2. APIs

What you will be able to do:

- Define differences between libraries, SDKs, APIs, and frameworks
- Describe how an API works using the correct terminology
- Implement a GET request that retrieves JSON data from an API
  - We will dive into what JSON is next session!

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Tools you will need for today:

- extra screen (your phone works!)
- pencil and scratch paper (8.5” x 11” ish)

  … or screen and stylus

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What definitions do you know?

- API
- SDK
- Library
- Framework
- REST
- SOAP

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Definitions

- Application Programming Interface (API) - set of rules structuring how to interact between applications
- Library - set of related, reusable code (e.g. pandas, matplotlib)
- Framework - structured code that makes it easier for a programmer or developer to create a desktop/mobile/web application; it usually includes a set of libraries to perform various tasks
- REST - most popular type of API; an architectural style
- SOAP - more secure version of REST

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APIs

Types of APIs

Local APIs	Web APIs	Program APIs
The original API, created to provide operating system or middleware services to application programs.	Designed to represent widely used resources like HTML pages and are accessed using a simple HTTP protocol. Often called REST APIs or RESTful APIs.	Based on RPC technology that makes a remote program component appear to be local to the rest of the software.

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Why Use APIs?

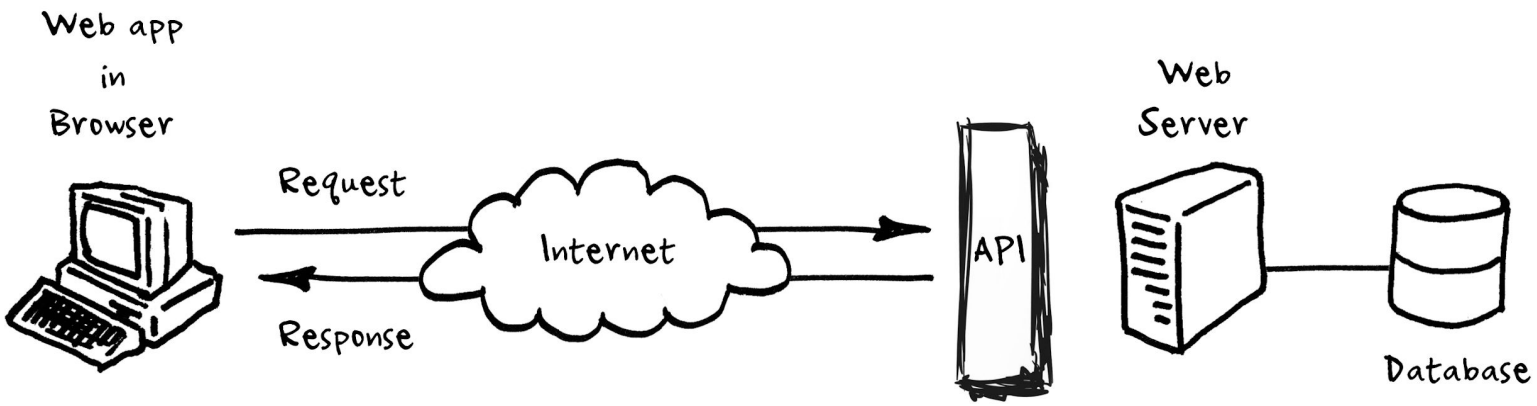
A popular goal for using many (web) APIs is to get information!

- Want to build a music web app that displays lyrics to a song? The Genius.com API provides lyrics to a bunch of songs!
- Want to build a web app that displays the weather from any location you input? The weather.com API provides forecasts!
- Want to build a web app that displays recipes using specific ingredients? the Spoonacular.com API provides recipes!

How APIs work

To access and interface with a source's stored information, we need to use their provided APIs:

1. Client sends a request for data using an API endpoint , which includes a URL and parameters
2. Server sends response with the resource



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Let’s draw this out.

API Diagram

Say I want to create a web app that pulls in random lyrics of my favorite artist. Instead of manually typing up 100m+ songs, I can use lyrics from genius.com....

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HTTP Requests

	HTTP Method	Path	Protocol Version
Start Line	GET	/codio/home	http/1.1
HTTP Headers	mandatory: Host: codio.com optional: Accept-Language: en		
Empty String			
Message Body *(optional)*			

- Request methods:
  - GET – requests resource
  - POST – requests resource be posted on server (e.g. posting on a forum)
  - PUT – requests resource be put in specific place on server
  - DELETE – request resource is removed from server

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Making HTTP Requests (the easy way)

- HTTP requests are generally formulated on our behalf via...
  - software (such as a browser)
  - a library such as the requests library python
  - a shell command, such as curl.
- When requesting information, all we usually have to do is provide the HTTP method (GET in our case)* and the host to send the request to.

** In some cases, you don't even need to provide GET!*

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HTTP Responses

	Protocol Version	Status Code	Status Message
Start Line	http/1.1	200	OK
HTTP Headers	content-length=[1256] content-type=[text/html; charset=UTF-8] date=[Thu, 02 Mar 2023 20:25:34 GMT]		
Empty String			
Message Body *(optional)*	<!doctype html> <html> <head> <title>Example Domain</title>		

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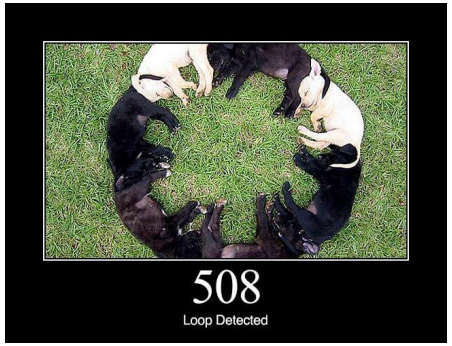
HTTP Response Status Code Classes

- The first digit of the status code indicates it's class:
  - 1XX (informational) - the request was received, continuing process
  - 2XX (successful) - request received, understood, and accepted
  - 3XX (redirection) - further action needed to complete the request
  - 4XX (client error) - the request cannot be fulfilled (bad syntax)
  - 5XX (server error) - the server failed to fulfill a valid request



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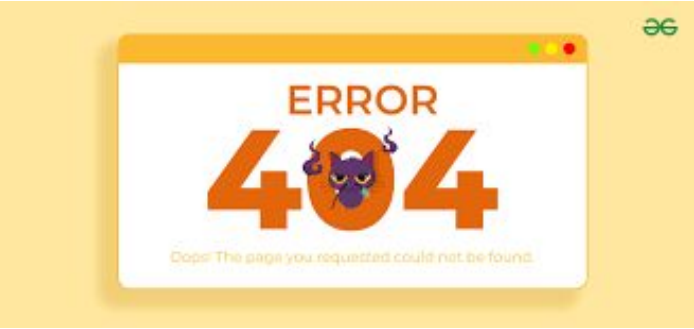
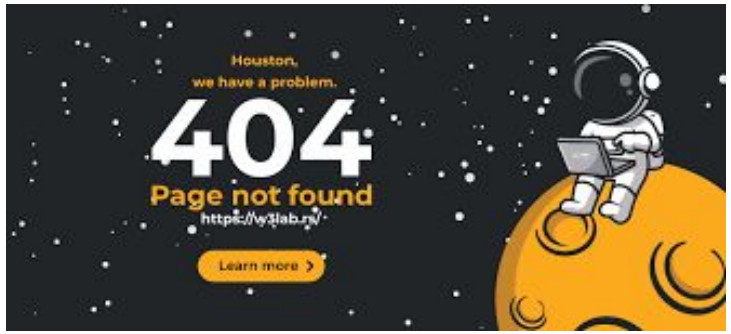
404 - One of the most popular HTTP statuses





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Using an API - Making a Request

1. Head to the website's API documentation
2. Sign up/Register for authorization
3. Find the data you want to access
4. Look for the endpoint needed to access the data
   - the endpoint is usually a URL when dealing with APIs
5. Use their endpoint and make an HTTP Request (from a service that does it for you)

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DEMO Using APIs

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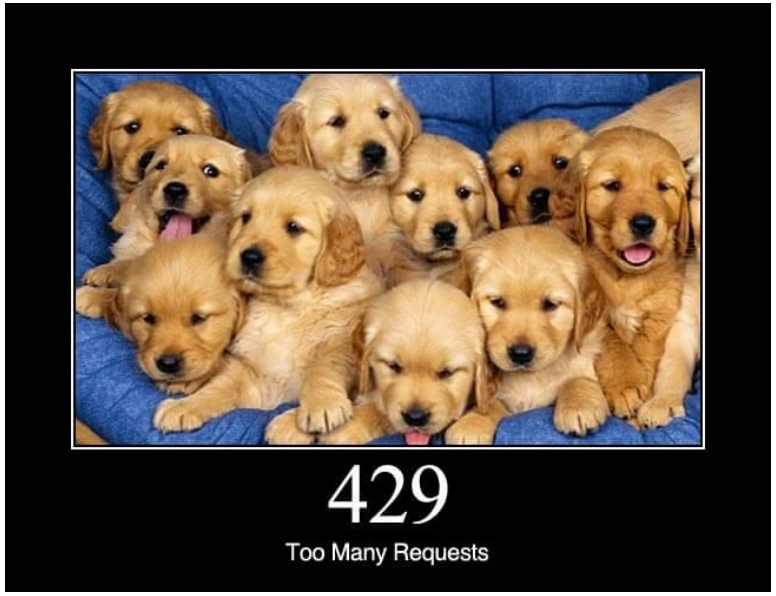
Other Important API Considerations

Authorization - verification that the requester has access to information

- sometimes needed to get access to data behind an API
  - There are a few popular methods:
    - Tokens, API keys, OAuth
  - Failed authorization will result in a 401 status

- Rate limits
  - APIs limit the rate of requests a client can send
  - When you exceed the limit, you get a 429 status



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Read API Docs

- https://developer.spotify.com/documentation/web-api
  - What do you need to obtain for API authorization?
  - What time window is used to monitor the rate limit?
  - What type of information can you receive from the Spotify API, what endpoint do you use?

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Free API Resources

- Public APIS on GitHub
  - Has the most APIs, but no search box
- Rapid API
  - Has some APIs, *and* has a search box
- Any API
  - Contains mostly “name brand” APIs

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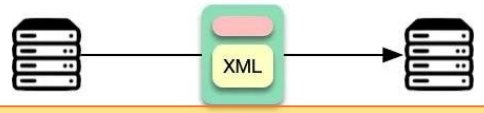
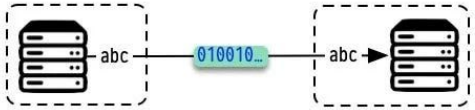
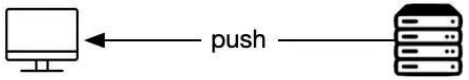
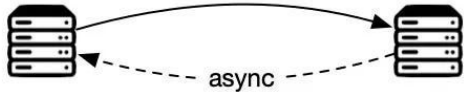
Types of API Architectures

Style	Illustration	Use Cases
SOAP		XML-based for enterprise applications
RESTful		Resource-based for web servers
GraphQL		Query language reduce network load
gRPC		High performance for microservices
WebSocket		Bi-directional for low-latency data exchange
Webhook		Asynchronous for event-driven application

source: www.bytebytego.com

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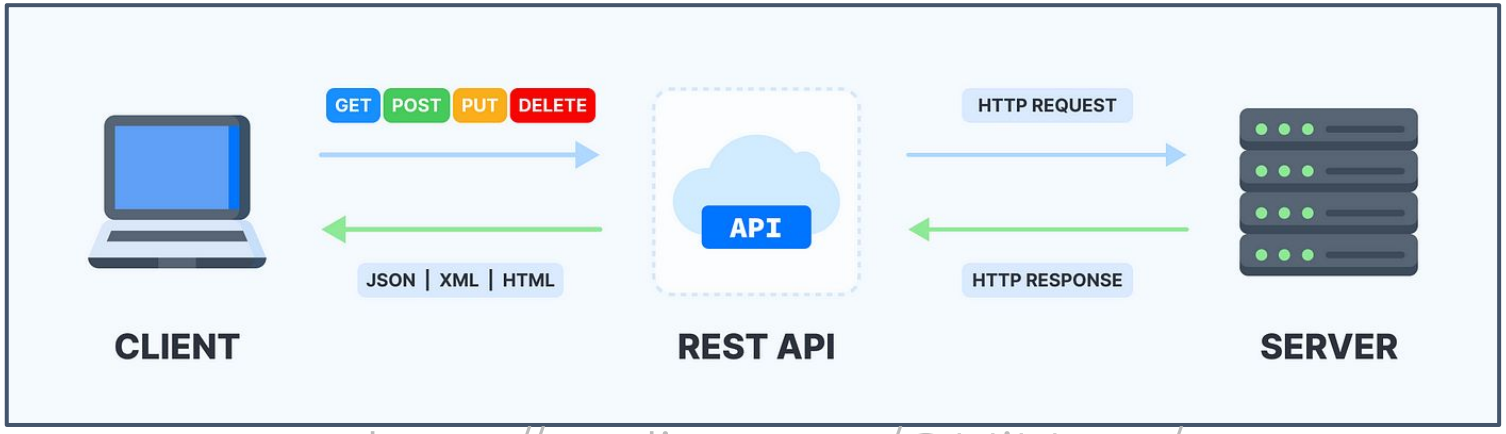
REST APIs

- Rest stands for REpresentational State Transfer
- It is an architecture style that was created to manage communication across complex networks (like the Internet)



source: https://medium.com/@MiMuuu/

- If a system is REST compliant (AKA adhere's to REST design principles) it is called RESTful

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REST Design Principles

1. **Uniform interface** - All API requests for the same resource should look the same
2. **Client-server decoupling** - client and server applications must be completely independent of each other
3. **Statelessness** - each request needs to include all the information necessary for processing it
4. **Cacheability** – Resource should be cacheable on the client or server side
5. **Layered system architecture** - calls and responses go through different layers.
6. **Code on demand (optional)** - REST APIs *usually* send static resources

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Thank you!