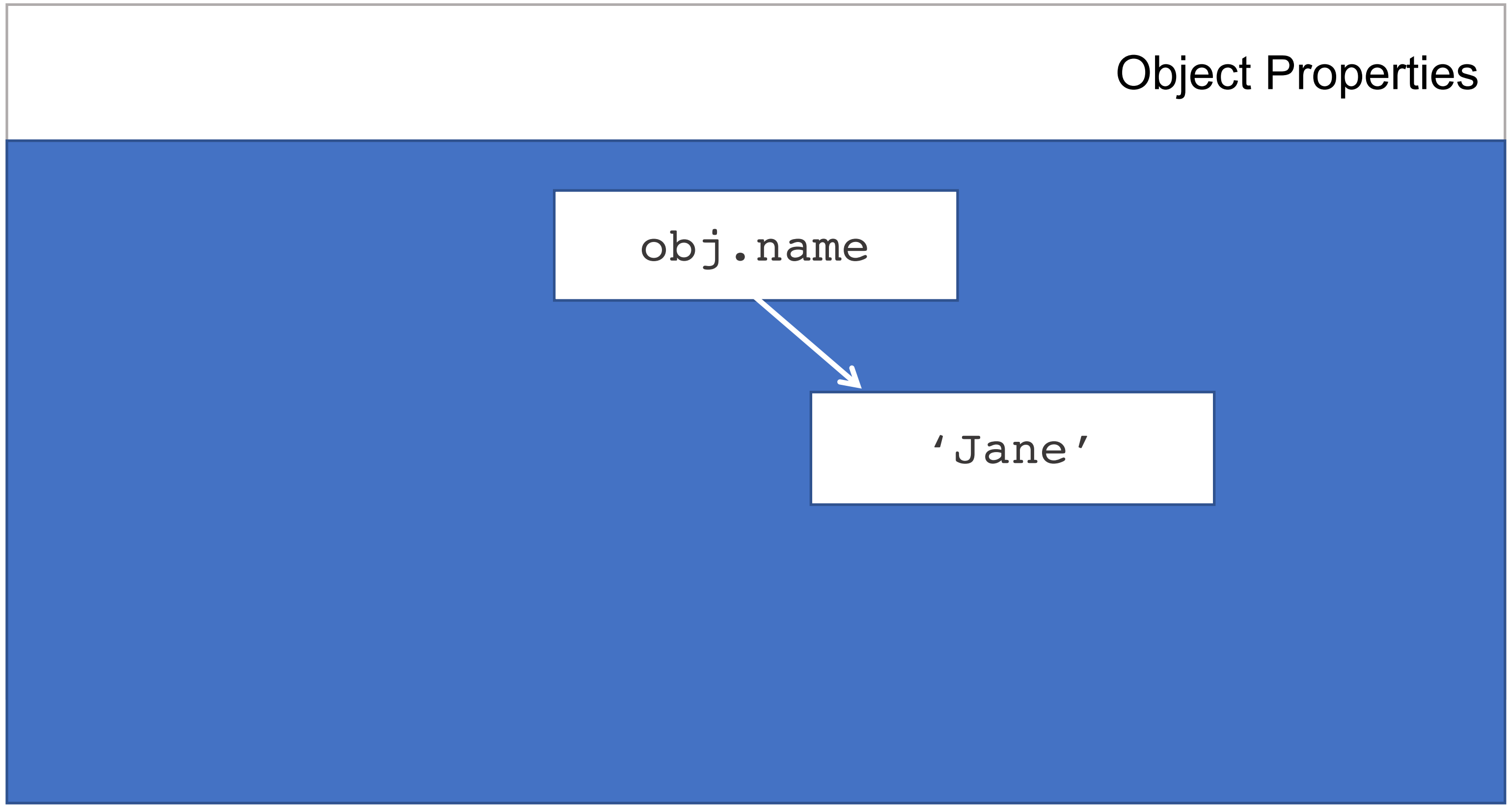
A first, typical or preliminary model of something, especially a machine, from which other forms are developed or copied.

What is a prototype in JavaScript?

Prototypes are the mechanism by which JavaScript objects inherit features from one another.

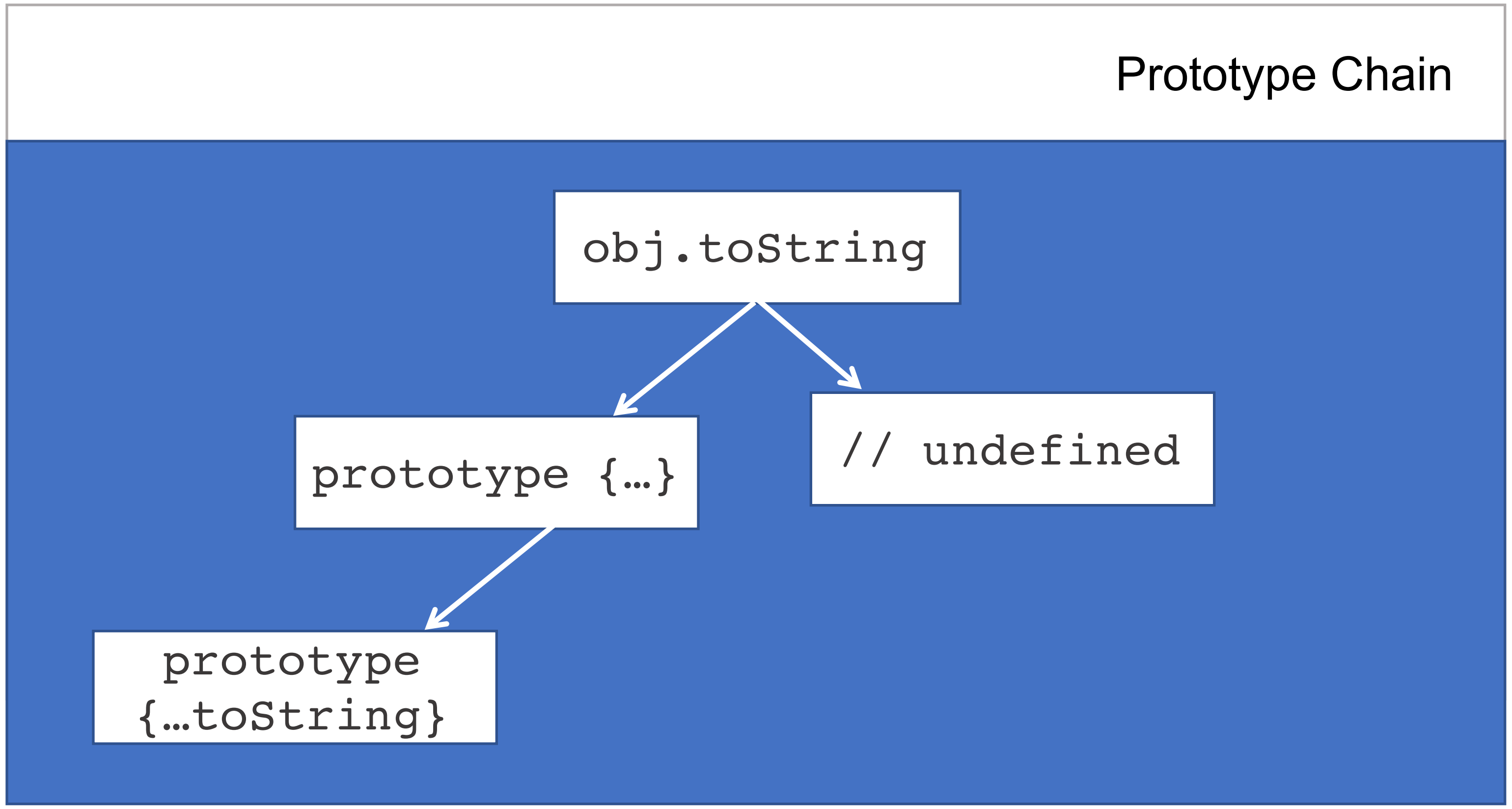
What is a prototype in JavaScript?

```
var obj = {
  name: ‘Jane’
}
```



What is a prototype in JavaScript?

```
var obj = {
  name: ‘Jane’
}
```



What is a prototype in JavaScript?

`__proto__`

What is a prototype in JavaScript?

Prototypes are the mechanism by which JavaScript objects inherit features from one another.

Everything is an Object!

How to tell if a property is on the object or proto?

```
var obj = {
   name: ‘Jane’
}
```

```
obj.hasOwnProperty(‘name’);
// true

obj.hasOwnProperty(‘toString’);
// false
```

Why bother about prototypes?

5.1d

Classes

5.2

Section 6

1. Objects, Hoisting and Execution
2. Functions and IIFEs
3. Closure, Apply/Call/Bind
4. ES6 Syntax Refresher
5. Classes & Inheritance
6. Design Patterns
7. Async Programming

Design Patterns

Learning objectives of this section:

- Module Pattern
- Revealing Module Pattern
- Singleton

Design Patterns

A design pattern is a general repeatable solution to a commonly occurring problem in software design.

Why learn design patterns?

A design pattern is a general repeatable solution to a commonly occurring problem in software design.

- No need to re-invent the wheel
- Read faster by recognizing patterns
- Shared vocabulary
- Consistency in large code bases

Why learn design patterns?

A design pattern is a general repeatable solution to a commonly occurring problem in software design.

Let’s code…

6

Section 7

1. Objects, Hoisting and Execution
2. Functions and IIFEs
3. Closure, Apply/Call/Bind
4. ES6 Syntax Refresher
5. Classes & Inheritance
6. Design Patterns
7. Async Programming

Async Programming

Learning objectives of this section:

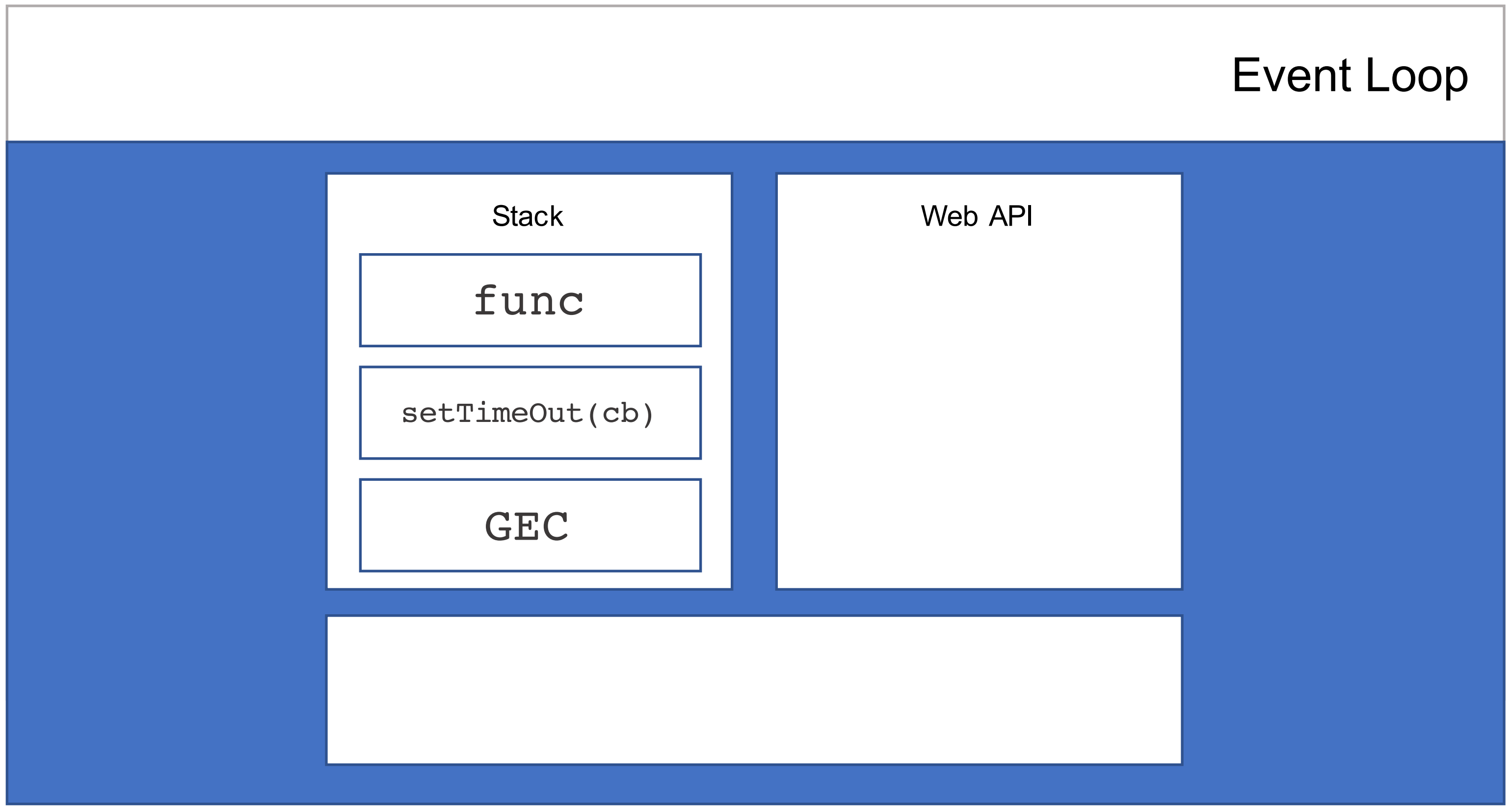
- JavaScript Event Loop
- Callbacks
- Callback Hell
- Promises
- Using Promises
- Async/Await

What is a Web API?

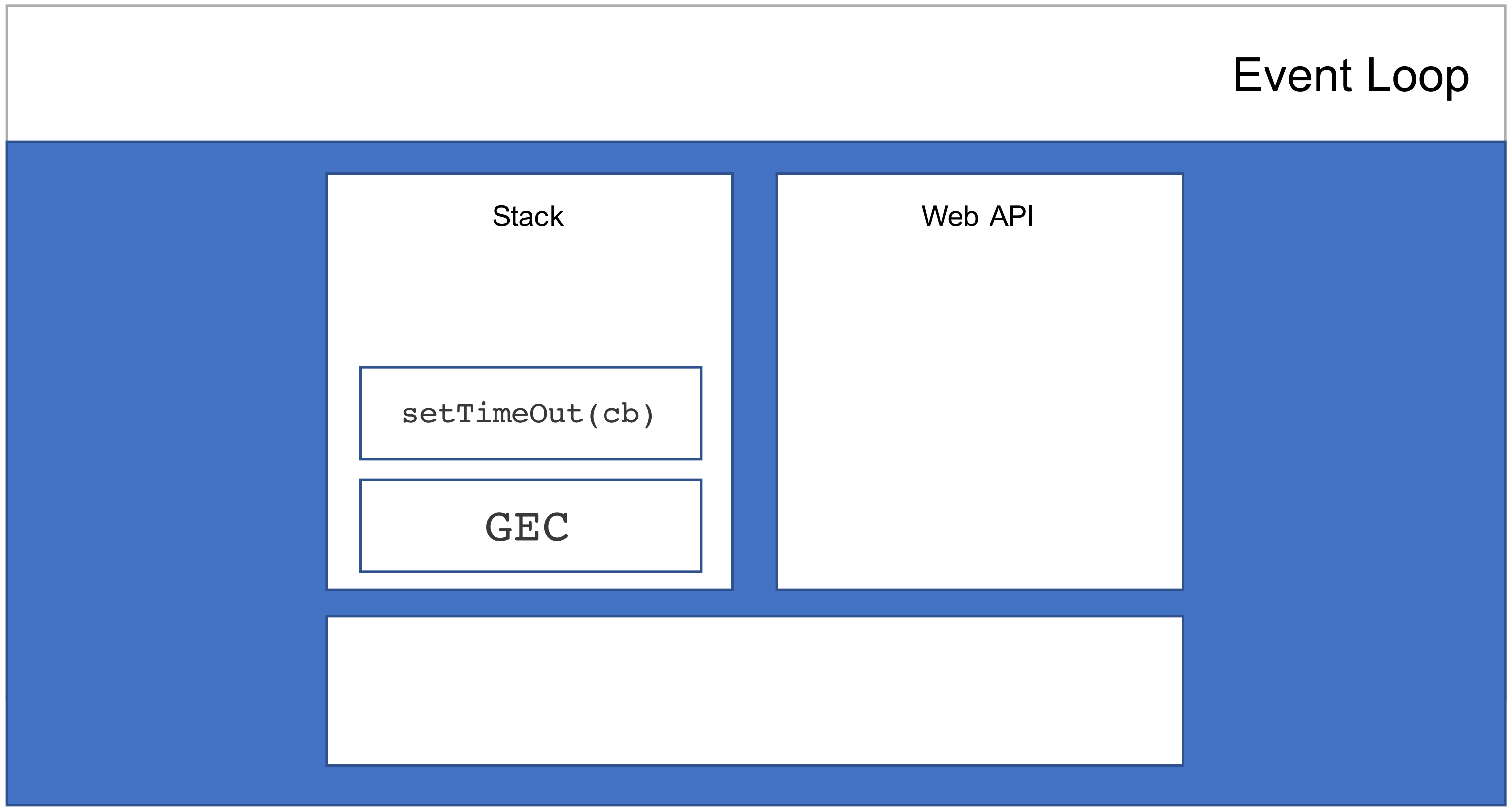
A Web API, in the context of the browser, simply is an API, provided by the browser and that we can communicate with using JavaScript in order to solve our front-end problems.

Even though these APIs are accessible with JavaScript, their implementation is in the language that the browser uses, for example, for Google Chrome it is C++.

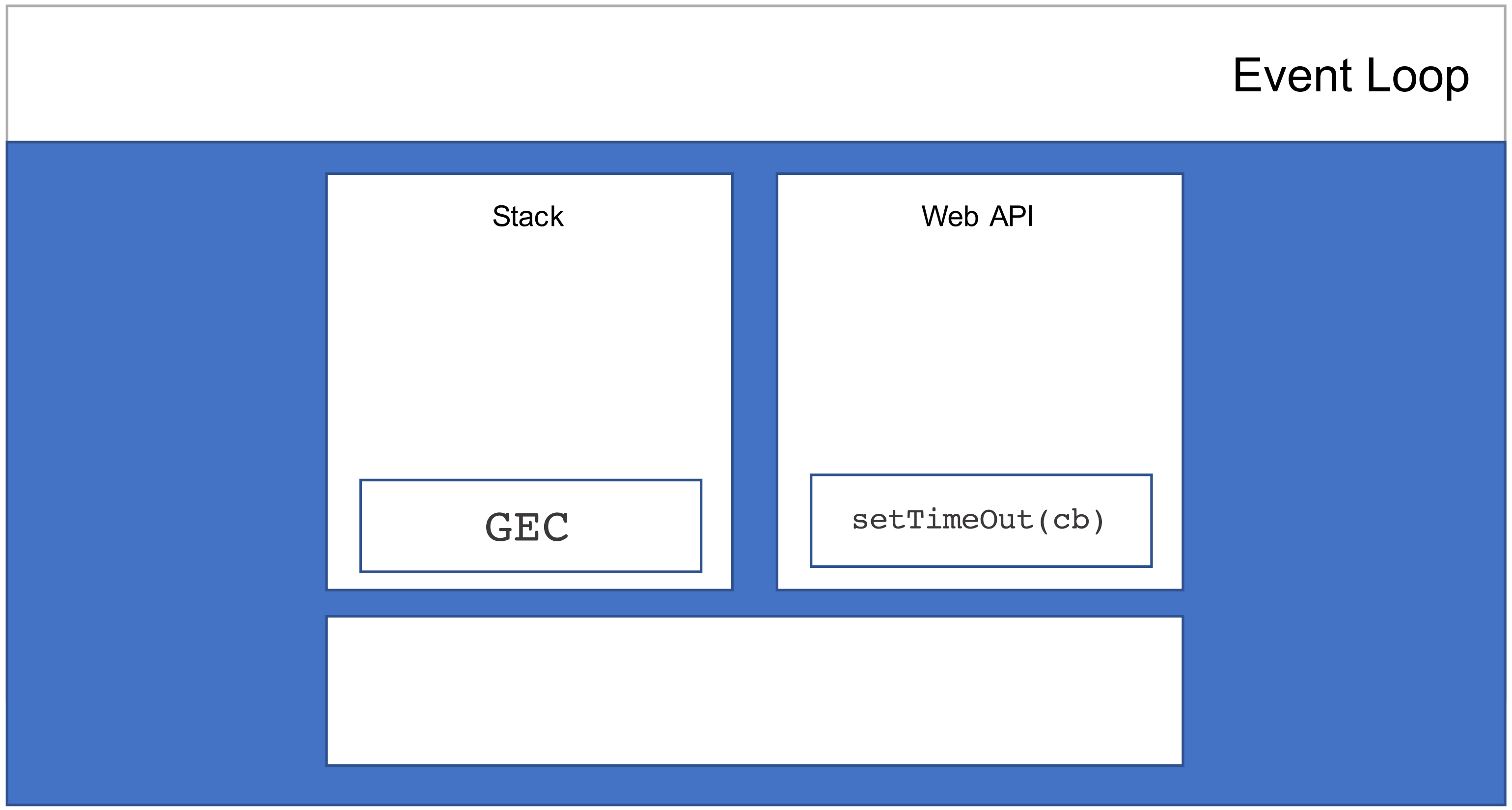
JavaScript Event Loop



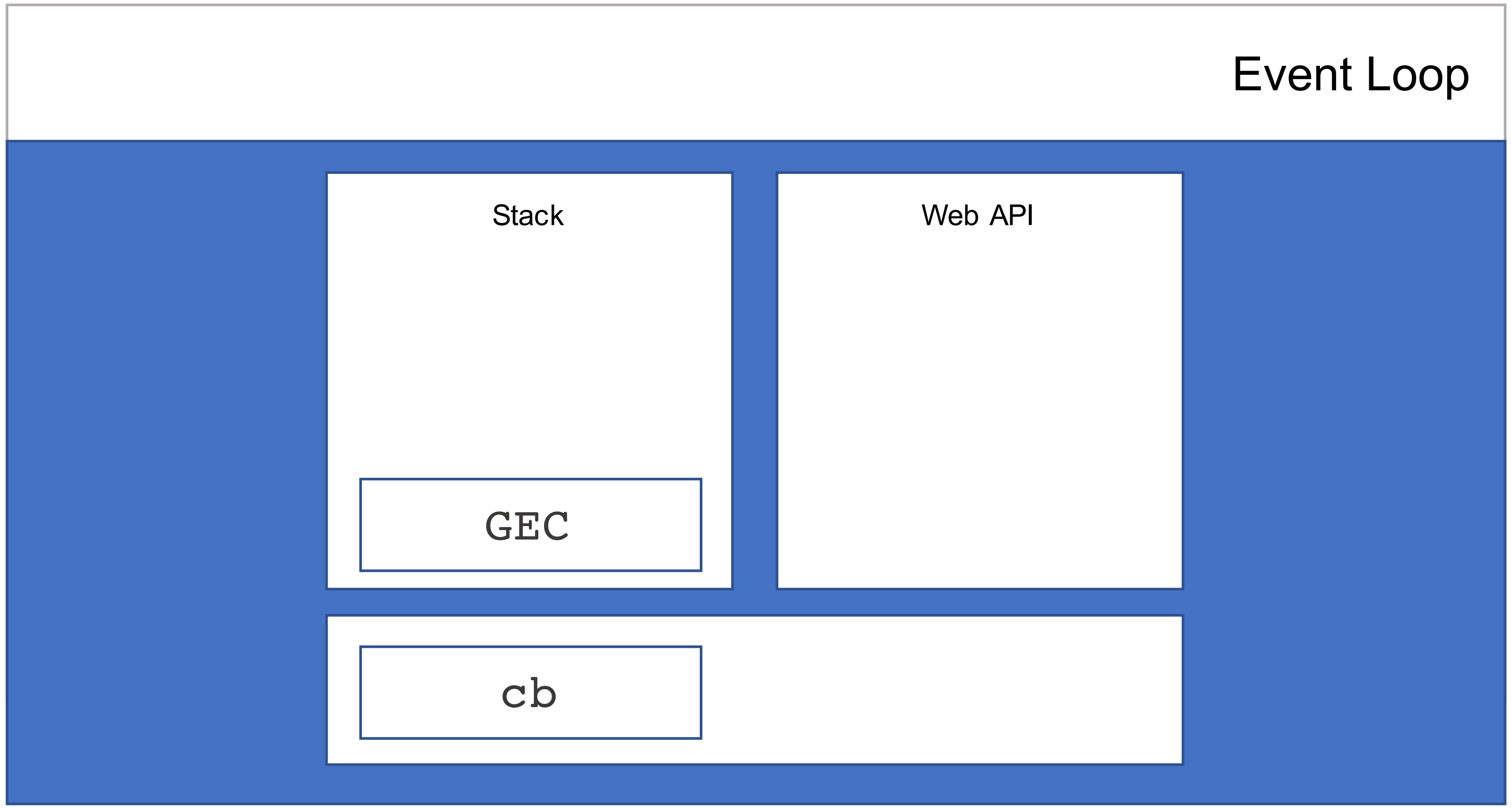
JavaScript Event Loop



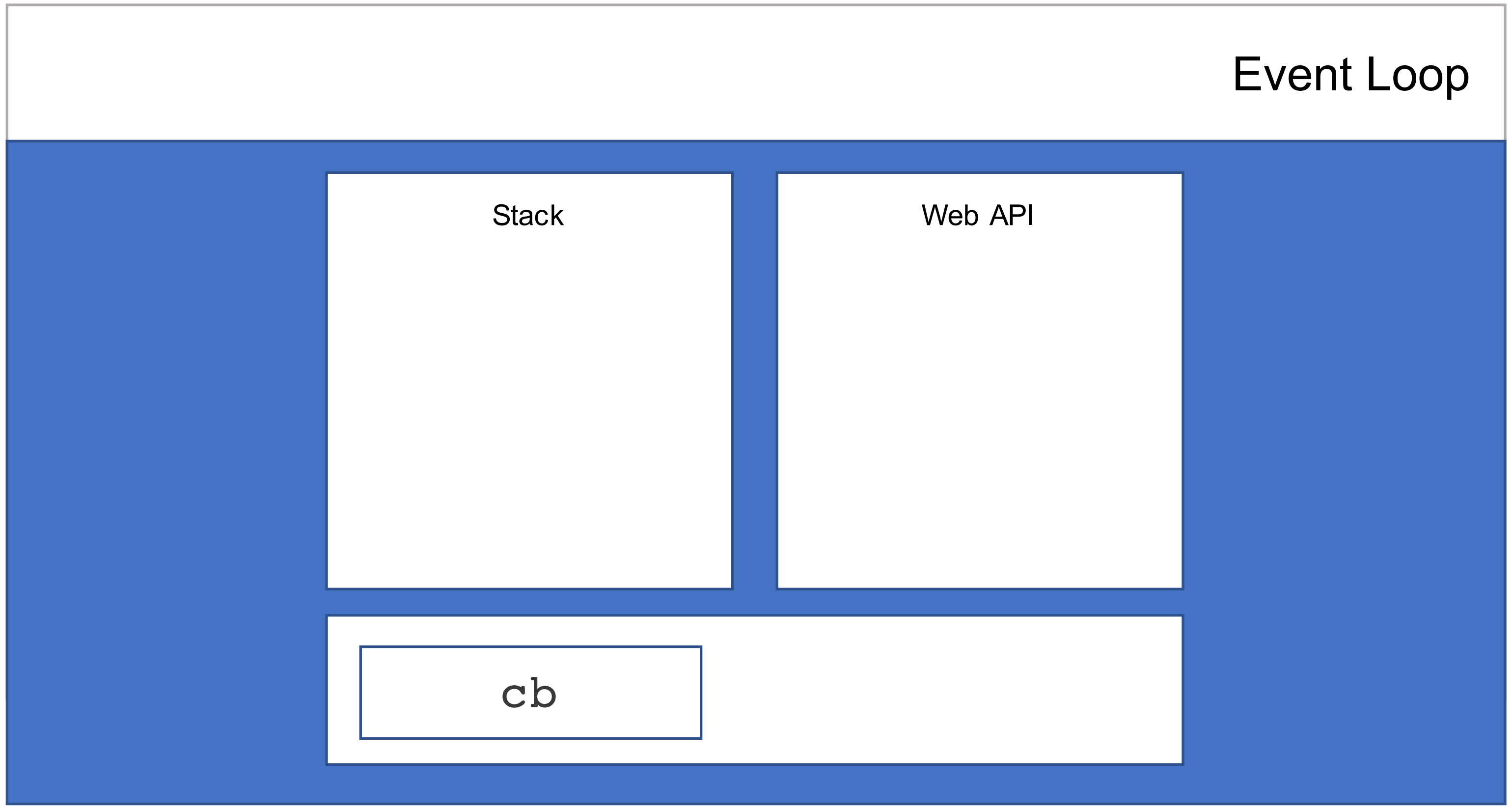
JavaScript Event Loop



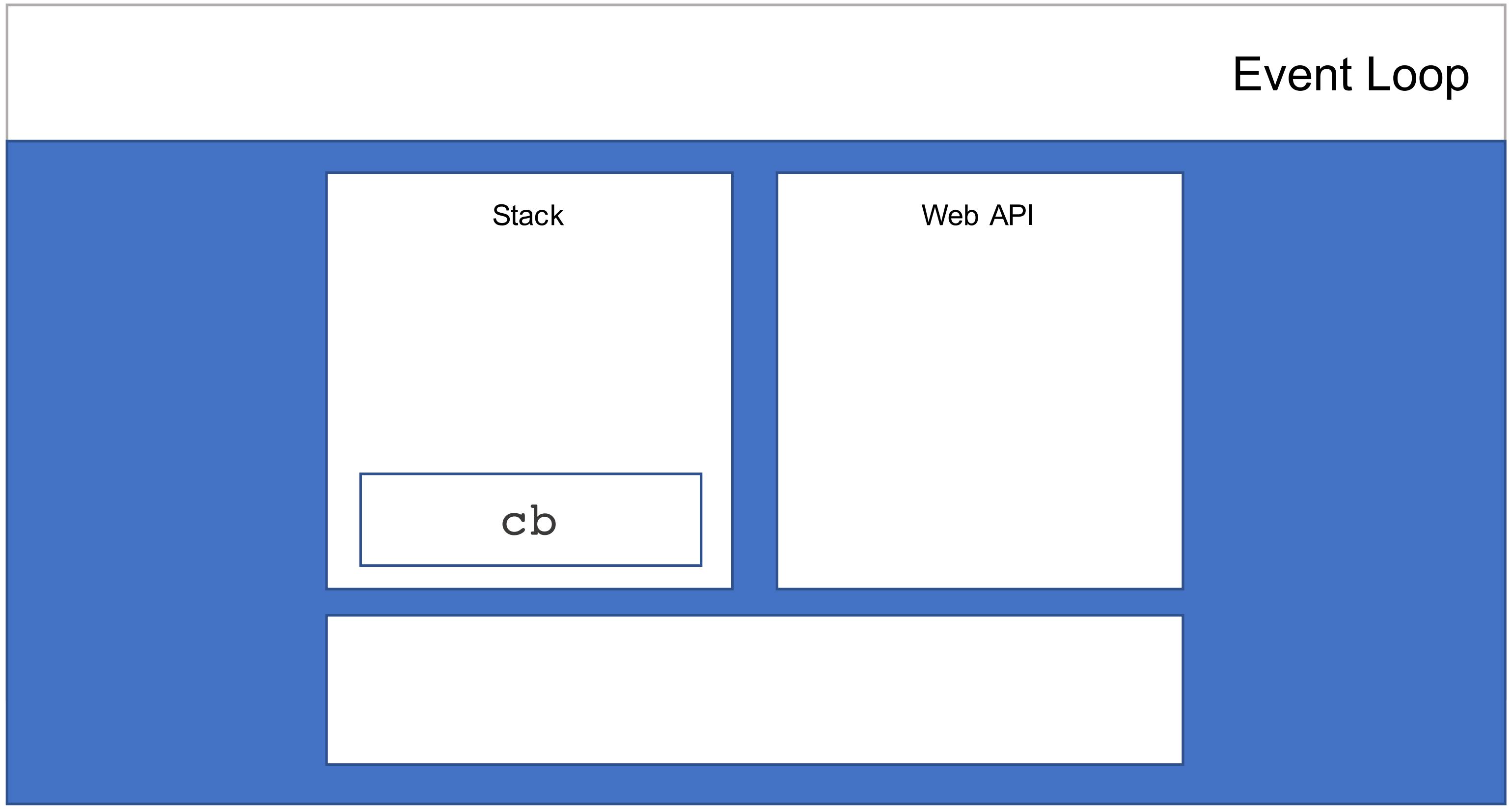
JavaScript Event Loop



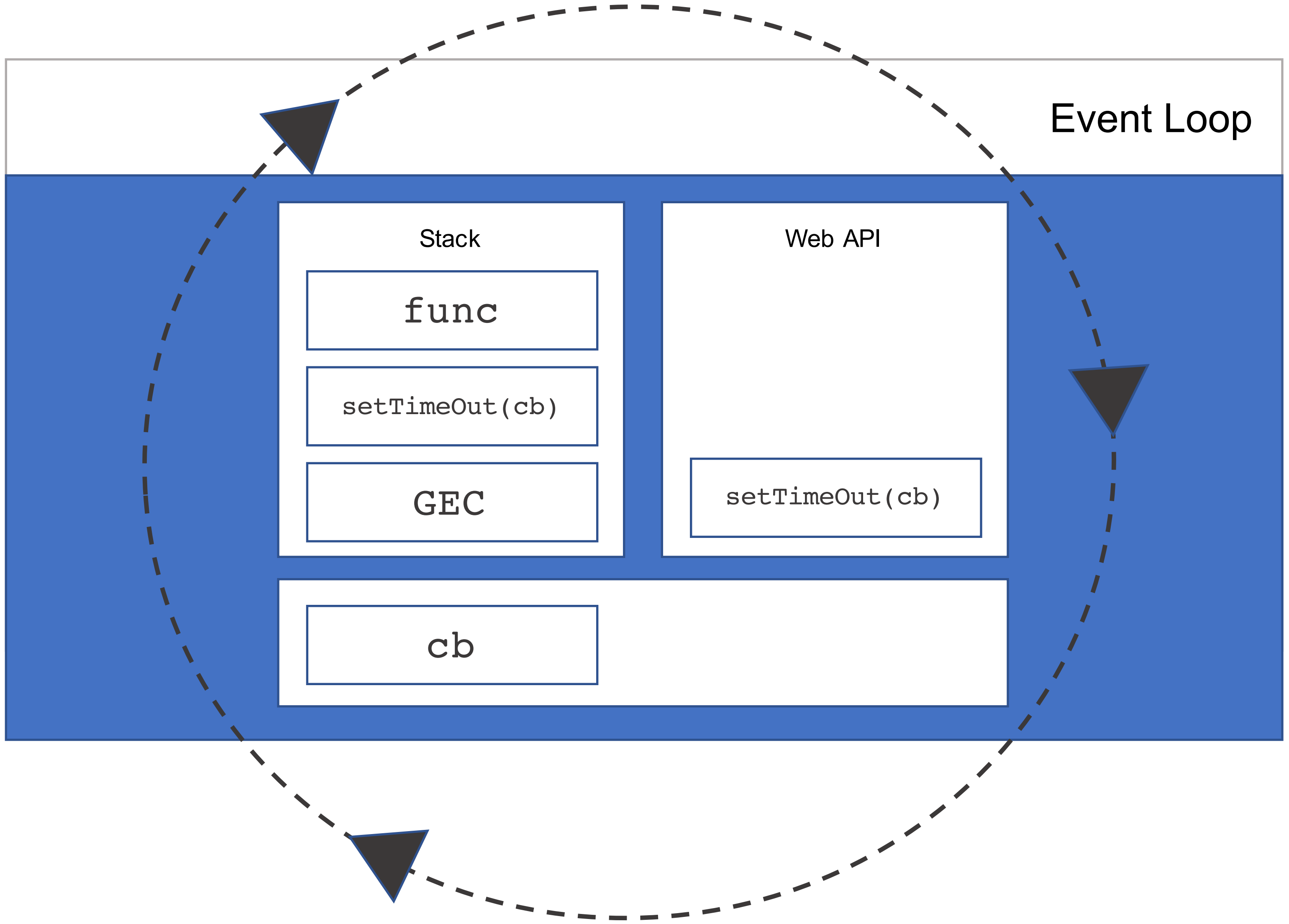
JavaScript Event Loop



JavaScript Event Loop



JavaScript Event Loop



Let’s code…

7.2

Summary

- ✓ Objects, Hoisting and Execution
- ✓ Functions and IIFEs
- ✓ Closure, Apply/Call/Bind
- ✓ ES6 Syntax Refresher
- ✓ Classes & Inheritance
- ✓ Design Patterns
- ✓ Async Programming

Contact Information

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Please fill out the survey!

Thank You!

Resources

- https://github.com/airbnb/javascript
- https://devdocs.io/javascript/
- https://developer.mozilla.org/en-US/docs/Web/JavaScript
- https://www.codecademy.com/catalog/language/javascript