Javascript

in the Browser

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Example

```
<html>
<body>
<script type="text/javascript">
        document.body.innerHTML = "<h1>This is a heading</h1>";
</script>
</body>
</html>
```

Javascript: Inline, embedded or separate file?

Inline

```
<button onclick="console.log("Hello World!);">Click me</button>
```

Embedded

```
<script type="text/javascript">
     console.log("Hello World!);
</script>
```

Separate file

```
<script src="js/script.js"></script>
```

Warning: this is not the proper way to load a Javascript module (more later)

Javascript in the browser is restrictive

- ✓ You can access elements of the webpage and the browser
- ✓ You can track user actions on the webpage (events)
- ✓ You can create threads (web workers)
- ✓ You can open sockets (web sockets)
- ✓ …
- ◉ You cannot access the file system (only via the upload form)
- ◉ You cannot access to other programs
- ◉ You cannot access to other tabs in the browser
- ◉ …

The Browser

Pop-up Boxes

`alert("hello world!")`	dialog box with “ok” button
`confirm("are you sure?")`	dialog box with “ok” and “cancel” buttons
`prompt("Name?","John")`	input box with prompt text and default value

The Browser

`screen`	the visitor's screen
`browser`	the browser itself
`window`	the current browser window
`url`	the current url
`history`	Back and forward URLs

Document Object Model

DOM
Document Object Model

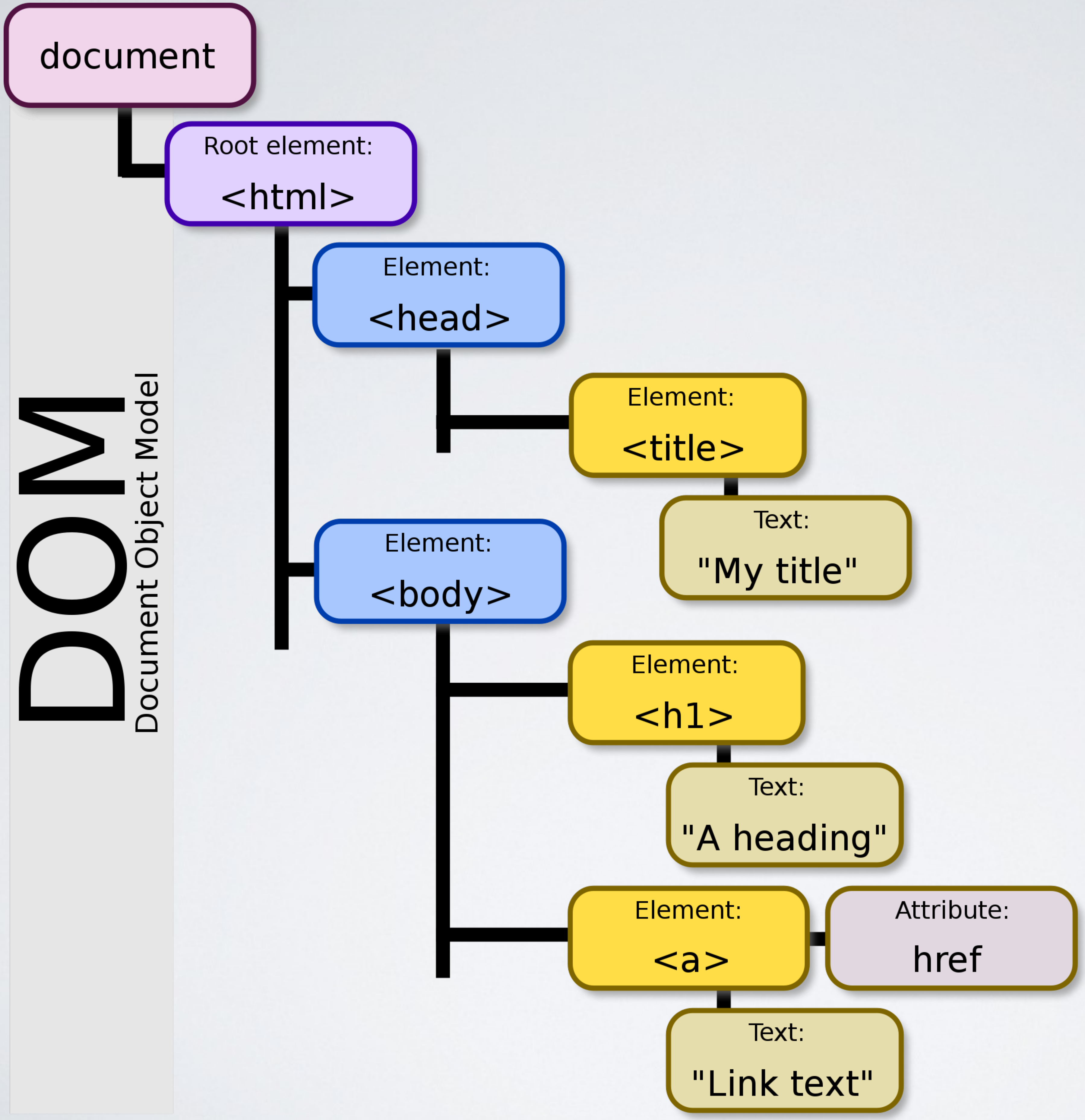


image source: *wikipedia*

Node accessors

The root node

```
document
```

Accessors

```
document.getElementById("id")
document.getElementsByTagName("p");
document.getElementsByClassName("class");
document.querySelector("#id .class p");
document.querySelectorAll("#id .class p");
```

DOM methods

`x.innerHTML`	the content of x
`x.attributes`	the attributes nodes of x
`x.style`	css of x
`x.parentNode`	the parent node of x
`x.children`	the child nodes of x
`x.appendChild`	insert a child node to x
`x.removeChild`	remove a child node from x
...	...

https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model

Events

DOM events and handlers

`load`	when e is fully loaded
`click`	when e is clicked
`submit`	when e is submitted
`hover`	when the mouse is on top e
`keydown`	when a key is pressed while e is in focus
...	...

https://developer.mozilla.org/en-US/docs/Web/Events

Different ways to handle events

```
// Overwrite the existing handler
e.onclick = function(e){
     ...
};

// Add another event handler
e.addEventListener('click', function(e){
     ...
});
```

User-defined events and listeners

```
// Listen for the event
document.addEventListener('myEvent', function(e){
     ...
});

// Dispatch the event
document.dispatchEvent(new Event('myEvent'));
```

Custom events

```
// Listen for the custom event
document.addEventListener('onSomething', function(e){
    console.log(e.detail);
});

// Dispatch the custom event
document.dispatchEvent(new CustomEvent('onSomething',
{ e.detail: 'Hello World!}));
```

Building Good Frontends

Recipes to become a good frontend developer

- ~~Write good Javascript code (strict mode)~~
- ~~Load Javascript code correctly and efficiently~~
- ~~Encapsulate Javascript in closures~~

Old way

- Use Javascript Modules (since **`es6`**)

New way

- Create a Frontend API (good practice)

The problem with Javascript interpreters

- ✓ **Good Javascript** is interpreted by browsers in a consistent way

- ◉ **Bad javascript** code is loosely interpreted by browsers in an inconsistent way

[old way] Using **`strict mode`**

➡ Force the browser to validate Javascript against the standard

✓ Dynamically raises errors (or warnings) in the console when the code is not compliant with the standard

```
"use strict";
let doSomething = function() {
    // this runs in strict mode
}
```

[old way] Problem with scoping

- In the browser, all Javascript files share the same execution environment i.e they share the same scope
  - variable (and function) naming conflicts
  - strict mode applied to all

[old way] Scoping problem with variable names

```
---------------------------------------
                                 file1.js
let doSomething = function() {
    // first declaration of doSomething
}


---------------------------------------
                                 file2.js
let doSomething = function() {
    // conflicting doSomething from file 1
}
```

[old way] Scoping problem with strict mode

```
------------------------------------------
                                       file1.js
"use strict";
let doSomething = function() {
    // strict mode applies
}

------------------------------------------
let doSomethingElse = function() {     file2.js
    // strict mode applies too
}
```

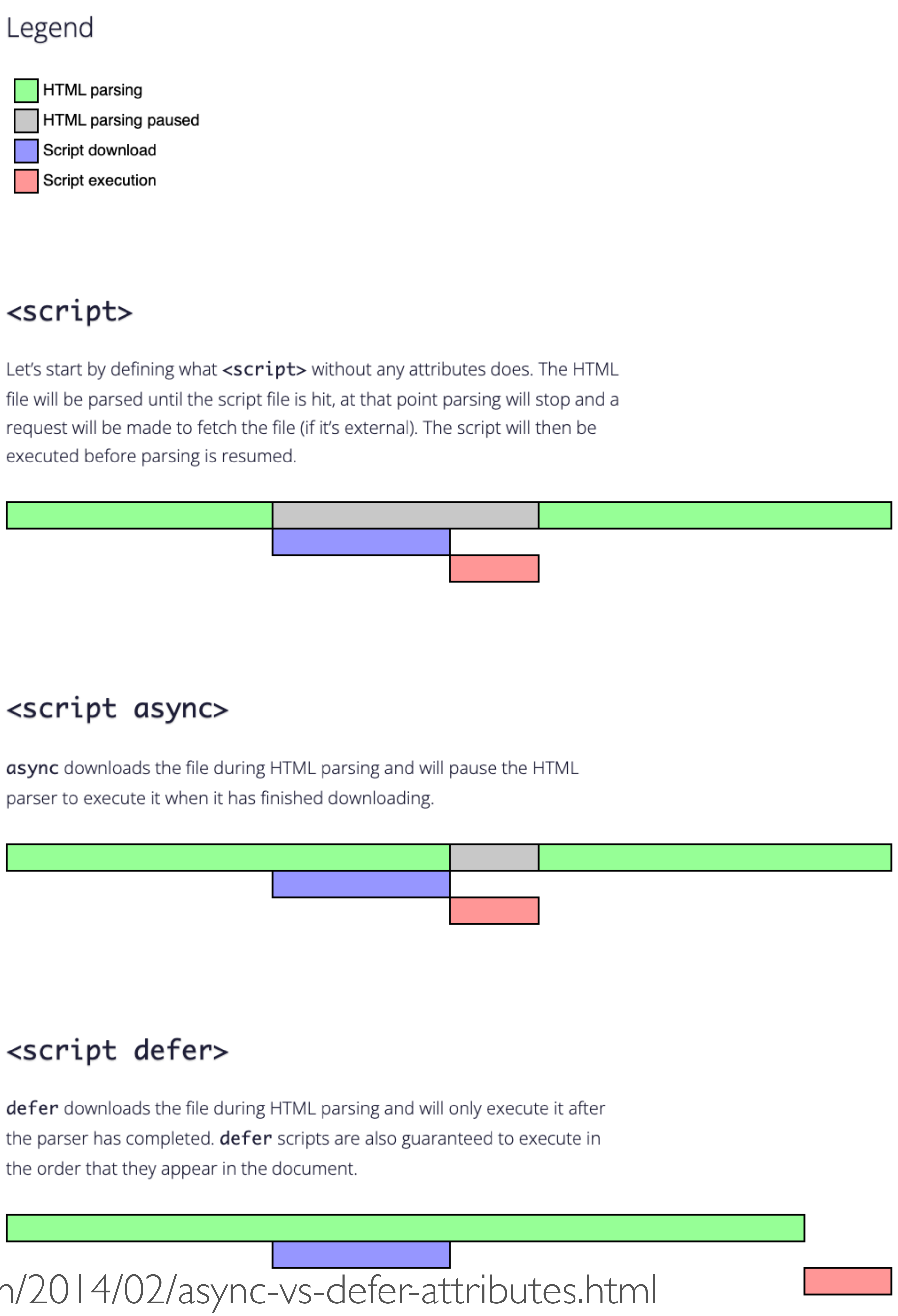
[old way] Encapsulate Javascript in **a closure**

```
(function() {
    "use strict";

    let private = function() {
        // private is not available from outside
    }
}());
```

[old way] encapsulate and export the **namespace**

```
let $ = (function() {
    "use strict";

    let module = {};

     let private = function(){
          // private is not available from outside
     }

    module.public = function(){
          // public is available from outside
    }

    return module;
}());
```

[old way] Loading Javascript



Legend

- 🟩 HTML parsing
- ⬜ HTML parsing paused
- 🟦 Script download
- 🟥 Script execution

`<script>`

Let's start by defining what `<script>` without any attributes does. The HTML file will be parsed until the script file is hit, at that point parsing will stop and a request will be made to fetch the file (if it's external). The script will then be executed before parsing is resumed.

`<script async>`

`async` downloads the file during HTML parsing and will pause the HTML parser to execute it when it has finished downloading.

`<script defer>`

`defer` downloads the file during HTML parsing and will only execute it after the parser has completed. `defer` scripts are also guaranteed to execute in the order that they appear in the document.

source: https://www.growingwiththeweb.com/2014/02/async-vs-defer-attributes.html

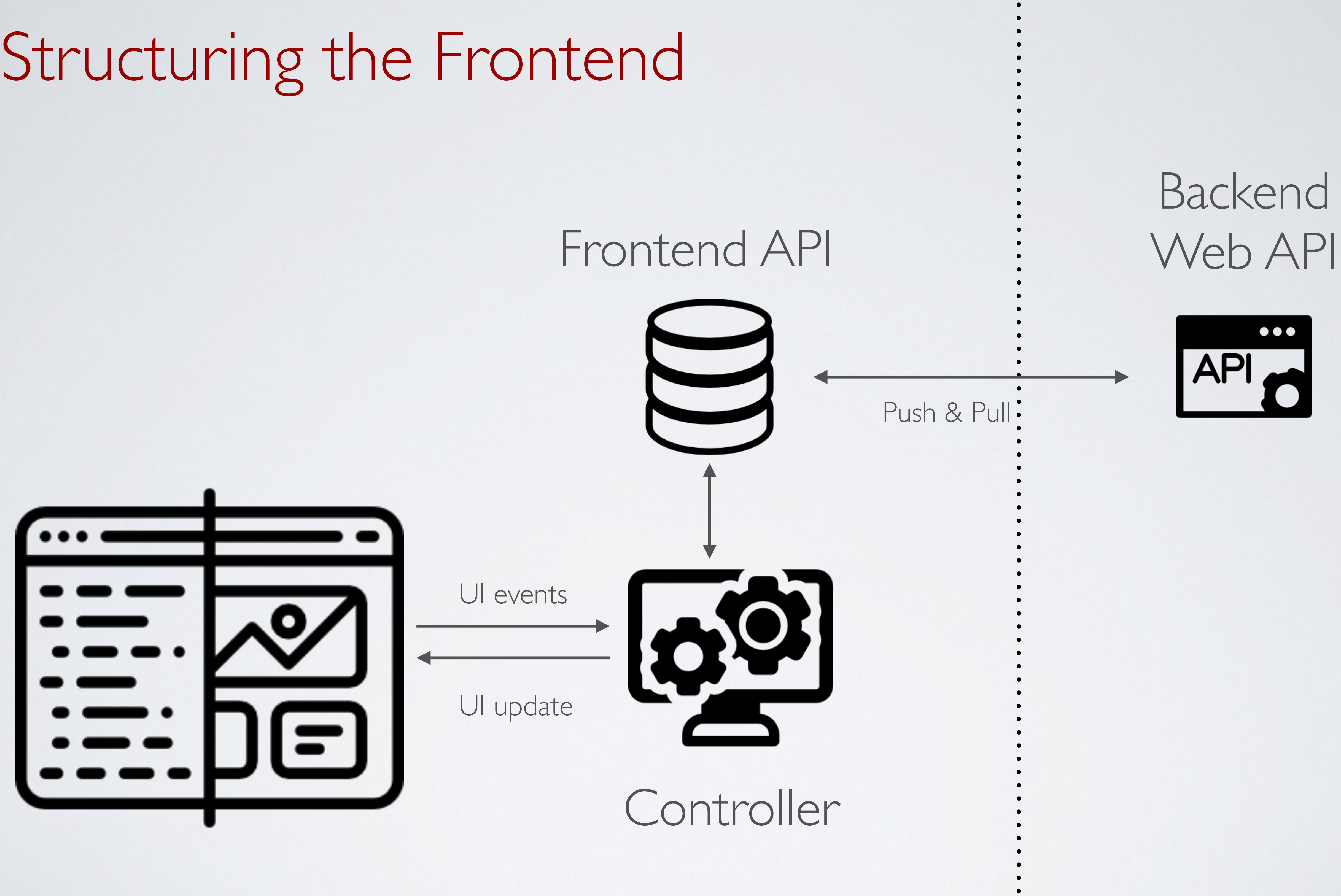
[new way] Javascript Modules (new in es6)

➡ provides encapsulation and namespace by default

➡ load the code asynchronously and defer execution by default

```
-------------------------------------------------
                                        index.html

<script type="module" src="file1.mjs">

 ----------------------------------------
                                    file1.mjs

export doSomething = ...

 ----------------------------------------
                                    file2.mjs

import { doSomething } from "/file1.mjs"
```

Structuring the Frontend


Backend
Web API
Frontend API
API
Push & Pull
UI events
UI update
Controller