Fetch API

Fetch API: `fetch()`

The Fetch API is the API to use to load external resources (text, JSON, etc) in the browser.

The Fetch API is made up of one function, and its syntax is is concise and easy to use:

```
fetch('images.txt');
```

Note: `XMLHttpRequest` ("XHR") is the old API for loading resources from the browser. XHR still works, but is clunky and harder to use.

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- It returns a `Promise`

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- The `fetch()` method takes the string path to the resource you want to fetch as a parameter
- It returns a `Promise`
  - **What the heck is a `Promise`?**

`Promises`:
Another conceptual odyssey

`Promises` and `.then()`

A `Promise`:

- An object used to manage asynchronous results
- Has a `then()` method that lets you attach functions to execute onSuccess or onError
- Allows you to build **chains** of asynchronous results.

`Promises` are easier to **use** than to **define**...

Simple example: getUserMedia

There is an API called `getUserMedia` that allows you get the media stream from your webcam.

There are two versions of getUserMedia:

- `navigator.getUserMedia` **(deprecated)**
  - Uses callbacks

- `navigator.mediaDevices.getUserMedia`
  - Returns a `Promise`

getUserMedia with callbacks

```
const video = document.querySelector('video');

function onCameraOpen(stream) {
  video.srcObject = stream;
}
function onError(error) {
  console.log(error);
}

navigator.getUserMedia({ video: true },
  onCameraOpen, onError);
```

CodePen

getUserMedia with Promise

```
const video = document.querySelector('video');

function onCameraOpen(stream) {
  video.srcObject = stream;
}
function onError(error) {
  console.log(error);
}

navigator.mediaDevices.getUserMedia({ video: true })
  .then(onCameraOpen, onError);
```

CodePen

Hypothetical Fetch API

```
// FAKE HYPOTHETICAL API.
// This is not how fetch is called!
function onSuccess(response) {
  ...
}
function onFail(response) {
  ...
}
fetch('images.txt', onSuccess, onFail);
```

Real Fetch API

```
function onSuccess(response) {
  ...
}
function onFail(response) {
  ...
}
fetch('images.txt').then(onSuccess, onFail);
```

Promise syntax

Q: How does this syntax work?

```
fetch('images.txt').then(onSuccess, onFail);
```

Promise syntax

Q: How does this syntax work?

```
fetch('images.txt').then(onSuccess, onFail);
```

The syntax above is the same as:

```
const promise = fetch('images.txt');
promise.then(onSuccess, onFail);
```

Promise syntax

```
const promise = fetch('images.txt');
promise.then(onSuccess, onFail);
```

The object `fetch` returns is of type `Promise`.

A promise is in one of three states:

- **pending**: initial state, not fulfilled or rejected.
- **fulfilled**: the operation completed successfully.
- **rejected**: the operation failed.

You attach handlers to the promise via `.then()`

Promise syntax

```
const promise = fetch('images.txt');
promise.then(onSuccess, onFail);
```

The object `fetch` returns is of type `Promise`.

A promise is in one of three states:

- **pending**: initial state, not fulfilled or rejected.
- **fulfilled**: the operation completed successfully.
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You attach handlers to the promise via `.then()`

Using Fetch

```
function onSuccess(response) {
  console.log(response.status);
}
fetch('images.txt').then(onSuccess);
```

The success function for Fetch gets a response parameter:

- `response.status`: Contains the status code for the request, e.g. 200 for HTTP success
  - HTTP status codes

Fetch attempt

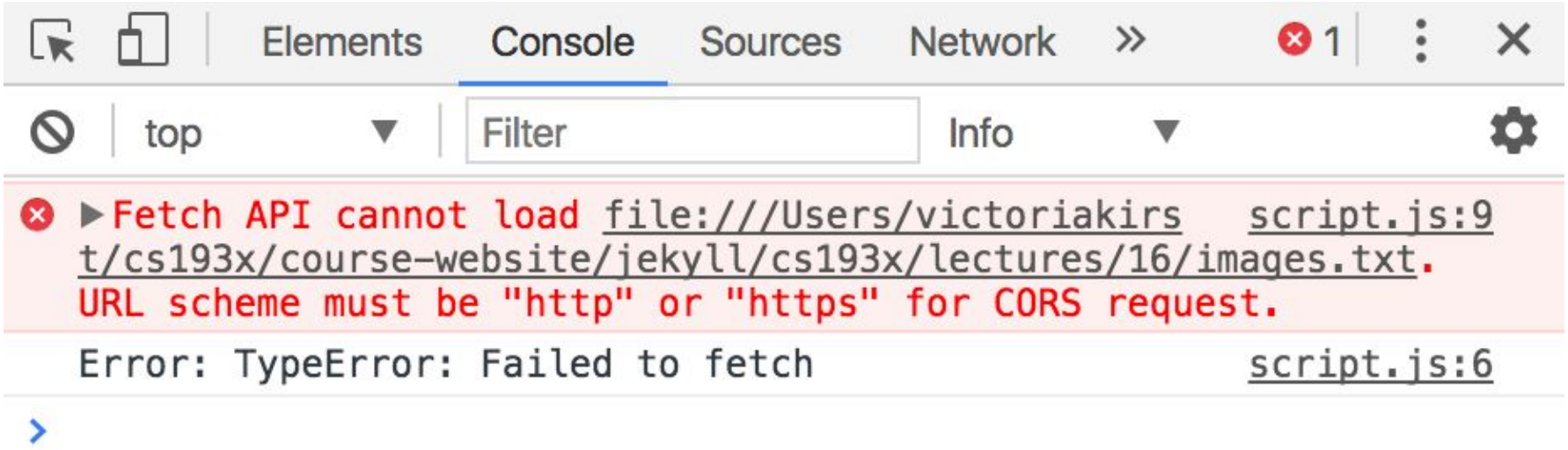
```
function onSuccess(response) {
  console.log(response.status);
}

function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt')
    .then(onSuccess, onError);
```

Fetch error

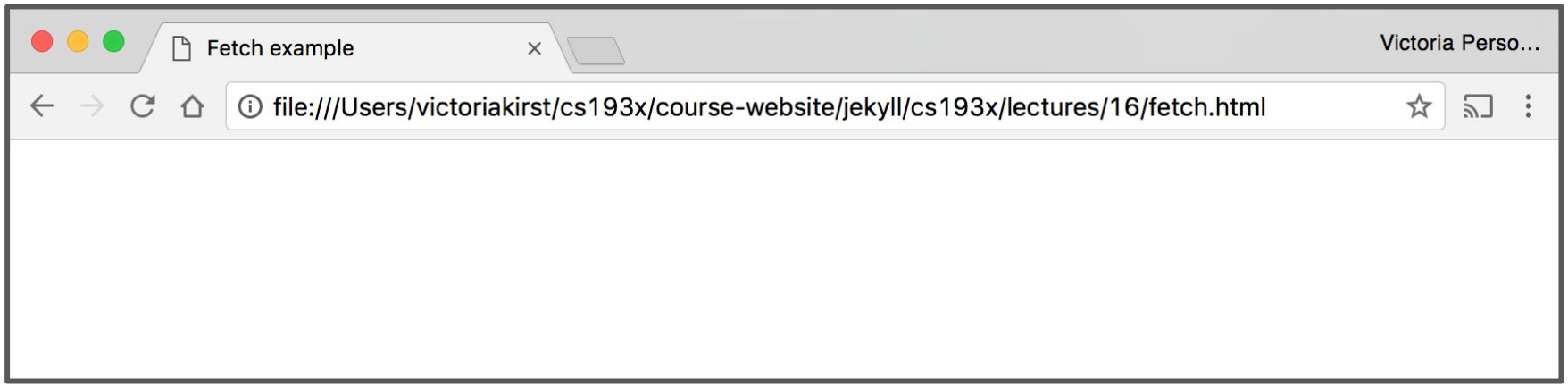
If we try to load this in the browser, we get the following JavaScript error:



Notice that our onError function was also called.

Local files

When we load a web page in the browser that is saved on our computer, it is served via `file://` protocol:



We are **not allowed** to load files in JavaScript from the `file://` protocol, which is why we got the error.

Serve over HTTP

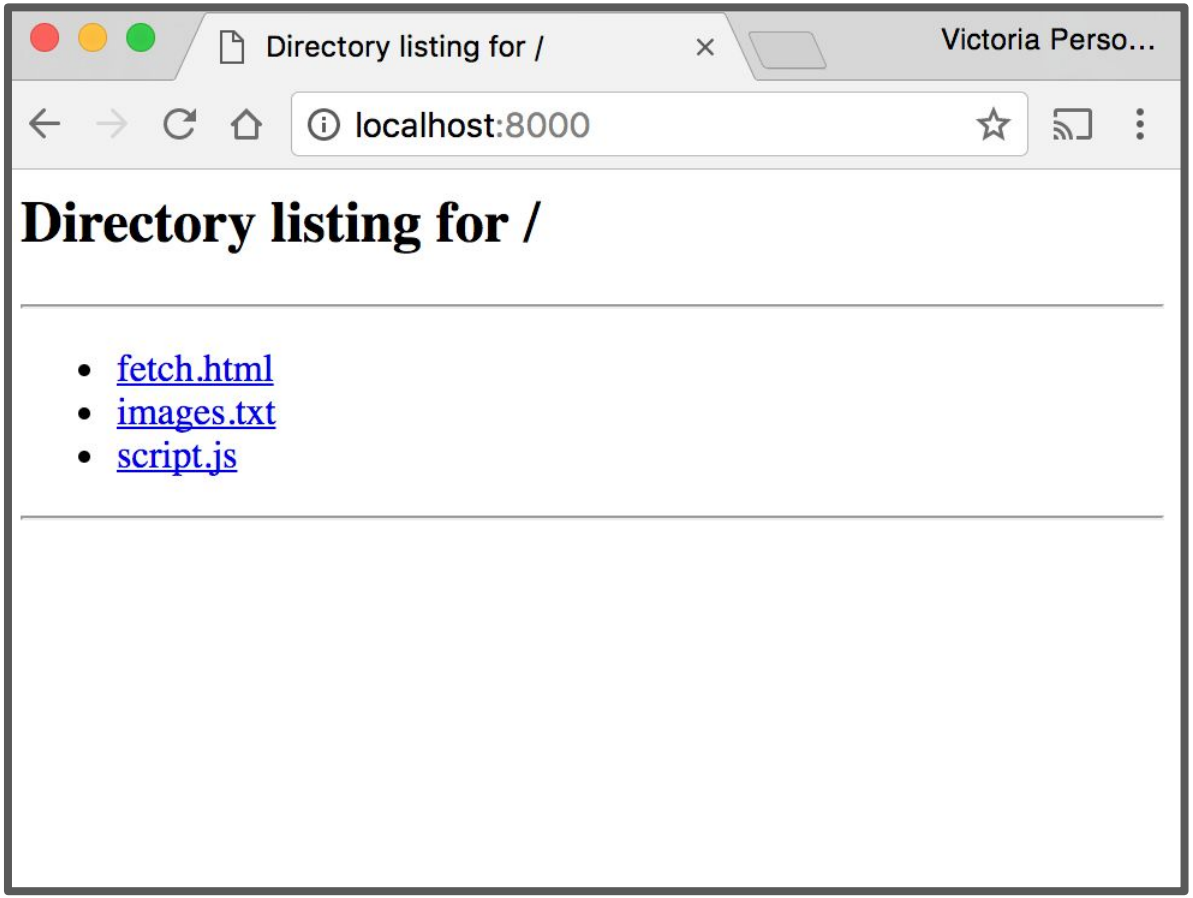
We can run a program to serve our local files over HTTP:

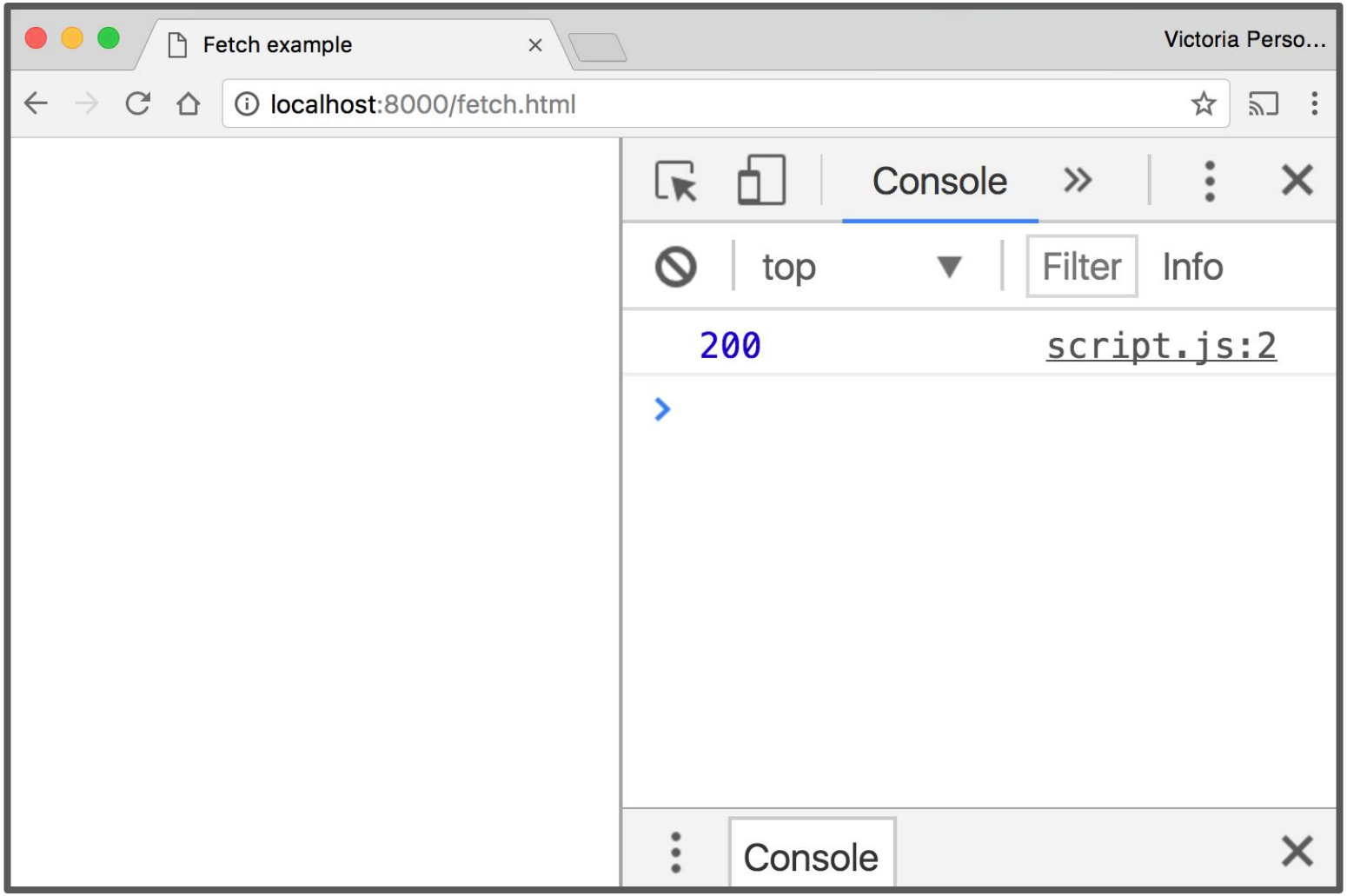
```
$ python -m SimpleHTTPServer
Serving HTTP on 0.0.0.0 port 8000 ...
```

This now starts up a **server** that can load the files in the current directory over HTTP.

- We can access this server by navigating to: http://localhost:8000/

```
$ python -m SimpleHTTPServer
Serving HTTP on 0.0.0.0 port 8000 ...
```





We got HTTP response 200, which is success! (codes)

How do we get the data from `fetch()`?

Using Fetch

```
function onSuccess(response) {
  ..
}
fetch('images.txt').then(onSuccess);
```

- `response.status`: Status code for the request
- `response.text()`:
  - Asynchronously reads the response stream
  - **Returns a `Promise`** that resolves with the string containing the response stream data.

text() Promise

Q: How do we change the following code to print out the response body?

```
function onSuccess(response) {
  console.log(response.status);
}

function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt')
    .then(onSuccess, onError);
```

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  console.log(response.status);
  response.text().then(onStreamProcessed);
}

function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt').then(onResponse, onError);
```

Chaining Promises

We want the following asynchronous actions to be completed in this order:

1. When the `fetch` completes, run `onResponse`
2. When `response.text()` completes, run `onStreamProcessed`

```
function onStreamProcessed(text) { … }
function onResponse(response) {
  response.text().then(onStreamProcessed);
}
fetch('images.txt').then(onResponse, onError);
```

We can rewrite this:

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  response.text().then(onStreamProcessed);
}

function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt').then(onResponse, onError);
```

We can rewrite this:

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  return response.text();
}

function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt')
    .then(onResponse, onError)
    .then(onStreamProcessed);
```

Chaining Promises

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  return response.text();
}

fetch('images.txt')
    .then(onResponse, onError)
    .then(onStreamProcessed);
```

Chaining Promises

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  return response.text();
}

const responsePromise = fetch('images.txt')
    .then(onResponse, onError)
responsePromise.then(onStreamProcessed);
```

The Promise returned by `onResponse` is effectively* the Promise returned by `fetch`. (*Not actually what's happening, but that's how we'll think about it for right now.)

Chaining Promises

```
function onStreamProcessed(text) {
  console.log(text);
}

function onResponse(response) {
  return response.text();
}

fetch('images.txt')
    .then(onResponse, onError)
    .then(onStreamProcessed);
```

If we don't think about it too hard, the syntax is fairly intuitive.

We'll think about this more deeply later!

Completed example

```
function onStreamProcessed(text) {
  const urls = text.split('\n');
  for (const url of urls) {
    const image = document.createElement('img');
    image.src = url;
    document.body.append(image);
  }
}
function onSuccess(response) {
  response.text().then(onStreamProcessed)
}
function onError(error) {
  console.log('Error: ' + error);
}

fetch('images.txt').then(onSuccess, onError);
```

JSON

JavaScript Object Notation

JSON: Stands for **J**ava**S**cript **O**bject **N**otation

- Created by Douglas Crockford
- Defines a way of **serializing** JavaScript objects
  - **to serialize**: to turn an object into a string that can be deserialized
  - **to deserialize**: to turn a serialized string into an object
- `JSON.stringify(`***object***`)` returns a string representing ***object*** serialized in JSON format
- `JSON.parse(`***jsonString***`)` returns a JS object from the ***jsonString*** serialized in JSON format

JSON.stringify()

We can use the `JSON.stringify()` function to seralize a JavaScript object:

```
const bear = {
  name: 'Ice Bear',
  hobbies: ['knitting', 'cooking', 'dancing']
};

const serializedBear = JSON.stringify(bear);
console.log(serializedBear);
```

CodePen

JSON.parse()

We can use the `JSON.parse()` function to deseralize a JavaScript object:

```
const bearString = '{"name":"Ice
Bear","hobbies":["knitting","cooking","danci
ng"]}';

const bear = JSON.parse(bearString);
console.log(bear);
```

CodePen

Why JSON?

JSON is a useful format for storing data that we can load into a JavaScript API via fetch().

Let's say we had a list of Songs and Titles.

- If we stored it as a text file, we would have to know how we are separating song name vs title, etc
- If we stored it as a JSON file, we can just deserialize the object.

JSON

songs.json

```json
{
  "cranes": {
    "fileName": "solange-cranes-kaytranada.mp3",
    "artist": "Solange",
    "title": "Cranes in the Sky [KAYTRANADA Remix]"
  },
  "timeless": {
    "fileName": "james-blake-timeless.mp3",
    "artist": "James Blake",
    "title": "Timeless"
  },
  "knock": {
    "fileName": "knockknock.mp4",
    "artist": "Twice",
    "title": "Knock Knock"
  },
  "deep": {
    "fileName": "janet-jackson-go-deep.mp3",
    "artist": "Janet Jackson",
    "title": "Go Deep [Alesia Remix]"
  },
  "discretion": {
    "fileName": "mitis-innocent-discretion.mp3",
    "artist": "MitiS",
    "title": "Innocent Discretion"
  },
  "spear": {
    "fileName": "toby-fox-spear-of-justice.mp3",
    "artist": "Toby Fox",
    "title": "Spear of Justice"
  }
}
```

Fetch API and JSON

The Fetch API also has built-in support for json:

```
function onStreamProcessed(json) {
  console.log(json);
}

function onResponse(response) {
  return response.json();
}

fetch('songs.json')
    .then(onResponse, onError)
    .then(onStreamProcessed);
```