Using API's

INFO 253A: Frontend Web Architecture
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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
function getMaximum(num1, num2) {
    /* ... working code ... */
    return answer;
}
```
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

```javascript
function getMaximum(num1, num2) {
    let answer = num1;
    if(num1 < num2) {
        answer = num2;
    }
    return answer;
}
```
API as a contract example

index.html

```html
<!DOCTYPE html>
<html>
<body>
<button onclick="alert(getMaximum(5, 3))">
Call API function getMaximum
</button>
<script src="../js/api.js"></script>
</body>
</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
```
{
    "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!

```bash
1  curl -v "http://api.openweathermap.org/data/2.5/weather?q=Berkeley,ca"
```
API HTTP Response

```
HTTP/1.1 401 Unauthorized
Server: openresty
Date: Fri, 02 Nov 2018 12:34:35 GMT
Content-Type: application/json; charset=utf-8
Content-Length: 107
Connection: keep-alive
X-Cache-Key: /data/2.5/weather?q=berkeley,ca
Access-Control-Allow-Origin: *
Access-Control-Allow-Credentials: true
Access-Control-Allow-Methods: GET, POST

{ "cod":401, "message": "Invalid API key. 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?q=Berkeley,ca&appid=af578739923ac7f173a6054b24c606ea"
How to call an API

Response

Note the Content Type

```json
{
    "coord": {
        "weather": [
            {
                "id": 800,
                "main": "Clear",
                "description": "clear sky",
                "icon": "01d"
            }
        ]
    }
}
```
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?