Using API's

INFO 253A: Frontend Web Architecture

Kay Ashaolu

API

- Application Programming Interface

What is an API?

From Quora: An API (Application Programming Interface) is best thought of as a contract provided by one piece of computer software to another.

Simple API: a function in JavaScript

```javascript
1  function getMaximum(num1, num2) {
2          /* ...
3             working code
4             ...
5          */
6
7          return answer;
8  }
```

Simple API: a function in JavaScript

- Imagine that you didn't know how that function was implemented
- You only know that you enter two numbers in the function and you receive the greater of those two numbers
- **That is an API!**

API as contract

- The getMaximum function can be considered as one piece of computer software
- The rest of your code can be considered as another piece of computer software
- The contract between those two pieces of software:
  - If you call the getMaximum function and pass it two numbers as data
  - It will return a number that is the maximum of the numbers provided.

API as a contract example

../js/api.js

```js
1  function getMaximum(num1, num2) {
2          let answer = num1;
3
4          if (num1 < num2) {
5                  answer = num2;
6          }
7
8          return answer;
9  }
```

API as a contract example

index.html

```html
1  <!DOCTYPE html>
2  <html>
3          <body>
4                  <button onclick="alert(getMaximum(5, 3))">
5                          Call API function getMaximum
6                  </button>
7                  <script src="../js/api.js"></script>
8          </body>
9  </html>
```

API as a contract example

- api.js defined an API action called getMaximum
- It accepts two pieces of information: two numbers
- It returns one piece of information: a number
- Any web page can import api.js and by following the above contract can utilize the getMaximum function

Now what really is an API?

- When people say an API, they don't really mean what we just covered
- So let's talk about what people really mean when they say "API"

Now what really is an API?

The power of APIs

- Web applications used to combine all of their functionality in their website
- Now they separated their "functions" into independent APIs so that clients other than their own websites can use it
- So now anyone can access that information

The power of APIs Example

- **Without API:** An app finds the current weather in London by opening http://www.weather.com/ and reading the web page like a human does, interpreting the content.
- **With API:** An app finds the current weather in London by sending a message to the weather.com API (in a structured format like JSON). The weather.com API then replies with a structured response.

APIs over HTTP

- Let's take that function concept to the Internet
- We can define functions that can be called "through the Internet" using the HTTP protocol
- We can use the same protocol as we do for web servers to send and receive information
- Caveat: Instead of sending HTML/CSS/JS, we send and receive a more structured data representation, like XML or JSON

JSON

- JavaScript Object Notation
- A lightweight format that is used for data interchanging
- It's a subset of the JavaScript language
- It's the way objects are built in JavaScript

JSON Example

```json
{
        "coord": {
                "weather": [
                        {
                                "id":800,
                                "main":"Clear",
                                "description":"clear sky",
                                "icon":"01d"
                        }
                ],
                "base": "stations",
                "main": {
                        "temp":294.787,
                        "pressure":1024.49,
                        "humidity":52,
                        "temp_min":294.787,
                        "temp_max":294.787,
                        "sea_level":1032.69,
                        "grnd_level":1024.49
                }, ...
```

JSON Example

- The previous example was the response to a call to the OpenWeather API
- We send a GET request to the OpenWeather API server sending a single parameter:
  - "q" to query for the city
- We get the JSON response from the previous slide

How to call an API

Let's use curl!

```
1  curl -v "http://api.openweathermap.org/data/2.5/weather?\
2  q=Berkeley,ca"
```

API HTTP Response

```
 1  HTTP/1.1 401 Unauthorized
 2  Server: openresty
 3  Date: Fri, 02 Nov 2018 12:34:35 GMT
 4  Content-Type: application/json; charset=utf-8
 5  Content-Length: 107
 6  Connection: keep-alive
 7  X-Cache-Key: /data/2.5/weather?q=berkeley,ca
 8  Access-Control-Allow-Origin: *
 9  Access-Control-Allow-Credentials: true
10  Access-Control-Allow-Methods: GET, POST
11
12  Connection #0 to host api.openweathermap.org left intact
13  {"cod":401, "message": "Invalid API key.
14        Please see http://openweathermap.org/faq#error401 for more info."}
```

We got a 401 error

From website: Starting from 9 October 2015 our API requires a valid APPID for access. Note that this does not mean that our API is subscription-only now - please take a minute to register a free account to receive a key.

We got a 401 error

- Remember that 400s HTTP response codes mean that there is a client error
- So we made a mistake
- Now this openweathermap API requires an appid and it's telling you to sign up and generate one

But what is an appid?

- Many API's require some sort of identification so that the API knows who is making the requests
- Typically the backend will assign id's by user or by **application** (one user could have several applications)
- Statistics, rate limiting, blocking, and levels of authorization are all possible when you require application ids to be passed on every request

How do you typically get an appid?

- First you will need to go to the website that hosts the application and go through their signup process
- Next look for somewhere where they tell you how to use their API: typically they will show you how to generate a new application id
- Let's do this now: Openweathermap signup

Now we have an appid!

- af578739923ac7f173a6054b24c606ea
- We can now add our appid in our curl query to get a 200 response back

How to call an API

```
1 curl -v "http://api.openweathermap.org/data/2.5/weather?\
2 q=Berkeley,ca&appid=af578739923ac7f173a6054b24c606ea"
```

How to call an API Response

Note the Content Type

```
 1  HTTP/1.1 200 OK
 2  Server: openresty
 3  Date: Thu, 20 Oct 2016 22:54:46 GMT
 4  Content-Type: application/json; charset=utf-8
 5  Content-Length: 461
 6
 7  {
 8          "coord": {
 9                  "weather": [
10                          {
11                                  "id":800,
12                                  "main":"Clear",
13                                  "description":"clear sky",
14                                  "icon":"01d"
15                                  ...
16
```

How to call an API

- Since this API function call is using a GET request, we can use the address bar on a browser to call this API function
- For POST requests, we cannot do this

Questions?