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APIs, Dictionaries, and JSON

What you will be able to do:

- Explain how libraries, SDKs, APIs, and frameworks are different, yet related
- Describe how an API works using the correct terminology
- Implement a POST request for an API in python
- Explain how hashing works
- Perform basic operations on Dictionaries
- Implement a GET request that retrieves JSON from an API
- Parse JSON to generate interesting output

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APIs

Put in chat any definitions you know already

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

Definitions

- API – Application Programming Interface – Set of rules structuring interaction between applications
- SDK – Software Development Kit – A set of libraries
- Library – A set of related, reusable functions (e.g. pandas, matplotlib)
- Framework -
- REST – most popular type of API
- SOAP – more secure version of REST

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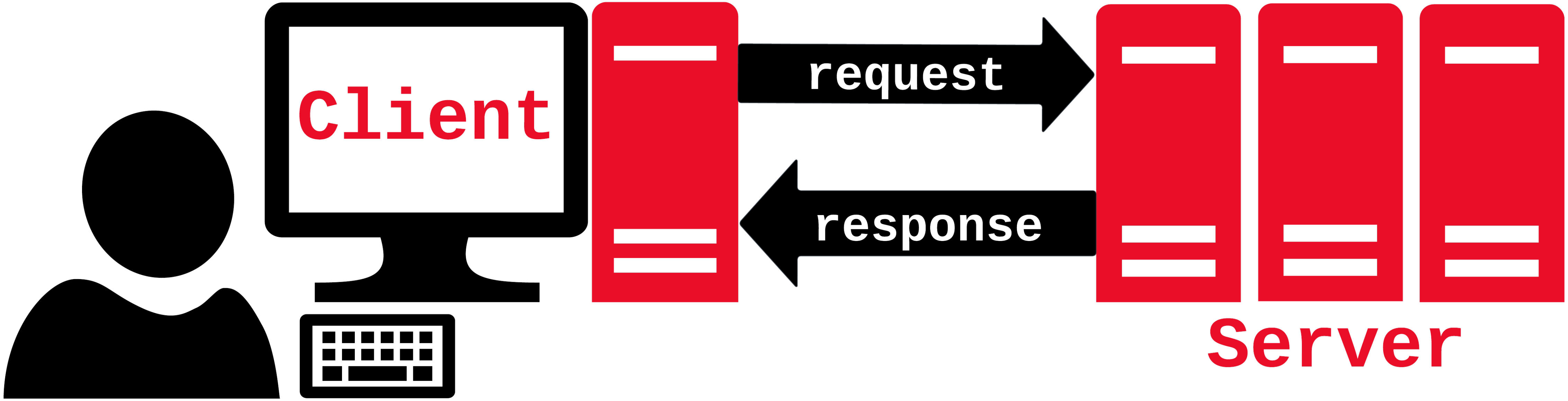
API Overview

- Client sends request resources - described by parameters
- Server sends response with the resource



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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

HTTP Responses

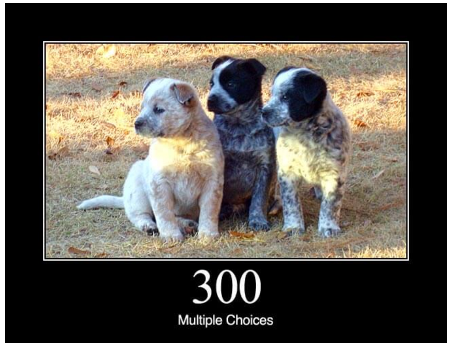
	Protocol Version	Status Code	Status Message
Start Line	http/1.1	200	OK

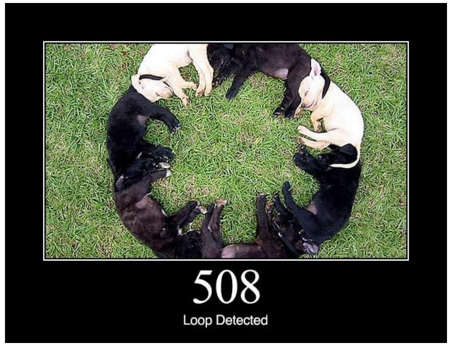
HTTP Headers	content-length=[1256]
	content-type=[text/html; charset=UTF-8]
	date=[Thu, 02 Mar 2023 20:25:34 GMT]		

Empty String			
Message Body *(optional)*	<!doctype html> <html> <head> <title>Example Domain</title>		

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

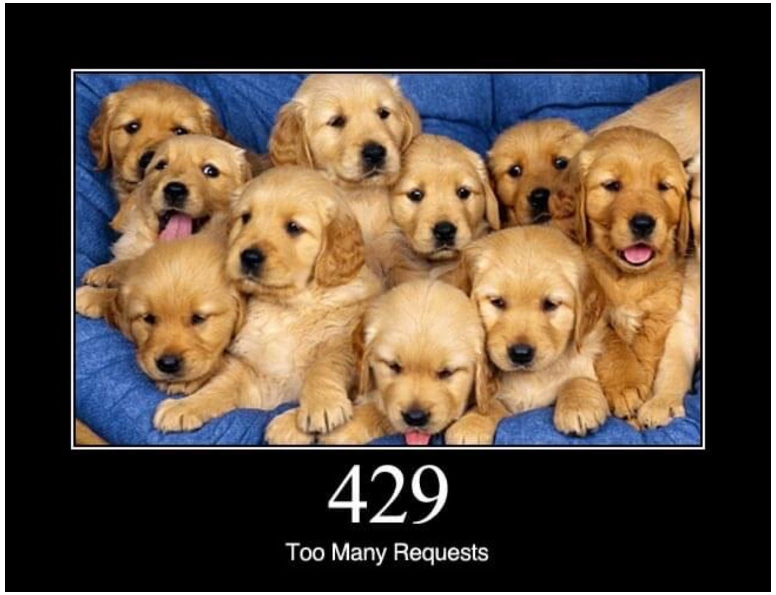




Other Important API Considerations

- Authentication
  - There are a few popular methods:
    - Tokens
    - API keys
    - Oauth
  - Sometimes the authentication method you use determines what you have access to
  - Failed authentication 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



Read API Docs

- https://developer.spotify.com/documentation/web-api
  - What authentication methods can we use?
  - What is the rate limit?
  - What does a request look like?

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. As a rule of thumb, don't assume that the client and server applications connect directly to each other
6. **Code on demand (optional) -** REST APIs usually send static resources, but in certain cases, responses can also contain executable code (such as Java applets). In these cases, the code should only run on-demand

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Dictionaries

Put in chat any definitions you know already

- Hashtable
- Hashing function
- Dictionary
- Key-Value Pair

Definitions

- Hashtable – a data structure where hashable-keys allow quick look up of corresponding values
- Hashing function – a one-way function often used in encryption
- Dictionary – python's built in hashtable structure
- Key-Value Pair – a hash table entry

Let’s build a zip code dictionary!

- In chat, put your zip code and city in the following format:
  ######: ‘city name’,
- For example:
  77478: ‘Sugar Land’,
- Python code for creating dictionary:

  -
    ```
    zip_codes = { 11201: 'Brooklyn’,
                  94112: 'San Francisco’ }
    ```
- Accessing information in dictionary:

  -
    ```
    print(zip_codes[77478])
    ```

Modifying a Dictionary

- Creating/Updating a value:
  - `dictionary['key'] = new_value`

- `pop(key)` – removes specified key and returns associated value
  - `popitem()` – removes last item and returns tuple

API Response body

- Some API GET requests return a python dictionary

- Example:

```
import requests

response =
    requests.get("https://api.quotable.io/random")
data = response.json()

print(data['content'])
```

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JSON

JavaScript Object Notation or JSON

- JSON syntax looks like dictionary with nested dictionaries and lists
- Some API GET Responses return JSON
- Easily parse-able by machines
- Python has `json` library
  - `json.loads()`
    - turns JSON into a dictionary

```
{
  "firstName": "John",
  "lastName": "Smith",
  "age": 21,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "zipCode": "10021"
  },
  "children": [
    "Mary",
    "James"
  ]
}
```

What questions do you have about…

- Explain how libraries, SDKs, APIs, and frameworks are different, yet related
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Thank you!