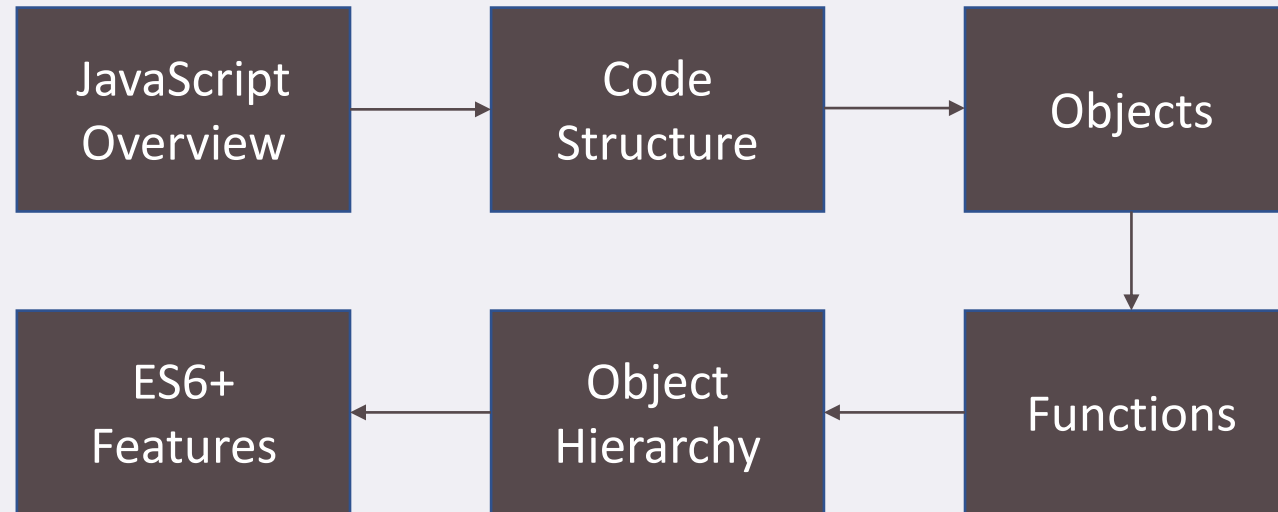


JAVASCRIPT

THE SCRIPTING LANGUAGE FOR WEB PROGRAMMING

TRAINING AGENDA



SOME QUICK CONSIDERATIONS BEFORE WE START

You need to code along with me!

Try all the coding challenges!

If you want the concepts to stick, take notes. Notes on code syntax, notes on theory concepts, notes on everything!

Before moving on from a topic, make sure that you understand exactly what was covered.

If you have an error or a question, start by trying to solve it yourself!

Most importantly, have fun!

JAVASCRIPT FUNDAMENTALS

A BRIEF INTRODUCTION TO JAVASCRIPT

WHAT IS JAVASCRIPT?

JAVASCRIPT IS A HIGH-LEVEL,
OBJECT-ORIENTED, MULTI-PARADIGM
PROGRAMMING LANGUAGE.

We don't have to worry about complex stuff like memory management

We can use different styles of programming

Based on objects, for storing most kinds of data

Instruct computer to do things

JAVASCRIPT FEATURES

HIGH-LEVEL

PROTOTYPE-BASED
OBJECT-ORIENTED

MULTI-PARADIGM

INTERPRETED OR
JUST-IN-TIME
COMPILED

DYNAMIC

SINGLE-THREADED

NON-BLOCKING
EVENT LOOP

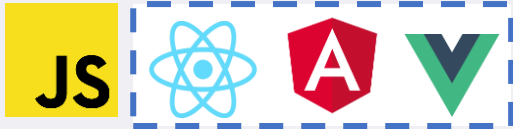
FIRST-CLASS
FUNCTIONS

GARBAGE-
COLLECTED

THERE IS NOTHING YOU CAN'T DO WITH JAVASCRIPT

FRONT-END APPS

Dynamic effects and
web applications in the
browser



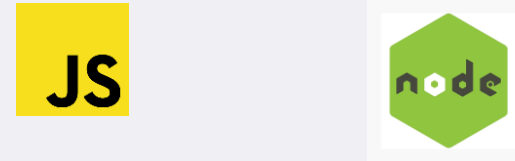
100% based on JavaScript.
They might go away,
but JavaScript won't!

Native mobile
applications

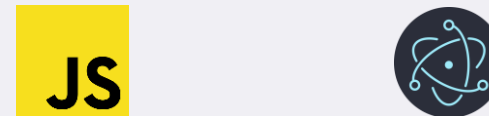


BACK-END APPS

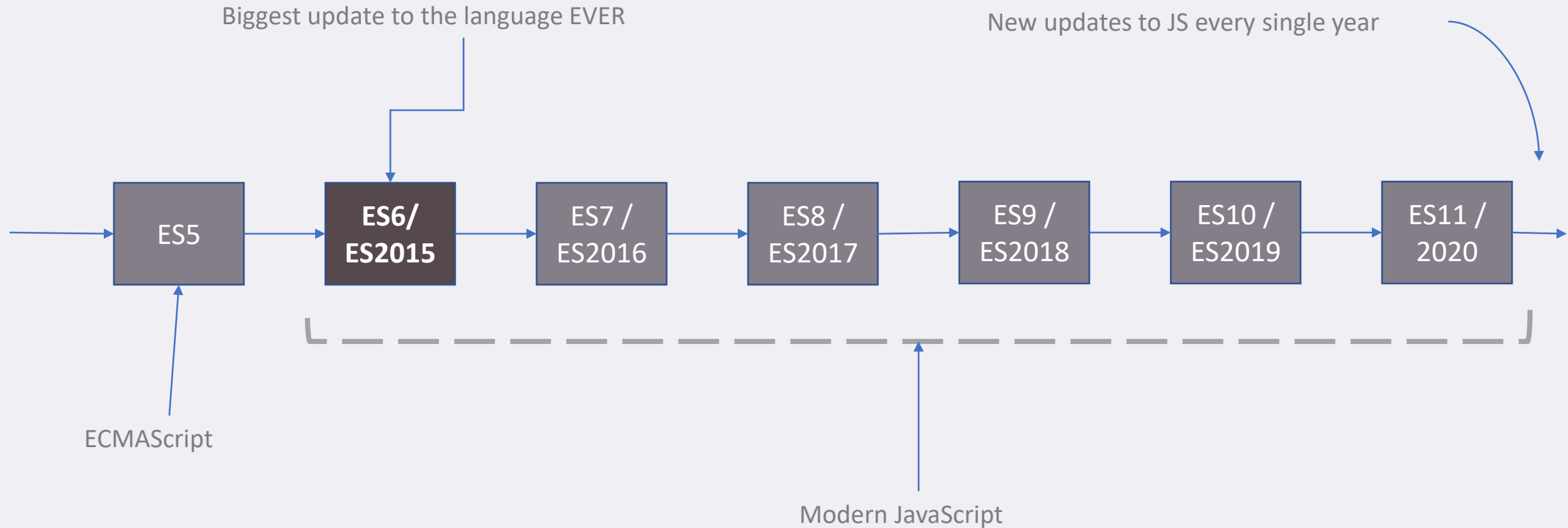
Web applications on
web servers



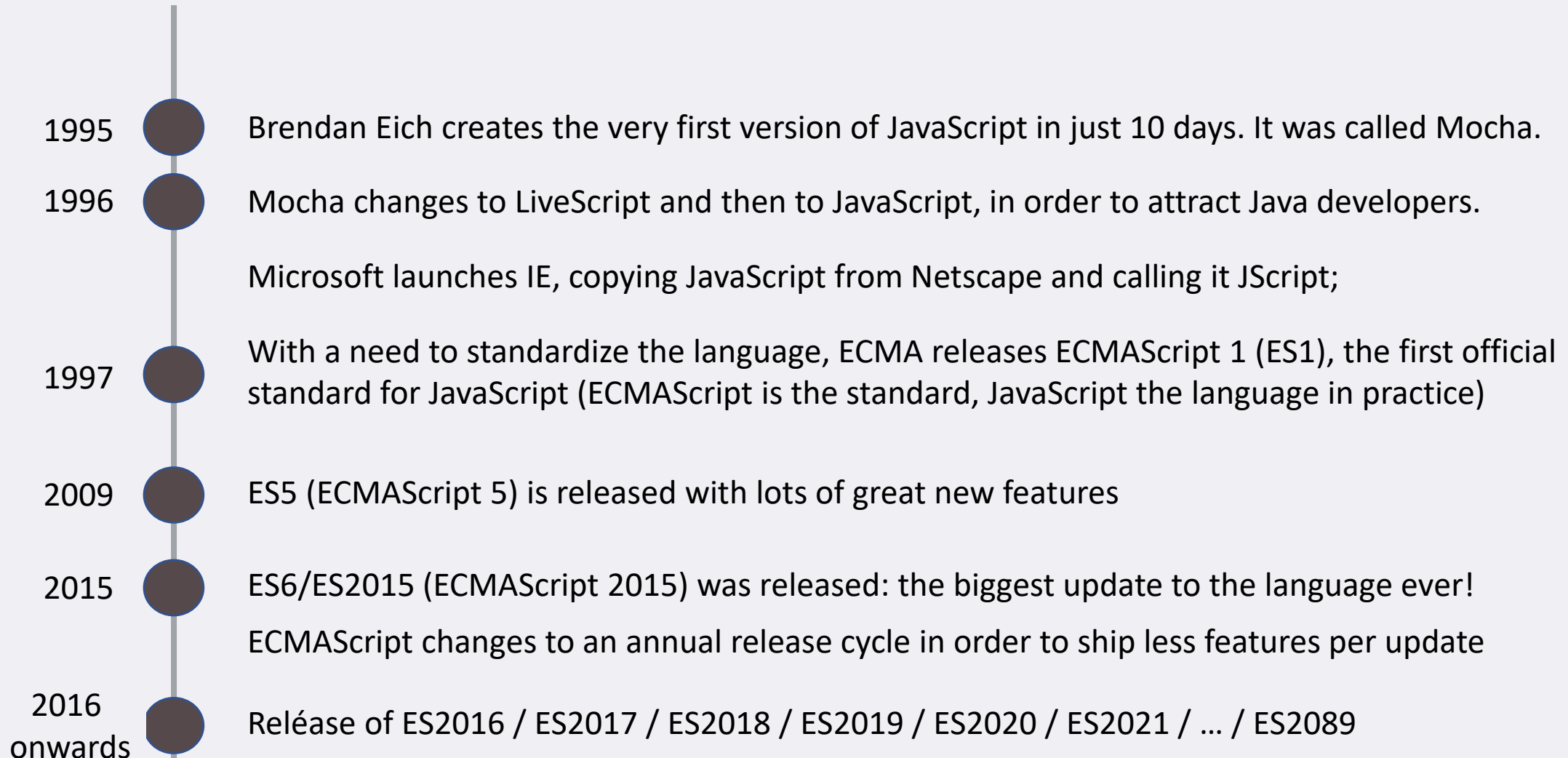
Native desktop
applications



JAVASCRIPT RELEASES...



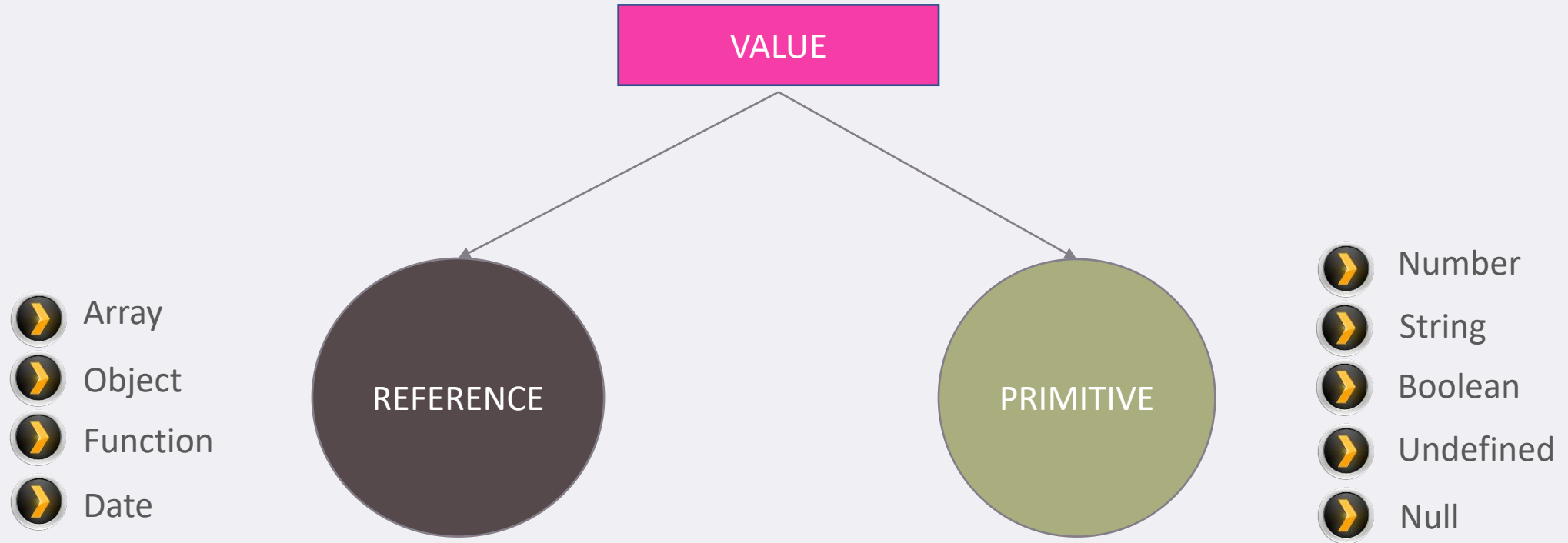
A BRIEF HISTORY OF JAVASCRIPT



DATA TYPES

LET'S GIVE IT A TYPE

OBJECTS AND PRIMITIVES

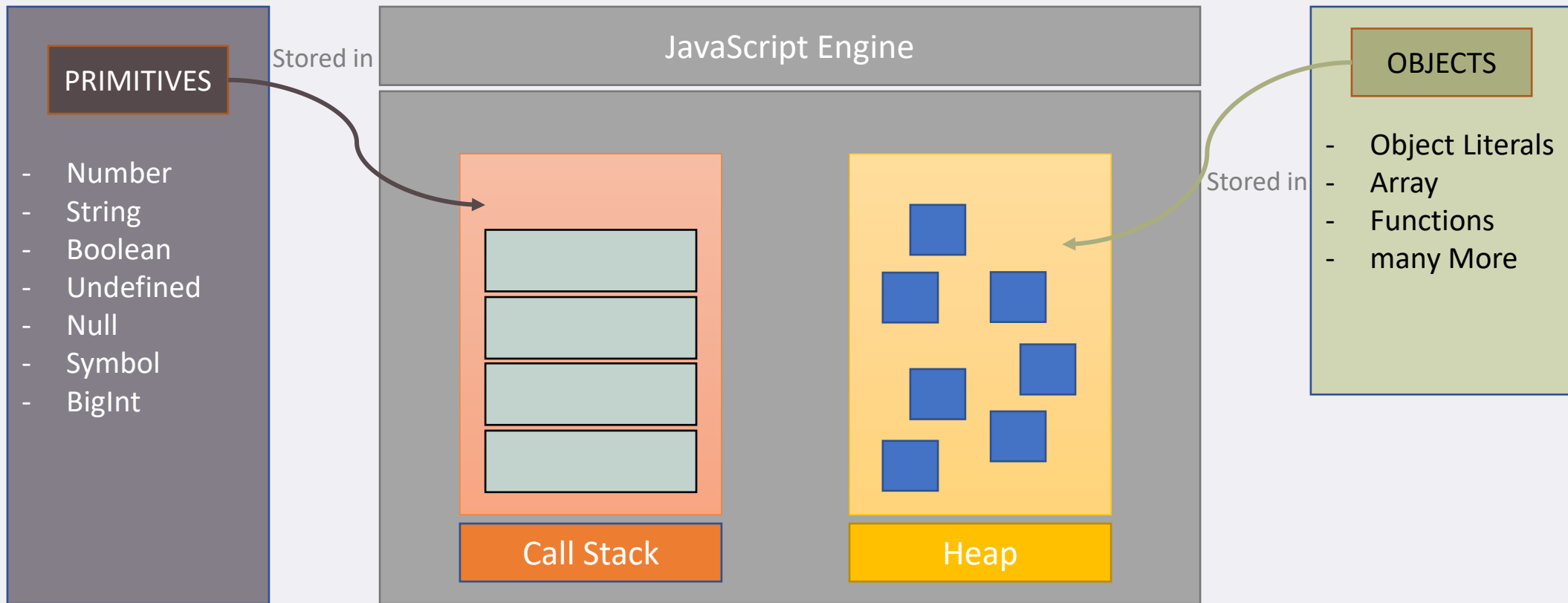


THE 7 PRIMITIVE DATA TYPES

Number	Floating point numbers. Used for decimals and integers
String	Sequence of characters. Used for text
Boolean	Logical type that can only be true or false. Used for taking decisions
Undefined	Value taken by a variable that is not yet defined ('empty value')
Null	Also means 'empty value'
Symbol (ES2015)	Value that is unique and cannot be changed
BigInt (ES2020)	Larger integers than the Number type can hold

JavaScript has dynamic typing: We do not have to manually define the data type of the value stored in a variable. Instead, data types are determined automatically.

PRIMITIVES, OBJECTS AND THE JAVASCRIPT ENGINE



MISCELLANEOUS TOPICS

CONCEPTS FROM GROUND ZERO

MISCELLANEOUS TOPICS

let, const &
var

Operators &
Precedence

Strings &
Template
Literals

Type
Conversion &
Coercion

Conditional &
Loops

Document
Object Model

DATA STRUCTURE

STORING DATA IN OBJECT AND ARRAY

OBJECTS & ARRAYS

Objects

represented by Flower Brackets – { }

- The Object type represents one of JavaScript's data types
- It is used to store various keyed collections and more complex entities
- Objects can be created using the Object() constructor or the object initializer / literal syntax

Arrays

represented by Square Bracket - []

- The Array object, as with arrays in other programming languages, enables storing a collection of multiple items under a single variable name, and has members for performing common array operations

WORKING WITH ARRAY

A COLLECTION OF MULTIPLE ITEMS UNDER A SINGLE VARIABLE NAME

ARRAY IN JAVASCRIPT

The Array object, as with arrays in other programming languages, enables storing a collection of multiple items under a single variable name, and has members for performing common array operations.

JavaScript arrays are resizable and can contain a mix of different data types

JavaScript arrays are not associative arrays and so, array elements cannot be accessed using strings as indexes

JavaScript arrays are zero-indexed

JavaScript array-copy operations create shallow copies

WHICH ARRAY METHOD TO USE?

I WANT ...

TO MUTATE ORIGINAL ARRAY

- Add methods -
 - push()
 - unshift()
- Remove methods -
 - Pop()
 - shift()
 - Splice()
- Others -
 - Reverse()
 - Sort()
 - Fill()

A NEW ARRAY

- Computed from original -
 - Map()
- Filtered using condition -
 - Filter()
- Portion of original -
 - Slice()
- Adding original to other -
 - Concat()

AN ARRAY INDEX

- Based on value -
 - indexOf()
- Based on test condition
 - findIndex()
- An array element -
 - Find()

WHICH ARRAY METHOD TO USE?

I WANT ...

KNOW IF ARRAY INCLUDES

- Based on value -
 - Includes()
- Based on test condition -
 - some()
 - every()
- Based on separator string-
 - Join()

TO TRANSFORM TO VALUE

- Based on accumulator
 - reduce()
- Based on callback-
 - forEach()

TYPED ARRAYS

JavaScript typed arrays are array-like objects that provide a mechanism for reading and writing raw binary data in memory buffers.

Each entry in a JavaScript typed array is a raw binary value in one of a number of supported formats, from 8-bit integers to 64-bit floating-point numbers

To achieve maximum flexibility and efficiency, JavaScript typed arrays split the implementation into **buffers** and **views**

A buffer (implemented by the `ArrayBuffer` object) is an object representing a chunk of data; it has no format to speak of and offers no mechanism for accessing its contents.

A view provides a context — that is, a data type, starting offset, and the number of elements — that turns the data into a typed array.

TYPED ARRAYS

ArrayBuffer

- It represent a generic, fixed-length binary data buffer
- You can't directly manipulate the contents of an *ArrayBuffer*
- Instead, you create a typed array view or a *DataView* which represents the buffer in a specific format, and use that to read and write the contents of the buffer.

DataView

- DataView is a low-level interface that provides a getter/setter API to read and write arbitrary data to the buffer
- With a DataView you are able to control the byte-order

Typed Array Views

- It provide views for all the usual numeric types like Int8, Uint32, Float64 and so forth

FUNCTIONS

FIRST CLASS CITIZENS IN JAVASCRIPT

FUNCTIONS

Function declaration

Function that can be used before it's declared

```
function calcAge(birthYear) {  
  return 2037 - birthYear;  
}
```

Function expression

Essentially a function value stored in a variable

```
const calcAge = function (birthYear) {  
  return 2037 - birthYear;  
};
```

Arrow function

Great for a quick one-line functions. (more later...)

```
const calcAge = birthYear => 2037 - birthYear;
```

Three different ways of writing functions, but they all work in a similar way -
Receive input data, transform data, and then output data.

FIRST-CLASS AND HIGHER-ORDER FUNCTIONS

FIRST-CLASS FUNCTIONS

JavaScript treats functions as first-class citizens.

This means that functions are simply values

Functions are just another “type” of object

Store functions in variables or properties

Pass functions as arguments to other functions

Can also return function from function

HIGHER-ORDER FUNCTIONS

A function that receives another function as an argument, that returns a new function, or both

This is only possible because of first-class functions

Function that receives another function

Function that returns new function

CLOSURES

A closure is the closed-over variable environment of the execution context in which a function was created, even after that execution context is gone

A closure gives a function access to all the variables of its parent function, even after that parent function has returned. The function keeps a reference to its outer scope, which preserves the scope chain throughout time

A closure makes sure that a function doesn't lose connection to variables that existed at the function's birth place

Less Formal

Less Formal

SCOPE AND THE SCOPE CHAIN

WHERE DO OUR VARIABLES LIVE?

SCOPING AND SCOPE IN JAVASCRIPT: CONCEPTS

Scope	Space or environment in which a certain variable is declared (variable environment in case of functions).
	There is global scope, function scope, and block scope;
Scope of a variable	Region of our code where a certain variable can be accessed
Lexical scoping	Scoping is controlled by placement of functions and blocks in the code

THE 3 TYPES OF SCOPE

GLOBAL SCOPE

- Outside of any function or block
- Variables declared in global scope are accessible everywhere

```
const me = 'Jonas';  
const job = 'teacher';  
const year = 1989;
```

FUNCTION SCOPE

- Variables are accessible only inside function, NOT outside
- Also called local scope

```
function calcAge(birthYear) {  
  const now = 2037;  
  const age = now - birthYear;  
  return age;  
}  
  
console.log(now); // ReferenceError
```

BLOCK SCOPE (ES6)

- Variables are accessible only inside block (block scoped)
- HOWEVER, this only applies to let and const variables
- Functions are also block scoped (only in strict mode)

```
if (year >= 1981 && year <= 1996) {  
  const millenial = true;  
  const food = 'Avocado toast';  
} ← Example: if block, for loop block, etc.  
  
console.log(millenial); // ReferenceError
```

CONSIDERATION WHILE WORKING WITH SCOPE

Only *let* and *const* variables are block-scoped. Variables declared with *var* end up in the closest function scope.

In JavaScript, we have *lexical scoping*, so the rules of where we can access variables are based on exactly where in the code functions and blocks are written.

Every scope always has access to all the variables from all its outer scopes. This is the *scope chain*.

When a variable is not in the current scope, the engine looks up in the scope chain until it finds the variable it's looking for. This is called *variable lookup*.

The scope chain is a one-way street: a scope will never, ever have access to the variables of an inner scope.

The scope chain has nothing to do with the order in which functions were called. It does not affect the scope chain at all.

THE *this* KEYWORD

this IS NOT THAT SAMPLE

HOW THE *this* KEYWORD WORKS

Special variable that is created for every execution context (every function). Takes the value of (points to) the “owner” of the function in which the *this* keyword is used.

‘*this*’ is NOT static. It depends on how the function is called, and its value is only assigned when the function is actually called.

Using
‘*this*’
with

Method -> *this* = Object that is calling the method

Simple function call -> *this* = undefined

Arrow functions -> *this* = ‘*this*’ of surrounding function (lexical *this*)

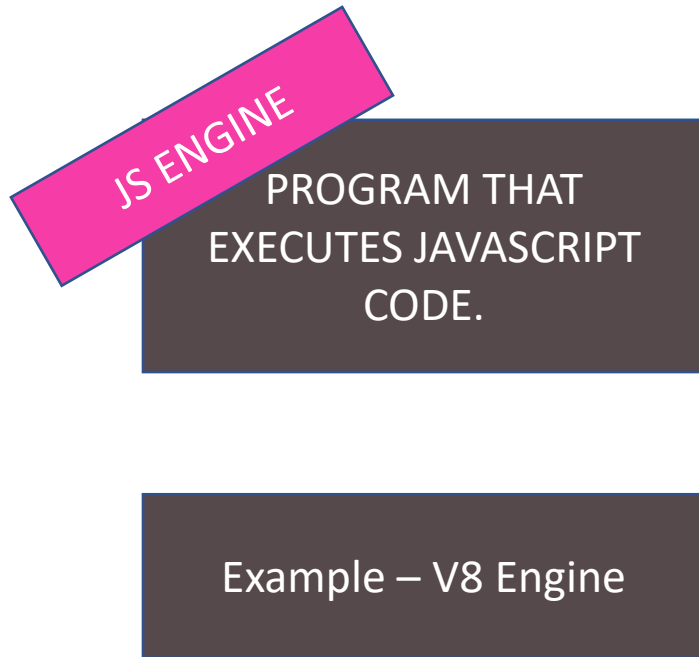
Event listener -> *this* = DOM element that the handler is attached to

call, apply, bind -> change the function ‘*this*’ context

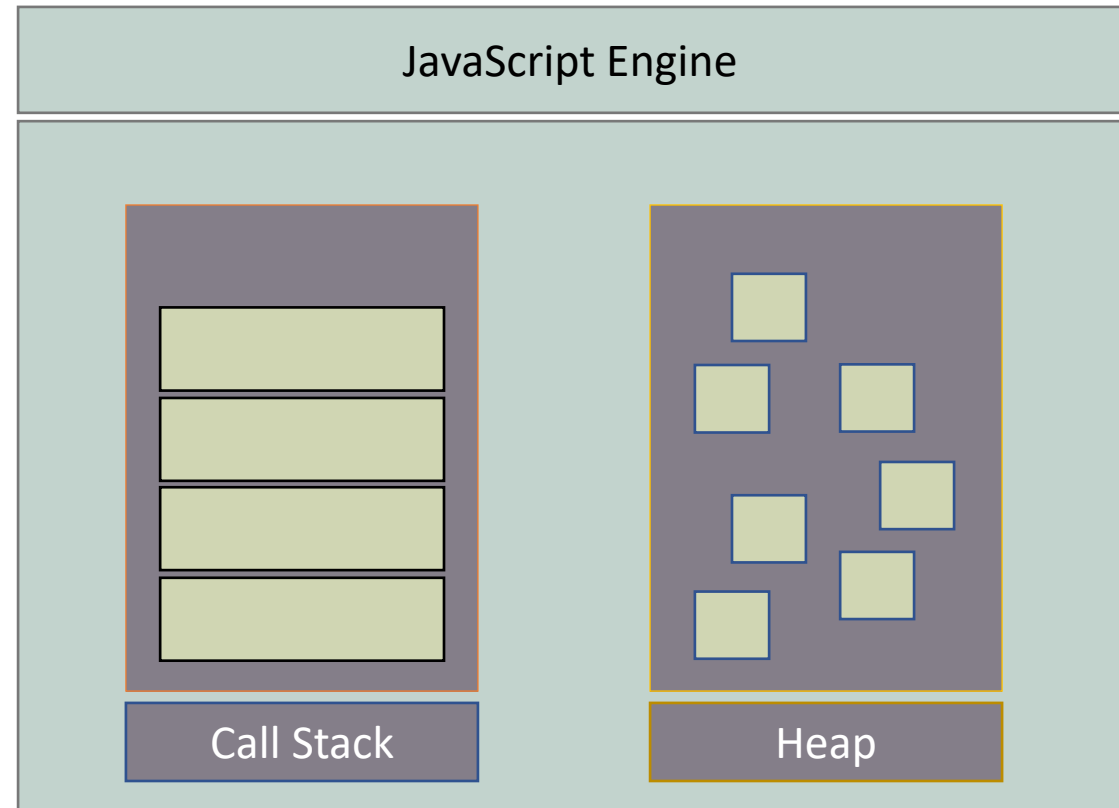
THE JAVASCRIPT ENGINE AND RUNTIME

HOW JAVASCRIPT WORKS BEHIND THE SCENES

WHAT IS A JAVASCRIPT ENGINE?



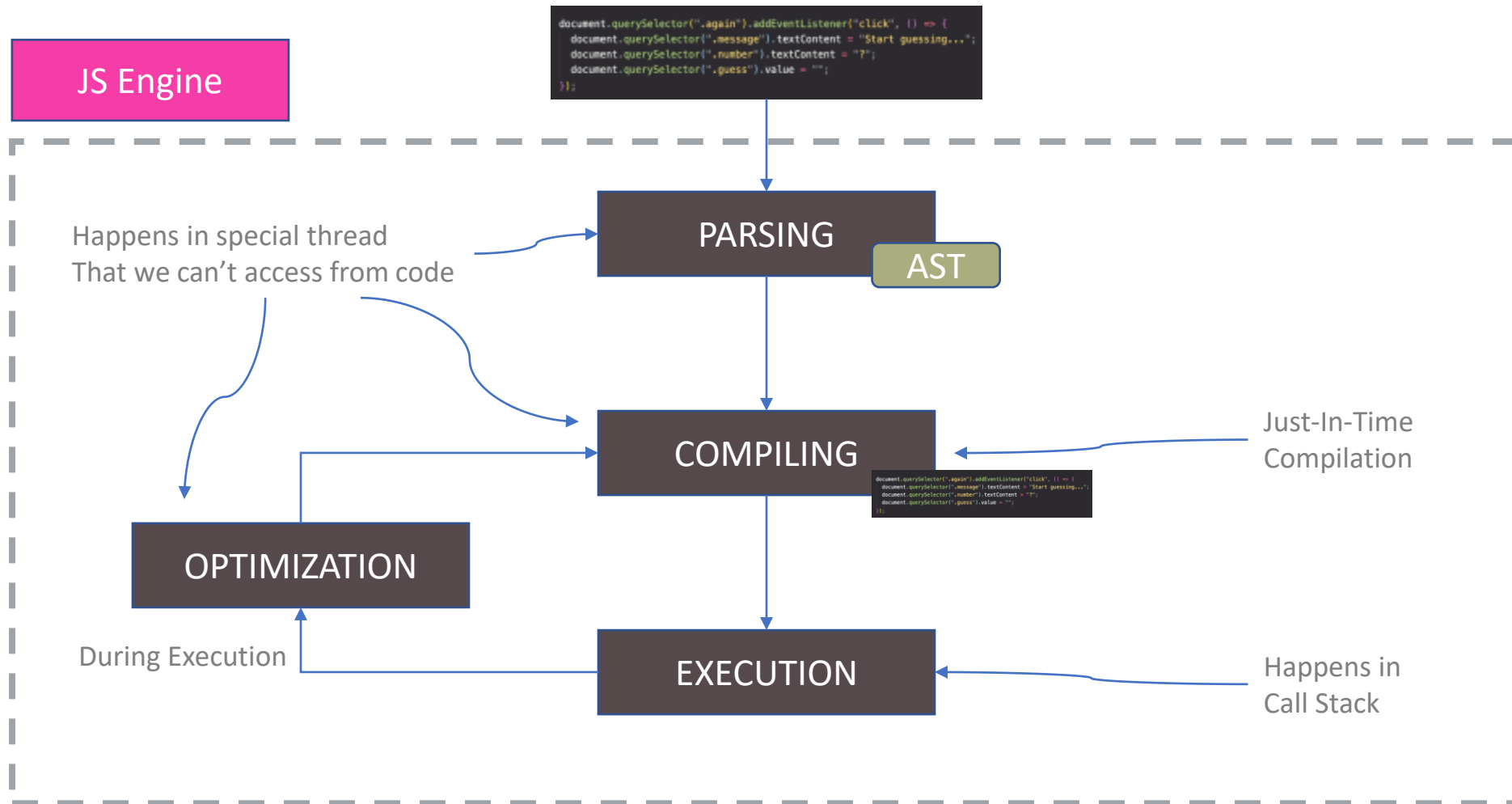
Execution
Context



Where our code is executed

Where objects are stored

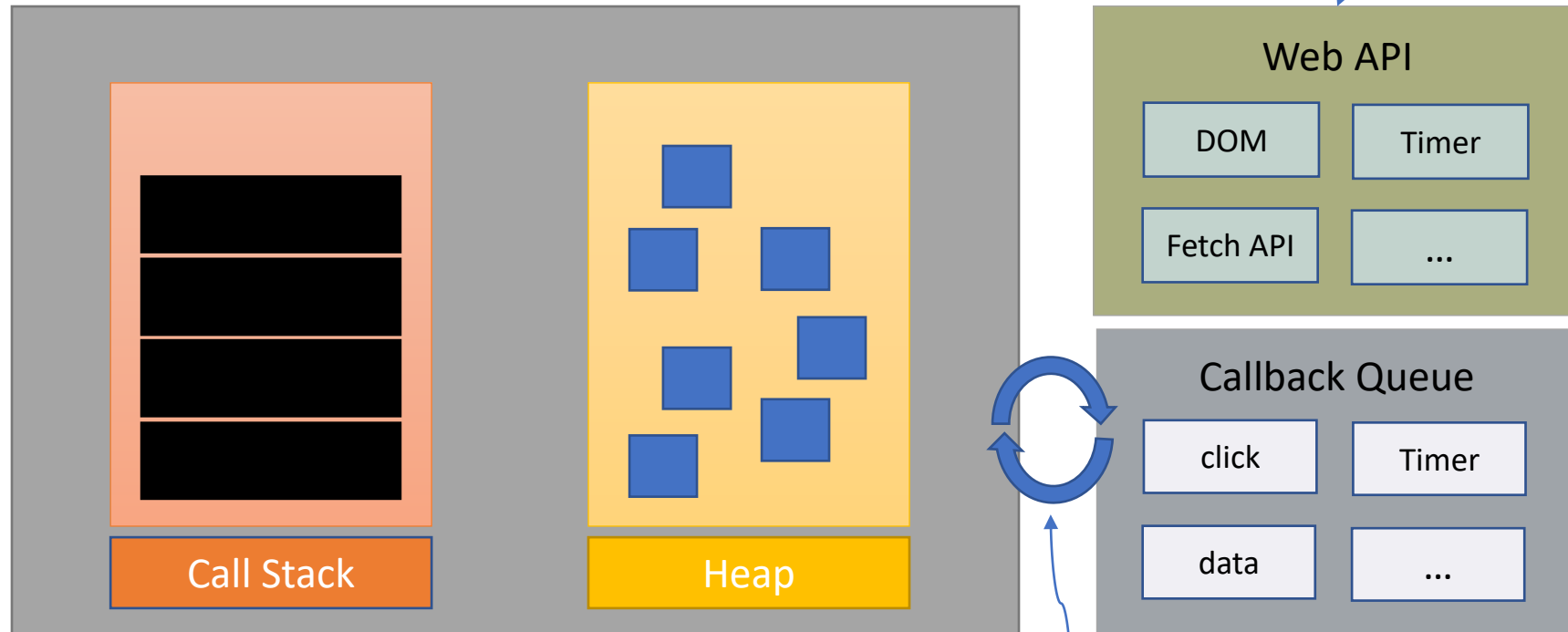
MODERN JUST-IN-TIME COMPILATION OF JAVASCRIPT



Container including all the things
that we need to use JavaScript
(in this case in the browser)

JS Runtime in the BROWSER

Functionalities provided to
the engine, accessible on
window object



Event Loop

Essential for non-blocking concurrency model

DOM AND EVENTS

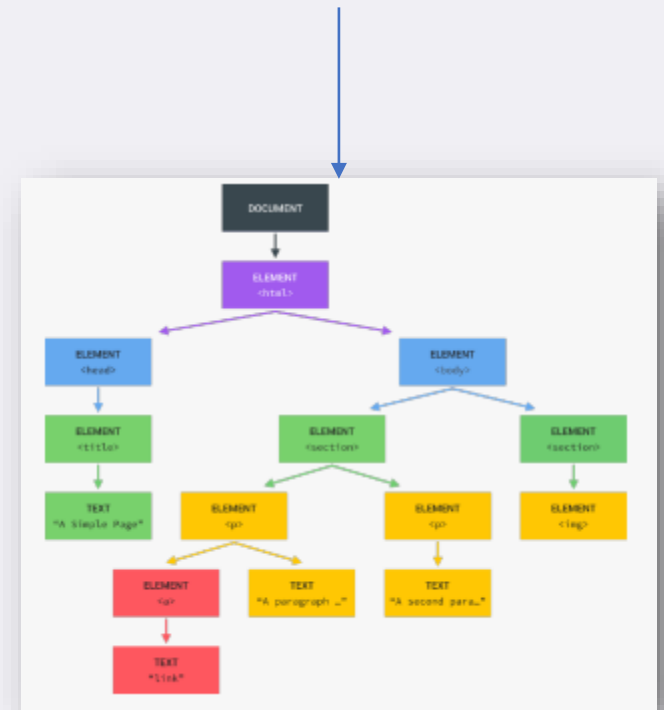
JAVASCRIPT IN THE BROWSER

WHAT IS THE DOM?

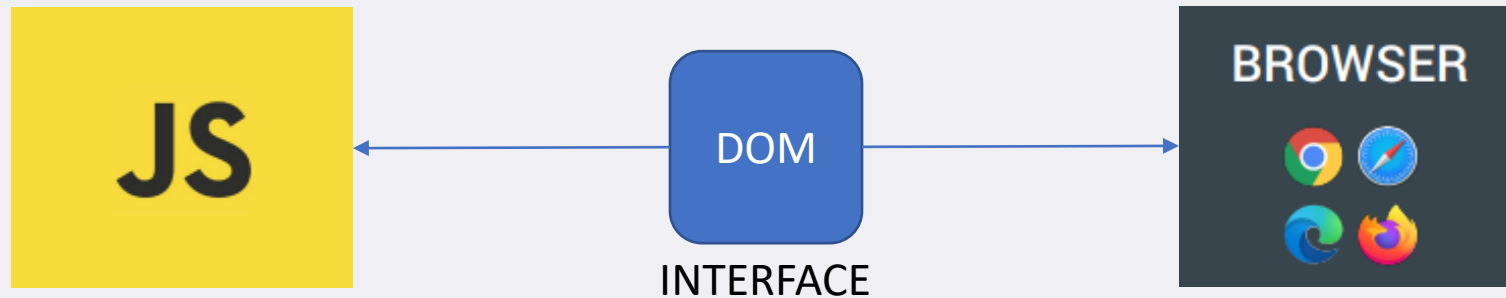
DOCUMENT OBJECT MODEL:
STRUCTURED REPRESENTATION OF
HTML DOCUMENTS. ALLOWS
JAVASCRIPT TO ACCESS HTML
ELEMENTS AND STYLES TO
MANIPULATE THEM

Change text, HTML attributes, and even CSS styles

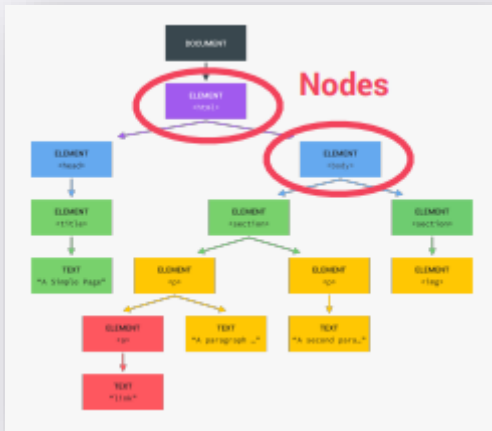
Tree structure, generated
by browser on HTML load



DOM IN DETAIL



Allows us to make JavaScript interact with the browser

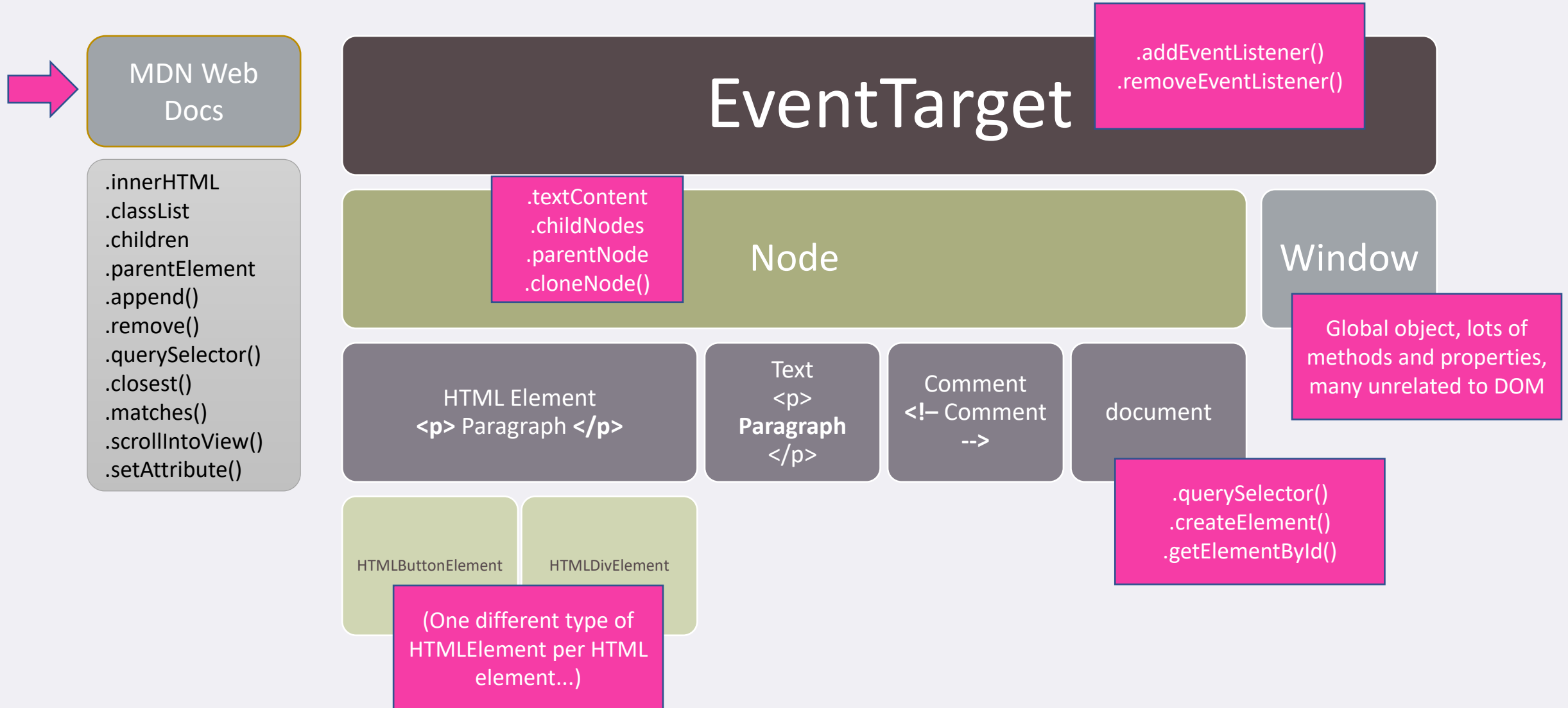


We can write JavaScript to create, modify and delete HTML elements set styles, classes and attributes; and listen and respond to events

DOM tree is generated from an HTML document, which we can then interact with

DOM is a very complex API that contains lots of methods and properties to interact with the DOM tree

HOW THE DOM API IS ORGANIZED BEHIND THE SCENES



REFERENCES

READING MATERIAL

- <https://developer.mozilla.org/en-US/docs/Web/JavaScript>
- <https://javascript.info>

VIDEO LINKS

- <https://www.youtube.com/watch?v=POPLF-Qc0OU&list=PLsyeobzWxl7rrvgG7MLNIMSTzVCDZZcT4&index=2>
- <https://www.youtube.com/watch?v=chx9Rs41W6g>