COMP6080
Web Front-End Programming

Week 2.1
The Javascript Ecosystem

What even is "Javascript"?

- Is it what Google Chrome has?
- Is it what NodeJS is?
- Is ReactJS different from Javascript?
- What version am I using?

Let's take a step back....

Language V Compiler/Interpreter

Language Definition (Standards)

- Describes how a language should function (rules, syntax)
- Typically defined as a globally recognised standard
- New features to a language mean new versions of the language

Compiler or Interpreter

- A program that takes source code (plain text) from you, and, following language definition rules, produces runnable code for execution
- E.G. Python3, Node, Gcc

Source Code (plain text)

- Programs that you write in .py, .js, .c, .cpp, .java files.
- Fundamentally just plain text (ascii) that compilers interpret based on a language definition

Language V Compiler (Interpreter)

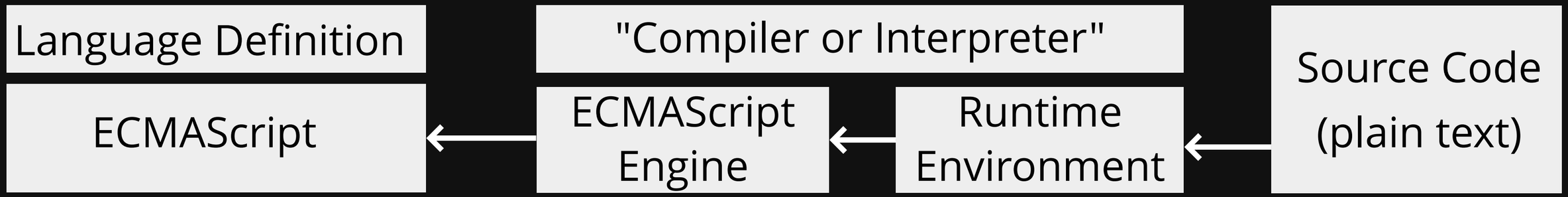
Language Definition (Standards)

Compiler or Interpreter

Source Code (plain text)

Compilers/Interpreters take source code (plain text) and produce executable programs. The way to interpret the source code into executable programs is provided in the language definition.

"Javascript"



- ECMAscript (ES)
- First appeared 1997
- Major releases are:
  - ES5 (ECMAScript 2009)
  - ES6 (ECMAScript 2015)
  - ECMAScript 2016
  - ... etc
  - ECMAScript 2019

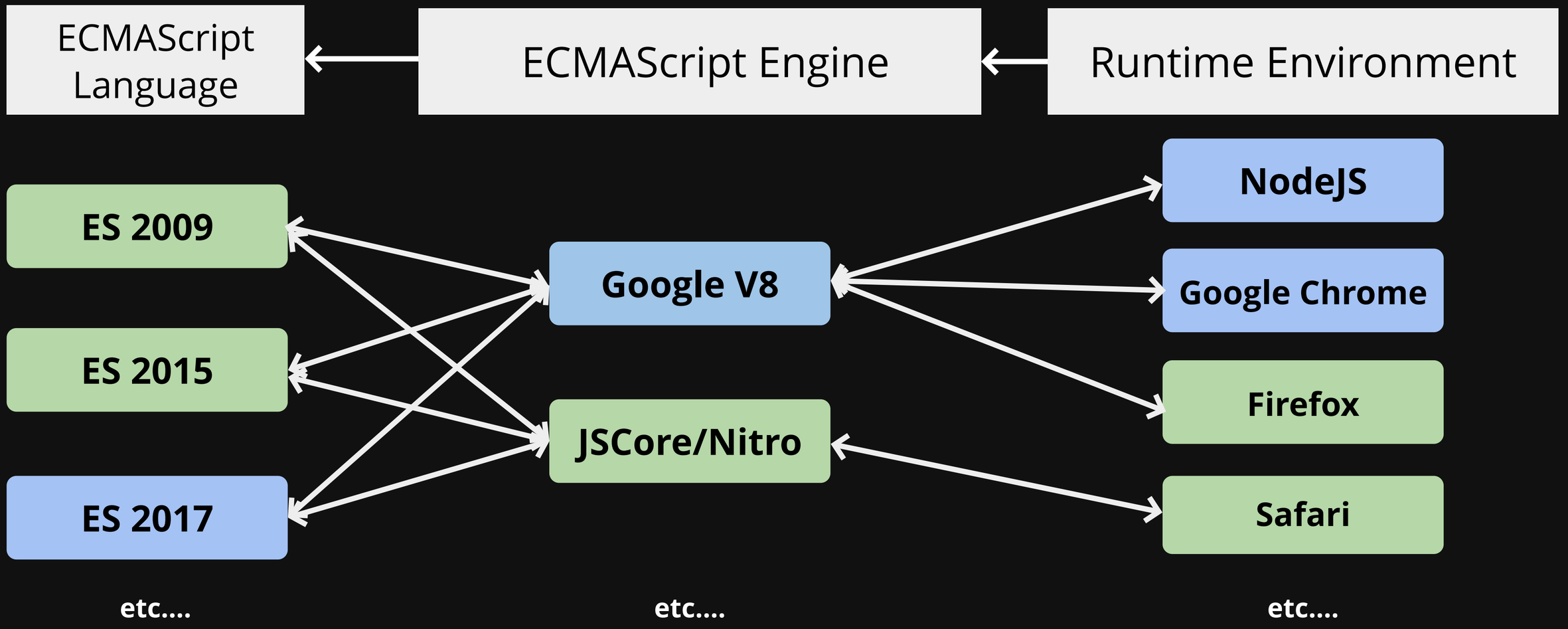
An article about language features

- Javascript compilers or interpreters are known as **runtime environments.**
  - Examples of runtime environments include NodeJS, Google Chrome
- Runtime environments are built on top of **ECMAScript Engines** which are the engines that interpret the ES language and produce runnable code. They do not have I/O nor do they have APIs
  - Examples of engines include V8, Nitro
- Let's chat about this more...

- .js files you write

Javascript refers to a runtime environment that is built on top of an ECMAScript engine

"Javascript"



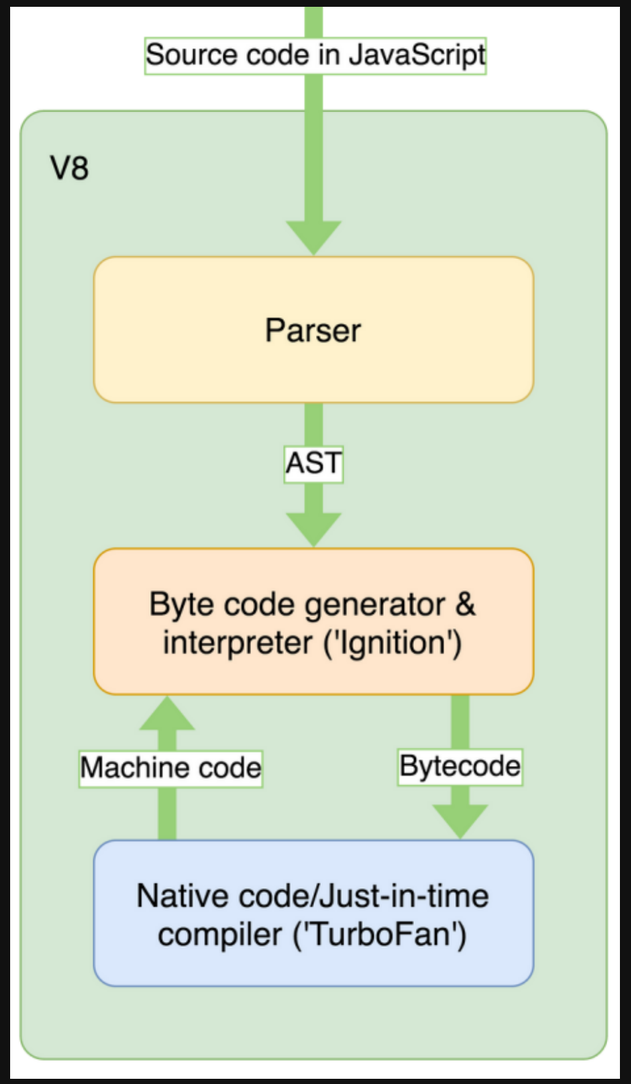
Each version of a runtime environment is built off a particular version of an ECMAScript engine.

Each version of an ECMAScript engine is built to a particular version of ECMAScript

Google V8 Engine

Google's V8 Engine is an open-source Javascript execution engine, a part of the Chromium project. It can run standalone, or can be embedded and extended into any C++ application as a library. V8 is just a compiler+vm toolset, it does not have I/O and APIs built in.

V8 parses, interprets, executes and compiles Javascript code. It is shipped ONLY with the APIs that the ECMAScript Standard specifies.

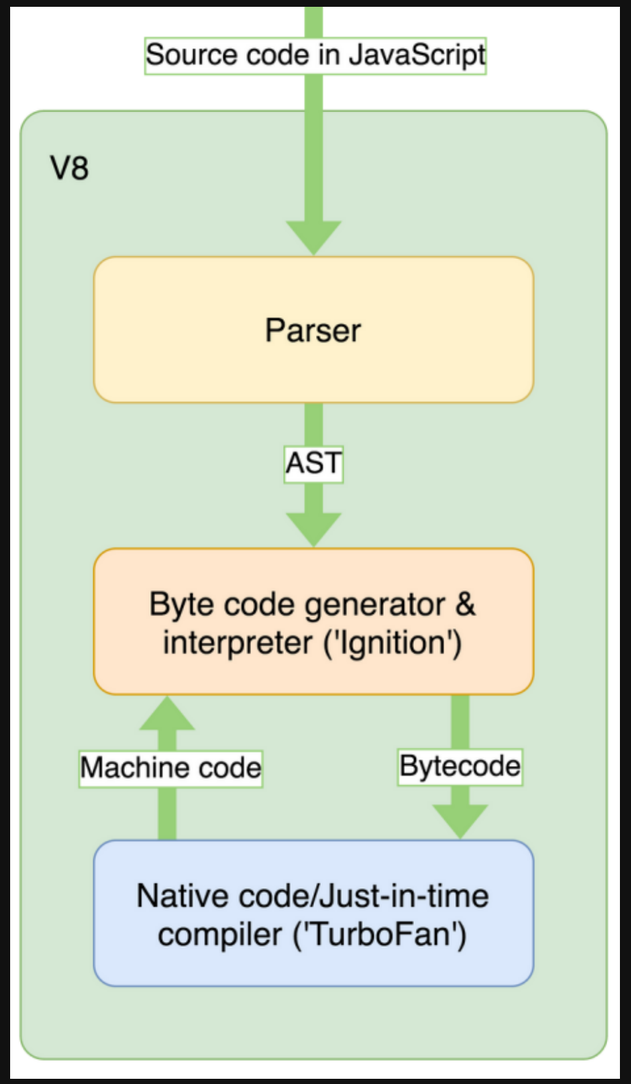


Node.JS

NodeJS is a javascript runtime, with easy to use **command-line** capabilities, that is built on Chrome's V8 Javascript engine.

V8 only provide the core parsing and compiling, but features such as the async event loop/queue are built on top as part of NodeJS.

NodeJS also ships with I/O APIs for network, file system operations, and the concept of modules.

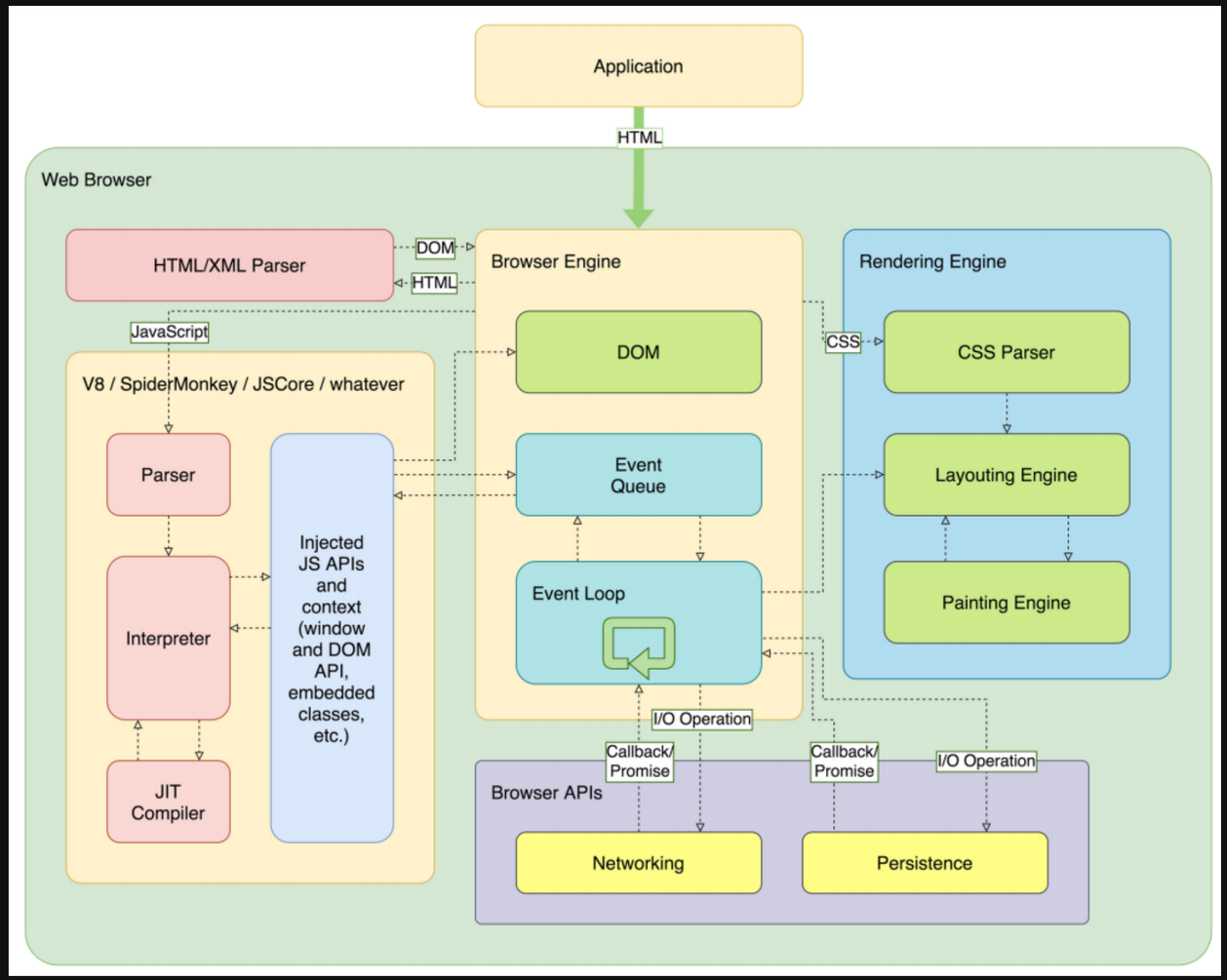


Google Chrome (any web browser)

A web browser is a HTML & CSS document renderer for client-side user interfaces.

The Javascript V8 engine is a small but critical part of a web browser that allows for the execution of Javascript. The primary purpose of Javascript execution in web browsers is to:

- Mutate the DOM
- Make network requests
- Persist data client-side



NodeJS: Managing Packages

- **NodeJS,** unlike web browsers, have popular package managers attached to them.
- **NPM** (Node Package Manager) is a package manager and package installer built off of NodeJS, that uses a number of packages stored on the cloud
  - **yarn** is an alternative to npm that is provides the same high level functionality, with a slightly different interface. Used commonly with create-react-apps.
  - **pnpm** is another alternative that we won't discuss
  - You only use ONE of these package managers per project

You can see the "NPM - Intro" lecture to learn more about NPM.

npm vs npx

- **npx** is a tool that runs a particular npm library in "executable" mode.
- Not all libraries/modules can be executed
- What's an example of a library we would want to execute?
- Did you know we can install yarn with npm?

OK, but what is ReactJS?...

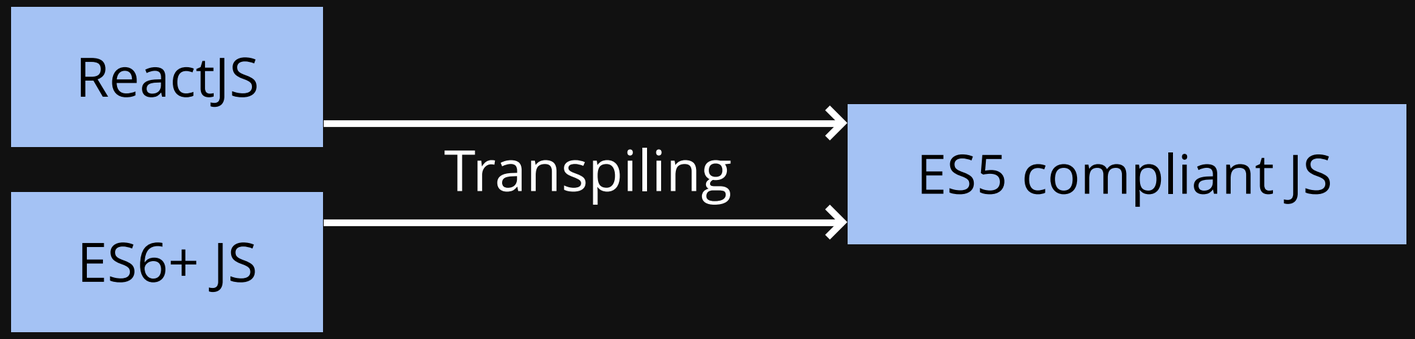
- ReactJS is a Javascript-like language that **builds (transpiles)** into standard ECMAScript compliant source code that is executed normally on a browser.
- ReactJS is covered in more detail in the ReactJS Lifecycle lecture.

Compiling & Transpiling

- **Compiling**: Broad term to describe the process of taking source code written in one another, and producing an output file typically with some lower level language

- **Transpiling**: Broad term to describe the process of taking source code written in a language and converting it to another source code file in typically a different version of the same language

Compiling & Transpiling



ReactJS is a language that uses JSX (a mix of HTML/Javascript) along with typically newer versions of Javascript, and is then "transpiled" (with tools such as babel) into extremely well supported classical javascript.

A modern development environment

NPM

Express
Written in ES6
Run natively with NodeJS

Frontend

ReactJS
Written in ES6 + ReactJS
Transpiled to ES5 vanilla
Run on a web browser

Backend

Just one example of how a web stack is setup
that is javascript based.

Feedback