Asynchronous Control Flow

Module 1 Week 4

Notes Repo: https://github.com/C-Shi/lhl-flex-lecture

Learning Objectives

Recap: Higher order function / Callbacks

Synchronous and Asynchronous programming

Async control flow with setTimeout and setInterval

Node.js File System

JavaScript Events

Higher Order Func / Callback

- A function that is passed to another function is a **Callback**
- The function that **takes in a callback**, or returning a function is called higher-order function
- Higher order functions allow us to write reusable code that **operates on action**

```
const first = () => { /* do something */ };

const second = (func) => { func() };

[1, -2, 3, -4].filter((x) => x > 0);
```

Synchronous Programming

JavaScript can only do one thing at a time. No exception

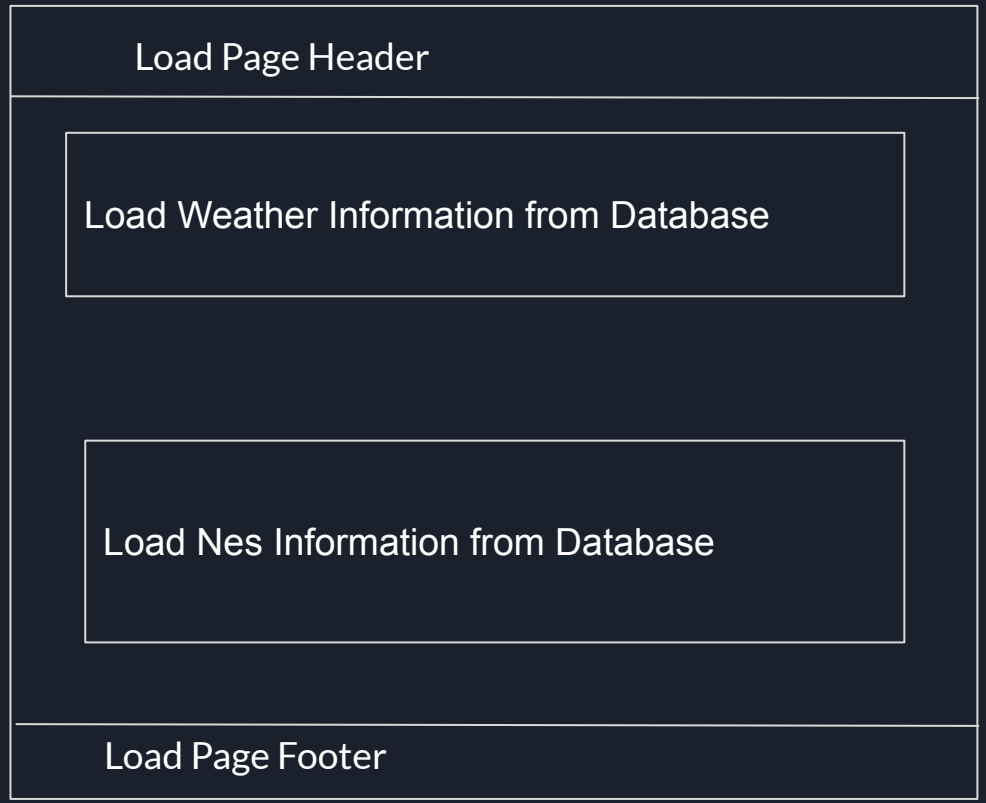
Synchronous JavaScript code will execute in the same sequence as you write

An operation that takes long time to finish can potentially block the other code

Even worse if an operation may or may not happens, which can block forever

So what is the solution?

Web Page Sample



Asynchronous JavaScript

To Schedule a feature execution when certain conditions met

Call Stack

Web API

Task Queue

Event Loop

1. JavaScript provide asynchronous programming ability
2. JavaScript can queue up asynchronous code to allow non-blocking code to finish
3. Async codes are usually written in the form of Callback or Promise
4. Not all Callback are asynchronous
5. This is NOT a time delay or pause

```
loadPageHeader();

getWeatherAsync(showWeatherAsync);

getNewsAsync(showNewsAsync);

loadPageFooter();
```

Call Stack

```
showNewsAsync()
```

Task Queue

```
showWeatherAsync with Weather Data

showNewsAsync with News Data
```

Terminal

Show Page Header

Getting Weather...

Getting News...

Show Page Footer

Vancouver: Sunny 20C

These are news

Quizzes

Are these operation synchronous or asynchronous in JavaScript ?

Read data from Database	Asynchronous
Toggle an list by clicking on a button on the page	Asynchronous
Sorting a long list using Array.sort() method	Synchronous
Build a browser timer/stopwatch	Asynchronous
Deep search for an value in a nested object	Synchronous

Common use cases of Async JavaScript

1. When interacting with external resources: Database, Files etc.
2. When user actions involved: Button Click, etc
3. When running a time based scheduling: Timer, etc

setTimeout and setInterval

setTimeout is an asynchronous functions that execute a callback after timer expires

setInterval is an asynchronous functions that repeatedly executes a callback with a fix interval

Timer is the minimum guaranteed time

```
setTimeout(() => {
  console.log('After 3 second')
}, 3000);

setInterval(() => {
  console.log('Nice to see you again');
}, 2000)
```

File system and fs module

Built in fs module to interact with file

Both synchronous and asynchronous

Reference to official Doc

```
const fs = require('fs');

fs.readFile('./file.txt', 'utf-8' ,(err, data) => {
  console.log('Reading the file...');
  console.log(data)
})

fs.writeFile('./file.txt', 'Write something to file', (err) => {
  console.log('Finish Writing')
})
```

JavaScript Event

Event is an action that registered ahead of time, and can be called later

Event can called synchronously or **asynchronously**

Async Event is very powerful in DOM

```
const button = document.querySelector('button');
// event can be asynchronously
button.addEventListener('click', function() {
  console.log('button click')
})

// event can also be trigger synchronously
button.dispatchEvent(new Event('click'))
```