

# API & REST

Client Server, HTTP, Request & Response,  
JSON, CRUD & REST API

Client Server

JSON

Data Exchange

Communication

REST API

CRUD

PaaS

SaaS

Cloud Services

HTTP Verbs

HTTP Request & Response

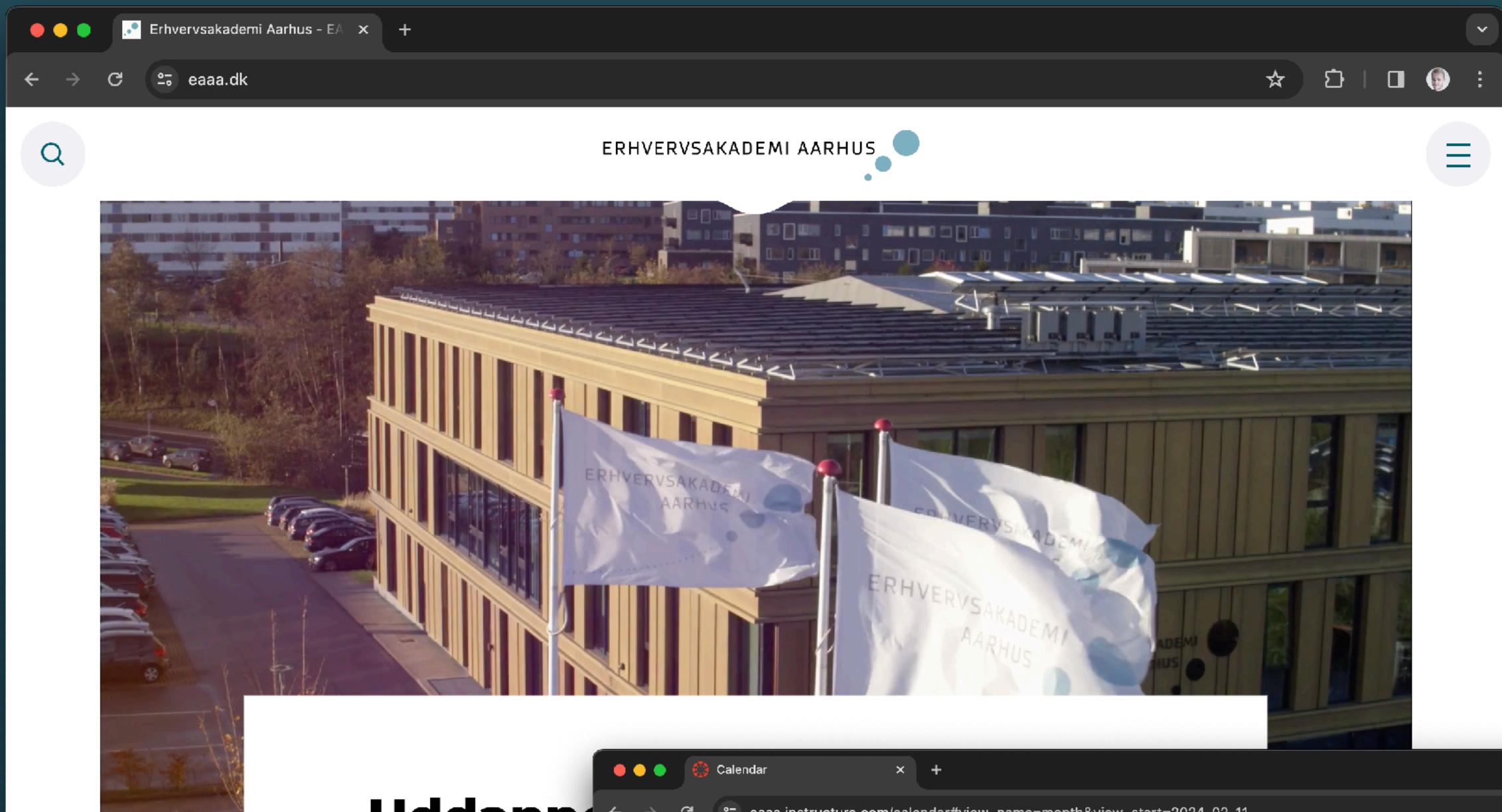
# Communication between two systems

Find examples



# How do systems communicate?

1. How do systems exchange information?
2. How does data travel between locations?
3. How can the same data be reused across platforms?
4. How do we integrate external data into our app?
5. What enables two systems to communicate?



A screenshot of the Instructure calendar interface for February 2024. The calendar shows a grid of days from Monday, February 29, to Sunday, March 3. Most days have multiple events listed, such as "08:30 AWU undervisning" at various times. There are also several "Hackathon" events scheduled throughout the month. The sidebar on the left includes links for Account, Admin, Dashboard, Courses, Calendar (with a red notification dot), Inbox, History, Commons, and Student links.

A screenshot of a Google search results page for the query "house of vincent ring". The results are sponsored ads for various gold rings from the brand House of Vincent. The first few ads show rings like the "GUL CITRIN FORGYLDT. 699 kr. SUN GAZER RING GUL CITRIN FORGYLDT." and the "CANDY ROCK RING". The right side of the page features a map of Northern Europe with a blue dot indicating Denmark, and a section titled "HOUSE OF VINCENT" with a "Website" button.

# Payment Gateways

Social Media Integration

# Healthcare Integration

## Maps and Location Services

## IoT (Internet of Things)

# API

## Weather Data

## News and Content Aggregation

## Financial Data

## Cloud Services

## E-commerce Platforms

Twitter API

Stripe API

Google Maps API

Microsoft HealthVault API

Fitbit API

API

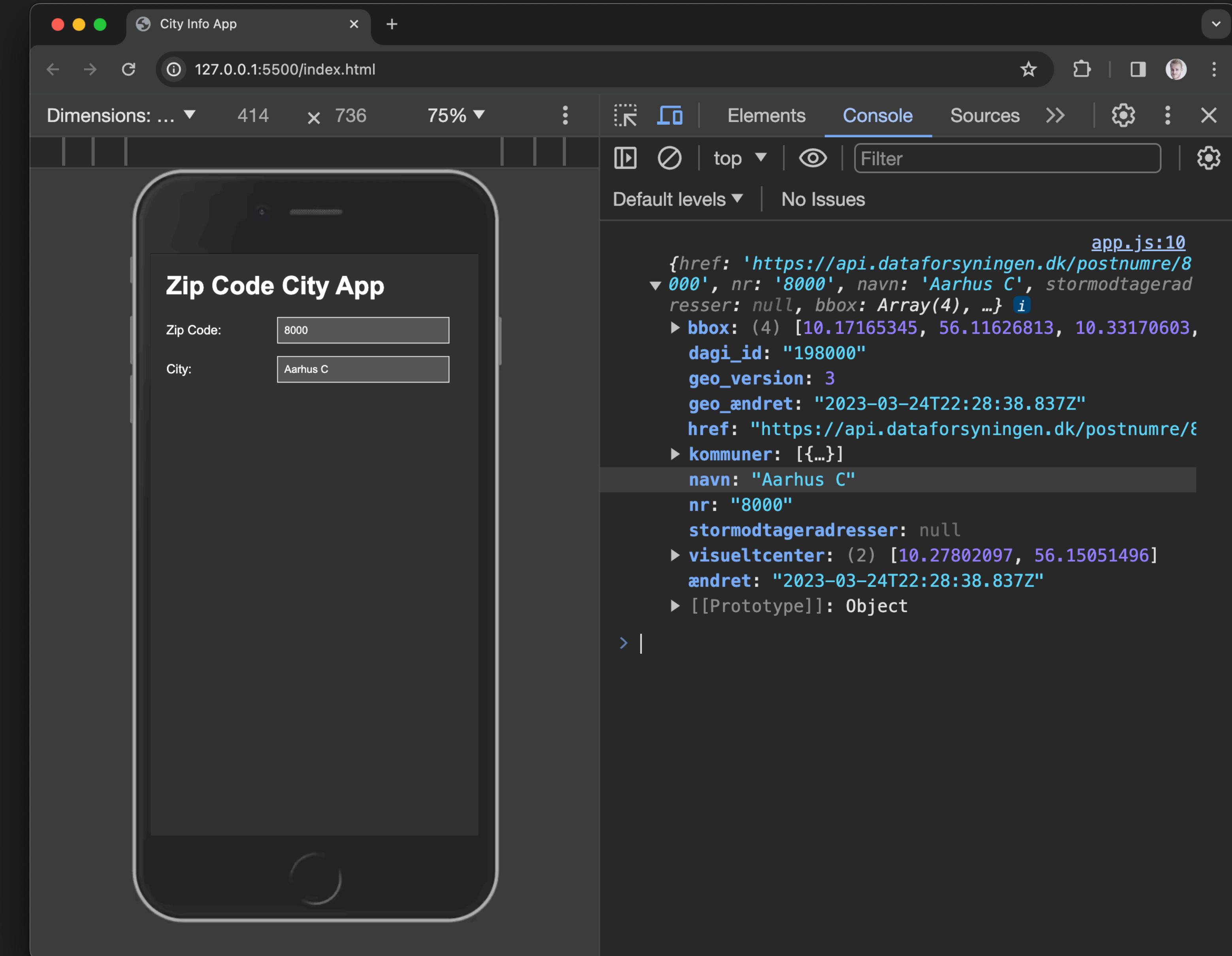
OpenWeatherMap API

The New York Times API

Amazon S3 API

Alpha Vantage API

Shopify API



The screenshot shows a mobile browser window titled "City Info App" with the URL "127.0.0.1:5500/index.html". The browser interface includes standard controls like back/forward, refresh, and zoom, along with developer tool tabs for Elements, Console, Sources, and more. The main content area displays a mobile application titled "Zip Code City App". The app has two input fields: "Zip Code:" containing "8000" and "City:" containing "Aarhus C". To the right of the browser window is the "Console" tab of the developer tools, which is active. It shows a single object returned from an API call, with the source line "app.js:10" indicated. The object contains properties such as href, nr, navn, stormodtageradresser, bbox, dagi\_id, geo\_version, geo\_endret, and visueltcenter.

```
app.js:10
{
  href: 'https://api.dataforsyningen.dk/postnumre/8000',
  nr: '8000',
  navn: 'Aarhus C',
  stormodtageradresser: null,
  bbox: [10.17165345, 56.11626813, 10.33170603, 56.15051496],
  dagi_id: "198000",
  geo_version: 3,
  geo_endret: "2023-03-24T22:28:38.837Z",
  href: "https://api.dataforsyningen.dk/postnumre/8000",
  kommuner: [...],
  navn: "Aarhus C",
  nr: "8000",
  stormodtageradresser: null,
  visueltcenter: [10.27802097, 56.15051496],
  endret: "2023-03-24T22:28:38.837Z"
}
```

<https://cederdorff.com/city-zip-code/>

# Dataforsyningen - REST API

One of many REST APIs



<https://dataforsyningen.dk/>

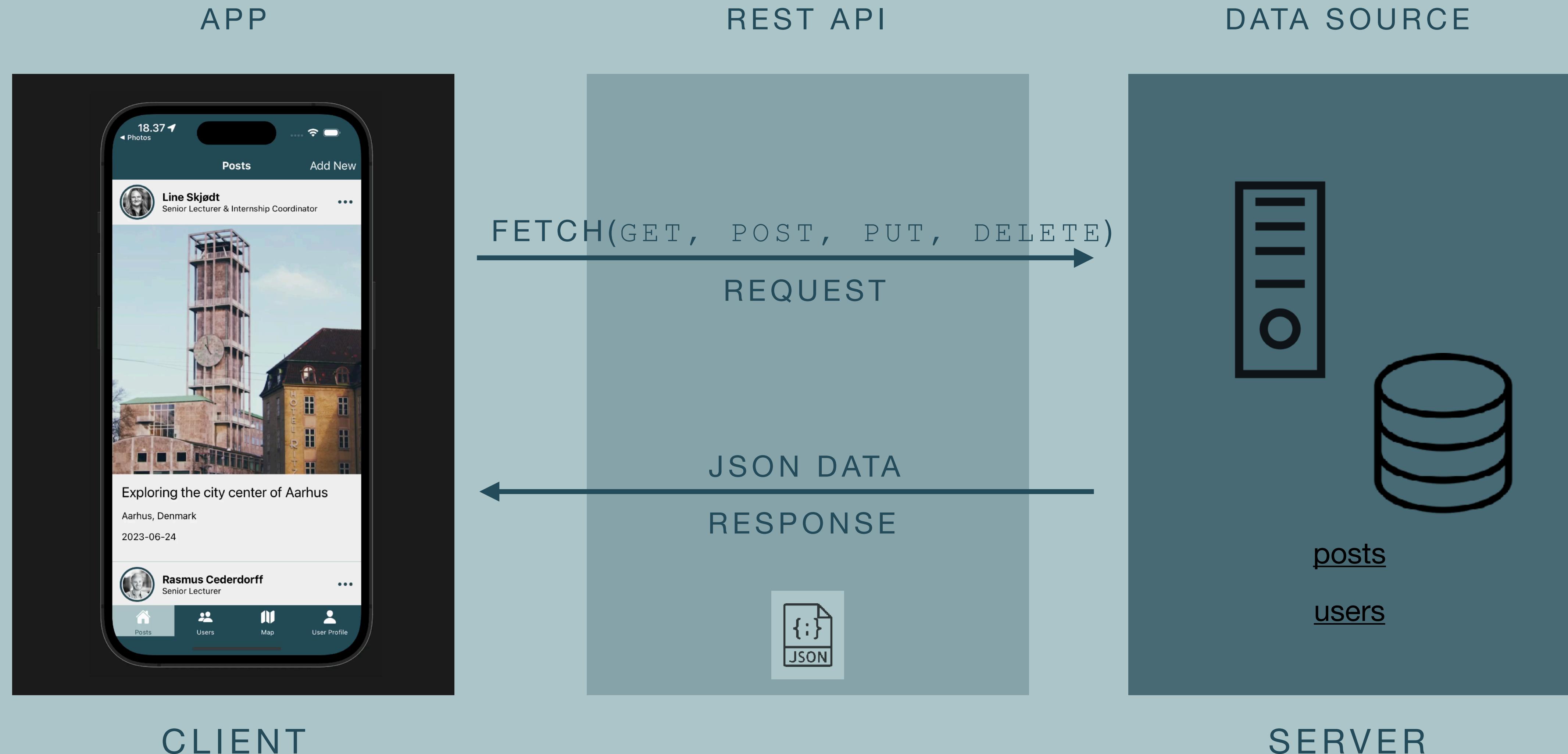
The screenshot shows the REST API documentation page. The title is "Dataforsyningen REST API". It provides links to the API ([API](https://api.dataforsyningen.dk/)), documentation ([DOCS](https://dataforsyningen.dk/)), and a data overview ([Dataoversigt](https://dataforsyningen.dk/data)). Below this, examples of calls are shown: "Eksempel på kald" (Call example) for "Danmarks adresser og vejnavne" (<https://dataforsyningen.dk/data/4729>) and "Docs (REST Services)" (<https://dawadocs.dataforsyningen.dk/dok/api>). The "Regioner" section lists "alle regioner" (all regions) with a GET call to <https://api.dataforsyningen.dk/regioner> and "en region" (one region) with a GET call to <https://api.dataforsyningen.dk/regioner/1082>.

[Dataforsyningen REST API](#)

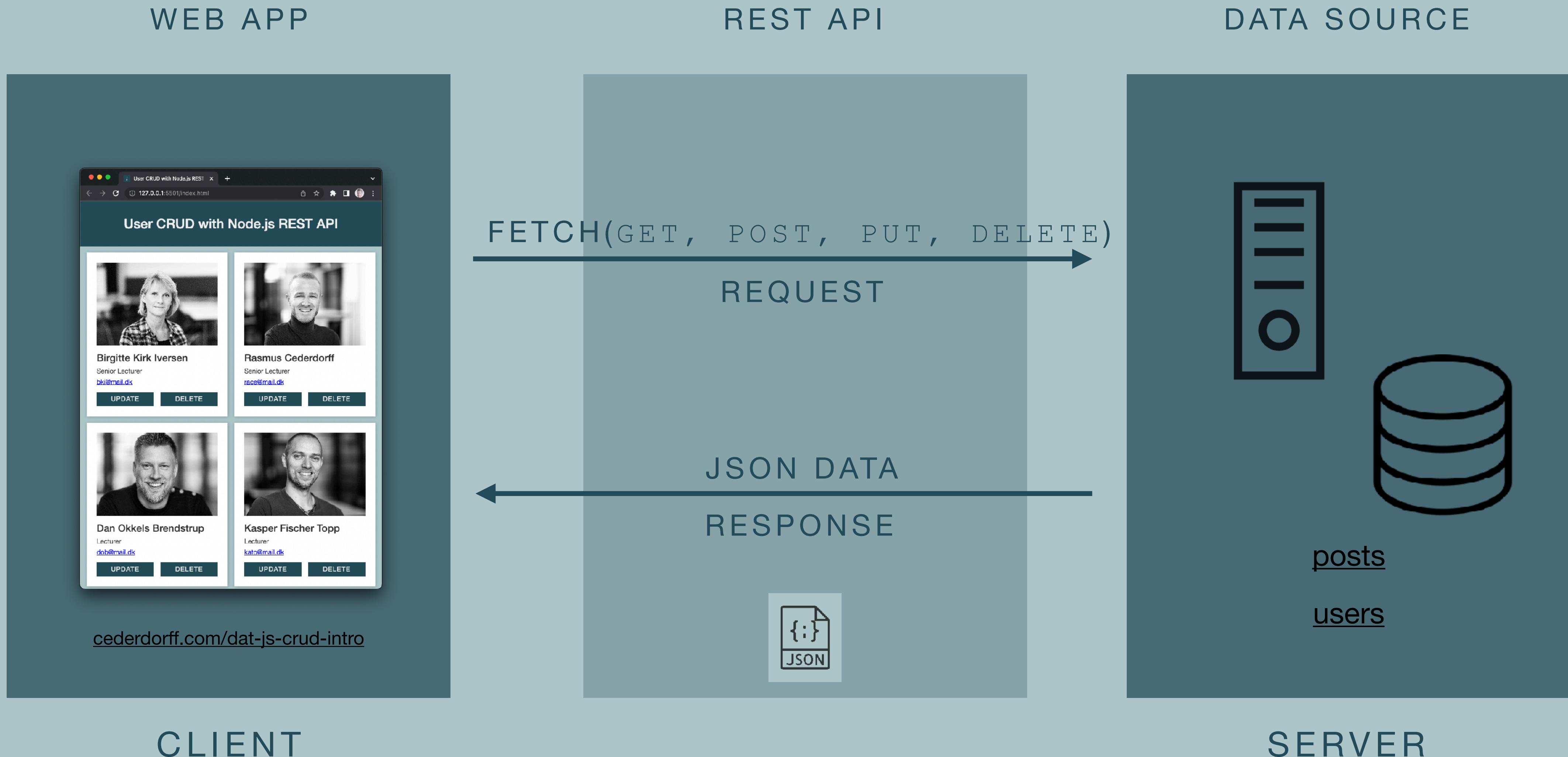
# Client Server

The Basic Architecture of the Web

# Client Server Architecture

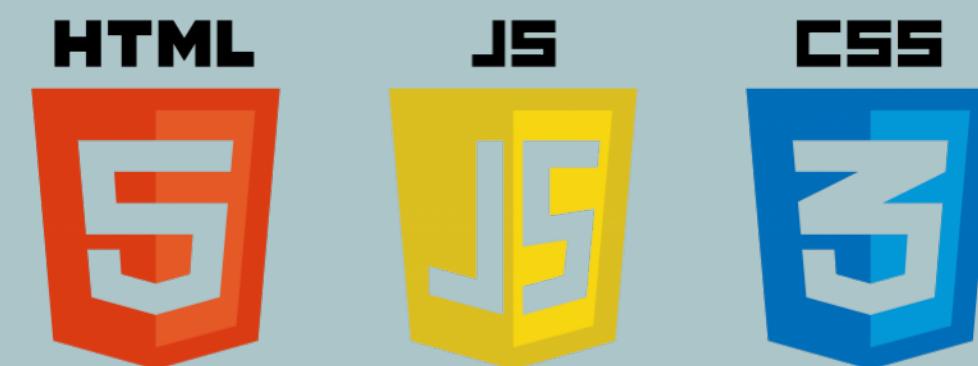


# Web Development



# Webudvikling

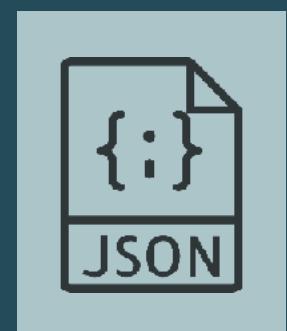
FRONTEND



REST API

FETCH(GET, POST, PUT, DELETE)  
REQUEST

JSON DATA  
RESPONSE

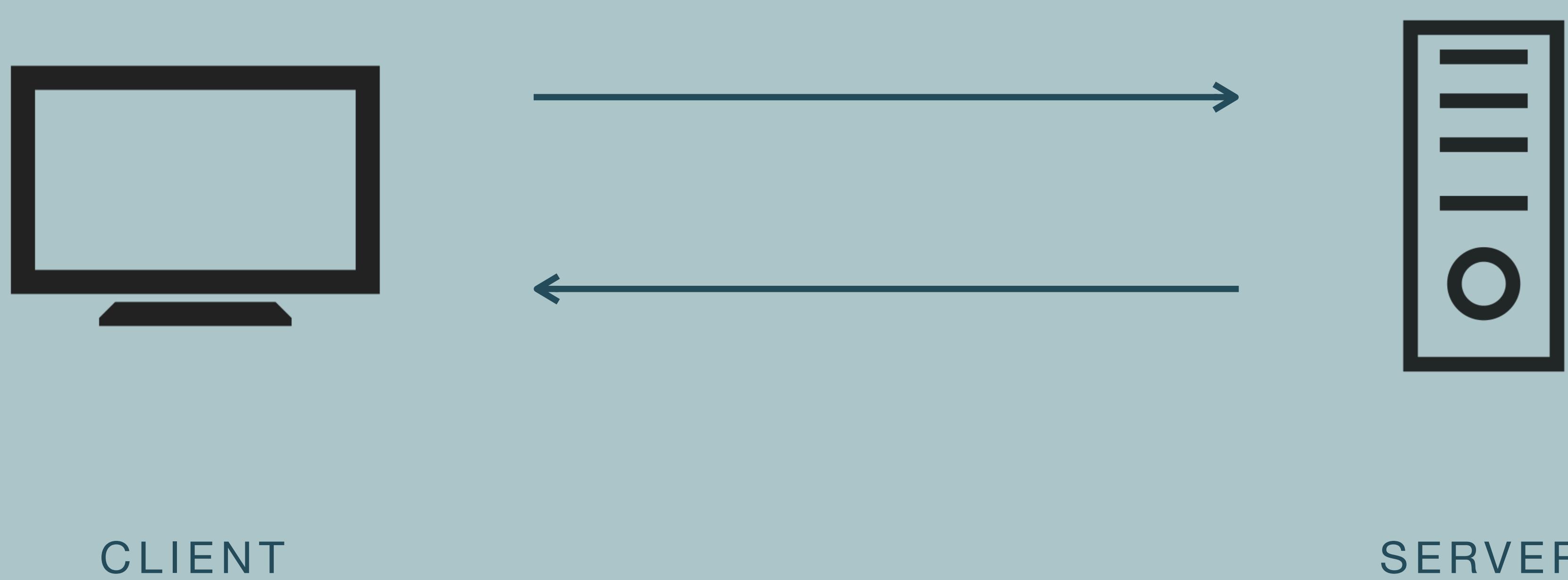


BACKEND



# Client-Server Model

Communication between web **clients** and web **servers**.



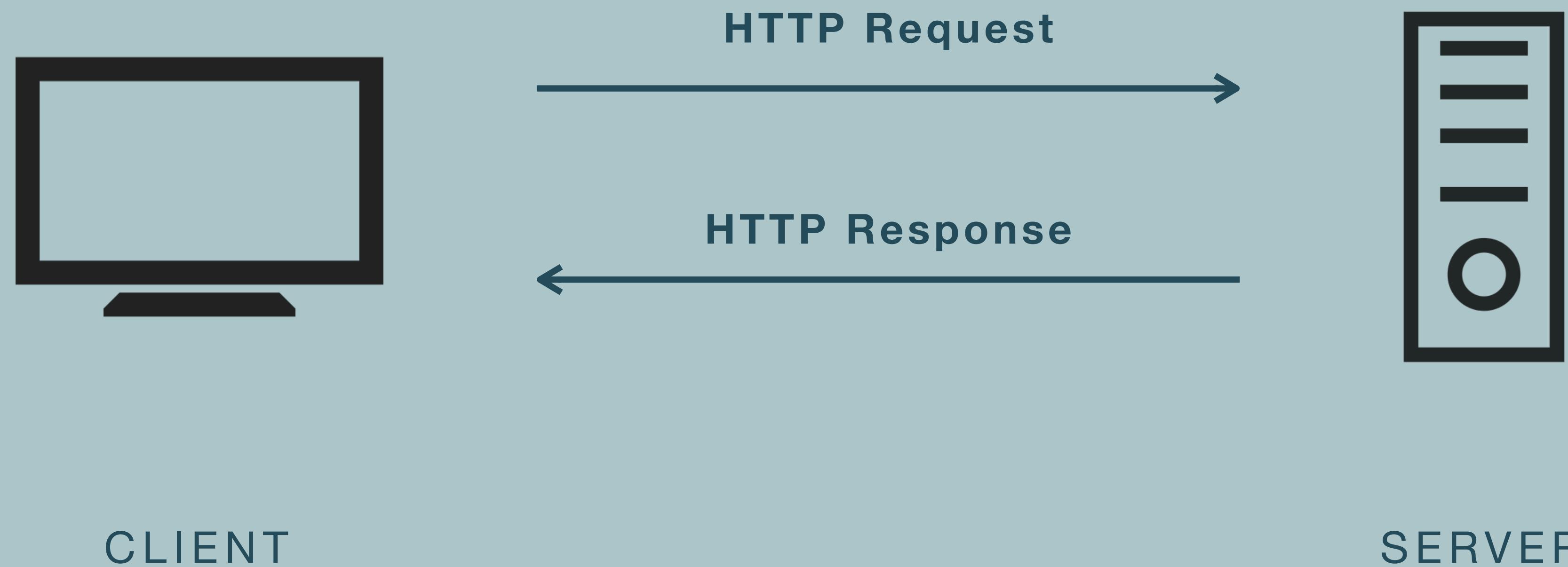
# Client-Server Model

Communication between web **clients** and web **servers**.



# Client-Server Model

Communication between web **clients** and web **servers**.



# Hyper Text Transfer Protocol

- A protocol and standard for fetching data, HTML and other resources (text, images, videos, scripts, JSON).
- The foundation of the web.



What is HTTP

Not Secure | w3schools.com/whatis/whatis\_http.asp

HTML CSS JAVASCRIPT SQL PYTHON

# HTTP Request / Response

Communication between clients and servers is done by **requests** and **responses**:

1. A client (a browser) sends an **HTTP request** to the web
2. A web server receives the request
3. The server runs an application to process the request
4. The server returns an **HTTP response** (output) to the browser
5. The client (the browser) receives the response

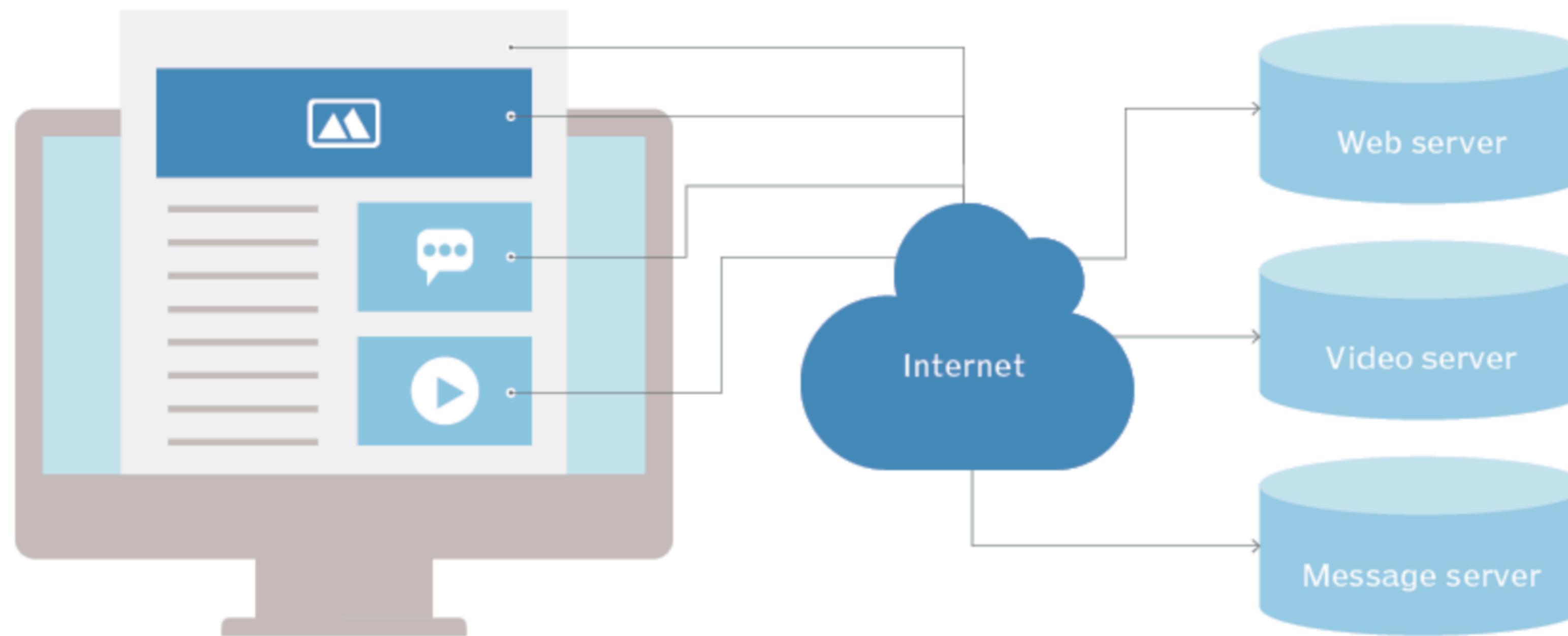
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## The HTTP Request Circle

A typical HTTP request / response circle:

1. The browser requests an HTML page. The server returns an HTML file.
2. The browser requests a style sheet. The server returns a CSS file.
3. The browser requests an JPG image. The server returns a JPG file.
4. The browser requests JavaScript code. The server returns a JS file
5. The browser requests data. The server returns data (in XML or JSON).

# How HTTP Works



<https://www.techtarget.com/whatis/definition/HTTP-Hypertext-Transfer-Protocol>

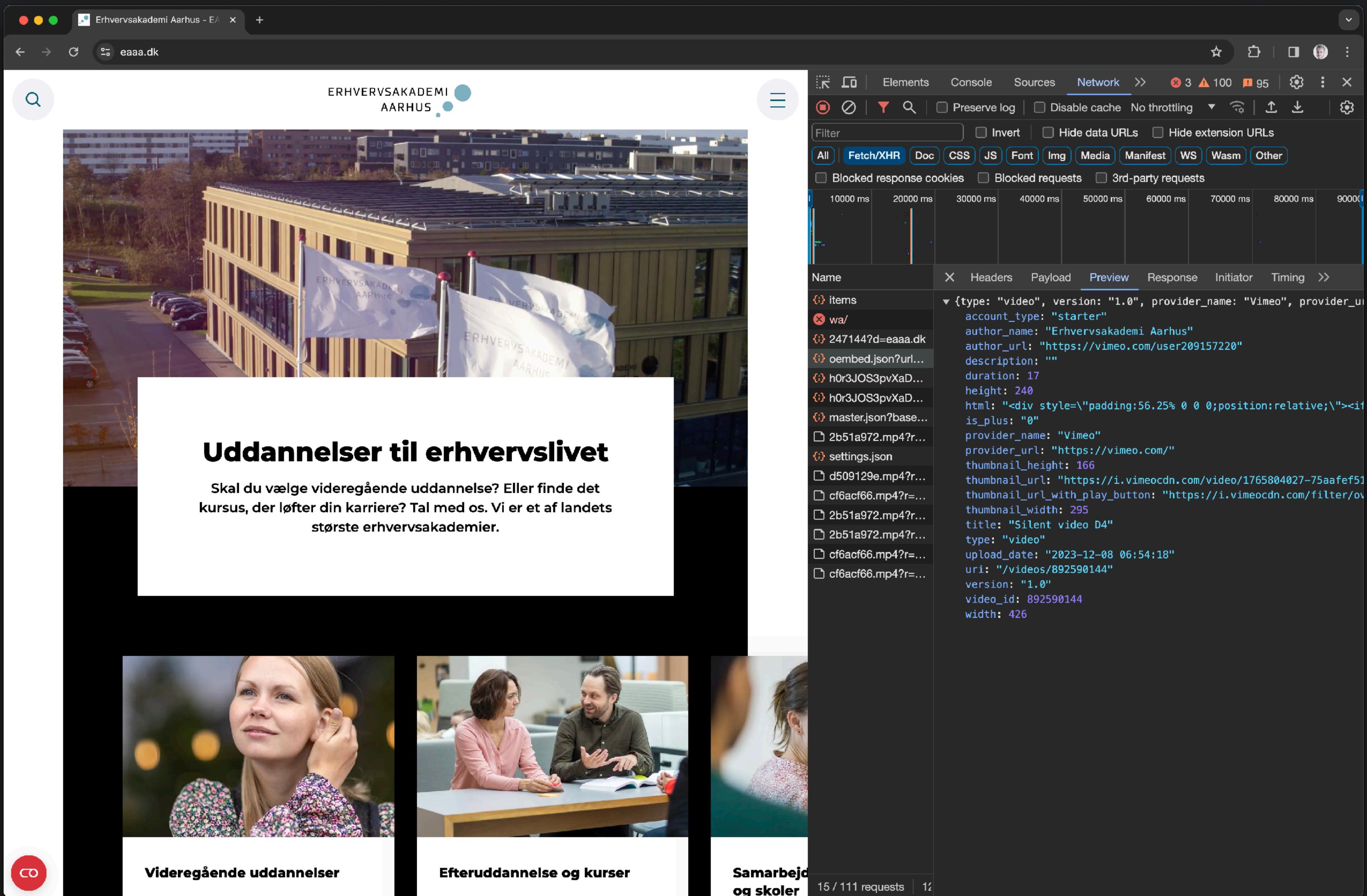
# Network Tab

The screenshot illustrates the Network tab of a browser's developer tools, overlaid on a live website. The website's content includes a header for 'ERHVERVSAKADEMI AARHUS', a main image of two people working, and three cards at the bottom: 'Uddannelser til erhvervslivet', 'Videregående uddannelser', 'Efteruddannelse og kurser', and 'Samarbejde og s...

Name	Method	Status	Type	Initiator	Size	T..	Waterfall
1.gif?dgi=70fb8fd...	GET	200	gif	uc.js?cbid...	(me... 0...		
heatmaps.js	GET	200	script	monsido-s...	(disk... 2...		
page-correct.js	GET	200	script	monsido-s...	(disk... 2...		
?a=h0r3JOS3pvXaDa...	GET	200	gif	monsido-s...	57 B 1...		
favicon.ico	GET	200	x-icon	Other	(disk... 1...		
h0r3JOS3pvXaDabSjt...	GET	200	xhr	heatmaps....	(disk... 0...		
h0r3JOS3pvXaDabSjt...	GET	200	xhr	page-corr...	(disk... 0...		
cast_sender.js?loadC...	GET	200	script	vendor.mo...	(disk... 0...		
1765804027-75aafef...	GET	200	avif	Other	(disk... 0...		
master.json?base64_i...	GET	200	xhr	vendor.mo...	3.0 kB 1...		
1765804027-75aafef...	GET	200	avif	vendor.mo...	(me... 0...		
cast_framework.js	GET	200	script	cast_send...	14 B 1...		
cast_sender.js	GET	200	script	cast_send...	(disk... 1...		
settings.json	GET	200	xhr	uc.js?cbid...	(disk... 0...		
widgetIcon.min.js	GET	200	script	uc.js?cbid...	(disk... 0...		
2b51a972.mp4?r=dX...	GET	200	xhr	vendor.mo...	5.4 kB 2...		
d509129e.mp4?r=dX...	GET	200	xhr	vendor.mo...	264 kB 3...		
cf6acf66.mp4?r=dXM...	GET	200	xhr	vendor.mo...	4.3 ... 2...		
2b51a972.mp4?r=dX...	GET	200	xhr	vendor.mo...	5.4 kB 1...		
2b51a972.mp4?r=dX...	GET	200	xhr	vendor.mo...	5.1 kB 2...		
cf6acf66.mp4?r=dXM...	GET	200	xhr	vendor.mo...	4.6 ... 2...		
cf6acf66.mp4?r=dXM...	GET	200	xhr	vendor.mo...	3.5 ... 3...		
collect?v=2&tid=G-D...	POST	204	ping	js?id=G-D...	17 B 6...		

91 requests | 12.8 MB transferred | 16.2 MB resources | Finish: 5.47 s | DOMContentLoaded: 290 ms

# Network Tab



ERHVERVSAKADEMI  
AARHUS

Kom til u-days 20.-22. februar

Besøg vores 29 videregående uddannelser – og bliv klogere på dit studievalg.

Læs om u-days her

Uddannelser til erhvervslivet

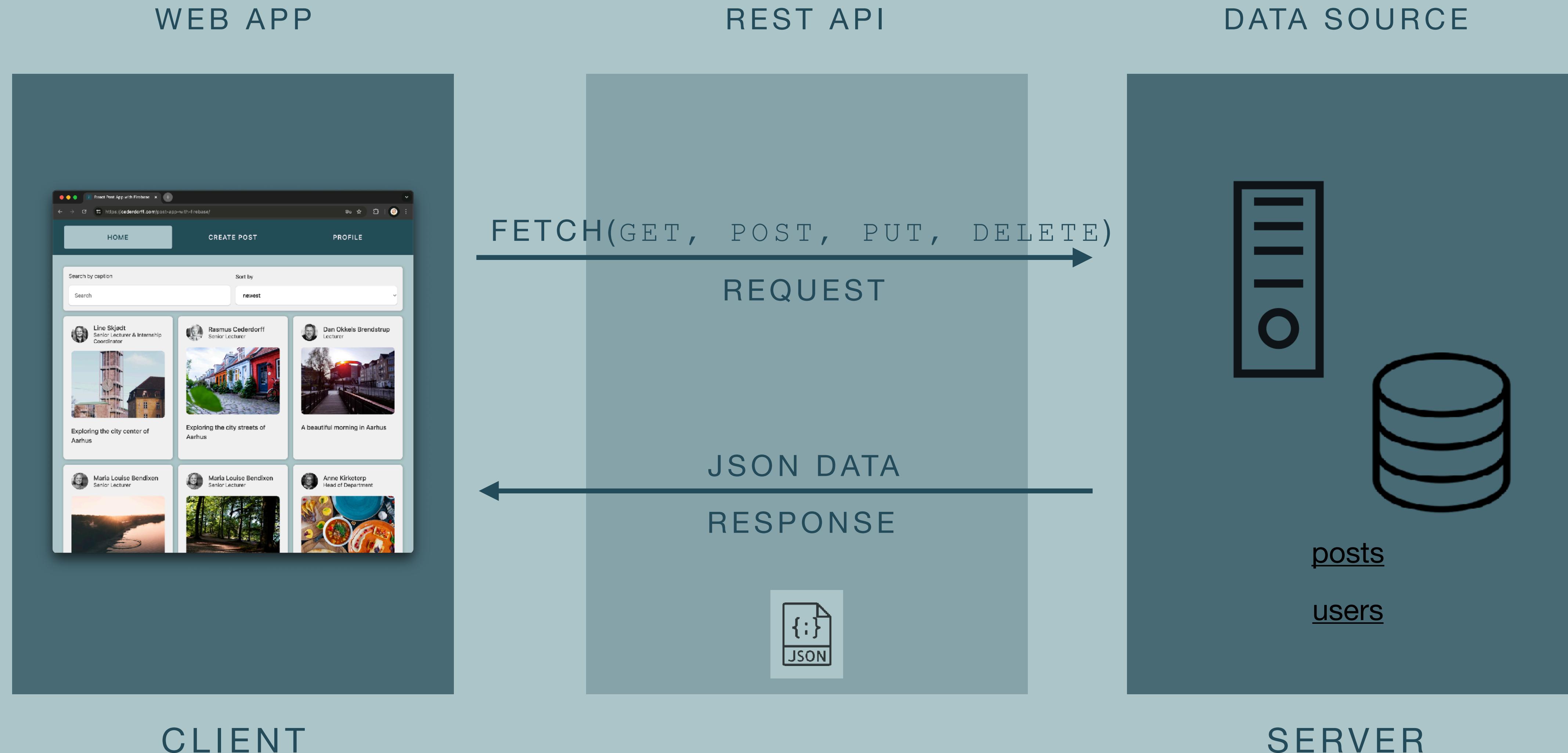
Tal du vælge videregående uddannelse? Eller finde det kursus, der løfter din karriere? Tal med os. Vi er et af landets største erhvervsakademier.

102 requests | 12.9 MB transferred | 17.4 MB resources | Finish: 2.59 s | DOMCo

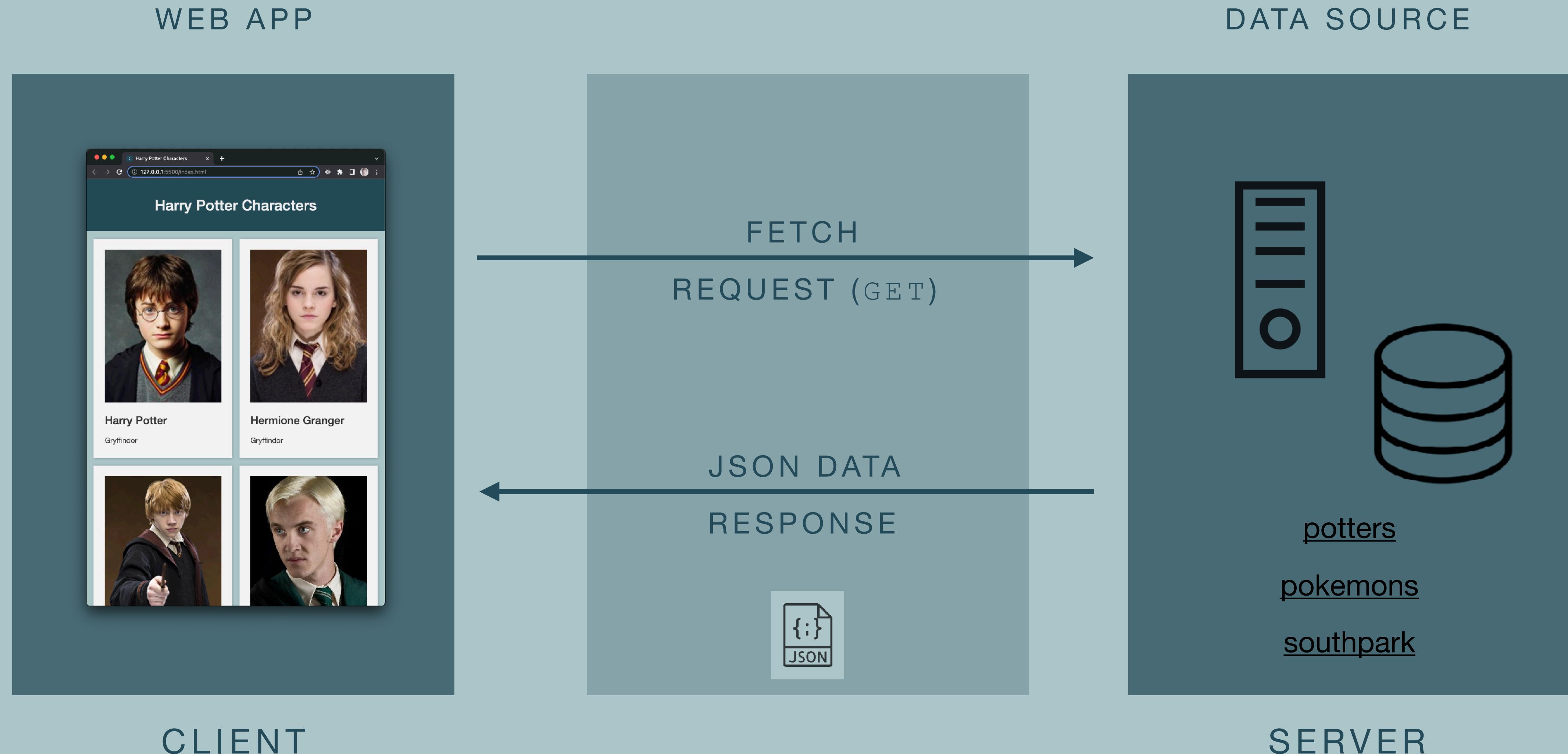
# Network Tab

## Investigating Network Activity in the Browser

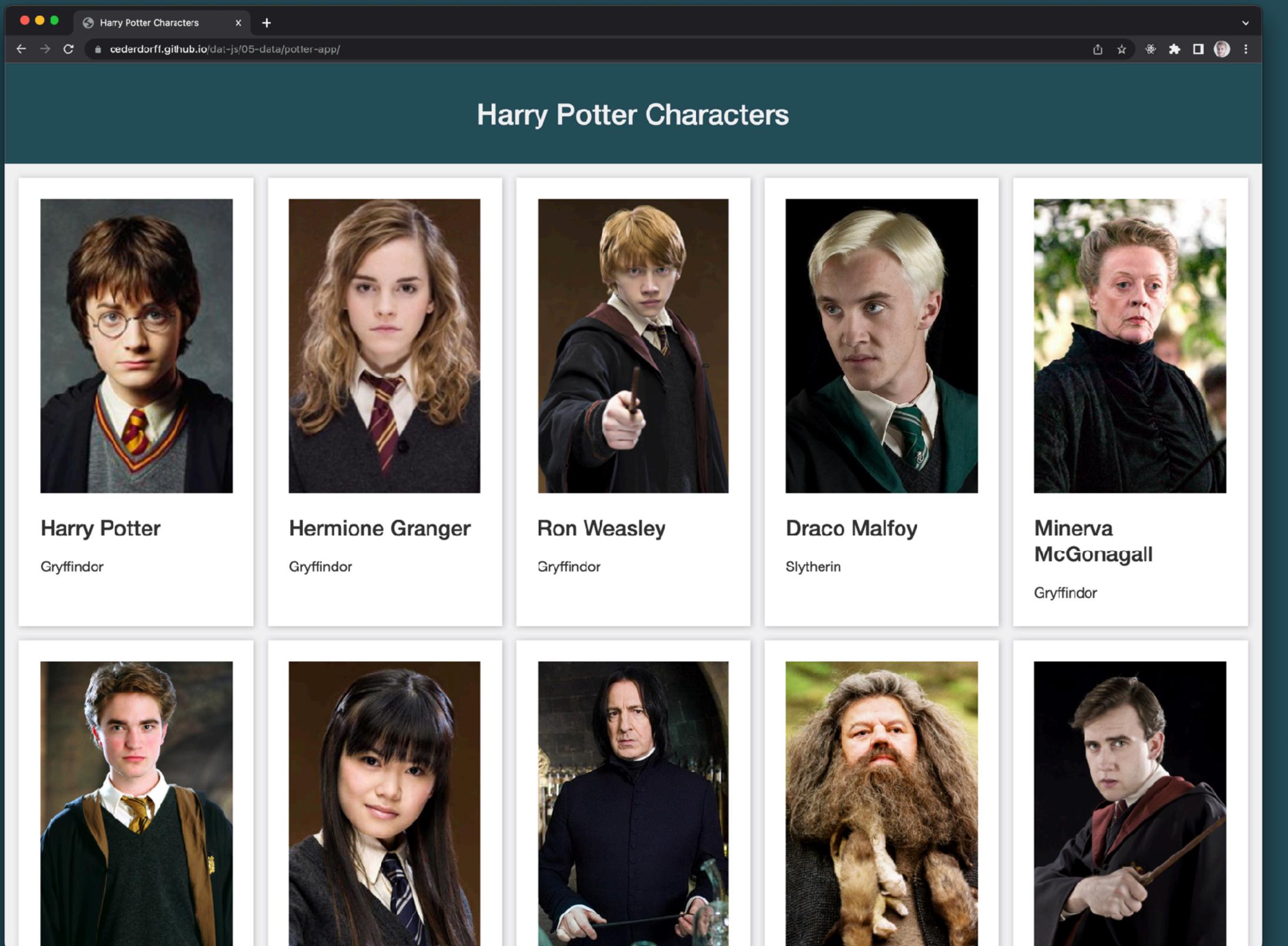
# Fetch, HTTP Request & Response



# Fetch, HTTP Request & Response



# Frontend (client)



# JSON Data Source (Server)

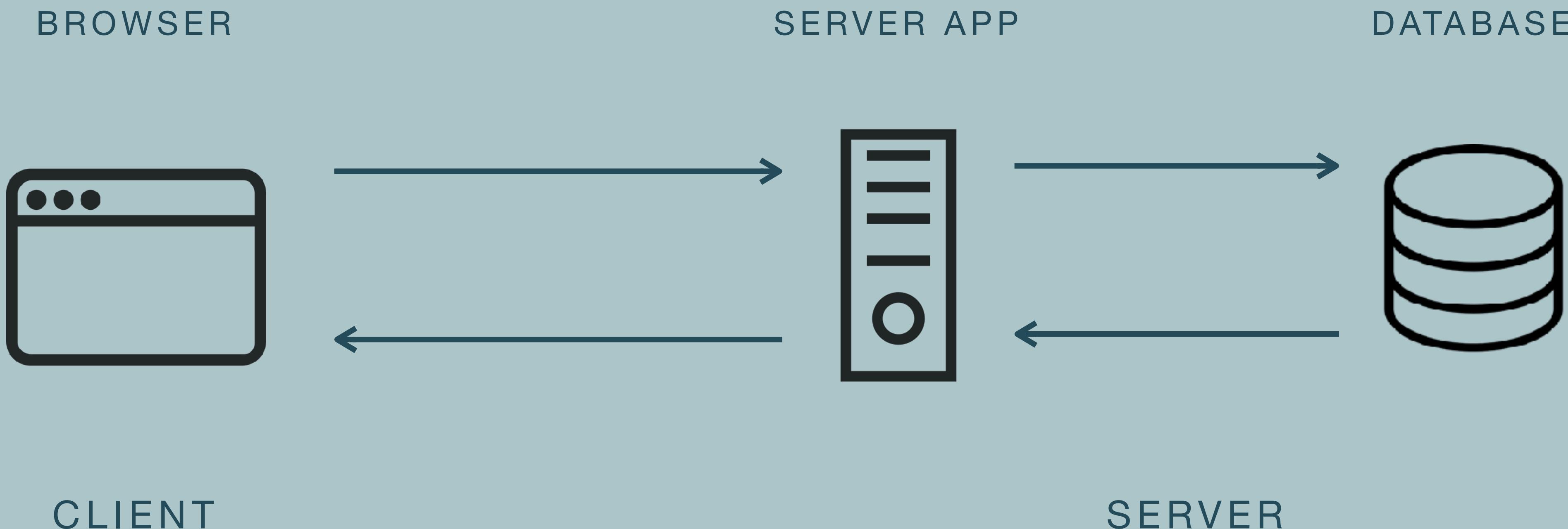
A screenshot of a browser window showing a JSON object representing a Harry Potter character. The JSON is displayed in two tabs: "Raw" and "Parsed". The "Parsed" tab shows the human-readable JSON, which includes details like name, species, gender, house, date of birth, year of birth, ancestry, eye color, hair color, and wand specifications. The "Raw" tab shows the raw JSON code.

```
Raw
{
  "name": "Harry Potter",
  "species": "human",
  "gender": "male",
  "house": "Gryffindor",
  "dateOfBirth": "31-07-1980",
  "yearOfBirth": 1980,
  "ancestry": "half-blood",
  "eyeColour": "green",
  "hairColour": "black",
  "wand": {
    "wood": "holly",
    "core": "phoenix feather",
    "length": 11
  },
  "patronus": "stag",
  "hogwartsStudent": true,
  "hogwartsStaff": false,
  "actor": "Daniel Radcliffe",
  "alive": true,
  "image": "http://hp-api.herokuapp.com/images/harry.jpg"
},
{
  "name": "Hermione Granger",
  "species": "human",
  "gender": "female",
  "house": "Gryffindor",
  "dateOfBirth": "19-09-1979",
  "yearOfBirth": 1979,
  "ancestry": "muggleborn",
  "eyeColour": "brown",
  "hairColour": "brown",
  "wand": {
    "wood": "vine",
    "core": "dragon heartstring",
    "length": ""
  },
  "patronus": "otter",
  "hogwartsStudent": true,
  "hogwartsStaff": false,
  "actor": "Emma Watson",
  "alive": true,
  "image": "http://hp-api.herokuapp.com/images/hermione.jpeg"
},
{
  "name": "Ron Weasley",
  "species": "human",
  "gender": "male",
  "house": "Gryffindor",
  "dateOfBirth": "01-03-1980",
  "yearOfBirth": 1980,
  "ancestry": "pure-blood",
  "eyeColour": "blue",
  "hairColour": "red",
  "wand": {
    "wood": "willow",
    "core": "unicorn hair",
    "length": 12
  }
}
```

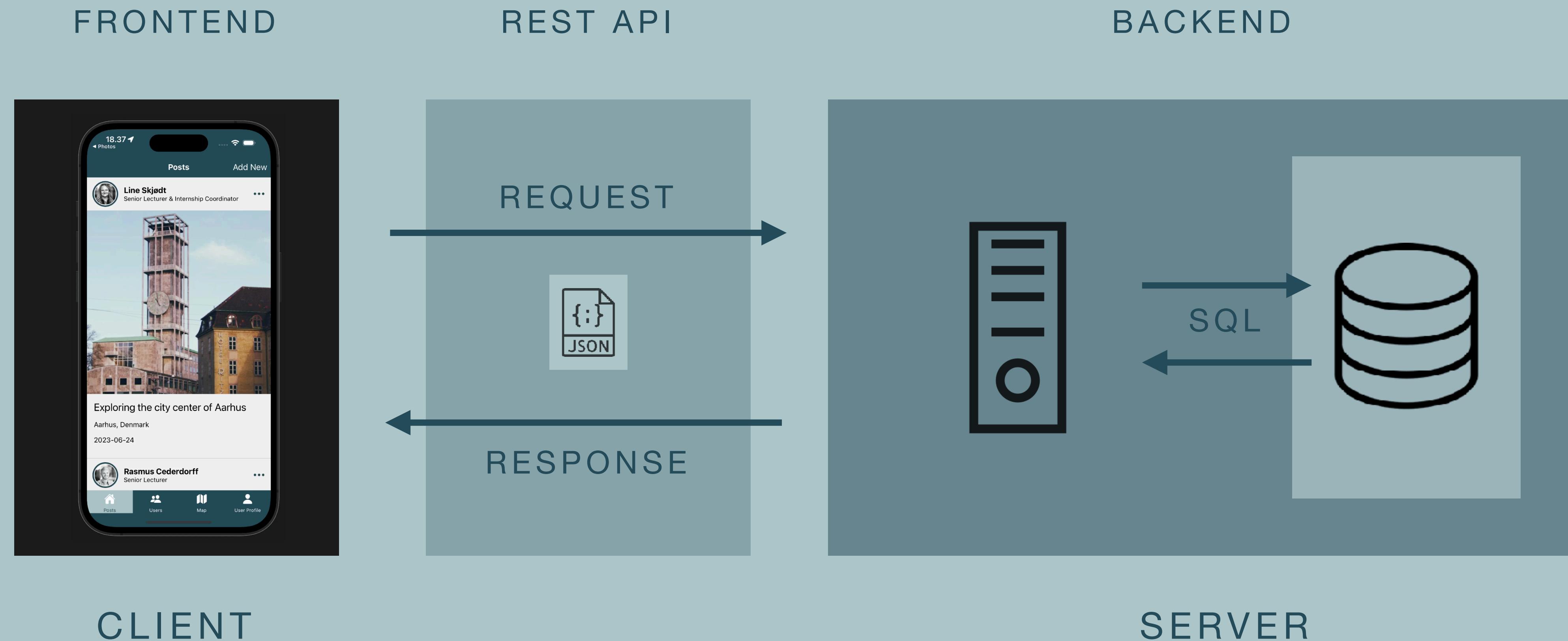
<https://cederdorff.com/potter-app/>

<https://raw.githubusercontent.com/cederdorff/dat-js/main/data/potter.json>

# Web Dev Architecture



# Web Dev Architecture



# API

Application Programming Interface

# API

Application Programming Interface

A way for two systems to communicate - get and post data.

# API

Enables communication between different software applications, specifying how they can request and exchange information.

# API



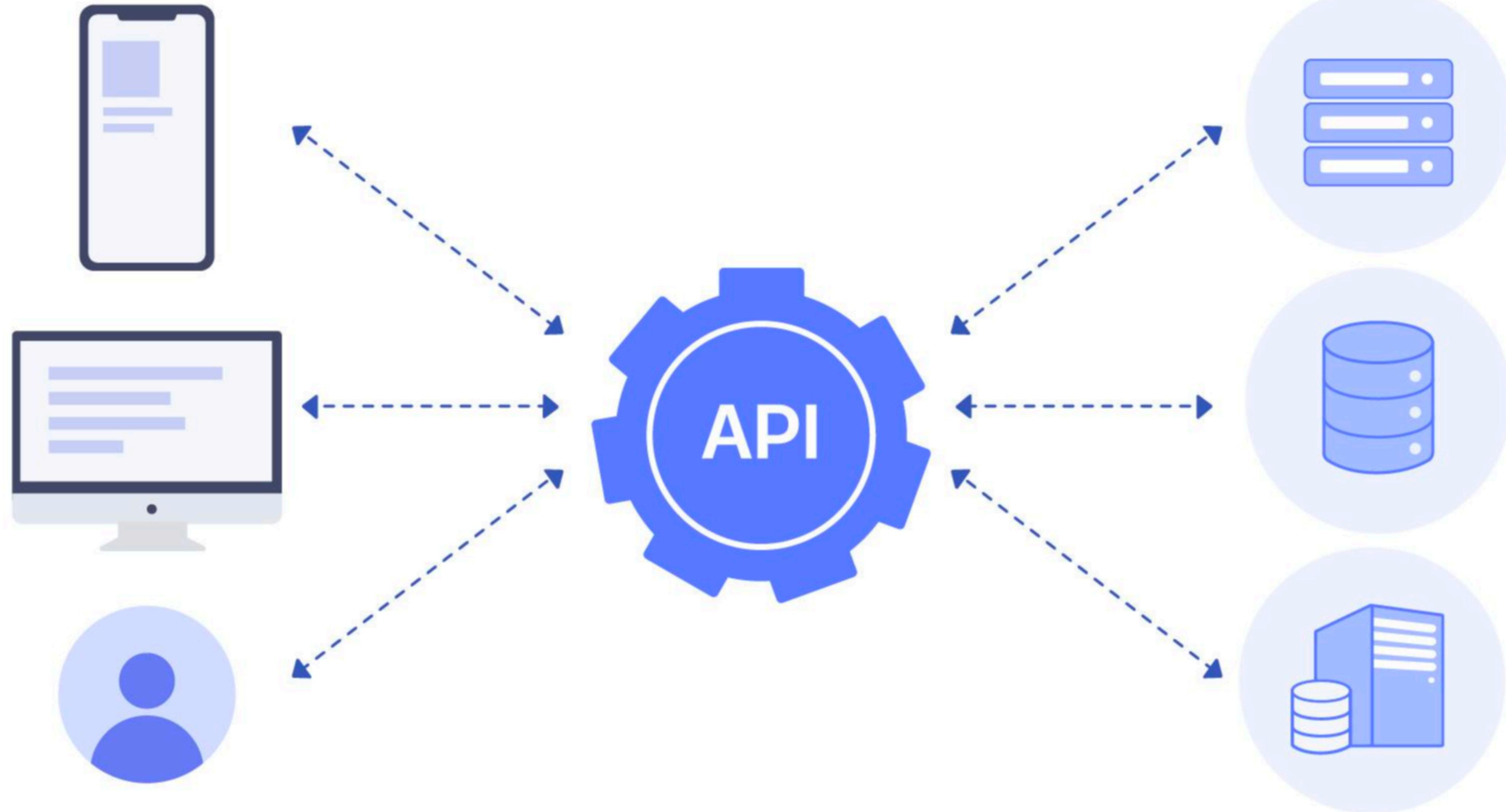
The image shows a screenshot of a development environment. At the top, there's a menu bar with 'Insomnia' and other options. Below it, there are two tabs: 'routes.py <...' and 'routes.py > ...'. The left tab contains Python code for a Flask application:

```
from flask import Flask, request
app = Flask("python-api-with-flask")
usuarios = []
@app.route("/olamundo", methods=["GET"])
def olamundo():
    return "Olá mundo"
@app.route("/cadastrar_usuario", methods=["POST"])
def cadastrar_usuario(usuario):
    usuarios.append(usuario)
    return {"usuario": usuario}
@app.route("/listar_usuarios", methods=["GET"])
def listar_usuarios():
    return {"usuarios": usuarios}
app.run()
```

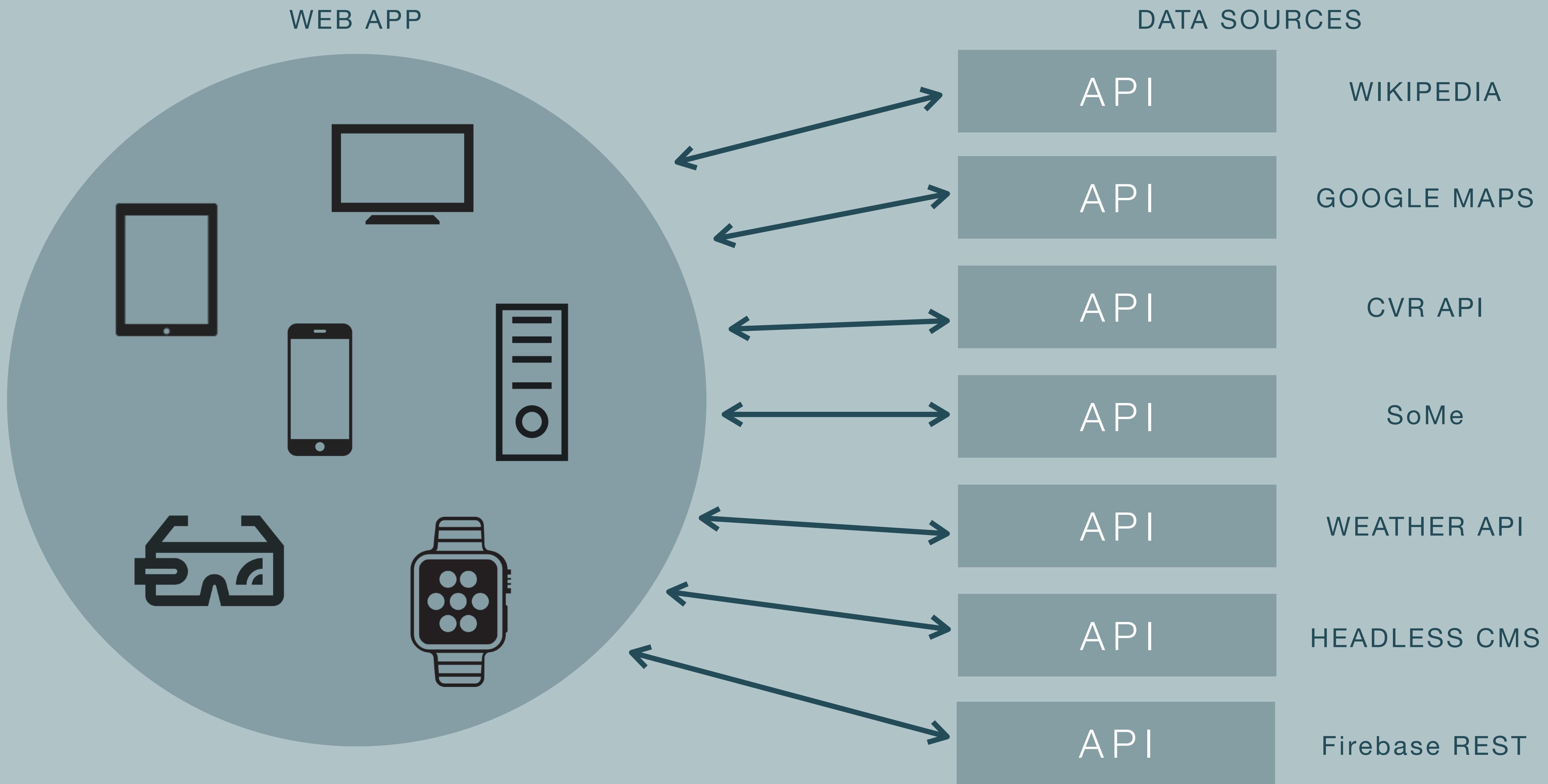
The right tab shows the 'Dashboard / Python with flask' interface with a list of routes: 'GET /olamundo', 'POST /cadastrar\_usuario', and 'GET /listar\_usuarios'. Below this, there's a terminal window with the command 'python routes.py' and its output, which includes logs of requests like 'GET /olamundo' and 'POST /cadastrar\_usuario'.

- A set of rules and tools that allows different software applications to communicate and interact with each other.
- It defines the methods and data formats that applications can use to request and exchange information.
- APIs are crucial for enabling the integration of different services and systems.

# API

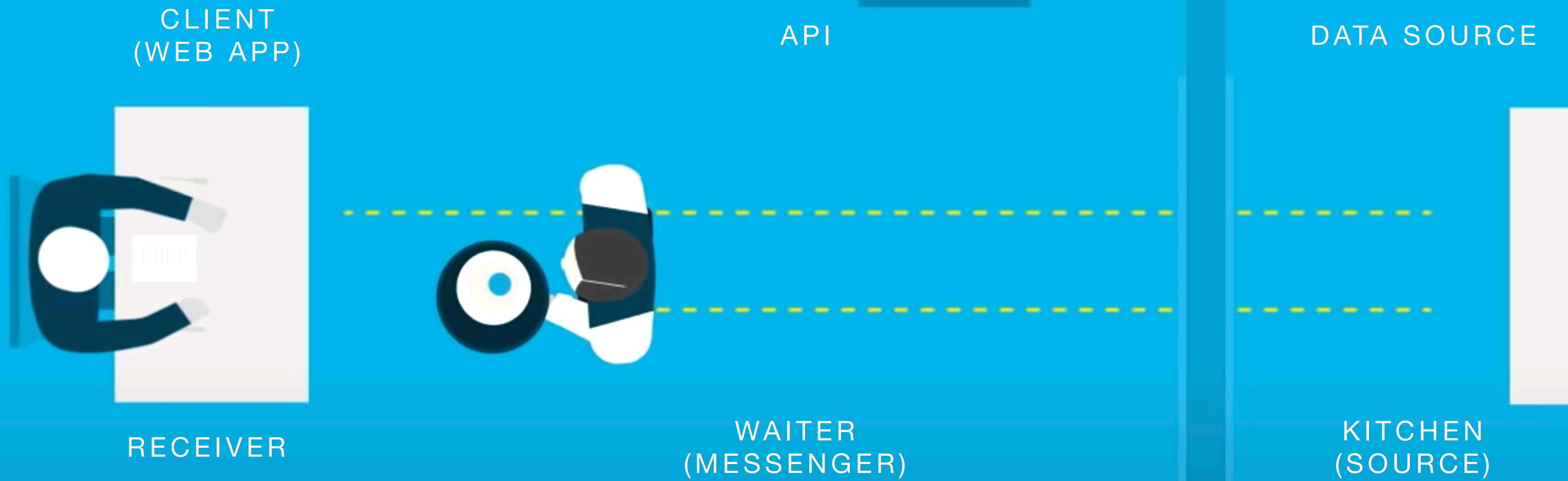


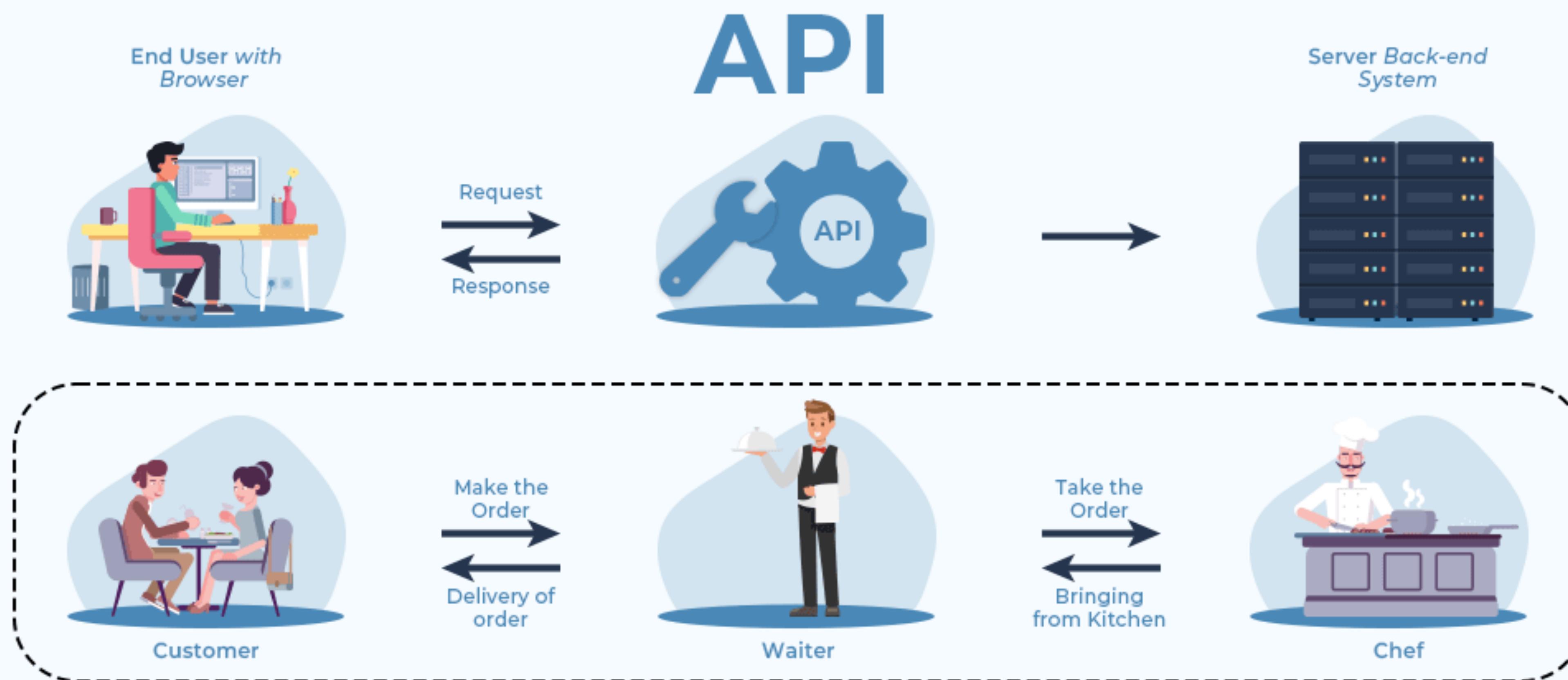
# API





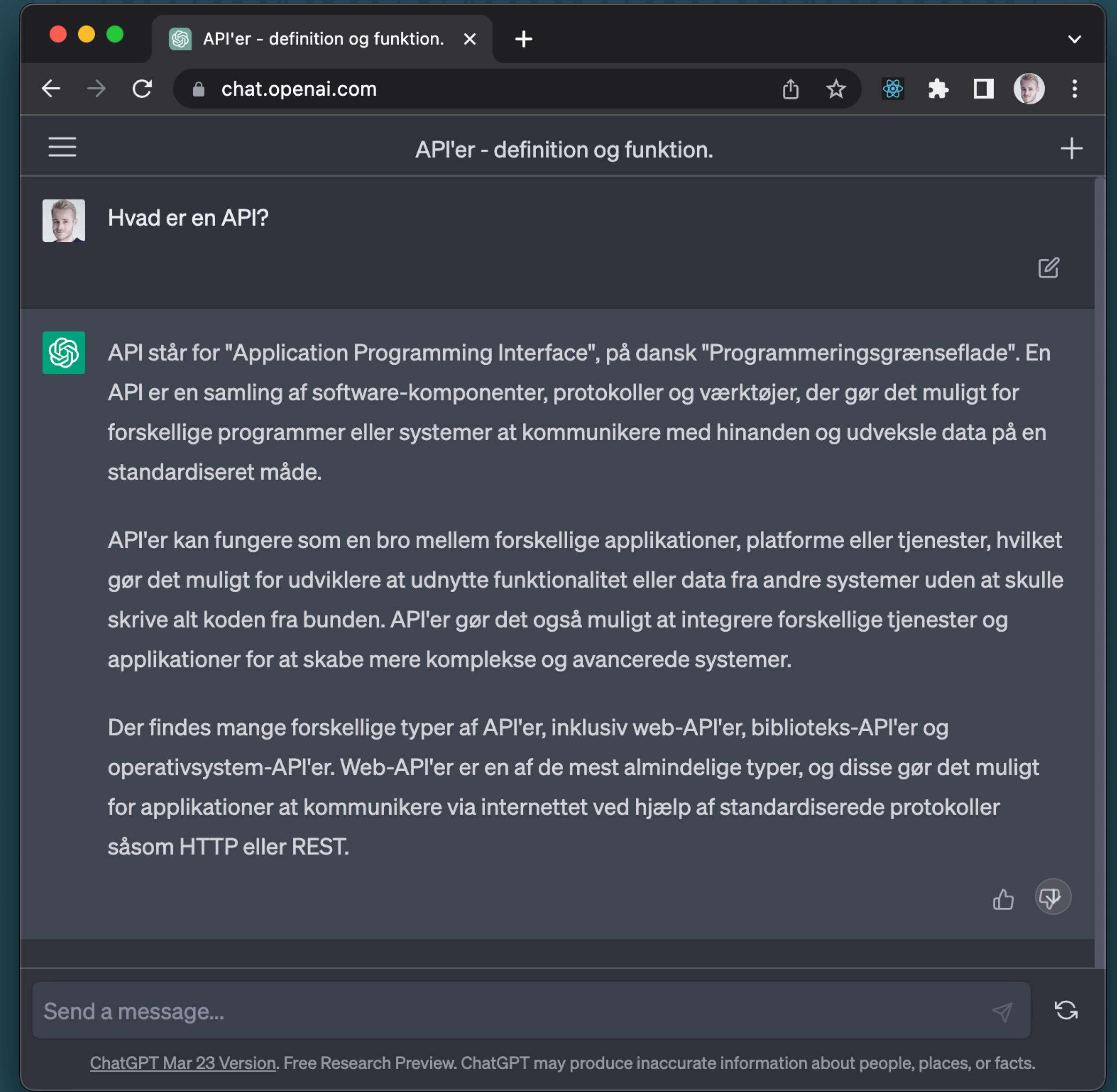
<https://www.youtube.com/watch?v=s7wmiS2mSXY>





# API

## APPLICATION PROGRAMMING INTERFACE



The screenshot shows a web browser window titled "API'er - definition og funktion." with the URL "chat.openai.com". The page content is a conversation with AI, starting with a user question "Hvad er en API?" followed by AI responses explaining what APIs are, their functions, and types.

**Hvad er en API?**

API står for "Application Programming Interface", på dansk "Programmeringsgrænseflade". En API er en samling af software-komponenter, protokoller og værktøjer, der gør det muligt for forskellige programmer eller systemer at kommunikere med hinanden og udveksle data på en standardiseret måde.

API'er kan fungere som en bro mellem forskellige applikationer, platforme eller tjenester, hvilket gør det muligt for udviklere at udnytte funktionalitet eller data fra andre systemer uden at skulle skrive alt koden fra bunden. API'er gør det også muligt at integrere forskellige tjenester og applikationer for at skabe mere komplekse og avancerede systemer.

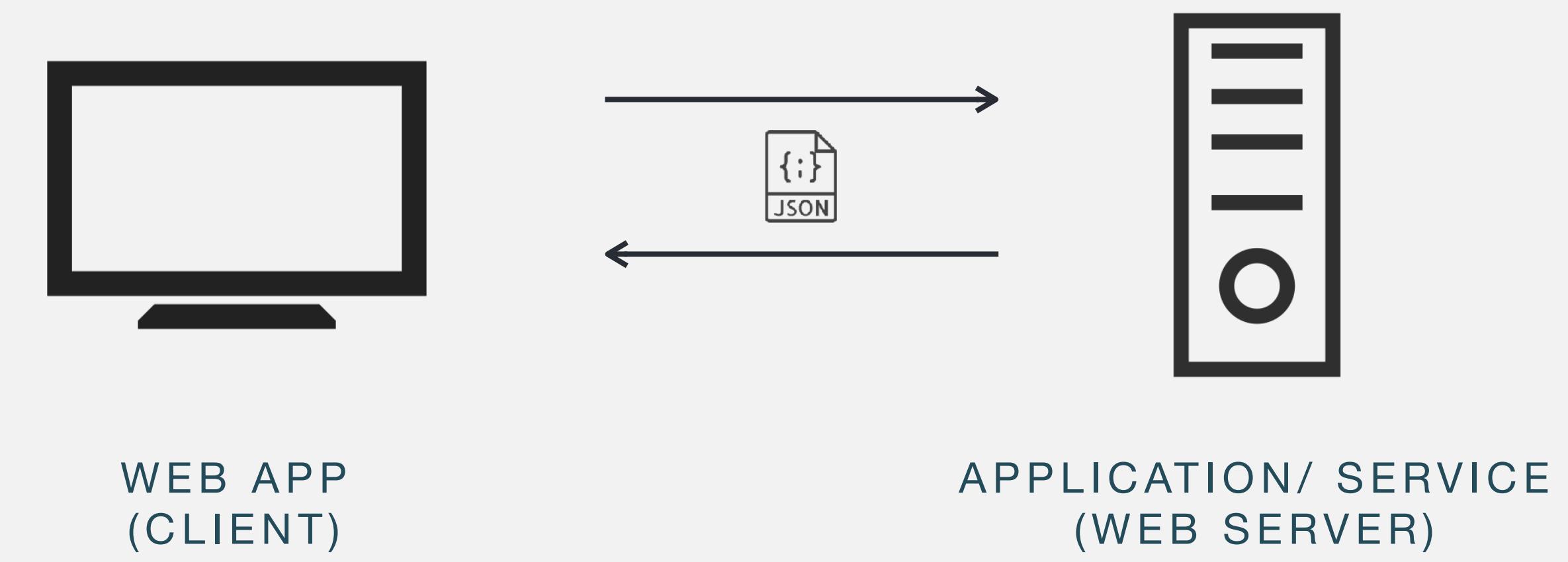
Der findes mange forskellige typer af API'er, inklusiv web-API'er, biblioteks-API'er og operativsystem-API'er. Web-API'er er en af de mest almindelige typer, og disse gør det muligt for applikationer at kommunikere via internettet ved hjælp af standardiserede protokoller såsom HTTP eller REST.

**Send a message...**

ChatGPT Mar 23 Version. Free Research Preview. ChatGPT may produce inaccurate information about people, places, or facts.

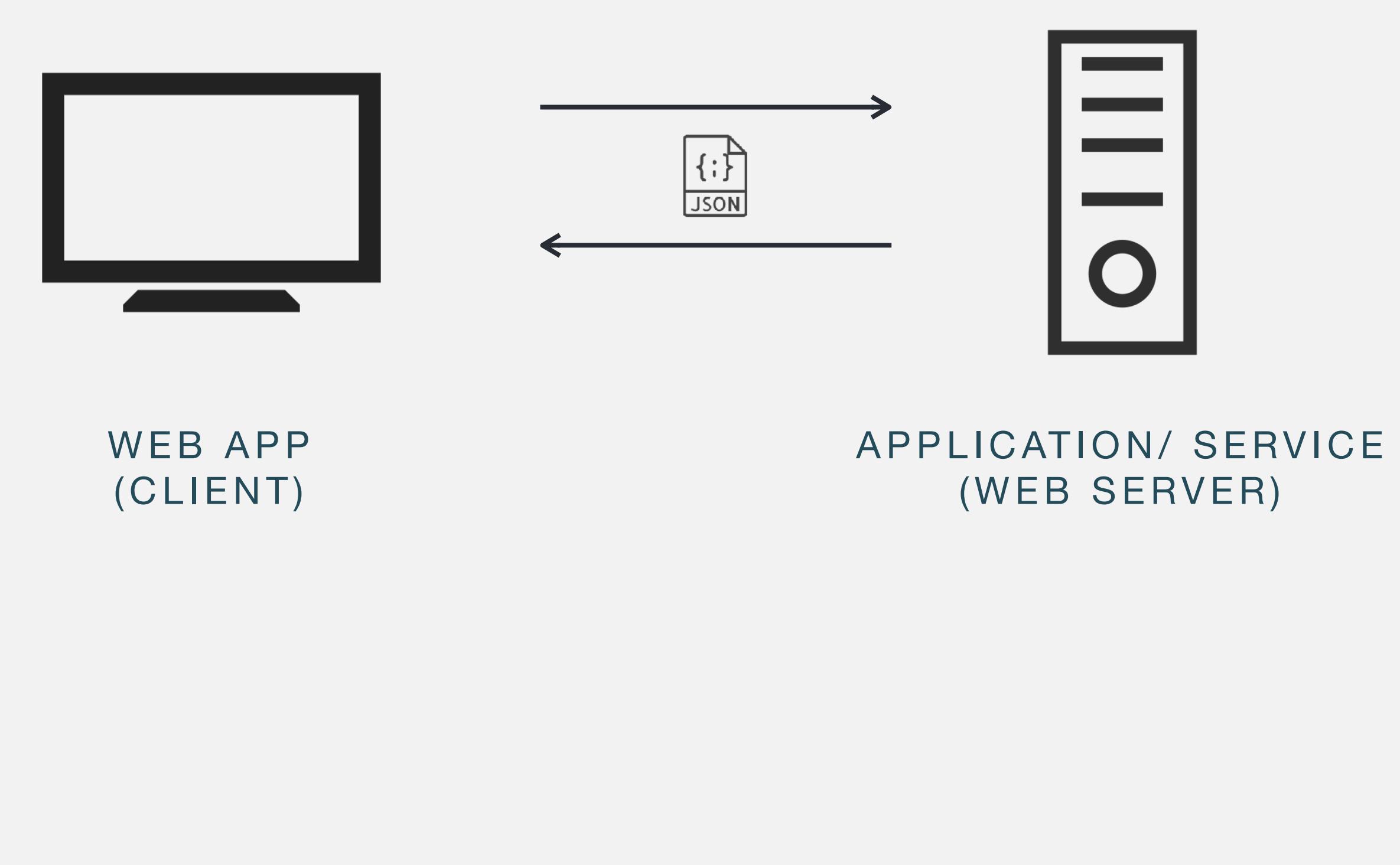
# Application Programming Interface

- **API Definition:** Application Programming Interface
- **Purpose:** Facilitates communication between software applications
- **Functionality:** Defines methods and data formats for information exchange
- **Integration:** Enables seamless interaction between different systems
- **Essential for:** Connecting and integrating diverse software services
- **Examples:** RESTful APIs, GraphQL, SOAP
- **Key Actions:** Requesting, sending, and exchanging data
- **Crucial for:** System interoperability and building modular applications



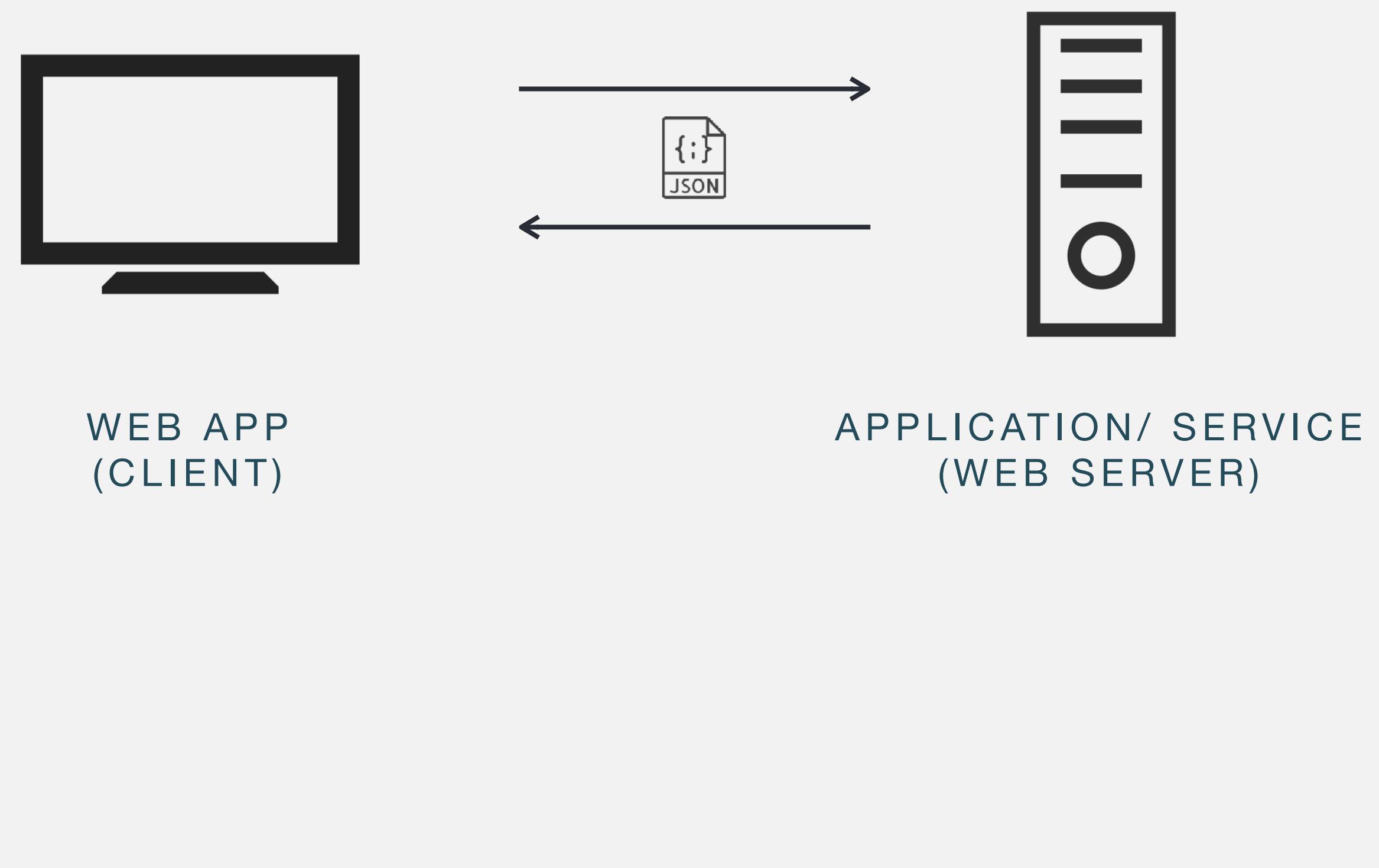
# Application Programming Interface

- **Communication Standard:** API sets a standard for how different software components should interact. It's an interface that allows two systems to communicate and exchange data in a standardised way.
- **Platform Agnostic / Platform independent:** APIs allow applications on different platforms to connect and work together. It can be used by different clients, devices, servers and users: websites, web apps, mobile apps, webshops and other clients
- **Abstraction Layer:** Serves as an abstraction layer, shielding internal complexities and exposing only necessary functionalities.
- **Scalability:** Facilitates scalability by allowing the integration of new features or services.
- **Developer Collaboration:** Enables collaboration between developers, allowing them to leverage each other's work.
- **Documentation Importance:** Well-documented APIs are crucial for developers to understand and use them effectively.
- **Security Measures:** APIs often include security measures like authentication and authorization for secure data exchange.
- **Real-time Interaction:** Supports real-time data transfer, enhancing dynamic and interactive applications.

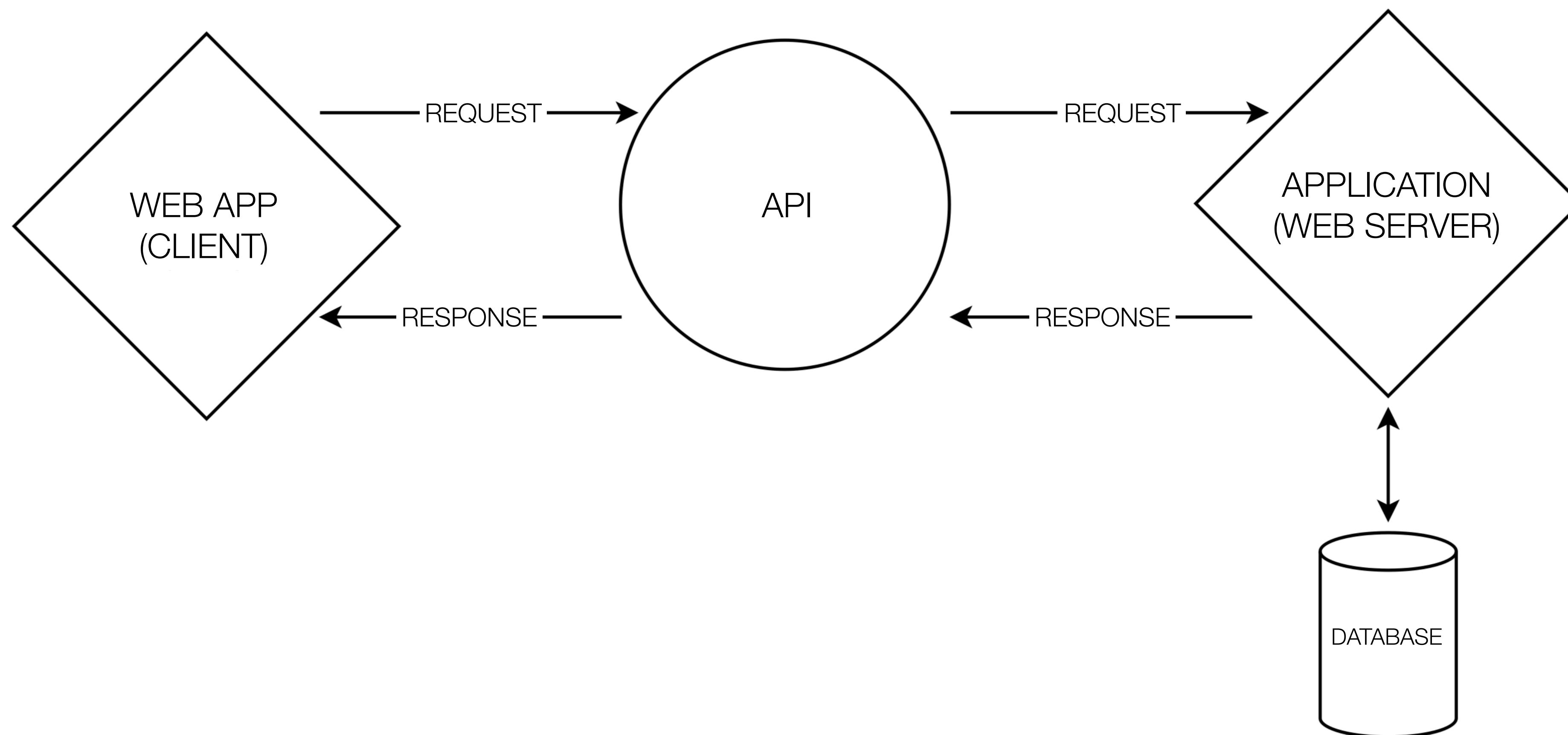


# Application Programming Interface

- **Data Formats:** APIs often use common data formats like JSON or XML for easy comprehension and parsing.
- **HTTP Methods:** Commonly employs HTTP methods such as GET, POST, PUT, and DELETE to perform different actions.
- **Versioning:** APIs may have versioning to manage changes and updates without disrupting existing integrations.
- **Rate Limiting:** Implementing rate limiting helps control the number of requests a client can make within a specified time frame.
- **Feedback Mechanism:** APIs often provide feedback in the form of status codes to indicate the success or failure of a request.
- **Testing and Debugging:** Developers can test and debug applications independently since APIs provide a clear interface.
- **Third-party Integration:** Enables third-party developers to build on top of existing services, fostering a broader ecosystem.
- **RESTful Principles:** RESTful APIs adhere to principles like statelessness and a uniform interface for consistency.



# Application Programming Interface



Course roster: WU-E22a - 1. se X +

https://eaaa.instructure.com/courses/15482/users

WU-E22a > People

60 Student view

Home Announcements Modules Assignments Discussions People BigBlueButton Grades Pages Files Syllabus Outcomes Rubrics Quizzes Collaborations Settings

Everyone Groups + Group set

Search people All roles + People

Name	Login ID	SIS ID	Section	Role	Last Activity	Total Activity
Clara Juul Birk	eaaclbi@students.eaaa.dk	WU-E22a - 1.	Student semester	Student	24 Aug at 13:16	01:04:21
Martin Rieper Boesen	eaamrbo@students.eaaa.dk	WU-E22a - 1.	Student semester	Student	24 Aug at 7:54	01:07:06
Dan Okkels Brendstrup	dob@eaaa.dk	WU-E22a - 1.	Teacher semester	Teacher	3 Aug at 8:55	
Rasmus Cederdorff	race@eaaa.dk	WU-E22a - 1.	Teacher semester	Teacher	25 Aug at 9:28	01:19:23
Jeffrey David Serio	jds@eaaa.dk	WU-E22a - 1.	Teacher semester	Teacher	17 Aug at 16:39	
Charlotte Meng Emanuel Dyrholm	eaacmed@students.eaaa.dk	WU-E22a - 1.	Student semester	Student	23 Aug at 16:59	22:24

Elements Components Network 22 Preset log Disable cache No throttling Invert Hide data URLs

All Fetch/XHR JS CSS Img Media Font Doc WS Wasm Manifest Other

Has blocked cookies Blocked Requests 3rd-party requests

5000 ms 10000 ms 15000 ms 20000 ms 25000 ms 30000 ms 35000 ms

Name Key Headers Payload Preview Response Initiator >

0: {id: "23974", name: "Clara Juul Birk", created\_at: "2020-08-24T13:16:21+02:00", email: "eaaclbi@students.eaaa.dk", login\_id: "eaaclbi@students.eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

1: {id: "36267", name: "Martin Rieper Boesen", created\_at: "2020-08-24T07:54:06+02:00", email: "eaamrbo@students.eaaa.dk", login\_id: "eaamrbo@students.eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 1, group\_categories: []}

2: {id: "29923", name: "Dan Okkels Brendstrup", created\_at: "2021-07-30T00:46:05+02:00", email: "dob@eaaa.dk", login\_id: "dob@eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

3: {id: "14427", name: "Rasmus Cederdorff", created\_at: "2020-08-25T09:28:23+02:00", email: "race@eaaa.dk", login\_id: "race@eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

4: {id: "41", name: "Jeffrey David Serio", created\_at: "2020-08-17T16:39:39+02:00", email: "jds@eaaa.dk", login\_id: "jds@eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

5: {id: "24043", name: "Charlotte Meng Emanuel Dyrholm", created\_at: "2020-08-23T16:59:24+02:00", email: "eaacmed@students.eaaa.dk", login\_id: "eaacmed@students.eaaa.dk", integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

6: {id: "23978", name: "Jeppe Frik", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

7: {id: "23963", name: "Daniel Tjerrild Gamborg", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

8: {id: "23992", name: "Casper Hedegaard Hansen", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

9: {id: "36266", name: "Morten Gedsted Hansen", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

10: {id: "23980", name: "Anders Husted", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

11: {id: "23531", name: "Søren Bo Jørgensen", created\_at: "2020-08-03T22:24:00+02:00", email: null, login\_id: null, integration\_id: null, custom\_links: [], unread\_count: 0, group\_categories: []}

6 / 157 requests

# Canvas

Find API uses to integrate systems.

The screenshot shows the Canvas Learning Management System (LMS) interface. On the left is a sidebar with various navigation links: Account, Admin, Dashboard, Courses, Calendar, Inbox, History, Commons, Student links, BigBlueButton, Grades, Pages, Files, Syllabus, Outcomes, Rubrics, Quizzes, Collaborations, and Settings. The main area displays a 'Course roster: WU-E22a - 1. sem' with a table of student information. A 'People' section is also visible. On the right, a developer's browser window is open, showing Network traffic and a JSON response from an API endpoint. The JSON data lists user profiles with fields like name, created\_at, role, and email.

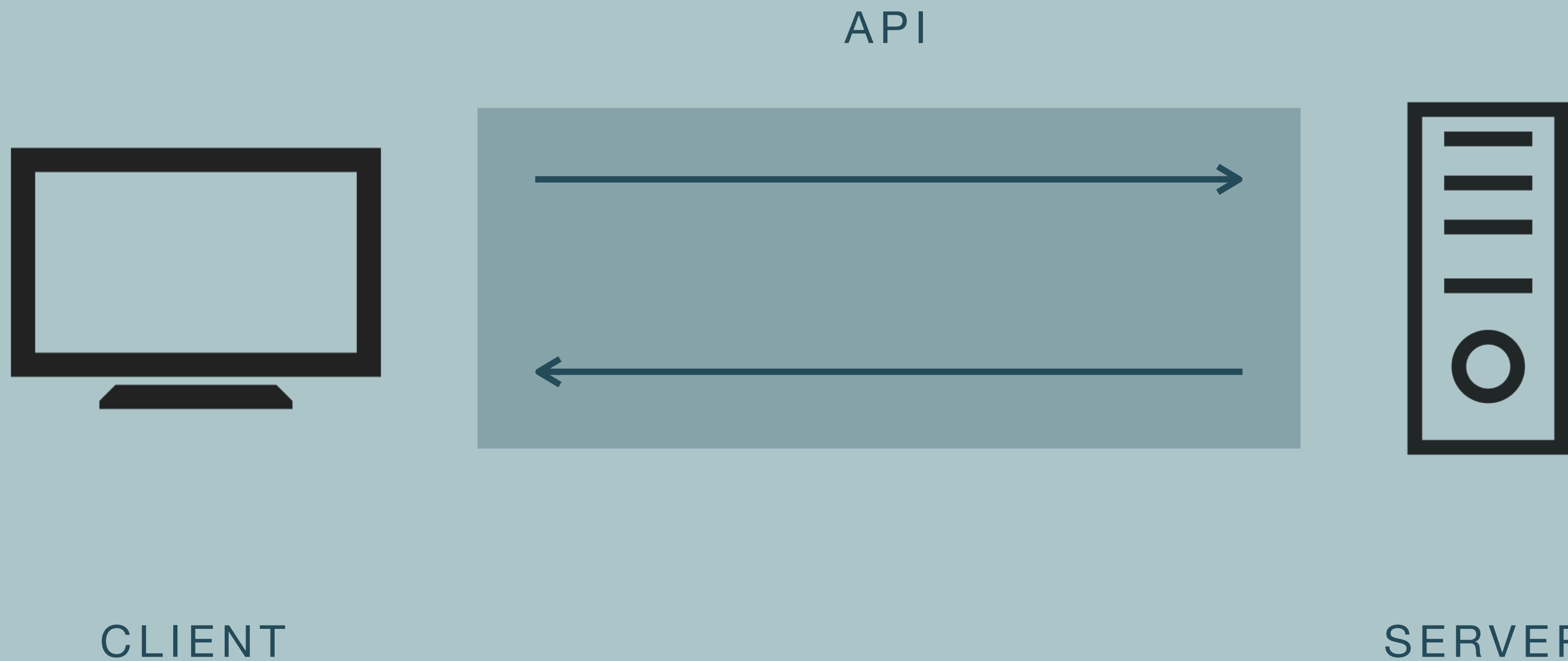
Name	Login ID	SIS ID	Section	Role	Last Activity	Total Activity
Clara Juul Birk	eaacibi@students.eaaa.dk	WU-E22a - 1.	Student	Student	24 Aug at 13:16	01:04:21
Martin Rieper Boesen	eaamrbo@students.eaaa.dk	WU-E22a - 1.	Student	Student	24 Aug at 7:54	01:07:06
Dan Okkels Brendstrup	dob@eaaa.dk	WU-E22a - 1.	Teacher	Teacher	3 Aug at 8:55	
Rasmus Cederdorff	race@eaaa.dk	WU-E22a - 1.	Teacher	Teacher	25 Aug at 9:28	01:19:23
Jeffrey David Serio	jds@eaaa.dk	WU-E22a - 1.	Teacher	Teacher	17 Aug at 16:39	
Chalotte Meng Emanuel Dyrholm	eaacmed@students.eaaa.dk	WU-E22a - 1.	Student	Student	23 Aug at 16:59	22:24

```
[{"id": "23974", "name": "Clara Juul Birk", "created_at": "2020-08-01T10:46:05+02:00"}, {"id": "23974", "name": "Clara Juul Birk", "created_at": "2020-08-01T10:46:05+02:00"}, {"id": "36267", "name": "Martin Rieper Boesen", "created_at": "2020-08-01T10:46:05+02:00"}, {"id": "29923", "name": "Dan Okkels Brendstrup", "created_at": "2021-07-30T00:46:05+02:00"}, {"id": "391064", "user_id": "29923", "course_id": "29923", "integration_id": null, "login_id": "dob@eaaa.dk", "name": "Dan Okkels Brendstrup", "short_name": "Dan Okkels Brendstrup (adjunkt \u2013 dob@eaaa.dk)", "sis_user_id": null, "sortable_name": "Brendstrup, Dan Okkels"}, {"id": "14427", "name": "Rasmus Cederdorff", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "41", "name": "Jeffrey David Serio", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "24043", "name": "Chalotte Meng Emanuel Dyrholm", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "23978", "name": "Jeppe Friki", "created_at": "2020-08-01T10:46:05+02:00"}, {"id": "23963", "name": "Daniel Tjerrild Gamborg", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "23992", "name": "Casper Hedegaard Hansen", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "36266", "name": "Morten Gedsted Hansen", "created_at": "2021-08-01T10:46:05+02:00"}, {"id": "23980", "name": "Anders Husted", "created_at": "2020-08-01T10:46:05+02:00"}, {"id": "23531", "name": "S\u00f8ren Bo J\u00f8rgensen", "created_at": "2021-08-01T10:46:05+02:00"}]
```



# Application Programming Interface

Communication between two systems



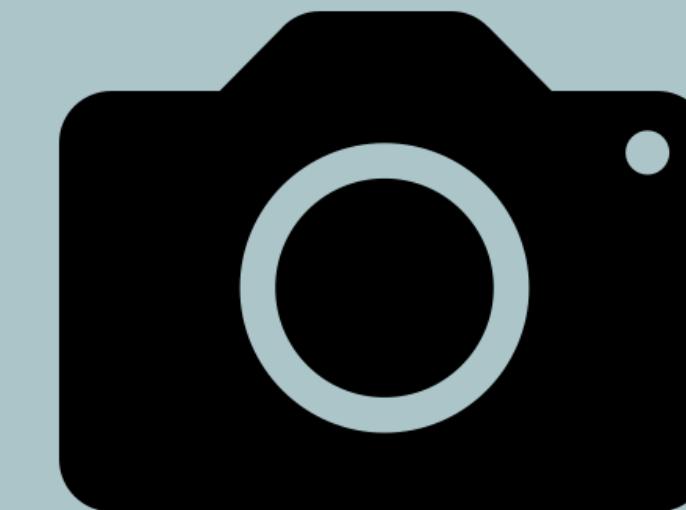
# Application Programming Interface

Communication between two systems



Web App

Camera API



Camera

Rasmus Cederdorff - Nybygg

https://www.instagram.com/cederdorff/

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Rasmus Cederdorff - Nybyggerne ham/him

@ cederdorff

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2

1 6

Nybyggerne Fuerteventura Hjem Vincent KOS 2024

POSTS REELS SAVED TAGGED

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Aarhus med @matias.vase

1

18 19

Elements Console Sources Network Performance Memory >

Filter Invert More filters

All Fetch/XHR Doc CSS JS Font Img Media Manifest WS Wasm Other

10,000 ms 20,000 ms 30,000 ms 40,000 ms 50,000 ms 60,000 ms 70,000 ms 80,000 ms 90,000 ms 100,000 ms 110,000 ms

Name Headers Payload Preview Response Initiator Timing Cookies

bz?\_\_a=1&...  
bz?\_\_a=1&...  
graphql  
query  
query  
query  
query  
query  
bz?\_\_a=1&...  
bulk-route-d...  
ig\_sso\_users/  
alF9XMAVSa...  
v6gIBYNK95...  
-l4caGgp-w...  
fH54y0OP2a...  
B1AsC9xG-h...  
main  
query  
query  
query  
graphql/  
graphql/  
graphql/  
graphql/

{...}  
data: {user: {friendship\_status: null, gating: null, is\_memorialized: false, is\_private: false, account\_badges: [], account\_type: 3, address\_street: "", ai\_agent\_type: null, bio\_links: [{...}], biography: "Nybyggerne 2025 – Rødt Hus\nLektor & Web App Udvikler\nAarhus med @matias.vase", biography\_with\_entities: {entities: [{hashtag: null, user: {username: "matias.vase", id: "17841405578189001"}}, {...}]}, category: "Personal blog", city\_name: "", external\_lynx\_url: "https://l.instagram.com/?u=https%3A%2F%2Fcederdorff.com%2Flinks%3Ffbclid=IwAR1J..."}, external\_url: "https://cederdorff.com/links", fb\_profile\_bio\_link\_web: null, fbid\_v2: "17841405578189001", follower\_count: 5374, following\_count: 808, friendship\_status: null, full\_name: "Rasmus Cederdorff - Nybyggerne", gating: null, has\_chaining: true, has\_profile\_pic: true, has\_story\_archive: true, hd\_profile\_pic\_url\_info: {...}, id: "5672009939", is\_business: false, is\_embeds\_disabled: false, is\_memorialized: false, is\_private: false, is\_professional\_account: true, is\_regulated\_c18: false, is\_unpublished: false}

54 / 192 requests

Rasmus Cederdorff - Nybygg

https://www.instagram.com/p/DGBr7EbOyh9/?img\_index=2

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matias.vase and cederdorff

matias.vase Vi malede alt mintgrønt og syede et par matchende gardiner – den røde fuge blev sgu da også meget god! ❤️ Første ud af ti 🙏

5d See translation

For you ~

af.jost Så fucking flot! ✨

5d 2 likes Reply See translation

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5 days ago

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Nybyggevej

Network

Elements Console Sources Network Performance Memory > 1 18 19

Fetch/XHR Doc CSS JS Font Img Media Manifest WS Wasm Other

Filter Invert More filters

500 ms 1,000 ms 1,500 ms 2,000 ms 2,500 ms 3,000 ms 3,500 ms 4,000 ms

Name Headers Payload Preview Response Initiator Timing Cookies

comments/?...

logging\_clie...

query

query

query

{can\_view\_more\_preview\_comments: false,...  
can\_view\_more\_preview\_comments: false  
caption: {pk: "18089478400497019", user\_id: "603311262", type: 1, did\_report\_as\_spam: false,...  
bit\_flags: 0  
content\_type: "comment"  
created\_at: 1739478368  
created\_at\_for\_fb\_app: 1739478368  
created\_at\_utc: 1739478368  
did\_report\_as\_spam: false  
has\_translation: true  
is\_covered: false  
is\_created\_by\_media\_owner: true  
is\_ranked\_comment: true  
media\_id: "356732555055077501"  
pk: "18089478400497019"  
private\_reply\_status: 0  
share\_enabled: true  
status: "Active"  
strong\_id\_\_: "18089478400497019"  
text: "Vi malede alt mintgrønt og syede et par matchende gardiner – den røde fuge blev sgu  
type: 1  
user: {pk: "603311262", pk\_id: "603311262", id: "603311262", username: "matias.vase",...  
user\_id: "603311262"  
caption\_is\_edited: false  
comment\_count: 69  
comment\_cover\_pos: "bottom"  
comment\_filter\_param: "no\_filter"  
comment\_likes\_enabled: true  
comments: [{pk: "18085219642597053", user\_id: "603763003", type: 0, did\_report\_as\_spam: false  
0: {pk: "18085219642597053", user\_id: "603763003", type: 0, did\_report\_as\_spam: false,...  
1: {pk: "18025521470358245", user\_id: "5633114583", type: 0, did\_report\_as\_spam: false,...  
2: {pk: "18039454121593713", user\_id: "7232374367", type: 0, did\_report\_as\_spam: false,...  
3: {pk: "18042334928366268", user\_id: "1638175743", type: 0, did\_report\_as\_spam: false,...

5 / 61 requests

Rasmus Cederdorff - Nybygg

https://www.instagram.com/p/DGBr7EbOyh9/?img\_index=2

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matias.vase Vi malede alt mintgrønt og syede et par matchende gardiner – den røde fuge blev sgu da også meget god! ❤️ Første ud af ti ❤️  
5d See translation

For you ↴  
af.jost Så fucking flot! ✨  
5d 2 likes Reply See translation  
View replies (3)

Liked by aniacederdorff and others  
5 days ago

Add a comment... Post

Nybyggevej

Network

Fetch/XHR Doc CSS JS Font Img Media Manifest WS Wasm Other

Name Headers Payload Preview Response Initiator Timing Cookies

comments/?can...  
comments: [{pk: "18085219642597053", user\_id: "603763003", type: 0, did\_report\_as\_spam: false,...},...]  
0: {pk: "18085219642597053", user\_id: "603763003", type: 0, did\_report\_as\_spam: false,...}  
bit\_flags: 0  
child\_comment\_count: 3  
comment\_index: 0  
comment\_like\_count: 2  
content\_type: "comment"  
created\_at: 1739479790  
created\_at\_for\_fb\_app: 1739479790  
created\_at\_utc: 1739479790  
did\_report\_as\_spam: false  
has\_disliked\_comment: false  
has\_liked\_comment: true  
has\_more\_head\_child\_comments: false  
has\_more\_tail\_child\_comments: true  
has\_translation: true  
inline\_composer\_display\_condition: "never"  
is\_covered: false  
is\_liked\_by\_media\_owner: true  
is\_ranked\_comment: true  
media\_id: "3567325555055077501"  
next\_max\_child\_cursor: "QVFCcHB2WjBj0UtobkIvMHFScGJrZkNEYWJ6M1l6am5uLUUpJbVZkSDBCVmNhc3k0RHBUUXNjU2EwakFrUTQwa...  
num\_tail\_child\_comments: 2  
other\_preview\_users: []  
pk: "18085219642597053"  
preview\_child\_comments: [{pk: "18134926063385737", user\_id: "5672009939", type: 2, did\_report\_as\_spam: false,...}  
private\_reply\_status: 0  
share\_enabled: true  
status: "Active"  
strong\_id\_\_: "18085219642597053"  
text: "Så fucking flot! ✨"  
type: 0  
user: {pk: "603763003", pk\_id: "603763003", id: "603763003", username: "af.jost",...}  
user\_id: "603763003"  
1: {pk: "18025521470358245", user\_id: "5633114583", type: 0, did\_report\_as\_spam: false,...}  
2: {pk: "18039454121593713", user\_id: "7232374367", type: 0, did\_report\_as\_spam: false,...}  
3: {pk: "18042334928366268", user\_id: "1638175743", type: 0, did\_report\_as\_spam: false,...}  
4: {pk: "18058454794955163", user\_id: "3028542997", type: 0, did\_report\_as\_spam: false,...}  
5: {pk: "18059270978058735", user\_id: "39137901", type: 0, did\_report\_as\_spam: false,...}  
6: {pk: "18080350462623617", user\_id: "455050897", type: 0, did\_report\_as\_spam: false,...}  
7: {pk: "18055910128869143", user\_id: "60029610162", type: 0, did\_report\_as\_spam: false,...}  
8: {pk: "18052344175933631", user\_id: "7182529838", type: 0, did\_report\_as\_spam: false,...}  
9: {pk: "18060586327980616", user\_id: "201958804", type: 0, did\_report\_as\_spam: false,...}

# API

More Examples: <https://race.notion.site/API-Examples-48baf0ecb20f490d916edd27f70204ed>

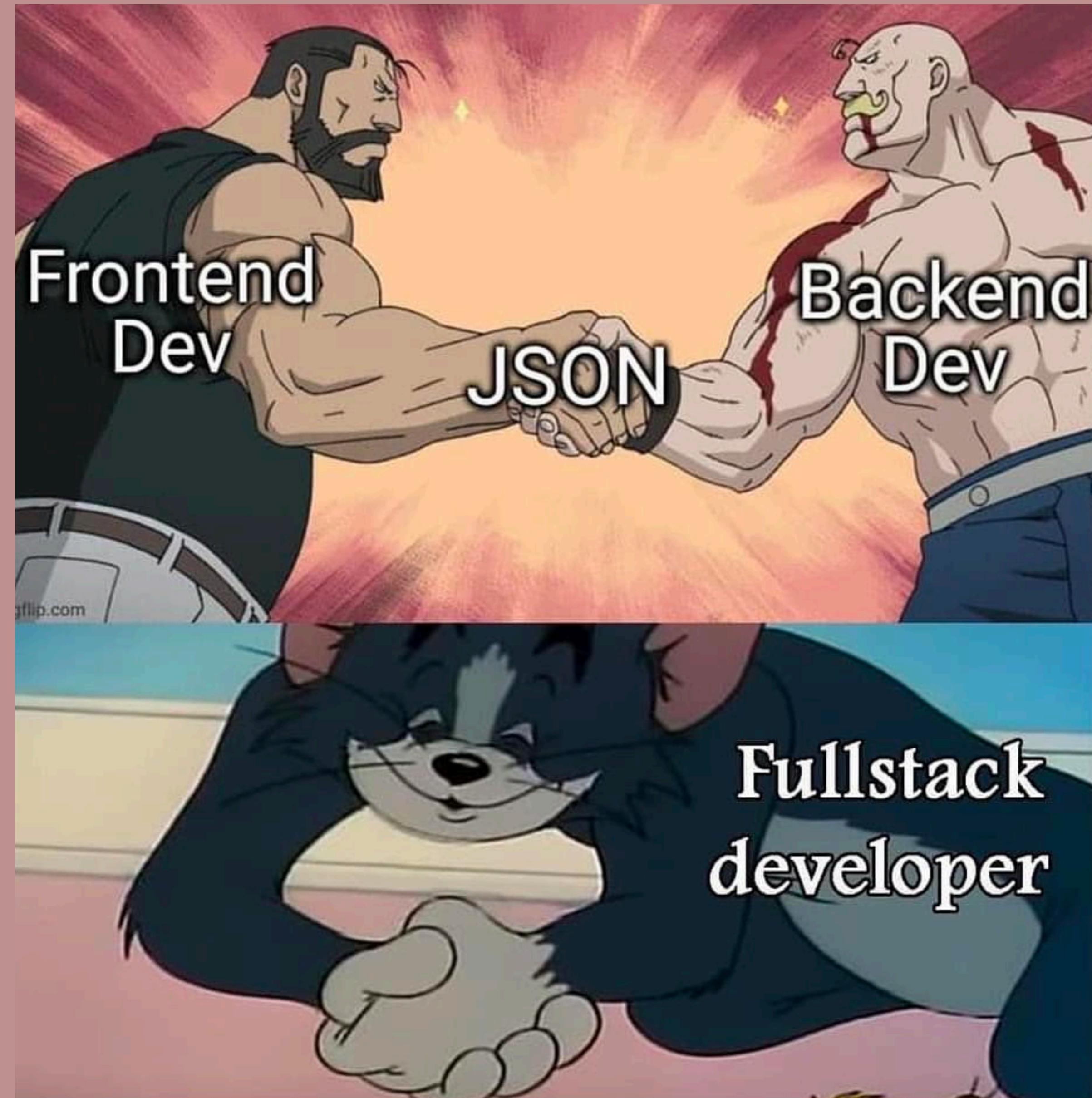
# JSON

JavaScript Object Notation

# JSON

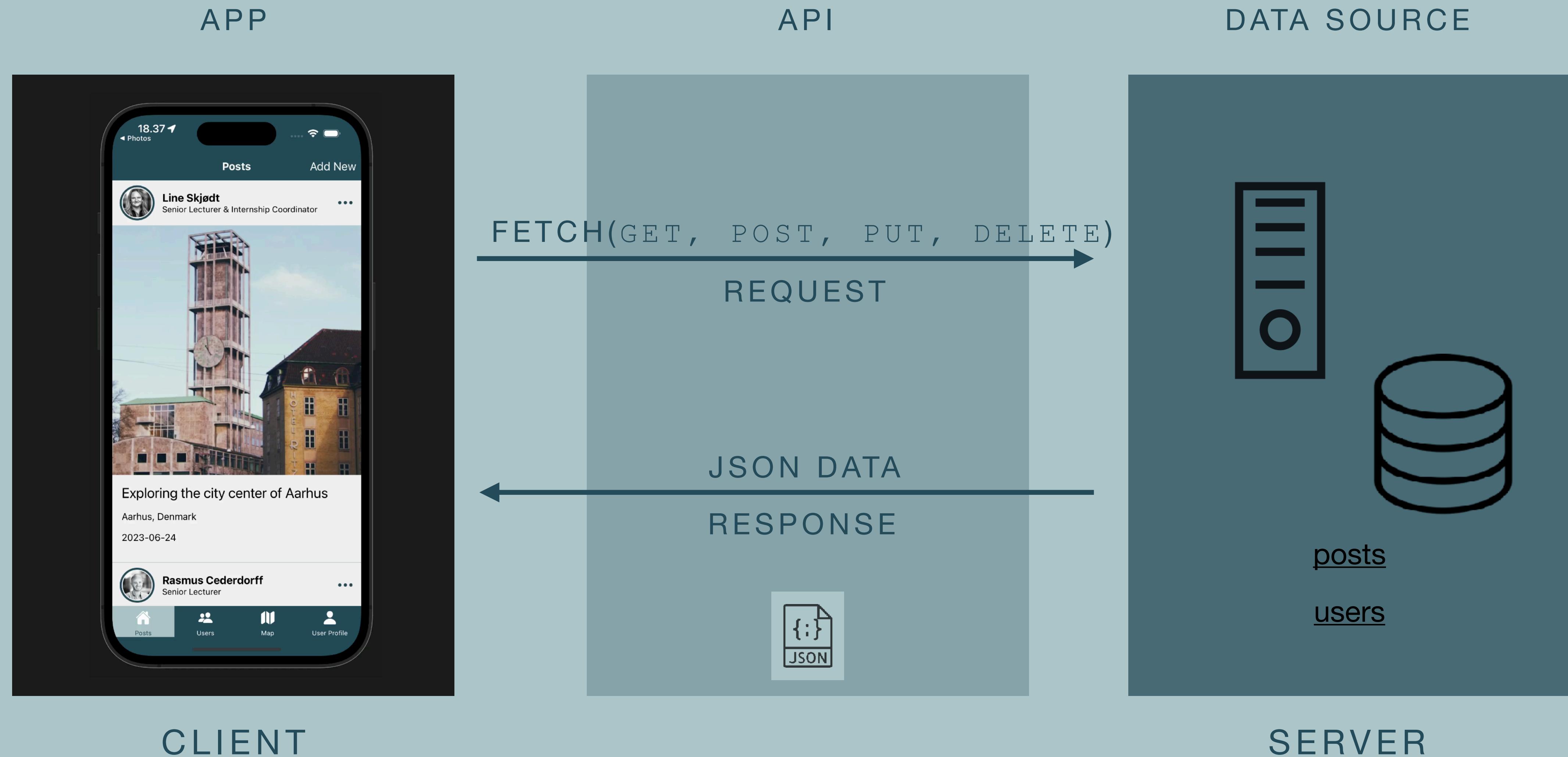
## JavaScript Object Notation

... a syntax for storing & exchanging data  
over the web



<https://www.instagram.com/p/CVqbCzgsZUF/>

# JSON (& API) is the glue



# JSON

... a syntax for storing and exchanging data over the web

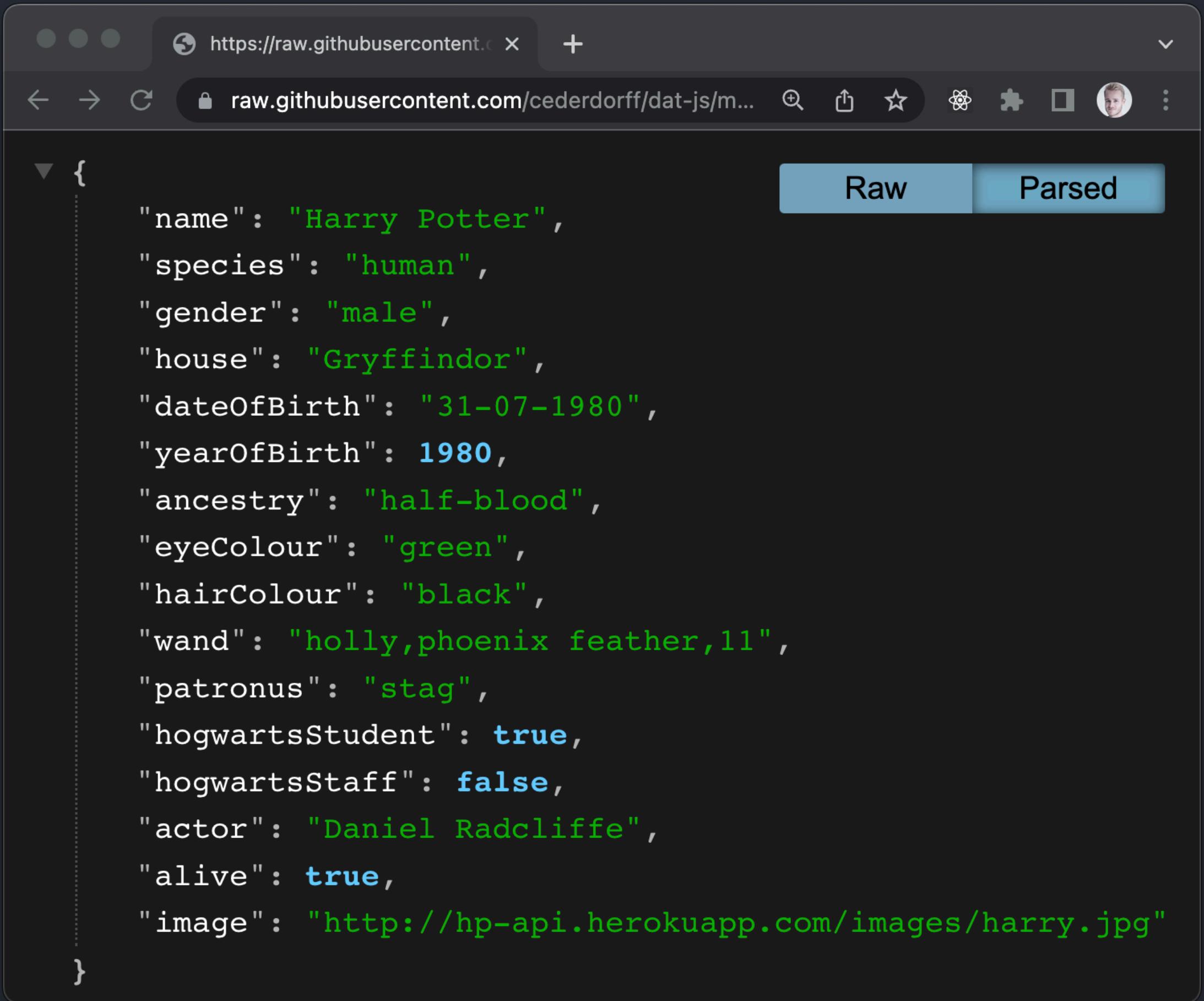
```
{  
  "name": "Alicia",  
  "age": 6  
}
```

JSON OBJECT

```
[{  
  "name": "Alicia",  
  "age": 6  
, {  
  "name": "Peter",  
  "age": 22  
}]
```

LIST OF JSON OBJECTS

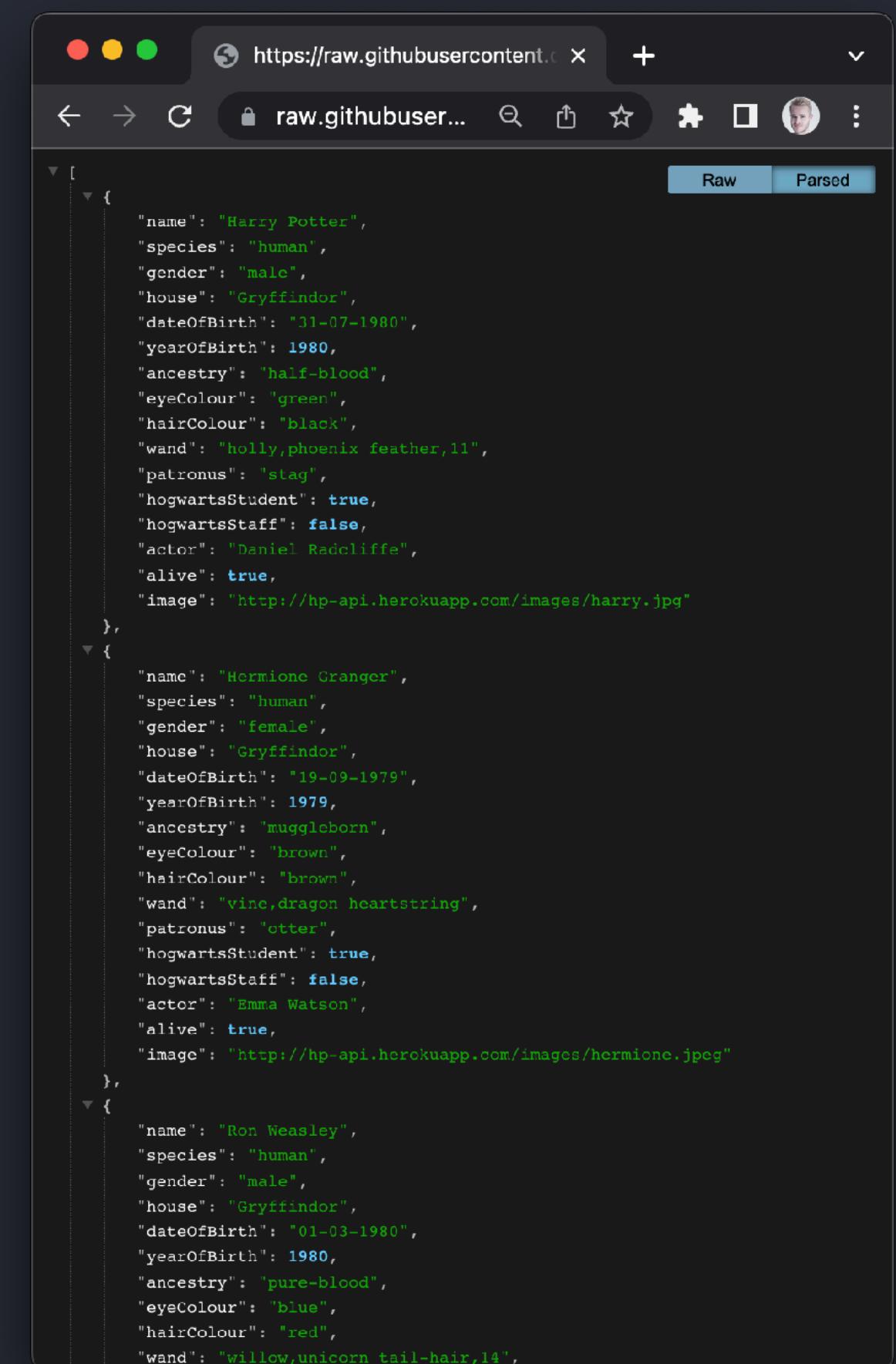
# JSON



A screenshot of a web browser window displaying a single JSON object. The URL is <https://raw.githubusercontent.com/cederdorff/dat-js/master/data/harry.json>. The JSON object represents Harry Potter's character details. The 'Raw' tab is selected, showing the raw JSON code, while the 'Parsed' tab shows the same data as a hierarchical tree structure.

```
{  
  "name": "Harry Potter",  
  "species": "human",  
  "gender": "male",  
  "house": "Gryffindor",  
  "dateOfBirth": "31-07-1980",  
  "yearOfBirth": 1980,  
  "ancestry": "half-blood",  
  "eyeColour": "green",  
  "hairColour": "black",  
  "wand": "holly,phoenix feather,11",  
  "patronus": "stag",  
  "hogwartsStudent": true,  
  "hogwartsStaff": false,  
  "actor": "Daniel Radcliffe",  
  "alive": true,  
  "image": "http://hp-api.herokuapp.com/images/harry.jpg"  
}
```

JSON OBJECT



A screenshot of a web browser window displaying a list of three JSON objects. The URL is <https://raw.githubusercontent.com/cederdorff/dat-js/master/data/characters.json>. The JSON array contains three objects: Harry Potter, Hermione Granger, and Ron Weasley. The 'Raw' tab is selected, showing the raw JSON code, while the 'Parsed' tab shows the data as a list of three objects.

```
[  
  {  
    "name": "Harry Potter",  
    "species": "human",  
    "gender": "male",  

```

LIST OF JSON OBJECTS

# JSON Object

The diagram illustrates the relationship between a JSON object and its representation in a web application. On the left, a screenshot of a web browser shows a character card for Harry Potter from the Harry Potter Characters application. The card displays a portrait of Harry Potter, his name, house affiliation (Gryffindor), and a link to his JSON data. On the right, a screenshot of another web browser shows the raw JSON data for Harry Potter. A red arrow points from the JSON object to the Harry Potter character card, indicating that the JSON data is the source of the character's information.

Harry Potter Characters

Harry Potter

Gryffindor

Hermione Granger

Gryffindor

Ron Weasley

Gryffindor

```
{  
  "name": "Harry Potter",  
  "species": "human",  
  "gender": "male",  
  "house": "Gryffindor",  
  "dateOfBirth": "31-07-1980",  
  "yearOfBirth": 1980,  
  "ancestry": "half-blood",  
  "eyeColour": "green",  
  "hairColour": "black",  
  "wand": "holly,phoenix feather,11",  
  "patronus": "stag",  
  "hogwartsStudent": true,  
  "hogwartsStaff": false,  
  "actor": "Daniel Radcliffe",  
  "alive": true,  
  "image": "http://hp-api.herokuapp.com/images/harry.jpg"  
}
```

<https://raw.githubusercontent.com/cederdorff/dat-js/main/data/harry.json>

# JSON Object

The diagram illustrates the flow of data between a JavaScript application and a browser's developer tools.

**JavaScript Application (Left):** A screenshot of a code editor showing a file named `app.js`. The code defines a function `showCharacter` that inserts an HTML article element into a container with the ID `#characters`. The article contains an image and two pieces of text: the character's name and house. The variable `character` is passed to this function.

```
28
29  function showCharacter(character) {
30      document.querySelector("#characters").insertAdjacentHTML(
31          "beforeend",
32          /*html*/
33          `

34              
35              <h2>${character.name}</h2>
36              <p>${character.house}</p>
37          </article>
38      `);
39  }
40 }


```

**Browser Console (Right):** A screenshot of a browser window displaying a JSON object. The object represents a character named Harry Potter, detailing his species, gender, house, birth dates, ancestry, eye and hair colors, wand, patronus, and current status. An arrow points from the `character` variable in the `showCharacter` function to this JSON object, indicating it is the data being passed.

```
{
  "name": "Harry Potter",
  "species": "human",
  "gender": "male",
  "house": "Gryffindor",
  "dateOfBirth": "31-07-1980",
  "yearOfBirth": 1980,
  "ancestry": "half-blood",
  "eyeColour": "green",
  "hairColour": "black",
  "wand": "holly,phoenix feather,11",
  "patronus": "stag",
  "hogwartsStudent": true,
  "hogwartsStaff": false,
  "actor": "Daniel Radcliffe",
  "alive": true,
  "image": "http://hp-api.herokuapp.com/images/harry.jpg"
}
```

<https://raw.githubusercontent.com/cederdorff/dat-js/main/data/harry.json>

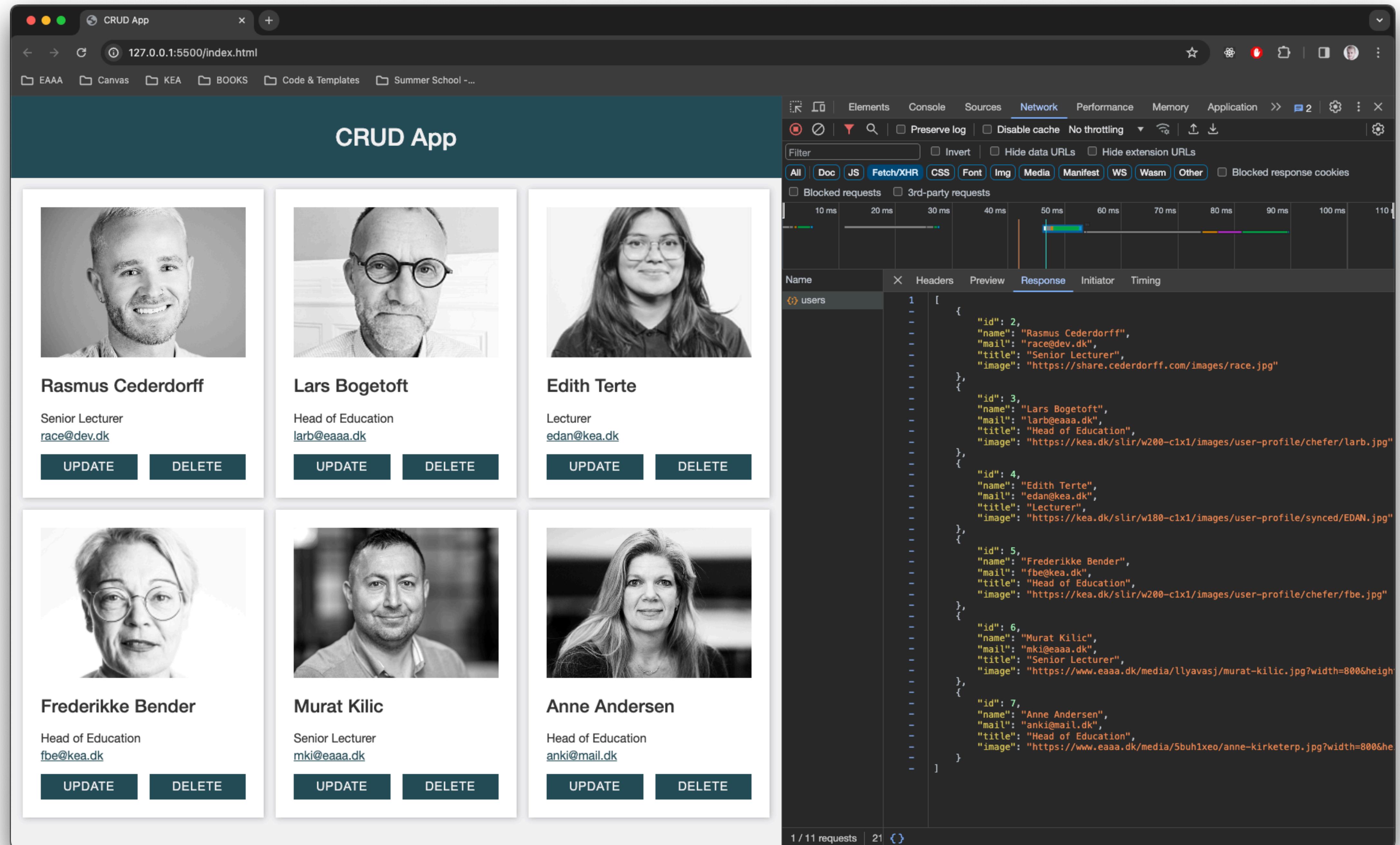
# JAVASCRIPT OBJECT NOTATION

- Collection of key-value pair: “key” : “value”
- List of values, collections or objects
- Lightweight data-interchange format
- Syntax / text format for storing and exchanging data over the web
- Human and machine readable **text**: small, fast and simple
- Language independent
- Can be parsed directly to JavaScript Object
- JavaScript Objects can be converted directly to JSON
- The glue between programs (interface between frontend and backend)

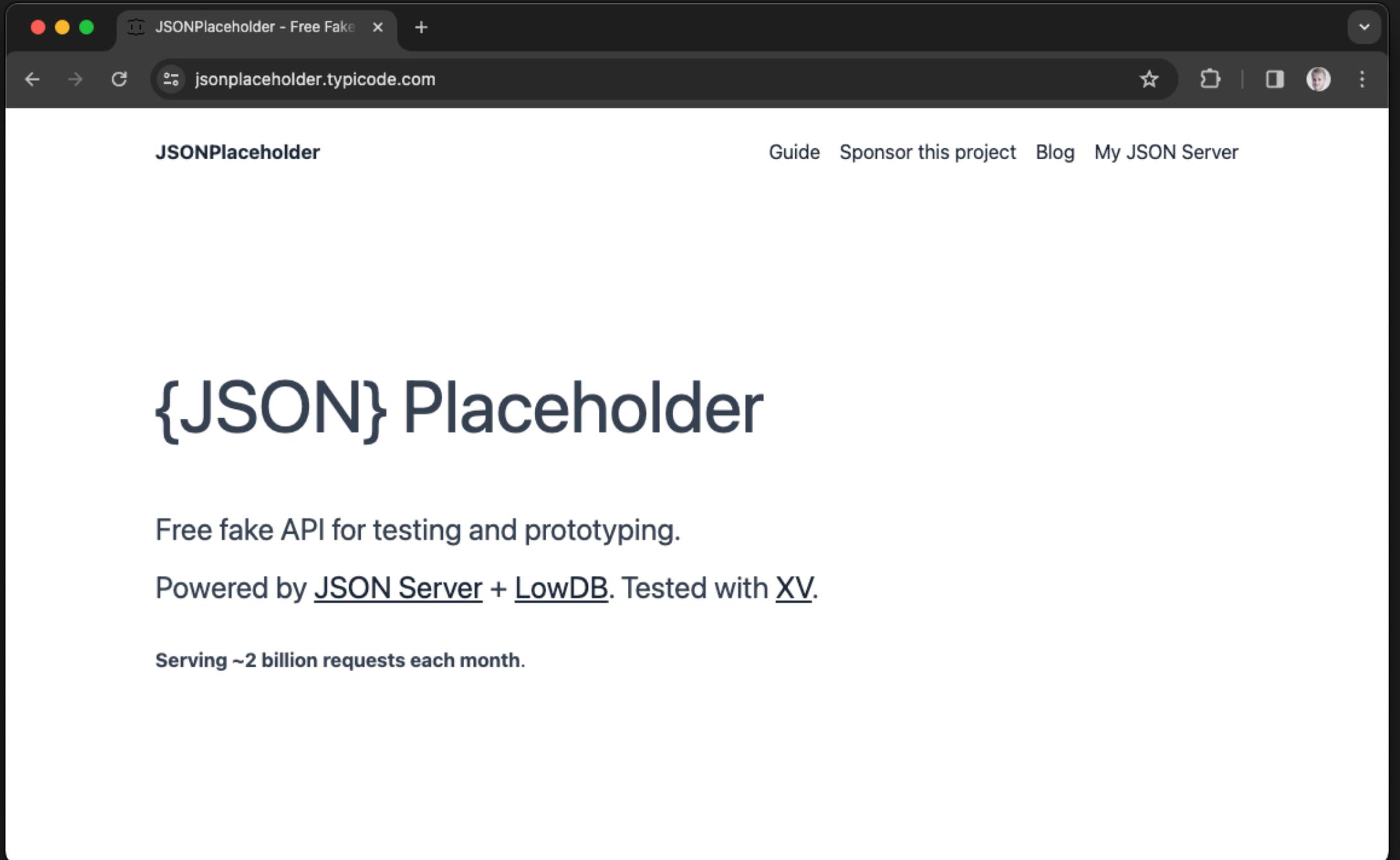
```
[  
 {  
   "id": "1",  
   "firstname": "Kasper",  
   "lastname": "Topp",  
   "age": "34",  
   "haircolor": "Dark Blonde",  
   "countryName": "Denmark",  
   "gender": "Male",  
   "lookingFor": "Female"  
 },  
 {  
   "id": "2",  
   "firstname": "Nicklas",  
   "lastname": "Andersen",  
   "age": "22",  
   "haircolor": "Brown",  
   "countryName": "Denmark",  
   "gender": "Male",  
   "lookingFor": "Female"  
 },  
 {  
   "id": "3",  
   "firstname": " Sarah",  
   "lastname": "Dybvad ",  
   "age": "34",  
   "haircolor": "Blonde",  
   "countryName": "Denmark",  
   "gender": "Female",  
   "lookingFor": "Male"  
 },  
 {  
   "id": "4",  
   "firstname": "Alex",  
   "lastname": "Hansen",  
   "age": "21",  
   "haircolor": "Blonde",  
   "countryName": "Denmark",  
   "gender": "Male",  
   "lookingFor": "Female"  
 }]
```

# JSON METHODS

```
const user = {  
    name: "John",  
    age: 30,  
    gender: "male",  
    lookingFor: "female"  
};  
  
// === JSON.stringify === //  
const jsonUser = JSON.stringify(user);  
console.log(jsonUser); // {"name":"John","age":30,"gender":"male","lookingFor":"female"}  
  
// === JSON.parse === //  
const jsonString = '{"name":"John","age":30,"gender":"male","lookingFor":"female"}';  
const userObject = JSON.parse(jsonString);  
console.log(userObject); // logging userObject
```



# Test endpoints



<https://jsonplaceholder.typicode.com/>

- Install [JSON Formatter](#)
- Test the following endpoints:
  - <https://jsonplaceholder.typicode.com/posts/>
  - <https://jsonplaceholder.typicode.com/posts/5>
  - <https://jsonplaceholder.typicode.com/users/>
  - <https://jsonplaceholder.typicode.com/users/1>
  - <https://jsonplaceholder.typicode.com/todos>
  - <https://jsonplaceholder.typicode.com/todos/5>

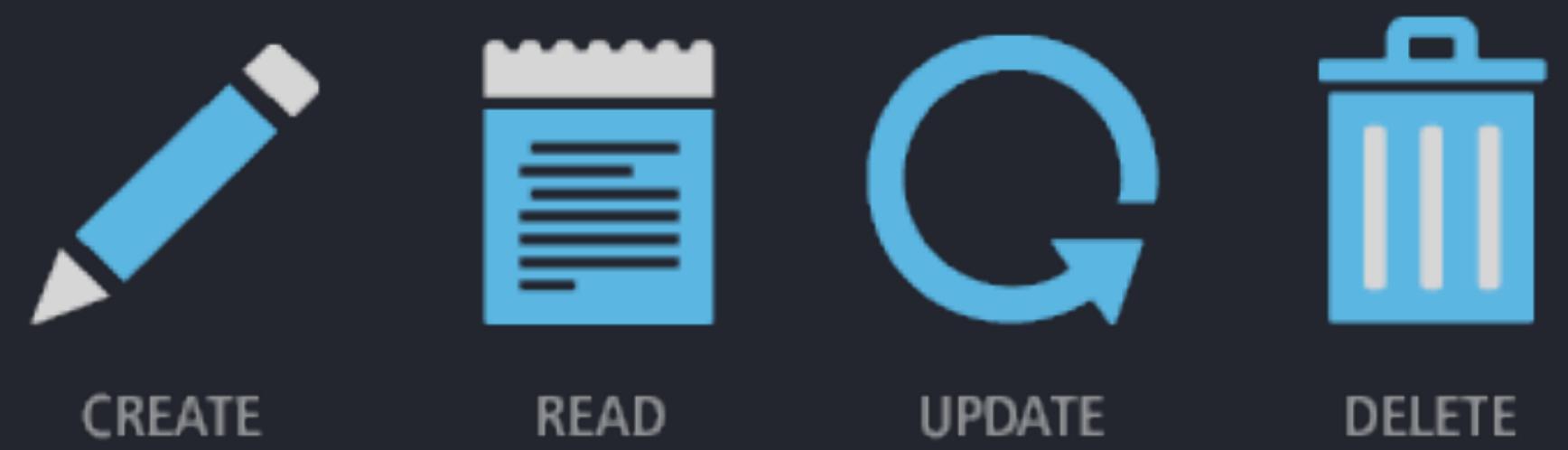
```
{  
  "name": "Rasmus Cederdorff",  
  "birthday": "1990-03-12",  
  "title": "Experienced JavaScript Developer",  
  "experienceYears": 10,  
  "education": {  
    "degree": "Master of Science in IT - Web Communication",  
    "specialization": "Web Architecture"  
  },  
  "skills": ["JavaScript", "React", "Node.js", "UI/UX Design"],  
  "currentPosition": "Senior Lecturer at EAAA",  
  "teachingSubjects": ["Web Development", "JavaScript", "React", "BaaS & Node.js"],  
  "lovesJavaScript": true  
}
```

# Define yourself with JSON

- <https://race.notion.site/Define-yourself-with-JSON-391944b6b1a041bfa341a0d46f5c0e4a?pvs=4>

# CRUD

Create - Read - Update - Delete



C R U D

# What's CRUD?

- CREATE objects like a post, user, movie, product, etc.
- READ objects like an array (or object) of objects (posts, users, movies, products, etc)
- UPDATE an object, often given by a unique id.
- DELETE an object, often given by a unique id.

# CRUD

Create - Read - Update - Delete  
Find App Examples

# REST API Design & CRUD



CRUD operations

Create

/api/products **POST**

Read

/api/products **GET**

Update

/api/products/:id **PUT**

Delete

/api/products/:id **DELETE**

# REST

## Representational State Transfer

# REST

REST (Representational State Transfer) is an architectural style for web services based on HTTP and stateless interactions.

# REST

A set of architectural **principles** of implementing an API.

# REST

A standard for systems (client & server) to communicate over HTTP.

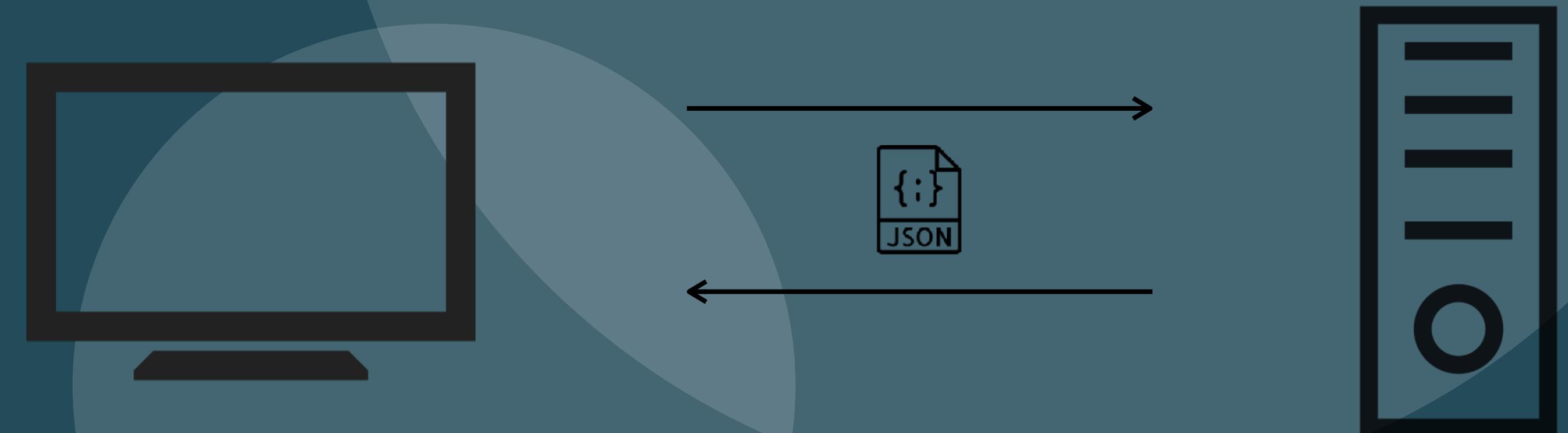
# REST

## Key Principles

1. Stateless Communication
2. CRUD and HTTP Methods
3. Resource-Based Design
4. Using HTTP Status Codes
5. JSON as the Standard Format
6. Client-Server Architecture

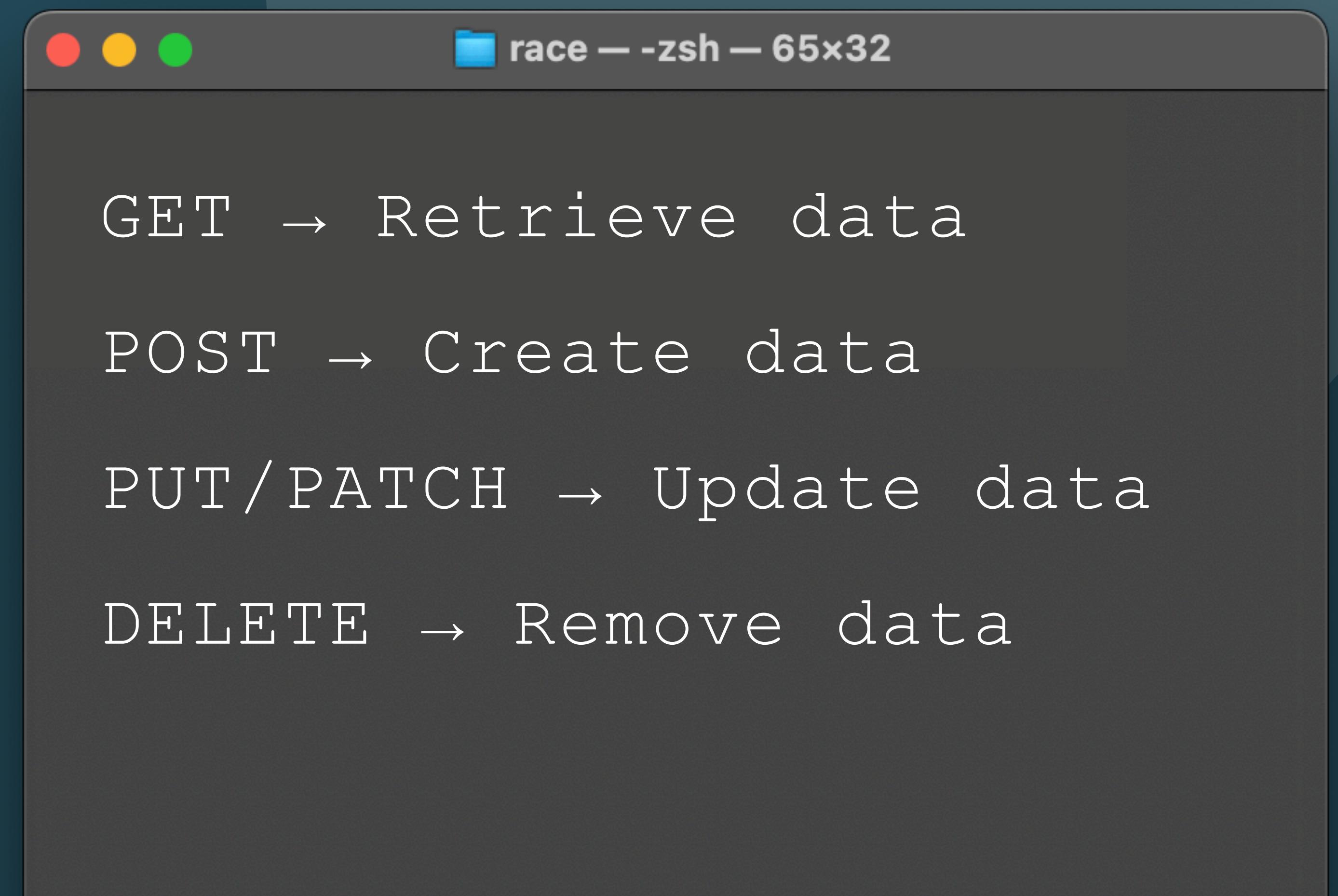
# 1. Stateless Communication

Each client request to the server contains all necessary information  
– the server does not store client state between requests.



# 2. CRUD and HTTP Methods

- RESTful APIs follow the CRUD principle using HTTP methods

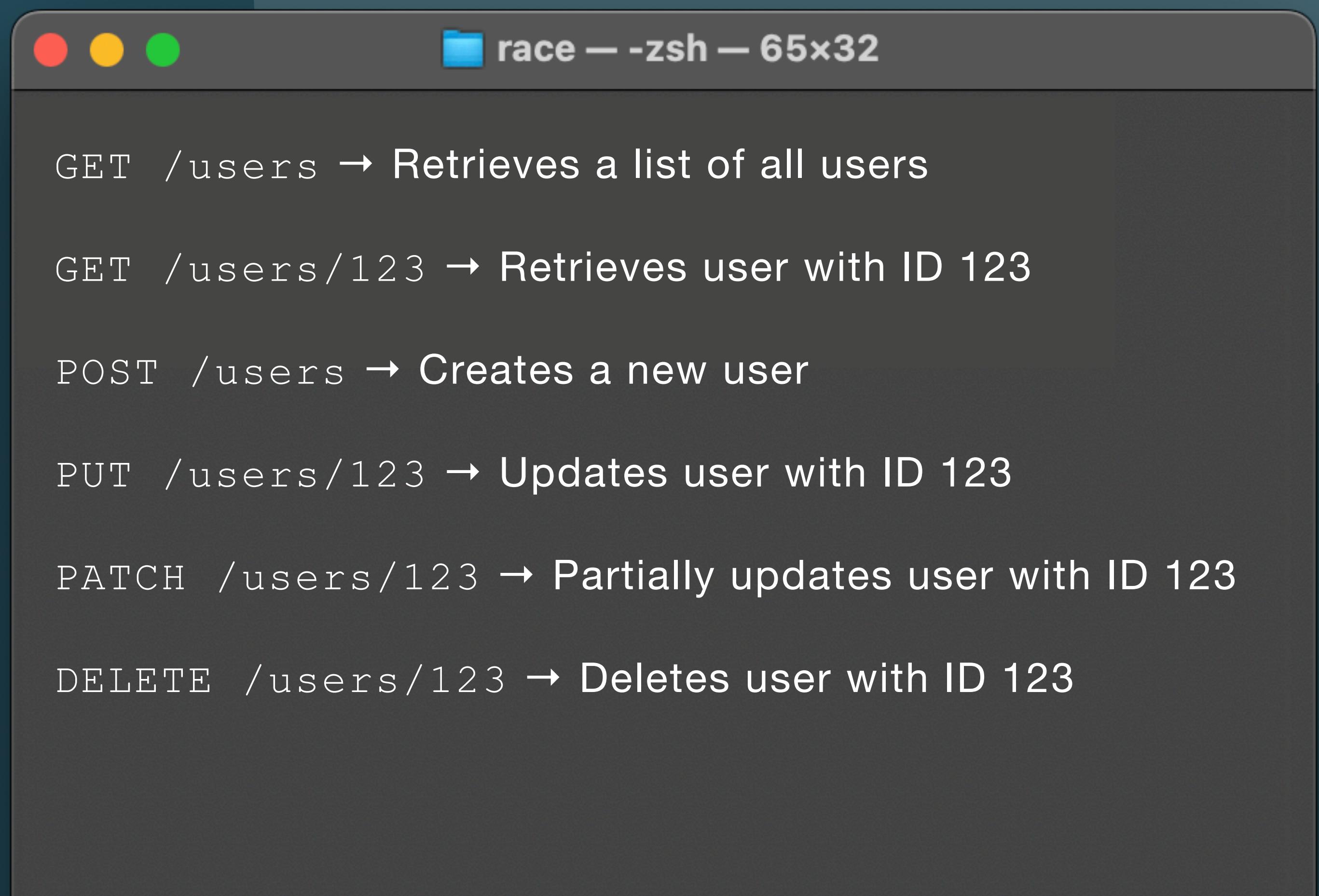


The image shows a dark-themed macOS terminal window. At the top, there are three colored window control buttons (red, yellow, green) and the title bar which reads "race -- zsh -- 65x32". The main area of the terminal contains four lines of text, each mapping an HTTP method to a CRUD operation:

- GET → Retrieve data
- POST → Create data
- PUT/PATCH → Update data
- DELETE → Remove data

# 3. Resource-Based Design

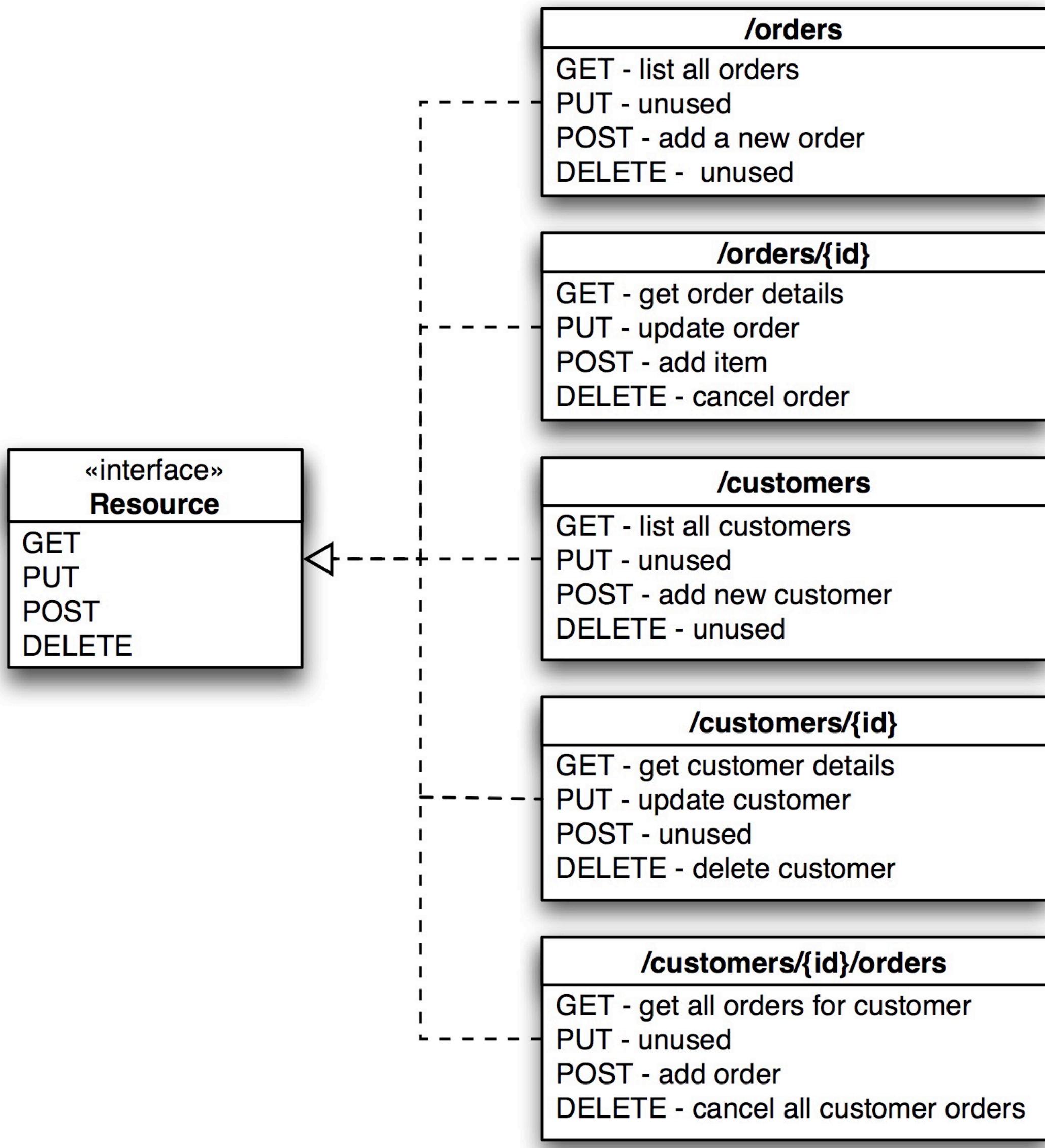
- In REST, everything is considered a resource.
- REST APIs are structured around uniquely identifiable resources, accessed via specific URLs.
- Each resource is represented as a URI and can be manipulated using standard HTTP methods (GET, POST, PUT, DELETE).



The screenshot shows a terminal window with the title bar 'race --zsh -- 65x32'. The window contains the following text:

```
GET /users → Retrieves a list of all users
GET /users/123 → Retrieves user with ID 123
POST /users → Creates a new user
PUT /users/123 → Updates user with ID 123
PATCH /users/123 → Partially updates user with ID 123
DELETE /users/123 → Deletes user with ID 123
```

# 3. Resource-Based Design



## • Resources and their Endpoints

- **Products:** <http://example.com/products>
- **Users:** <http://example.com/users>
- **Orders:** <http://domain.com/orders>

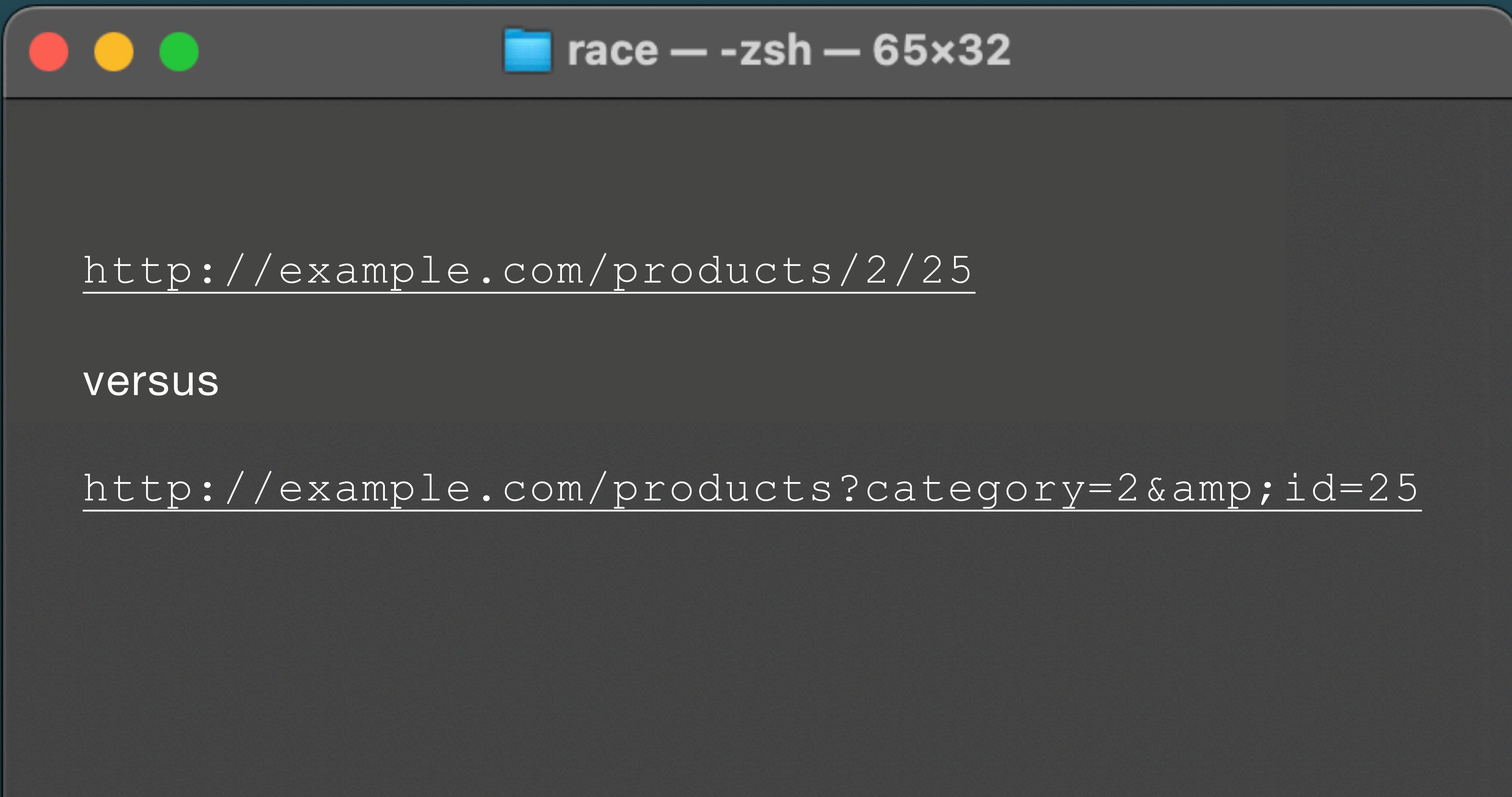
## • Resource Identifiers (IDs)

- **Specific Product:** <http://example.com/products/2/25>
- **Specific User:** <http://example.com/users/7503>
- **Specific Order:** <http://domain.com/orders/2014/06/4022>

## • Connected Data

- **User Order Item:**  
<http://example.com/users/7503/orders/3/item/1>

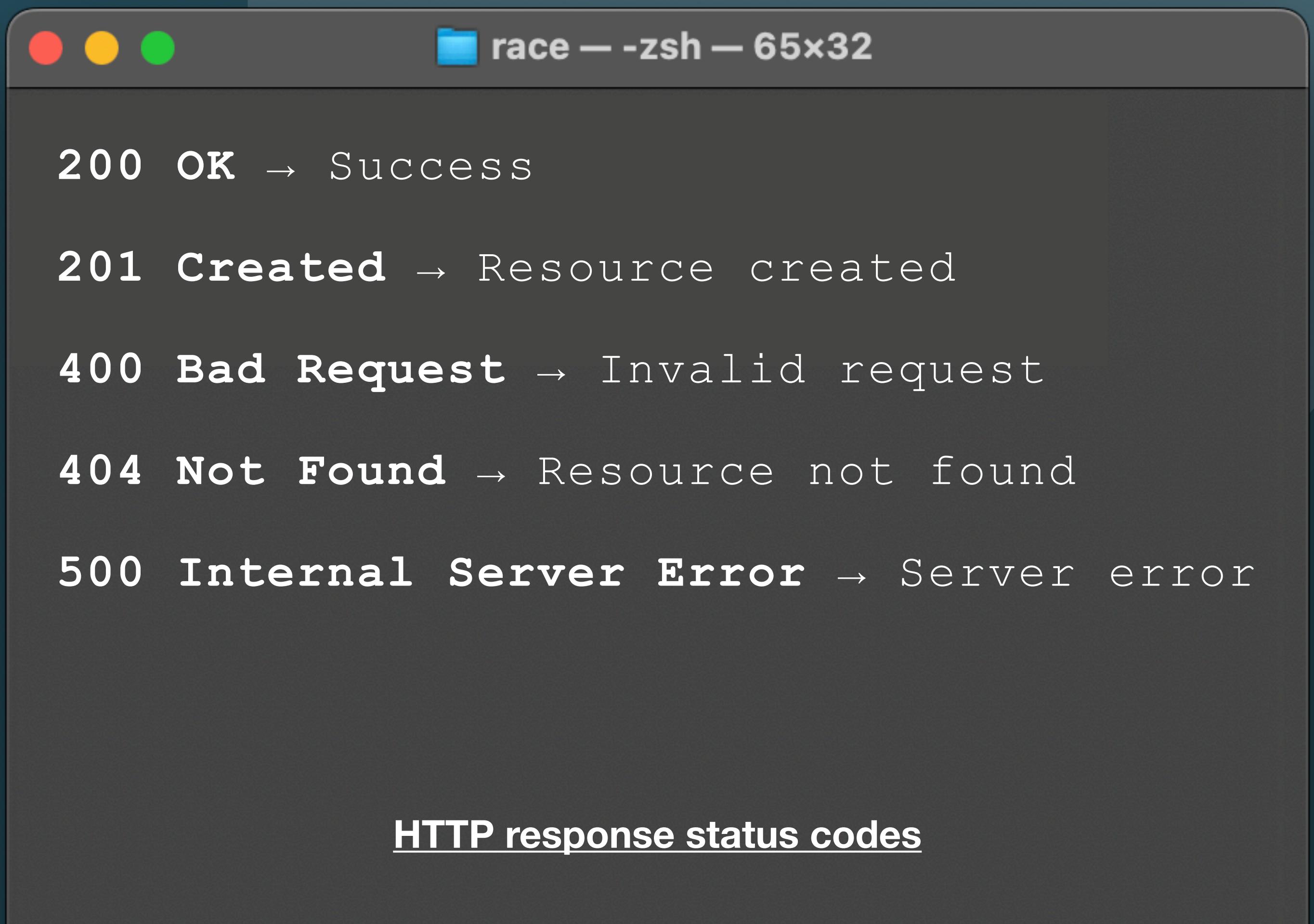
# Clean and Semantic URL



versus

# 4. Using HTTP Status Codes

- RESTful APIs use standard HTTP status codes to indicate the outcome of a request



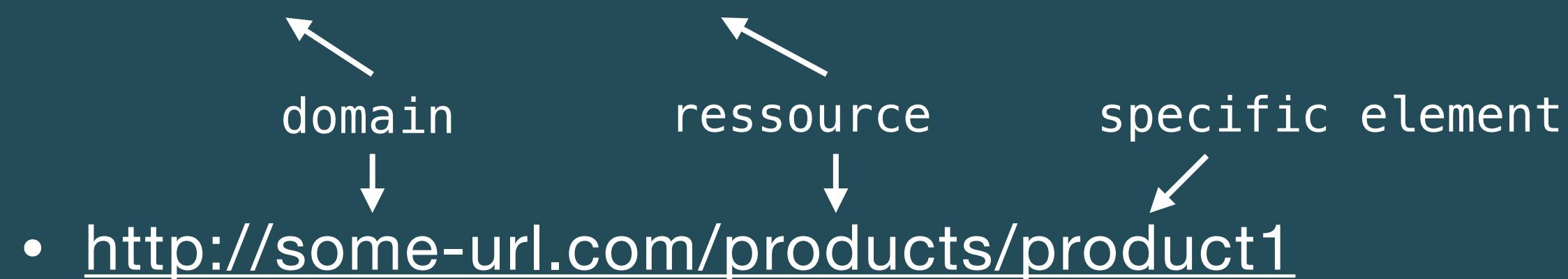
The terminal window displays the following information:

- 200 OK → Success
- 201 Created → Resource created
- 400 Bad Request → Invalid request
- 404 Not Found → Resource not found
- 500 Internal Server Error → Server error

**HTTP response status codes**

# RESTful API

- Base URL: http://some-url.com/products

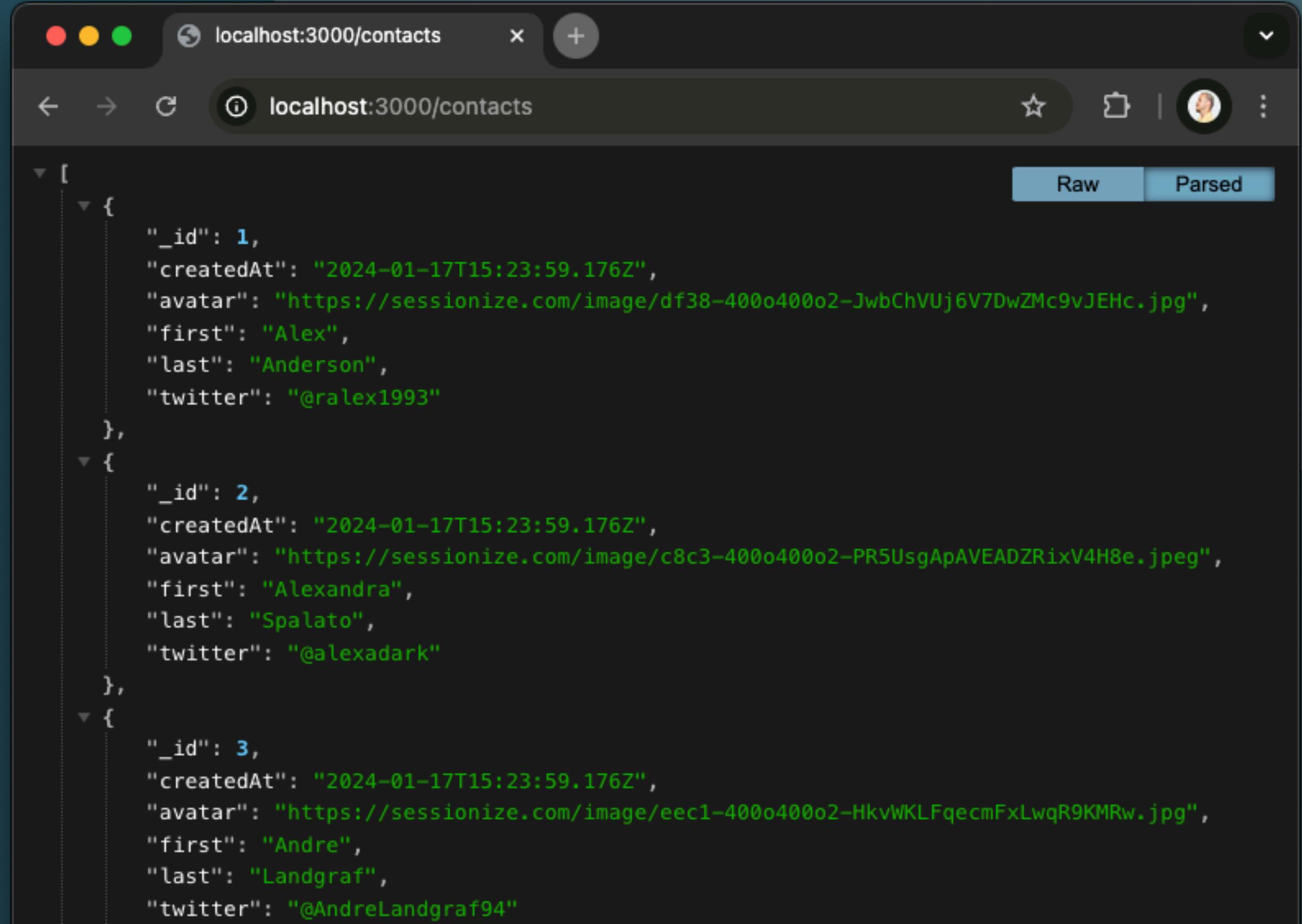


- Data type → JSON

Ressource	GET	POST	PUT	DELETE
Collection: <u>http://some-url.com/products</u>	Returns a list with all products	Creates new product, added to the collections	Replaces a collection with a another	Deletes all products
Element: <u>http://some-url.com/products/product1</u>	Returns a specific product	÷	Replaces product with new (updated) data	Deletes product

# 5. JSON as the Standard Format

REST APIs typically use JSON as the data format for efficient and readable communication between client and server.



A screenshot of a web browser window titled "localhost:3000/contacts". The browser's address bar also shows "localhost:3000/contacts". The main content area displays a JSON array of three contact objects. The first object has an \_id of 1, created at 2024-01-17T15:23:59.176Z, an avatar URL, a first name of "Alex", a last name of "Anderson", and a Twitter handle "@alex1993". The second object has an \_id of 2, created at 2024-01-17T15:23:59.176Z, an avatar URL, a first name of "Alexandra", a last name of "Spalato", and a Twitter handle "@alexadark". The third object has an \_id of 3, created at 2024-01-17T15:23:59.176Z, an avatar URL, a first name of "Andre", a last name of "Landgraf", and a Twitter handle "@AndreLandgraf94". The browser interface includes a "Raw" and "Parsed" tab, with "Parsed" selected.

```
[{"_id": 1, "createdAt": "2024-01-17T15:23:59.176Z", "avatar": "https://sessionize.com/image/df38-400o400o2-JwbChVUj6V7DwZMc9vJEHc.jpg", "first": "Alex", "last": "Anderson", "twitter": "@alex1993"}, {"_id": 2, "createdAt": "2024-01-17T15:23:59.176Z", "avatar": "https://sessionize.com/image/c8c3-400o400o2-PR5UsgApAVEADZRixV4H8e.jpeg", "first": "Alexandra", "last": "Spalato", "twitter": "@alexadark"}, {"_id": 3, "createdAt": "2024-01-17T15:23:59.176Z", "avatar": "https://sessionize.com/image/eec1-400o400o2-HkvWKLfqecmFxLwqR9KMRw.jpg", "first": "Andre", "last": "Landgraf", "twitter": "@AndreLandgraf94"}]
```

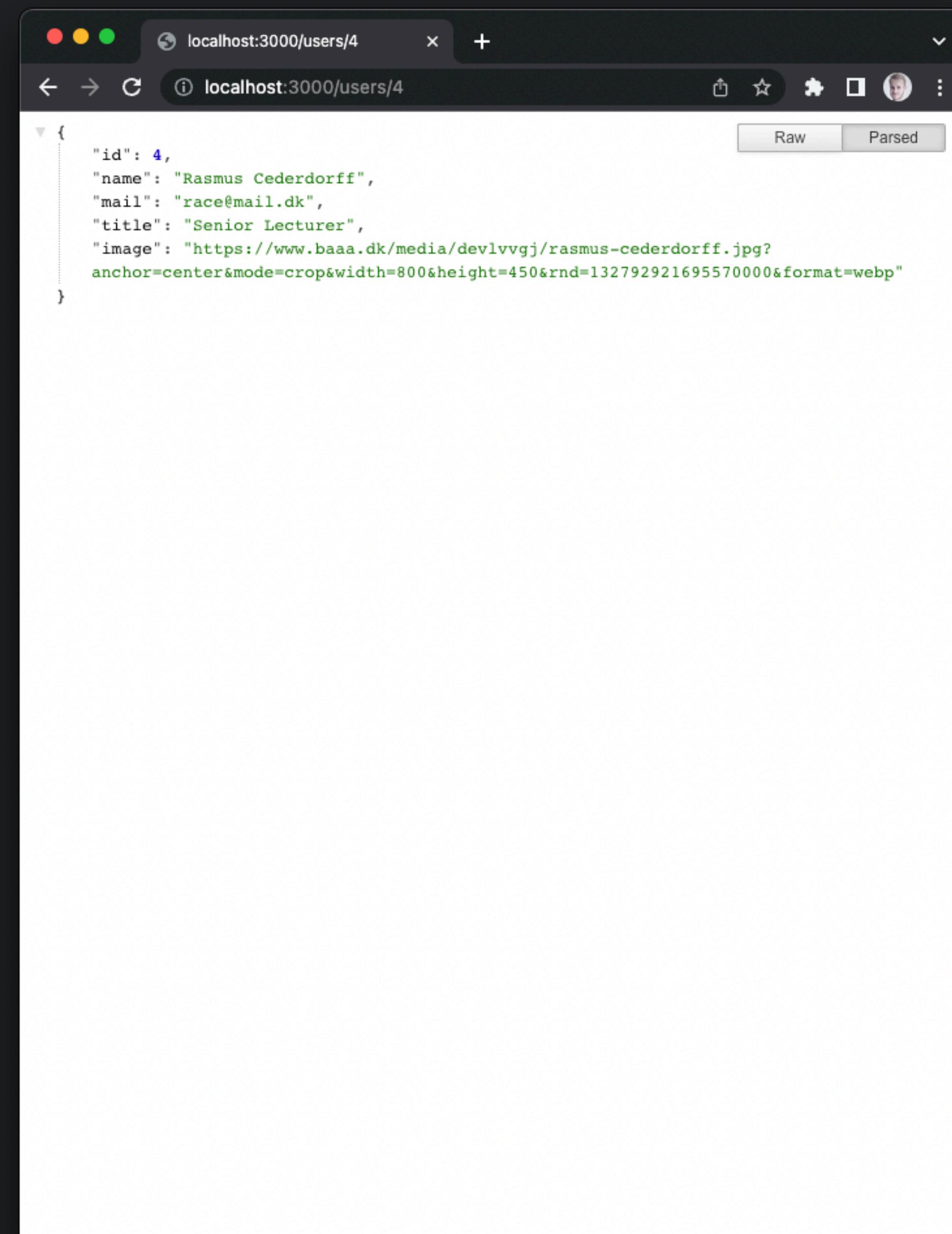
# Collections (JSON Array)



A screenshot of a web browser window titled "localhost:3000/users". The page displays a JSON array of user objects. Each object contains fields: id, name, mail, title, and image. The image field includes a URL and a query string for image processing. The browser interface shows a "Raw" and "Parsed" button.

```
[{"id": 1, "name": "Birgitte Kirk Iversen", "mail": "bki@mail.dk", "title": "Senior Lecturer", "image": "https://www.baaa.dk/media/u4gorzsd/birgitte-kirk-iversen2.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921541630000&format=webp"}, {"id": 4, "name": "Rasmus Cederdorff", "mail": "race@mail.dk", "title": "Senior Lecturer", "image": "https://www.baaa.dk/media/devlvgj/rasmus-cederdorff.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921695570000&format=webp"}, {"id": 5, "name": "Dan Okkels Brendstrup", "mail": "dob@mail.dk", "title": "Lecturer", "image": "https://www.eaaa.dk/media/bdojel41/dan-okkels-brendstrup.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921559630000&format=webp"}, {"id": 6, "name": "Kasper Fischer Topp", "mail": "kato@mail.dk", "title": "Lecturer", "image": "https://www.eaaa.dk/media/lxzcybme/kasper-topp.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921618200000&format=webp"}, {"id": 7, "name": "Line Skjødt", "mail": "lskj@mail.dk", "title": "Senior Lecturer & Internship Coordinator", "image": "https://www.eaaa.dk/media/14qpfeq4/line-skj%C3%B8dt.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921638700000&format=webp"}, {"id": 8, "name": "Martin Aagaard Nøhr", "mail": "mnor@mail.dk", "title": "Lecturer", "image": "https://www.eaaa.dk/media/oayjq02h/martin-n%C3%B8hr.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921658800000&format=webp"}]
```

# Element (JSON Object)

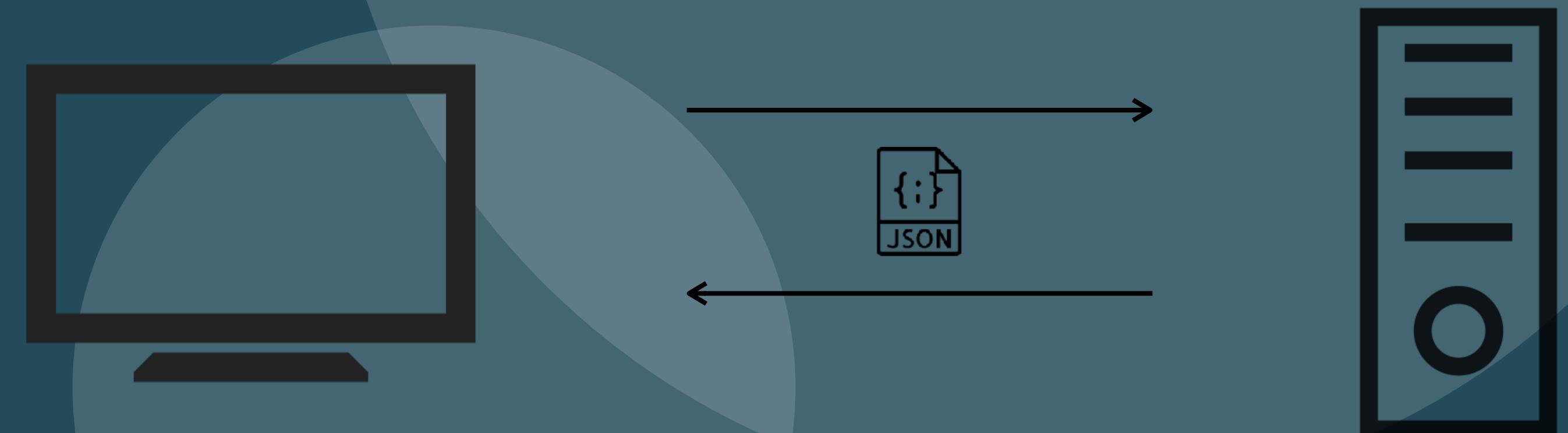


A screenshot of a web browser window titled "localhost:3000/users/4". The page displays a single JSON object representing a user with id 4. The object includes fields: id, name, mail, title, and image. The image field includes a URL and a query string for image processing. The browser interface shows a "Raw" and "Parsed" button.

```
{ "id": 4, "name": "Rasmus Cederdorff", "mail": "race@mail.dk", "title": "Senior Lecturer", "image": "https://www.baaa.dk/media/devlvgj/rasmus-cederdorff.jpg?anchor=center&mode=crop&width=800&height=450&rnd=132792921695570000&format=webp"}
```

# 6. Client-Server Architecture

- **Client-Server Architecture:** Separates the client and server responsibilities, enabling them to evolve independently. Clients are not concerned with data storage, while servers are not concerned with user interfaces.
- **Uniform Interface:** Defines a standardized way for clients to interact with resources. This includes resource identification through URLs, manipulation through representations, and self-descriptive messages.

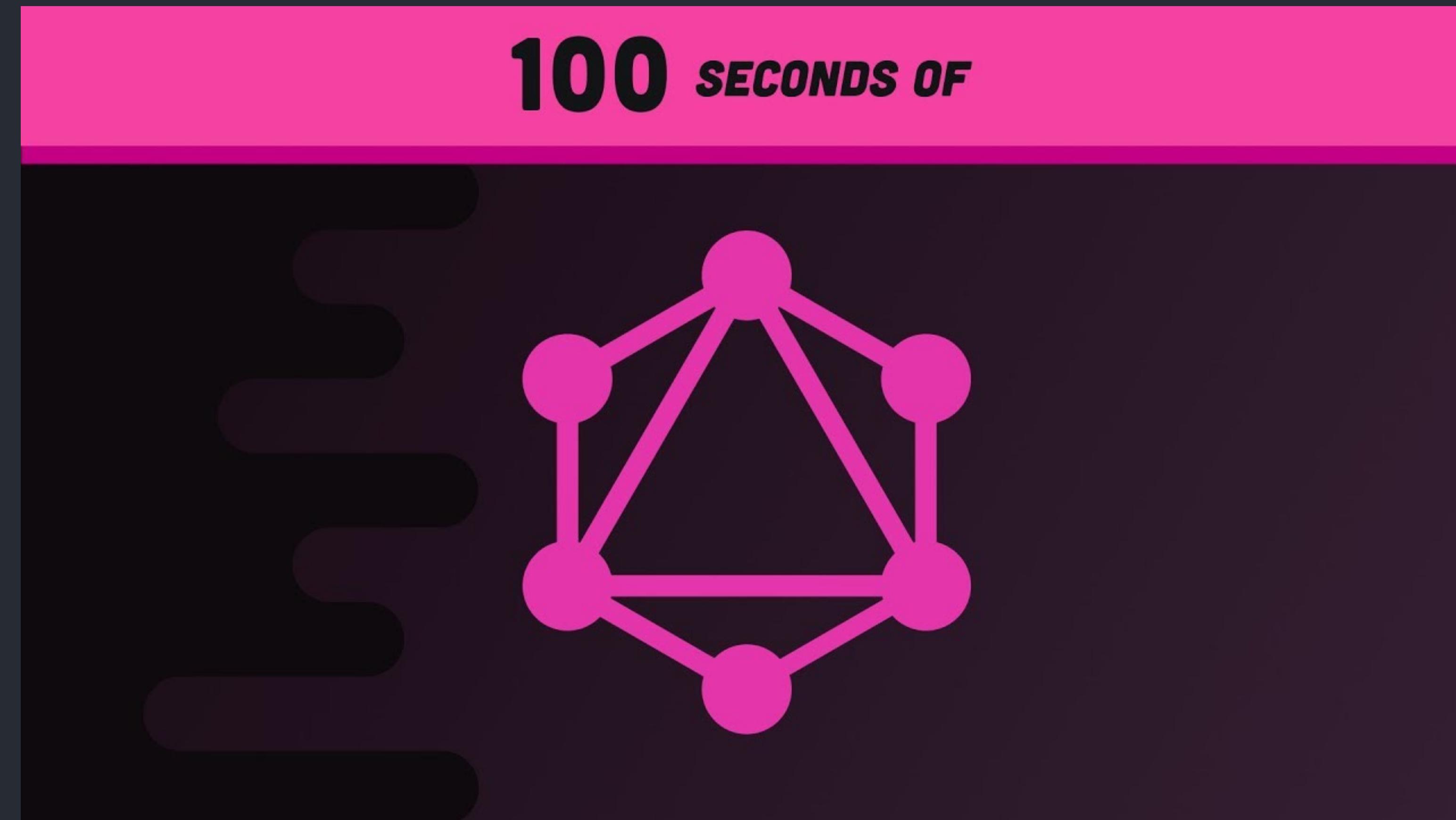


# 100 *SECONDS OF* node



[https://www.youtube.com/watch?v=-MTSQjw5DrM&ab\\_channel=Fireship](https://www.youtube.com/watch?v=-MTSQjw5DrM&ab_channel=Fireship)

# GraphQL - REST Alternative



[https://www.youtube.com/watch?v=elQh02xuVw4&ab\\_channel=Fireship](https://www.youtube.com/watch?v=elQh02xuVw4&ab_channel=Fireship)

# What are REST APIs?

<https://www.youtube.com/watch?v=SLwpqD8n3d0>

# Advantages of REST

- By following these REST principles, a REST API provides a simple and consistent way to interact with a database or other services. It allows developers to perform common operations using familiar HTTP methods, making it easier to integrate and interact with the database from different programming languages or platforms.
- It enables developers to perform CRUD (Create, Read, Update, Delete) operations on data resources using standard HTTP methods and benefit from the flexibility and interoperability that REST offers.

# Advantages of REST

- Independent of platform and programming language
- Based on existing standards (on top of HTTP)
- Semantic URL → Nice and clean URLs → SEO
- Restful API
- Scalable
- Performance
- Exchange formats like JSON, XML, or both

# Dataforsyningen - REST API

Why is it a REST API?



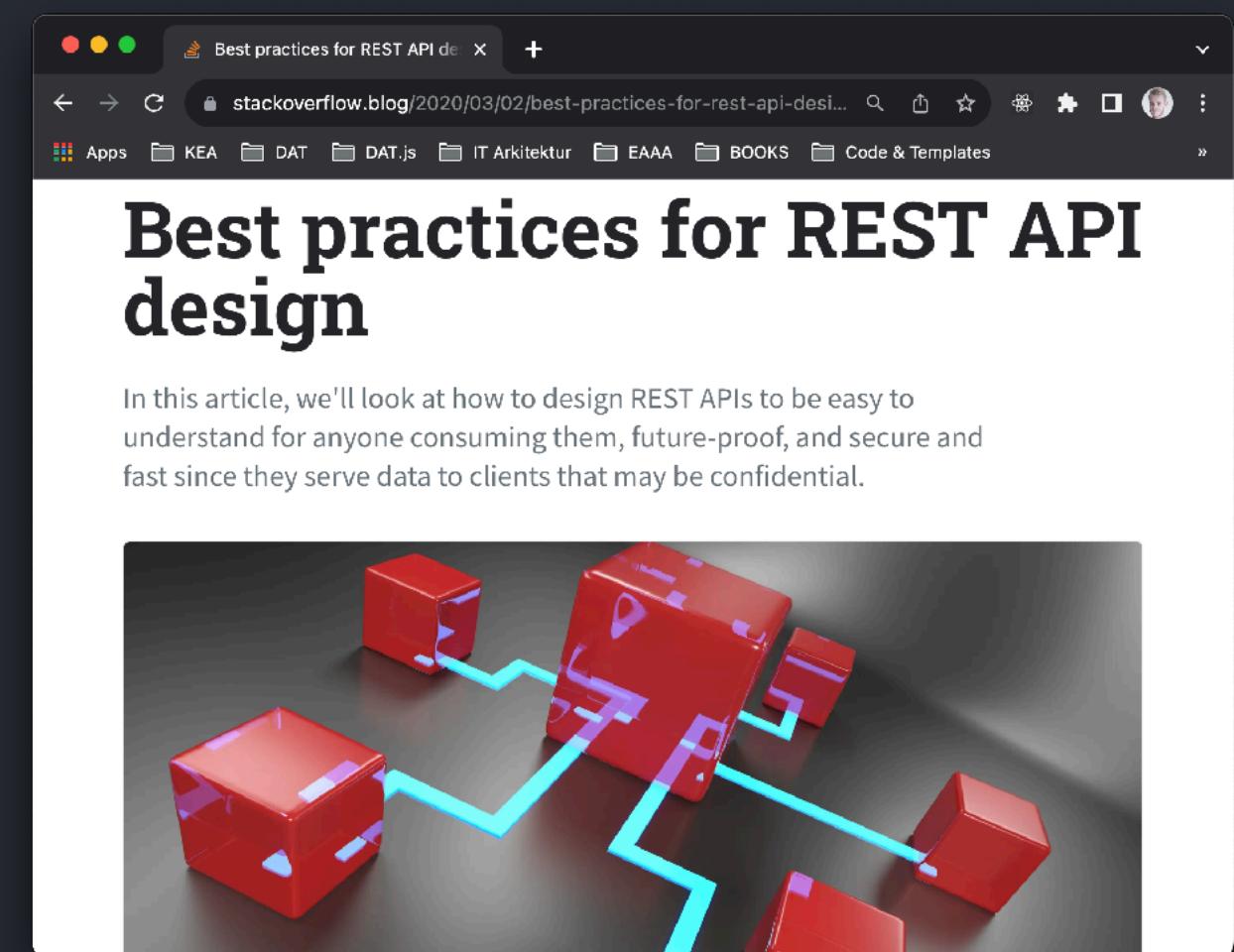
<https://dataforsyningen.dk/>

The screenshot shows the REST API documentation page. The title is "Dataforsyningen REST API". Below it, there are links to the API ([API](https://api.dataforsyningen.dk/)), documentation ([DOCS](https://dataforsyningen.dk/)), and a data overview ([Dataoversigt](https://dataforsyningen.dk/data)). The main content is divided into sections: "Eksempel på kald" (Example of call), "Regioner" (Regions), and "en region" (a region). Under "Eksempel på kald", there are examples for "Danmarks adresser og vejnavne" (Danish addresses and street names) and "Regioner". Under "Regioner", there is a link to "alle regioner" (all regions) with a GET method and the URL <https://api.dataforsyningen.dk/regioner>. Under "en region", there is a link to "Regioner" with a GET method and the URL <https://api.dataforsyningen.dk/regioner/1082>.

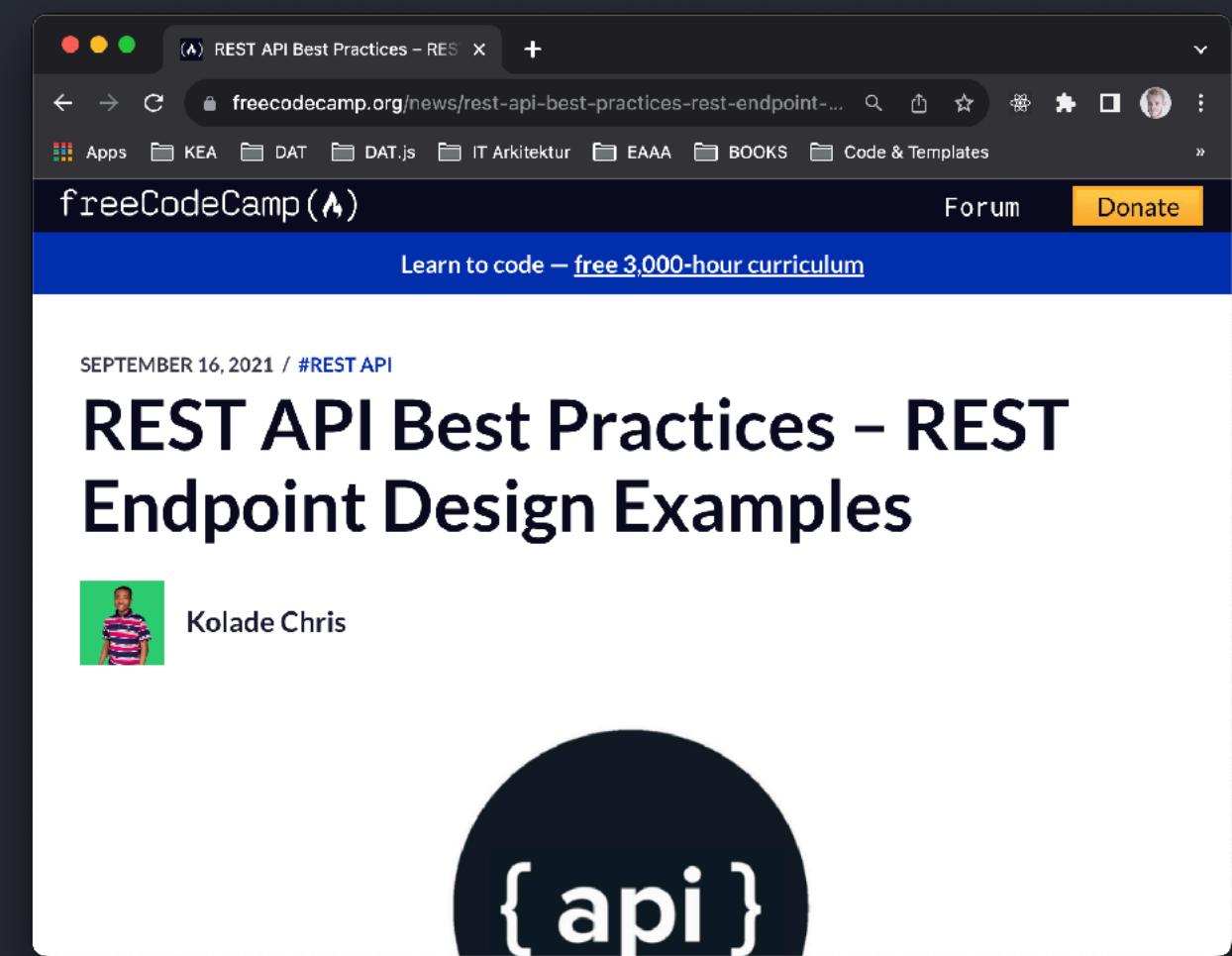
[Dataforsyningen REST API](#)

# 10 Best Practices for REST API Design

1. Data Format: Use JSON for Data Exchange
2. Endpoint Design: Use nouns, not verbs in endpoint paths
3. Resource Naming: Pluralize Collection Names
4. Error Handling: Utilize HTTP Status Codes & JSON-based error responses
5. Resource Relationships: Employ Nested Endpoints
6. Data Retrieval: Implement Filtering, Sorting, and Pagination
7. Security: Enforce SSL/TLS Encryption
8. Versioning: Clearly Define API Versions
9. Caching: Provide data caching to improve performance
10. Documentation: Provide Comprehensive API Docs

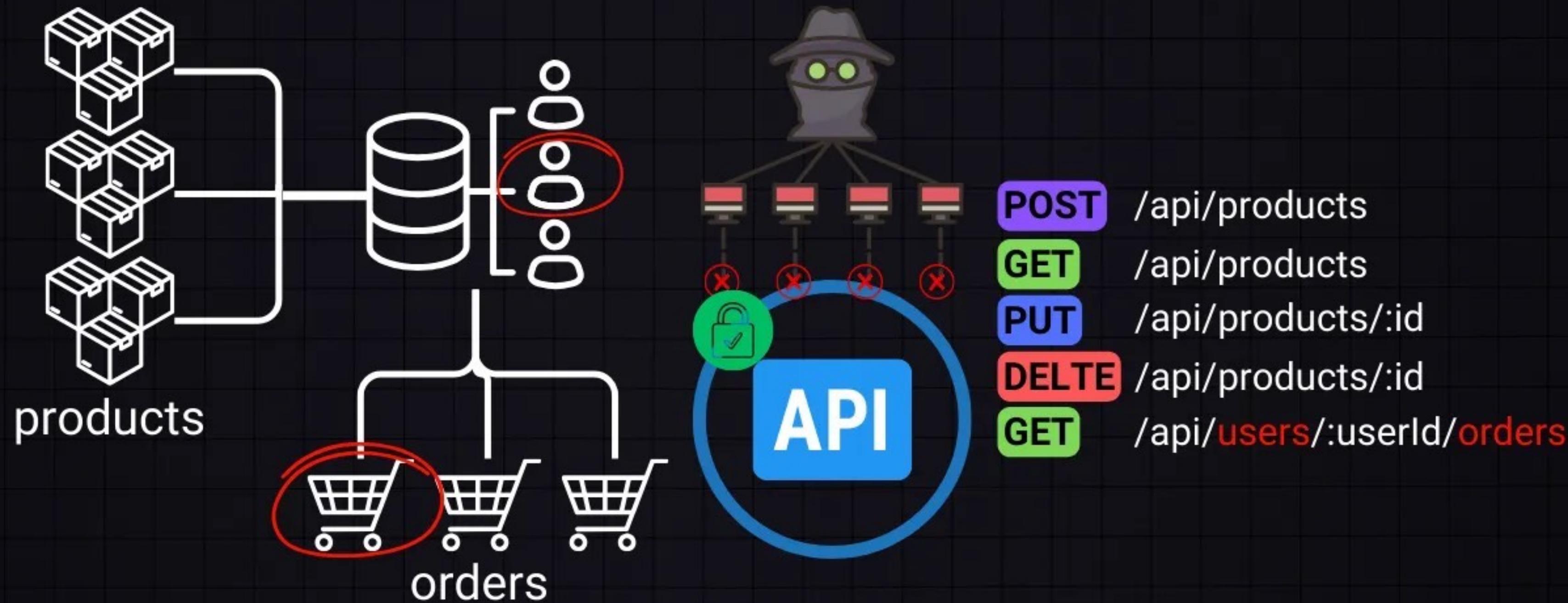


<https://stackoverflow.blog/2020/03/02/best-practices-for-rest-api-design/#h-cache-data-to-improve-performance>



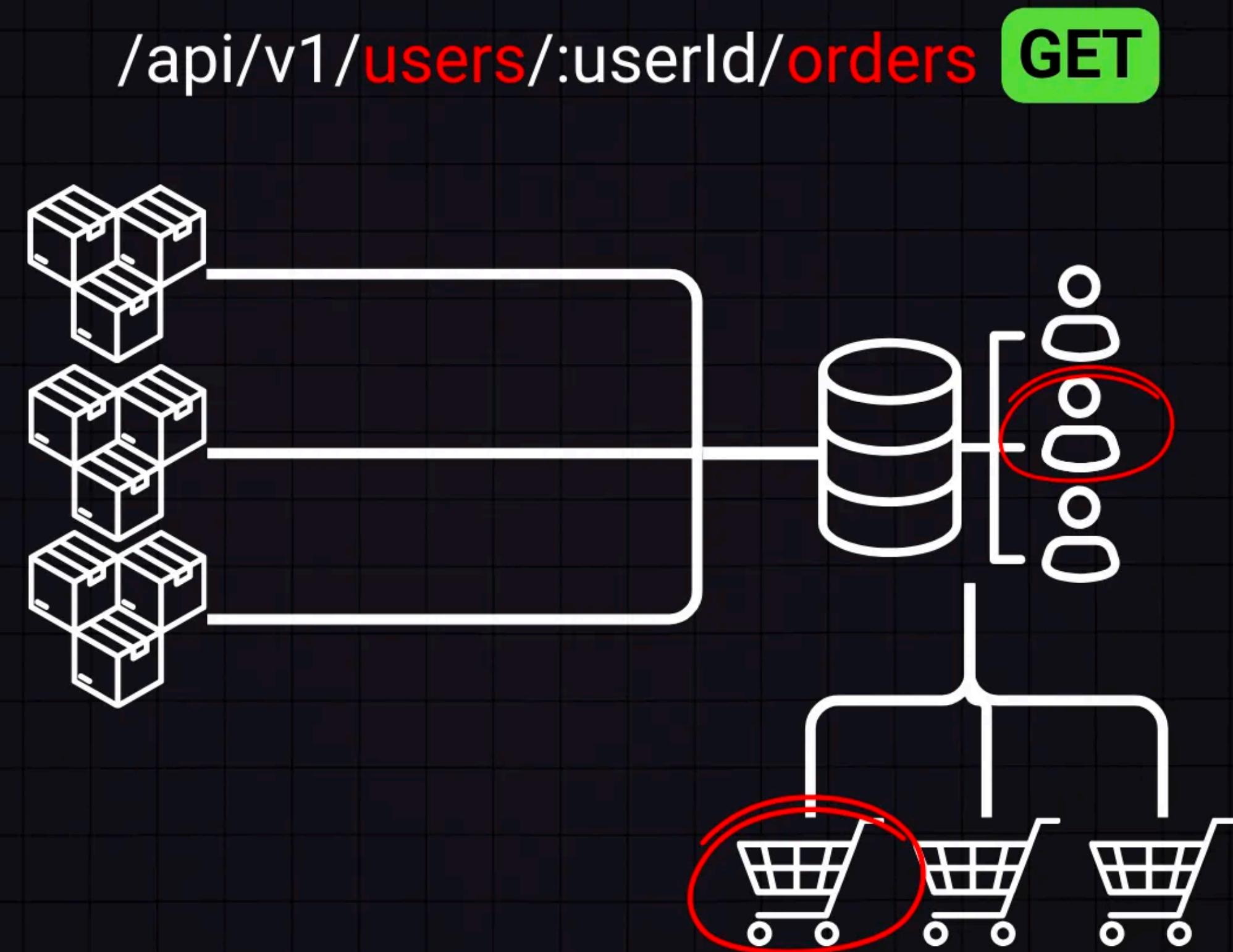
<https://www.freecodecamp.org/news/rest-api-best-practices-rest-endpoint-design-examples/>

# API DESIGN



API Design 101: From Basics to Best Practices

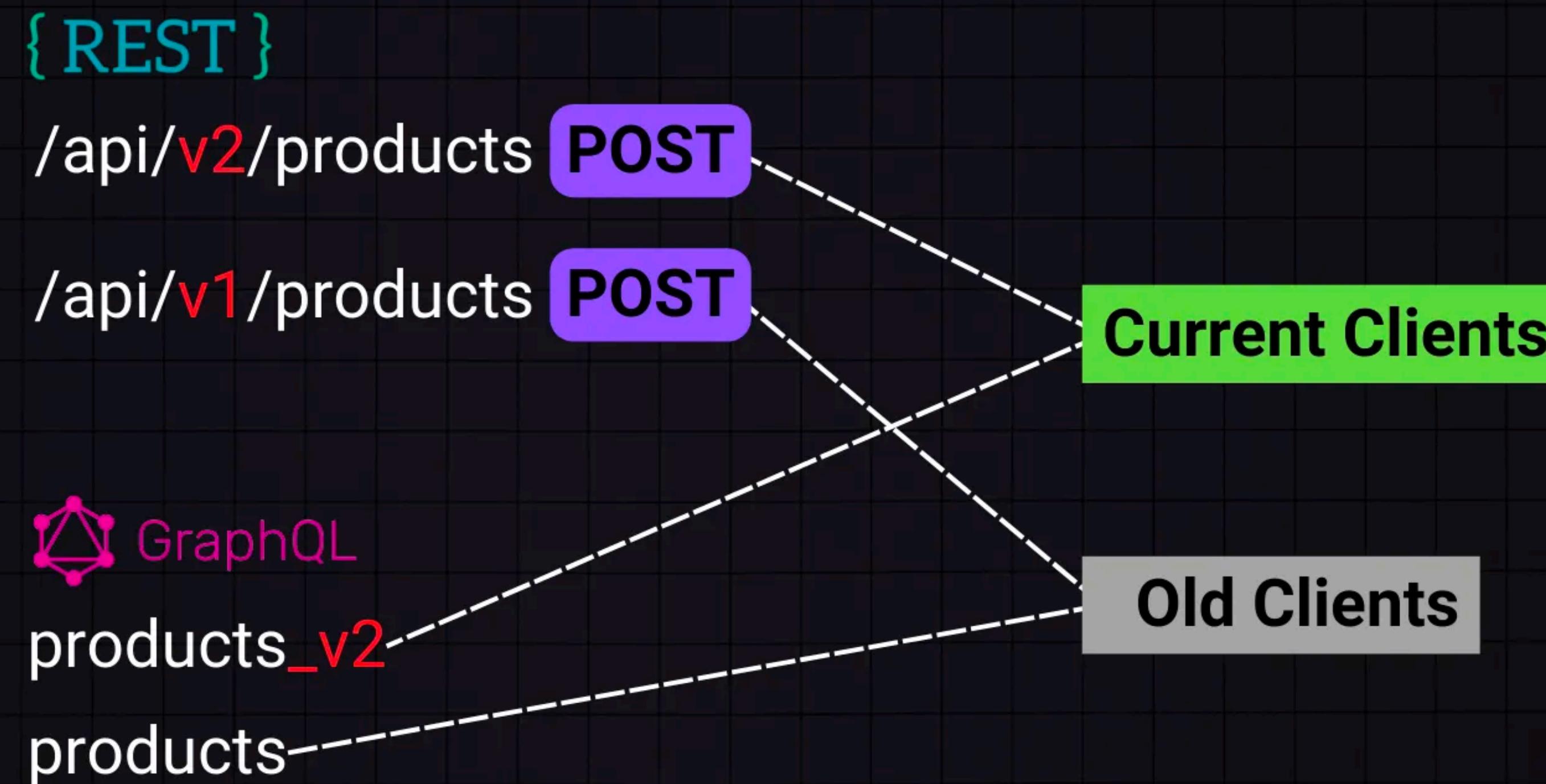
# Relationships in API Design



# Queries, Limit, and Idempotence of GET Requests



# Backward Compatibility and Versioning



# DOS & DON'TS

1. Let's just use POST for everything!
2. While we're at it...
3. Let's use PUT... What do you mean "404"!?
4. Everything is "OK"
5. Server: "400 Bad Request. Body: Empty..." — Client: "Thanks..."
6. "400 Bad Request. Body: Some random error" — Client: "But... this is a GET request"
7. 404 (Not Found) vs 410 (Gone)
8. Get your priorities right
9. "We want our API to be public, completely open, and free to use!"  
— The Care Bears
10. "500 Internal Server Error" more like "500 Whoops, code broke"

The screenshot shows a Medium article titled "RESTful APIs. 10 DOs and DON'Ts" by Julien Garrigues. The article was published in Creative by Black Pug Studio on May 16, 2018, and has 163 views. The content discusses common REST API anti-patterns, such as using POST for everything or returning empty bodies for errors. It includes a quote from the Care Bears and a note about missing documentation.

**RESTful APIs**  
10 DOs and DON'Ts  
Julien Garrigues · Follow  
Published in Creative by Black Pug Studio · 8 min read · May 16, 2018

In a world where RESTful APIs are used every day to feed our lives with more data than ever possible, it is necessary to understand how they work, or at least how they **SHOULD** work.

"Most APIs have unclear, incomplete, or simply missing documentation!"

As a developer, I was shocked to discover how few APIs actually follow the basic rules and guidelines in place. So, I thought I would show a few general DOs and DON'Ts based on live APIs that I've encountered or used in the past (without mentioning where they were found, no need for finger pointing of course!).

I won't go into extensive details about everything. In fact, I'll try to keep it short and straight to the point, and if you are interested after reading my

# HTTP Requests

GET - POST - PUT - DELETE

# HTTP REQUEST METHODS (verbs)

GET - POST - PUT - DELETE

HTTP (Hypertext Transfer Protocol) is the standard way to communicate between clients and servers (request-response protocol).

"HTTP defines a set of **request methods** to indicate the desired action to be performed for a given resource."

[https://www.w3schools.com/tags/ref\\_httpmethods.asp](https://www.w3schools.com/tags/ref_httpmethods.asp)

<https://developer.mozilla.org/en-US/docs/Web/HTTP/Methods>

# CRUD vs REST & HTTP Verbs

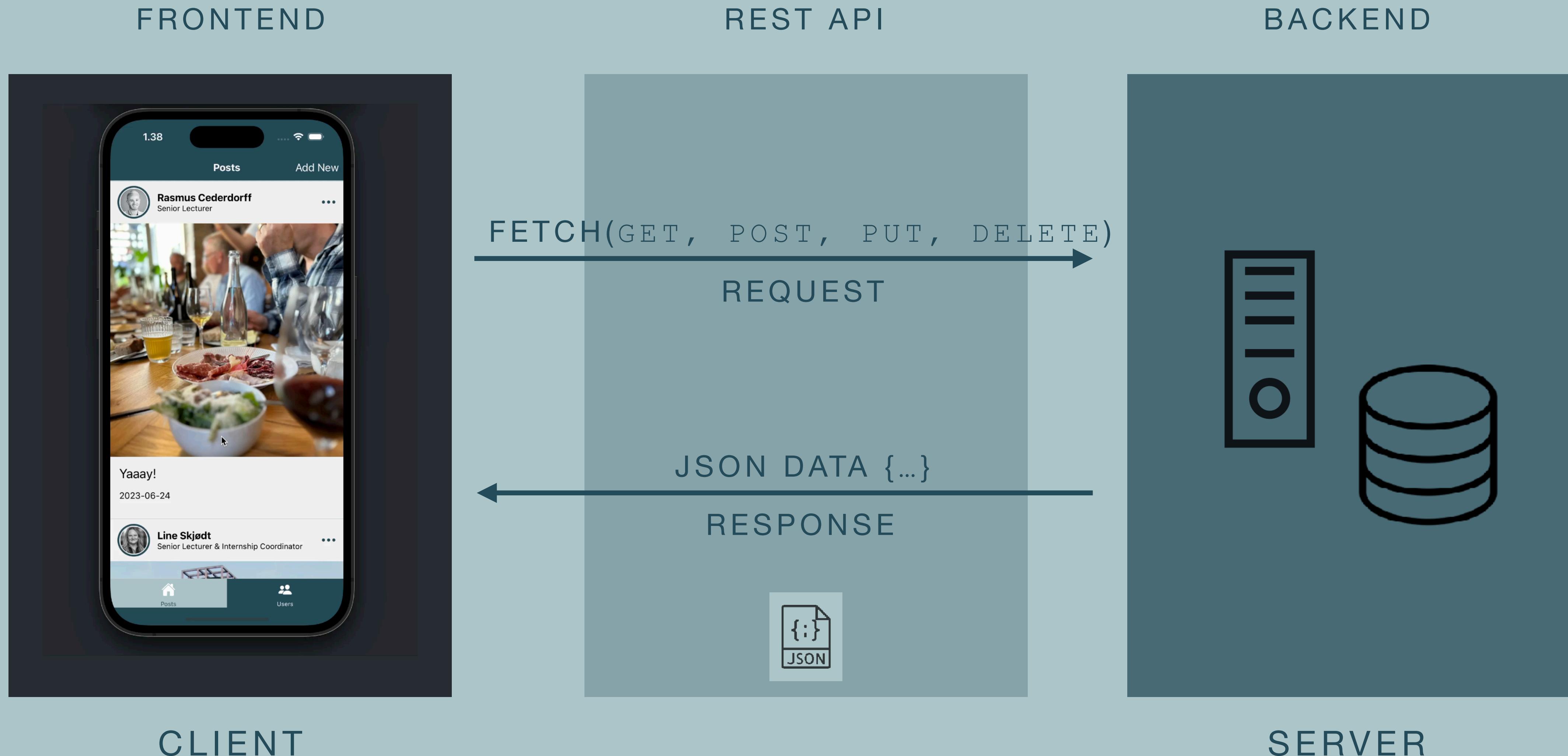
**CREATE** -> POST: create a new resource (object)

**READ** -> GET: retrieve a specific resource or a collection

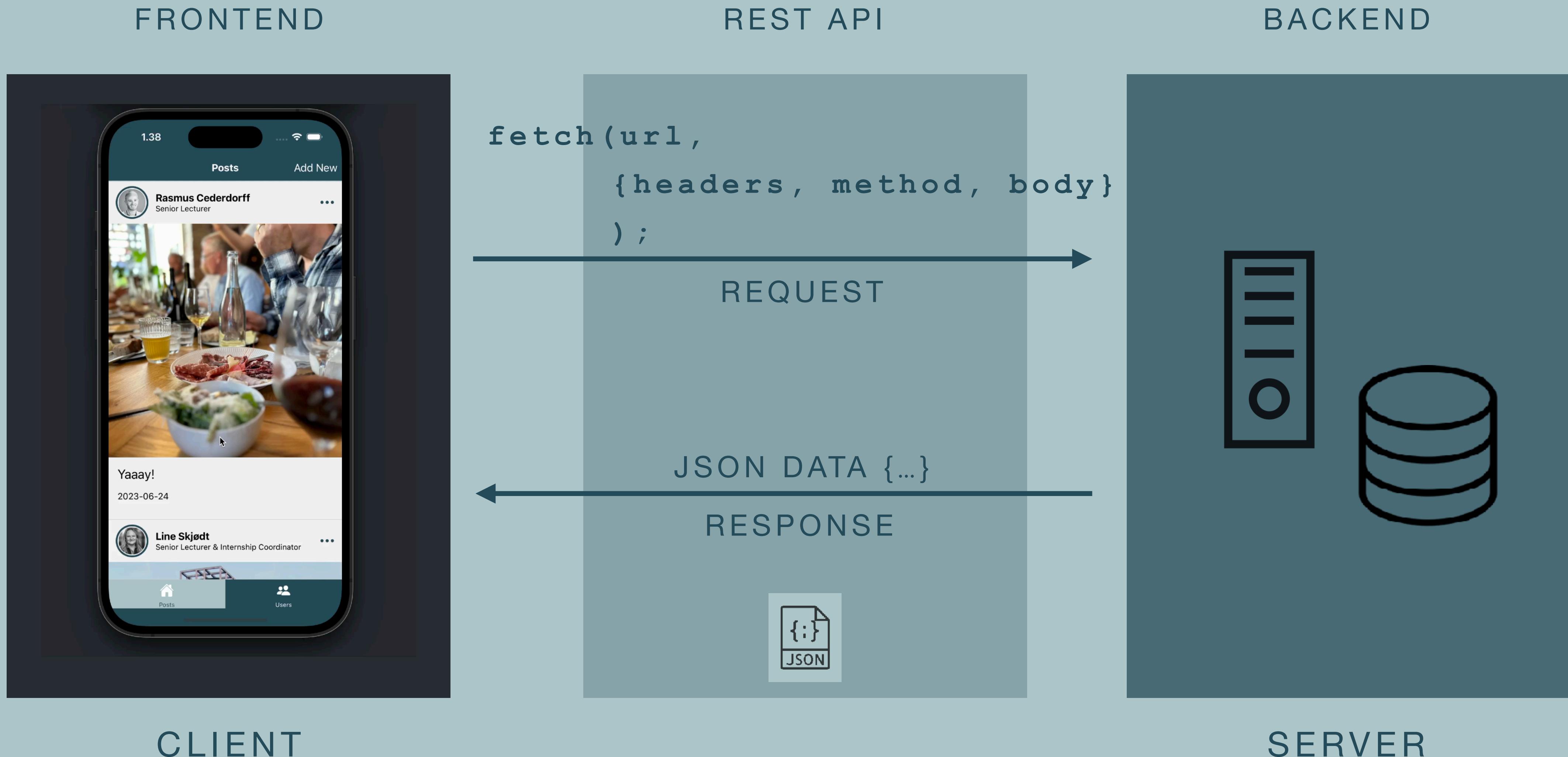
**UPDATE** -> PUT: update a specific resource (by id)

**DELETE** -> DELETE: remove a specific resource by id

# HTTP Request & Response



# HTTP Request & Response

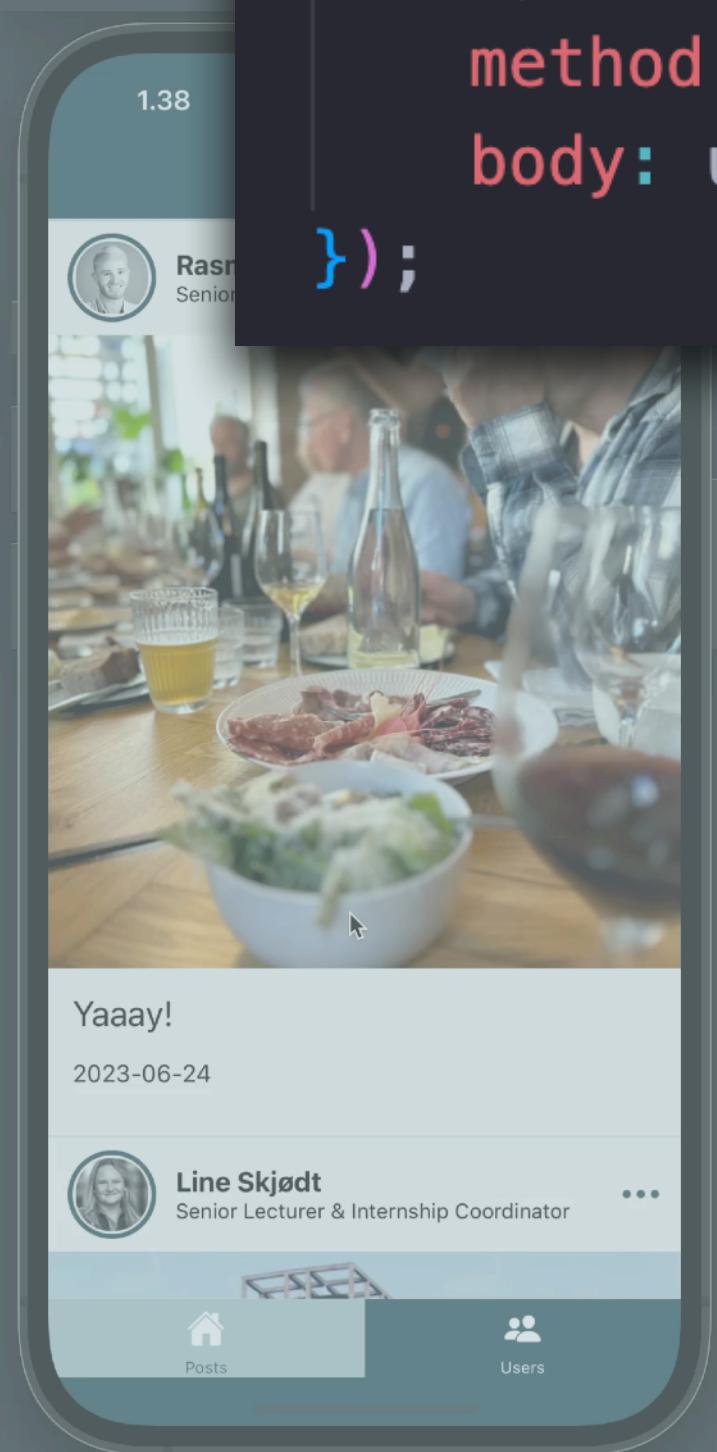


# HTTP REQUEST & RESPONSE

```
const newUser = { name, title, mail, image };
const userAsJson = JSON.stringify(newUser);

const response = await fetch("http://localhost:3333/users", {
  headers: {
    "Content-Type": "application/json"
  },
  method: "POST",
  body: userAsJson
});
```

FR



REQUEST

JSON DATA { ... }

RESPONSE



BACKEND



CLIENT

SERVER

URL



Specifies the web address of the resource you want to access.

Headers



Provide metadata and instructions for the request or response.

Body



Carries data, often used to send information to the server in requests.

# REQUEST headers

- “[...] contain more information about the resource to be fetched, or about the client requesting the resource.”
- "A request header is an HTTP header that can be used in an HTTP request to provide information about the request context, so that the server can tailor the response. For example, the Accept-\* headers indicate the allowed and preferred formats of the response. Other headers can be used to supply authentication credentials (e.g. Authorization), to control caching, or to get information about the user agent or referrer, etc."

<https://developer.mozilla.org/en-US/docs/Web/HTTP/Headers>

[https://developer.mozilla.org/en-US/docs/Glossary/Request\\_header](https://developer.mozilla.org/en-US/docs/Glossary/Request_header)

# REQUEST headers

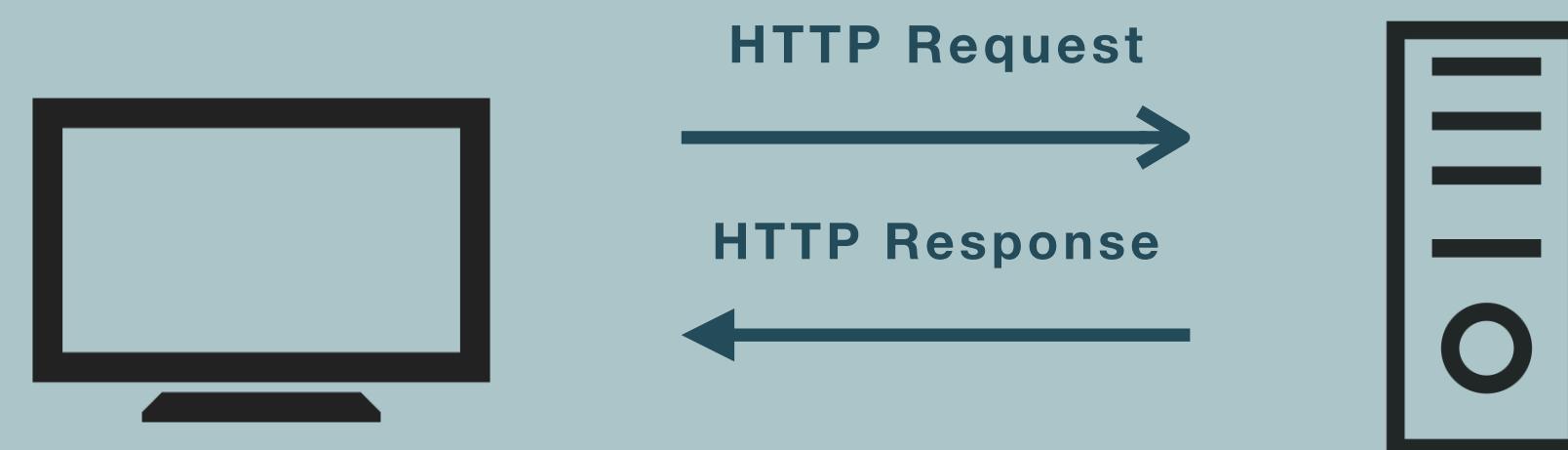
```
const response = await fetch("http://localhost:3333/users", {
  headers: {
    "Content-Type": "application/json"
  },
  method: "POST",
  body: userAsJson
});
```

```
const headers = {
  "Content-Type": "application/json"
};

// ===== CREATE ===== //
// Create (POST) user to backend using REST API
async function createUser(event) {
  event.preventDefault();
  const name = event.target.name.value;
  const title = event.target.title.value;
  const mail = event.target.mail.value;
  const image = event.target.image.value;
  // create a new user
  const newUser = { name, title, mail, image };
  const userAsJson = JSON.stringify(newUser);
  const response = await fetch(` ${endpoint}/users`, {
    headers: headers,
    method: "POST",
    body: userAsJson
  });

  if (response.ok) {
    // if success, update the users grid
  }
}
```

# REQUEST body



In HTTP requests, there are occasions when data must be transmitted. This data is enclosed within what we call the request body.

Different types of request body:

- **JSON Request Body:** Data sent as a structured JSON-encoded string.
- **Form Data Request Body:** Data transmitted in a structured format, commonly used for web forms.
- **Binary Data Request Body:** Non-textual data, such as files or images, sent in its raw binary form.
- **URL Search Params Request Body:** Simple data, like key-value pairs, sent as URL search parameters.

# REQUEST body

```
const url = "http://localhost:3000/json-api/posts/";
await fetch(url, {
  method: "POST",
  body: JSON.stringify(newPost)
});
```

```
async function savePost(postToUpdate) {
  const response = await fetch(url, {
    method: "PUT",
    body: JSON.stringify(postToUpdate)
  });
  const data = await response.json();
  console.log(data);
  navigate("/");
}
```

# Fetch and create post

Using POST to create a new post object in the resource.

```
// new post object
const newPost = {
  title: "My new post",
  body: "Body description of a new post",
  image: "image url or image data string"
};

const url = "https://race-rest-default-firebaseio.com/posts.json";
const response = await fetch(url, {
  method: "POST", // fetch request using POST
  body: JSON.stringify(newPost) // newPost object to JSON
});
```

# Fetch and update post

Using PUT to an existing post object by given id.

```
const postId = "5tl4jHHSRaKEB0UW9nQd"; // id of the object to update
const postToUpdate = { title: "...", body: "...", image: "..." };

const url = `https://race-rest-default-firebase.firebaseio.com/posts/${postId}.json`;
const response = await fetch(url, {
  method: "PUT", // using HTTP method PUT
  body: JSON.stringify(postToUpdate)
});
```

# Fetch and delete post

Using DELETE to an object by given id.

```
const postId = "5tl4jHHSRaKEB0UW9nQd"; // id of the object to update
const url = `https://race-rest-default-rtdb.firebaseio.com/posts/${postId}.json`;

const response = await fetch(url, {
  method: "DELETE"
});
```

# JSON to Figma



Plugin: <https://www.figma.com/community/plugin/789839703871161985>

Video: [https://www.youtube.com/watch?v=1qk3AbTQfYQ&ab\\_channel=Figma55](https://www.youtube.com/watch?v=1qk3AbTQfYQ&ab_channel=Figma55)

# Integrate JSON data in Figma

<https://race.notion.site/Integrate-JSON-data-in-Figma-eddb262bac8148c1a46761f20759b498>

The screenshot shows the "JSON to Figma" extension interface. On the left, a JSON array is displayed:

```
[{"name": "Cecil Mccallum", "job": "Operations", "email": "cecil@mail.com"}, {"name": "Romy Brandt", "job": "Lead of Engineering", "email": "romy@mail.com"}, {"name": "Iona Cherry", "job": "Developer", "email": "iona@mail.com"}, {"name": "Robert Curran", "job": "Management", "email": "robert@mail.com"}, {"name": "Elias Bains", "job": "Software Engineering", "email": "elias@mail.com"}]
```

In the center, a configuration panel allows selecting which fields from the JSON to map to Figma components. The selected fields are "email", "id", and "email". Under "address", only "street" is checked. Below the configuration are two buttons: "Populate selected 4" and "Randomise order".

On the right, four Figma components are generated, each containing an icon, a name, a job title, and an email address:

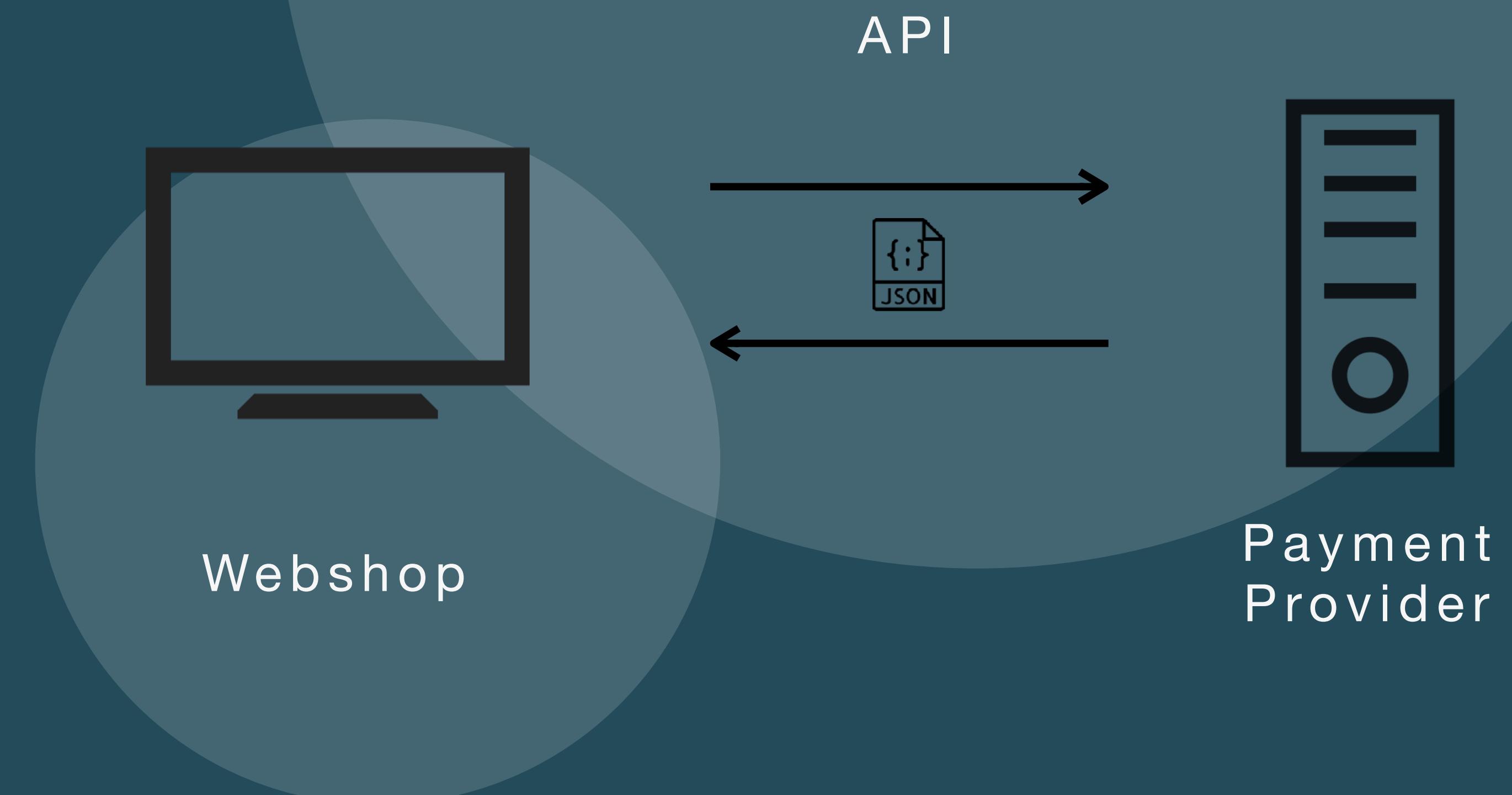
- Cecil Mccallum**  
Operations  
cecil@mail.com
- Romy Brandt**  
Lead of Engineering  
romy@mail.com
- Iona Cherry**  
Developer  
iona@mail.com

# Final Perspective

Digital Integrations, APIs, Cloud Services & SaaS

# The Role of APIs in Digital Integrations

- APIs act as digital bridges, enabling communication between systems.
- Example: Connecting a website to a payment service (Stripe) or CRM (HubSpot).
- Benefits: Automation, scalability, and streamlined workflows.



# APIs and Cloud Services

- Cloud platforms (AWS, Google Cloud, Azure, Firebase) offer APIs to interact with their services.
- Example: Cloud storage APIs (Google Drive API) or AI services (OpenAI API).
- Impact: Reduces infrastructure costs and enables global access.

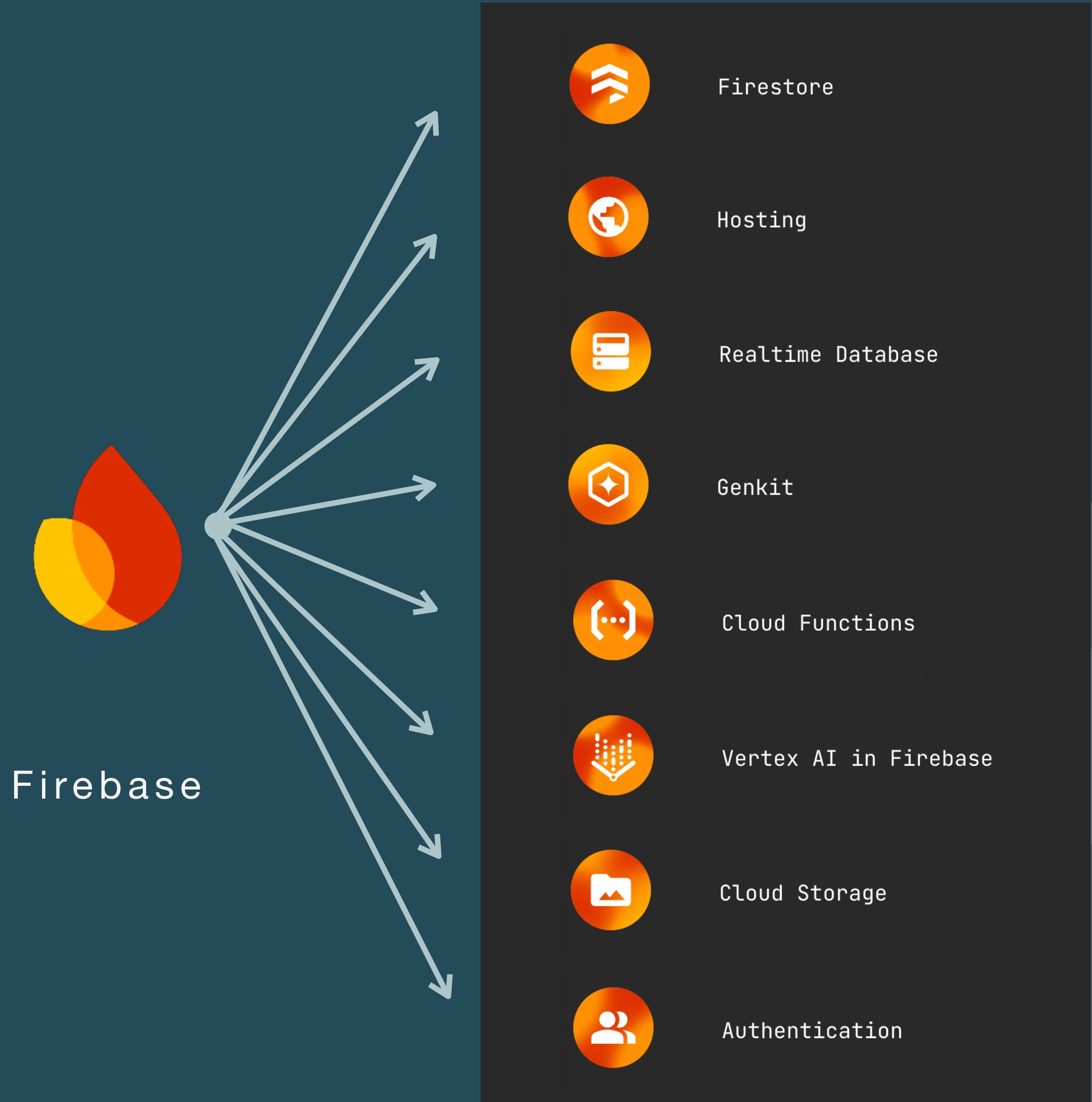
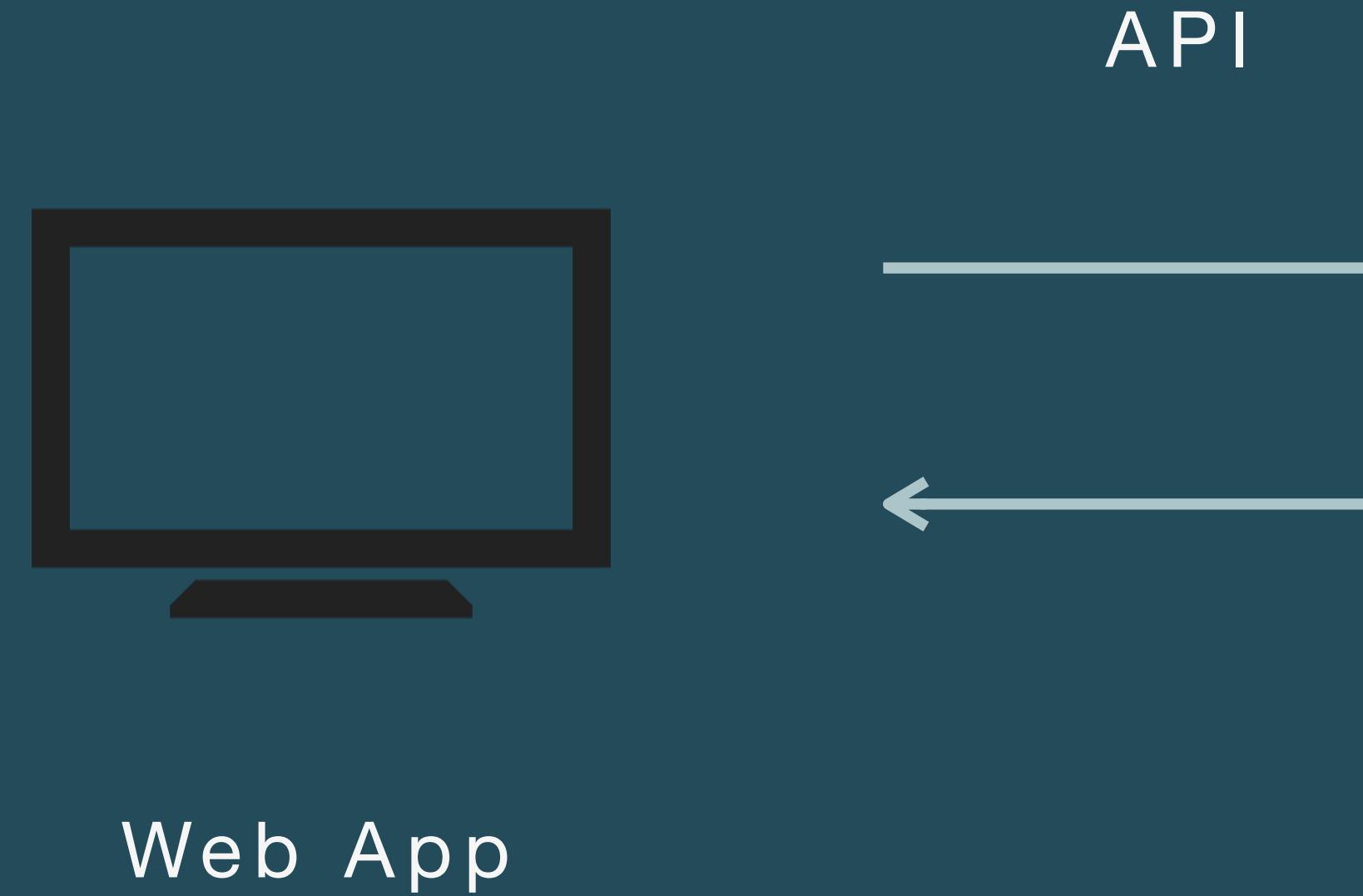


Web App

API



Firebase





# What is Firebase?

Platform, a suite of tools & Backend-as-a-Service  
for Web & App Development

# 100 *SECONDS OF*



<https://www.youtube.com/watch?v=vAoB4VbhRzM>

# SaaS & API-Driven Business Models

- SaaS platforms (Salesforce, Slack, Shopify) expose APIs for customization and integration.
- Example: Integrating a helpdesk tool (Zendesk API) with a customer database.
- Trend: "API-first" companies provide building blocks for digital products.



# API Economy & Monetization

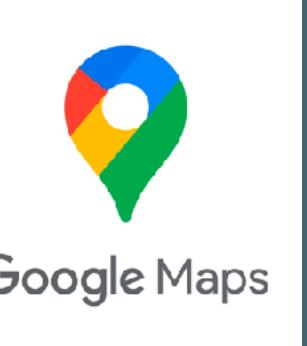
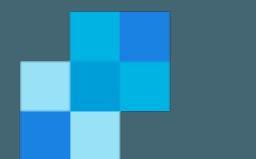
- Companies monetize APIs as products (e.g., Twilio for messaging, Google Maps for location services).
- Shift from standalone software to interconnected digital ecosystems.
- Key insight: APIs create new revenue streams and business opportunities.



Developers  
&  
Businesses



stripe



Meta



# The Future: AI, Automation & API-First Development

- AI-powered APIs (Mistral, OpenAI) enabling automation and smarter applications.
- Low-code/no-code platforms utilizing APIs for easy integrations.
- Emerging Trends: APIs in IoT, fintech, and digital transformation.



Web App

