

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

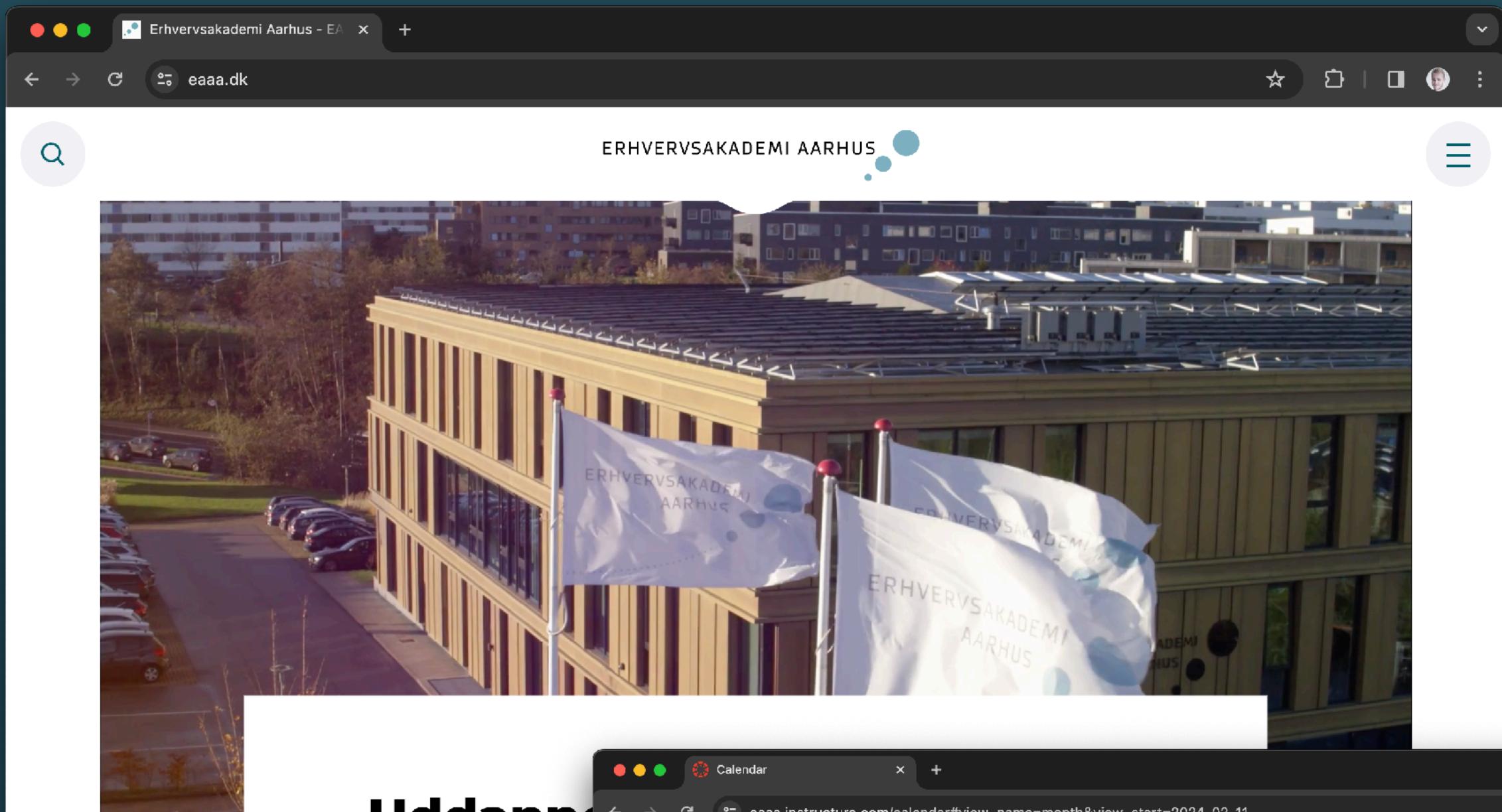
Communication between two systems

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 with citrines, amethysts, and emeralds. The search bar shows the query "house of vincent ring" and the location "Tilst · Vælg område". The right side of the screen displays a map of Denmark and surrounding countries, with a blue dot indicating the location of Tilst. The House of Vincent logo is visible in the bottom right corner of the search results.

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 application titled "Zip Code City App" running in a web browser. The app has a dark theme with white text. It features two input fields: "Zip Code:" containing "8000" and "City:" containing "Aarhus C". The browser's developer tools are open, with the "Console" tab selected. The console displays a JSON object from "app.js:10" representing a postal code entry. The object includes properties like href, nr, navn, 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/>

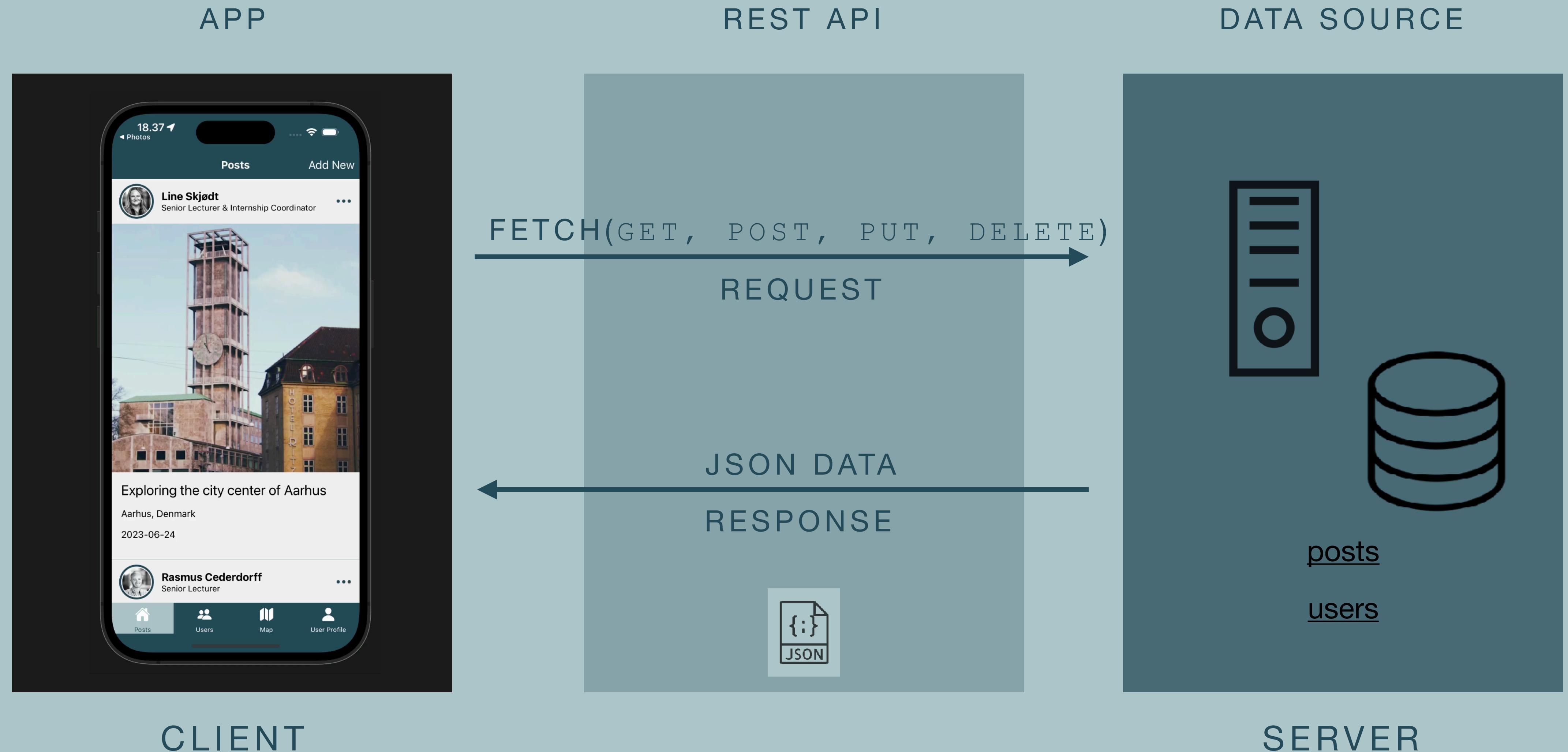
The screenshot shows the REST API documentation page. The title is "Dataforsyningen REST API". It provides links to the API ([API](https://api.dataforsyningen.dk/)), documentation ([DOCS](https://dataforsyningen.dk/)), and a data overview ([Dataoversigt](https://dataforsyningen.dk/data)). Below this, 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 endpoints for "alle regioner" (GET <https://api.dataforsyningen.dk/regioner>) and "en region" (GET <https://api.dataforsyningen.dk/regioner/1082>).

[Dataforsyningen REST API](#)

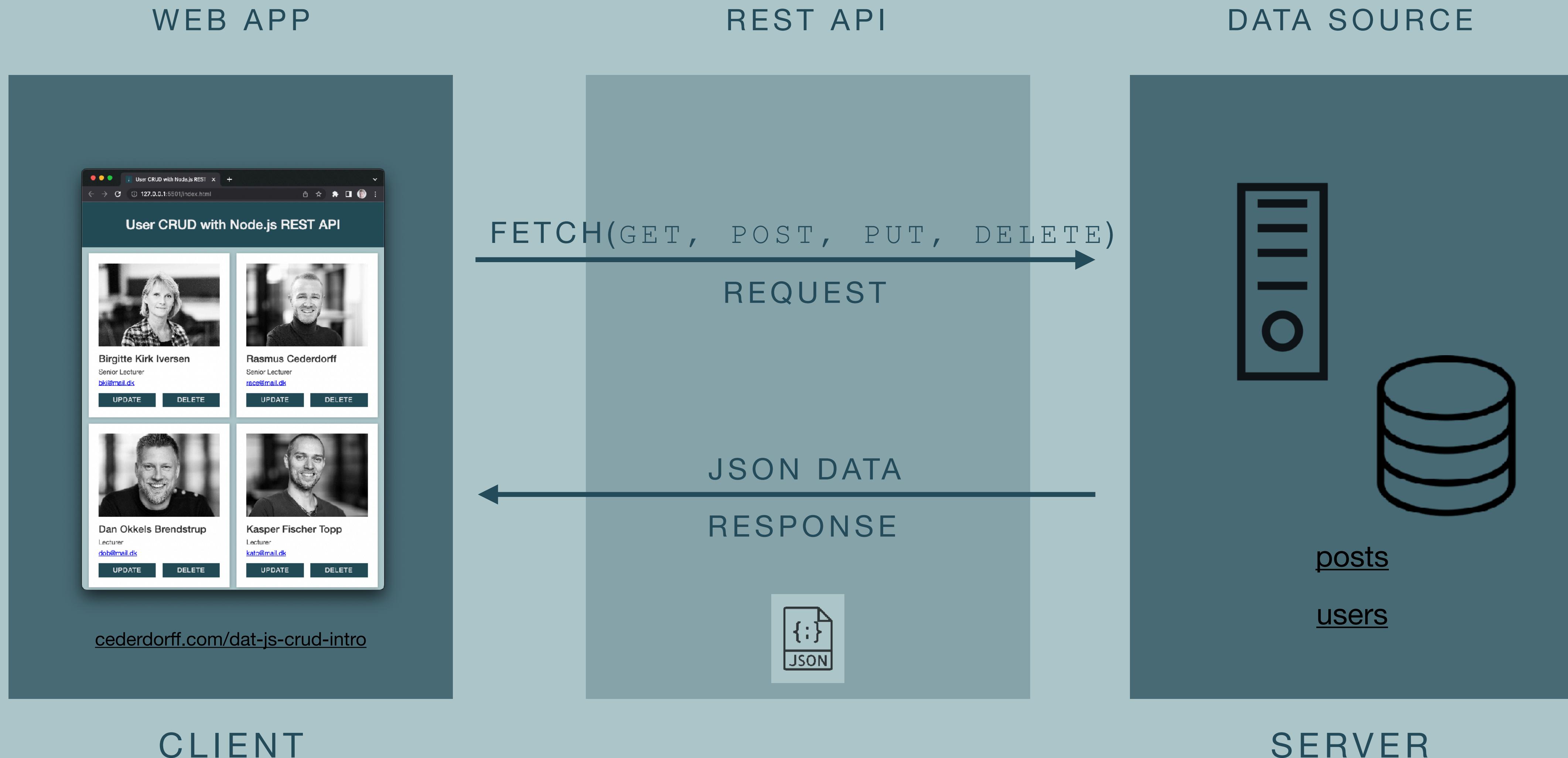
Client Server

The Basic Architecture of the Web

Client Server Architecture

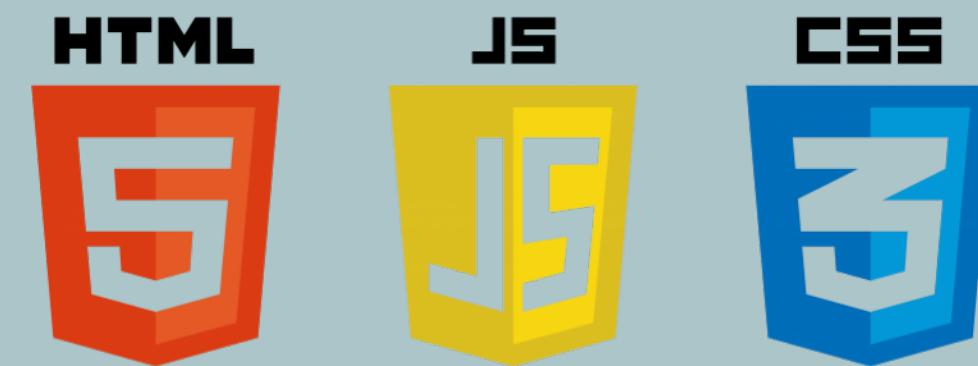


Web Development



Webudvikling

FRONTEND

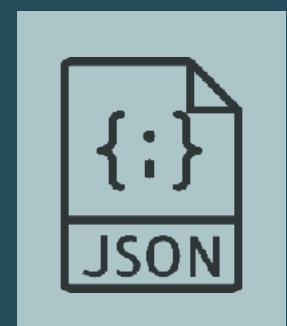


REST API

FETCH(GET, POST, PUT, DELETE)

REQUEST

JSON DATA
RESPONSE

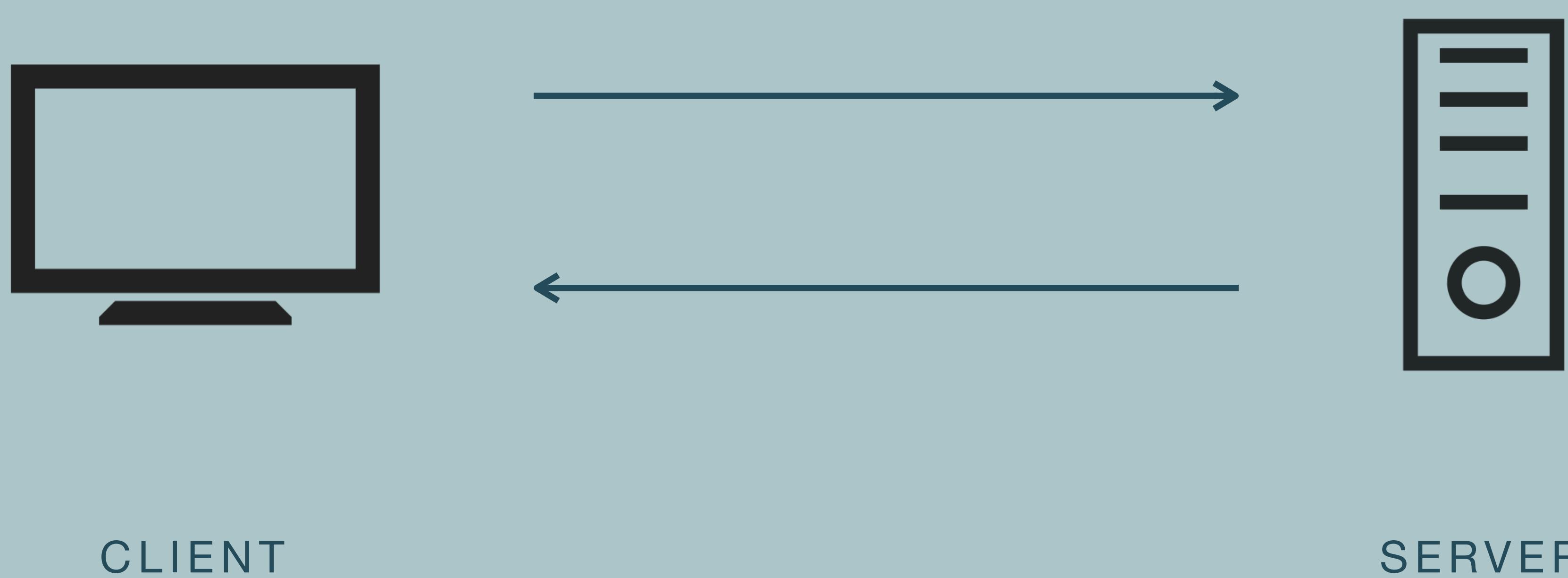


BACKEND



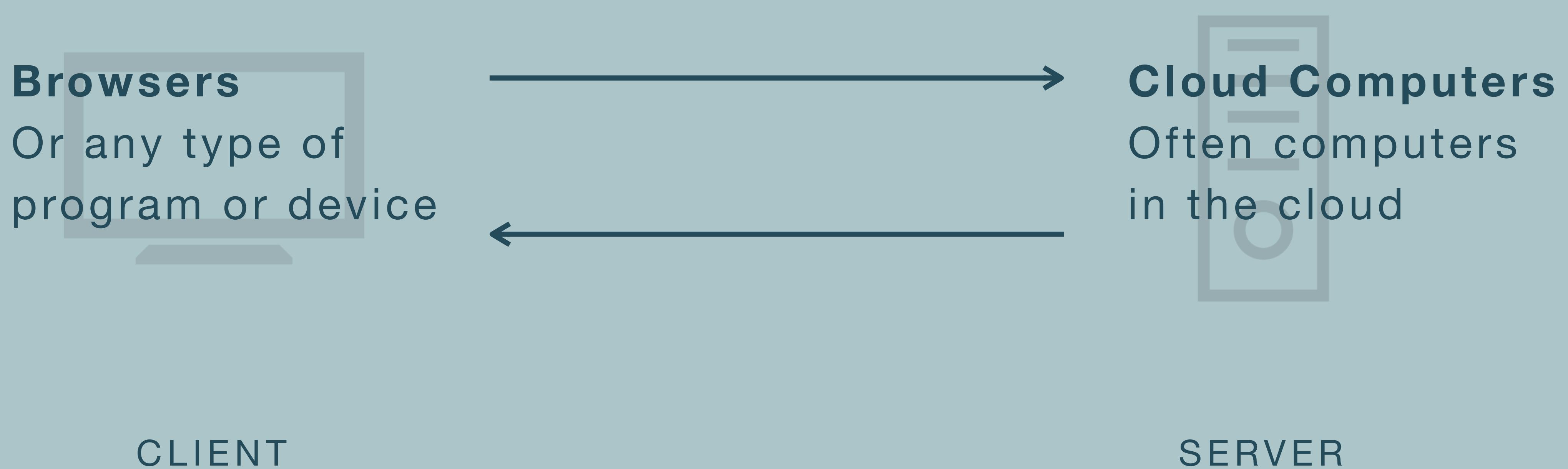
Client-Server Model

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



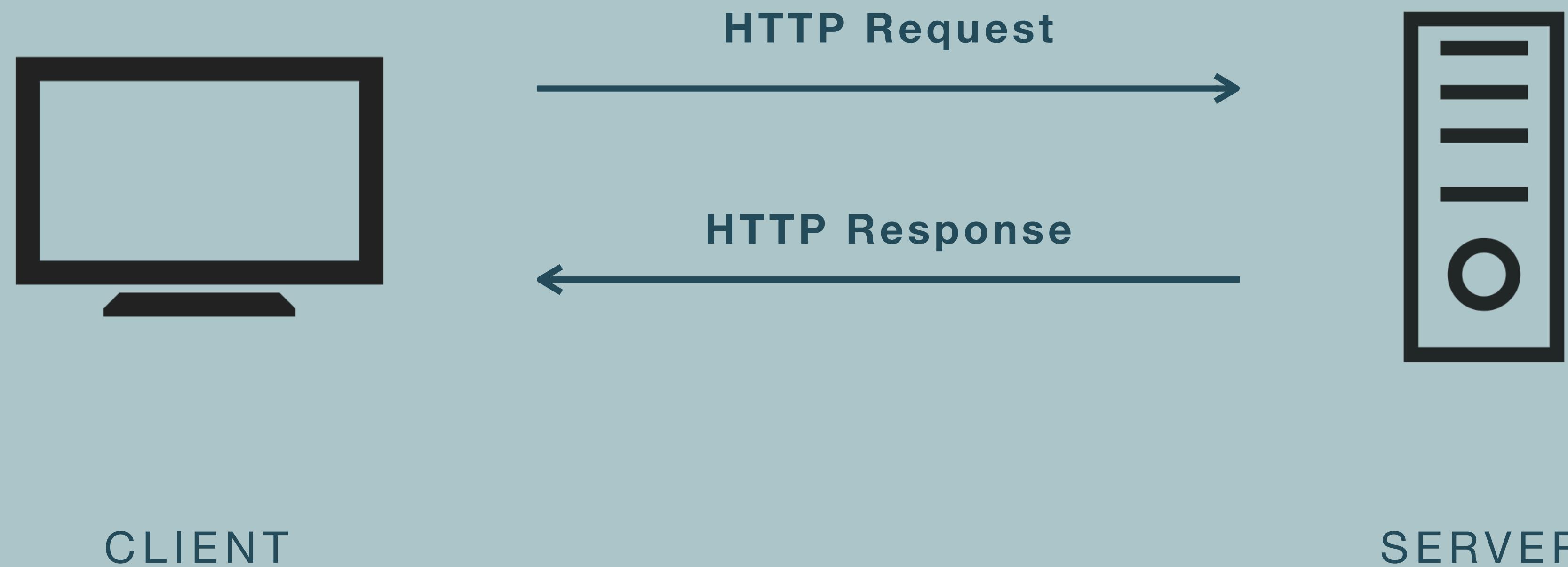
Client-Server Model

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**:

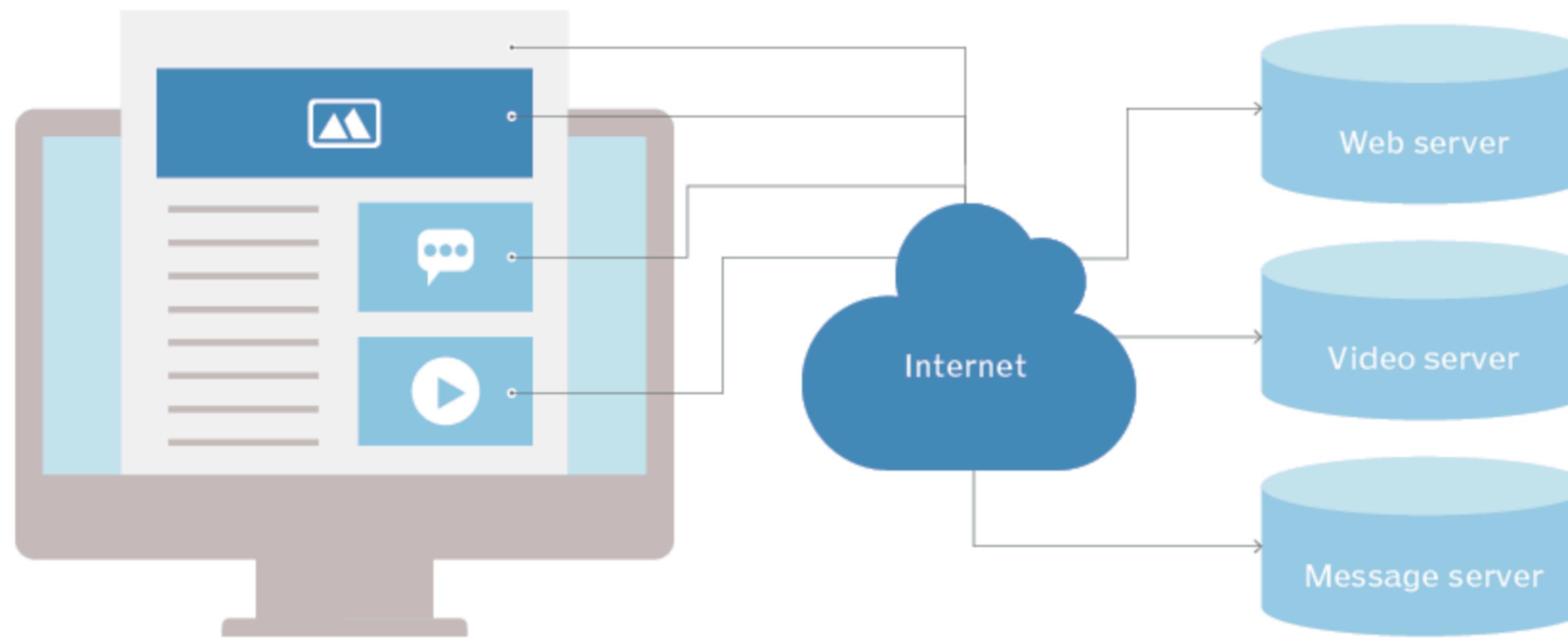
1. A client (a browser) sends an **HTTP request** to the web
2. A web server receives the request
3. The server runs an application to process the request
4. The server returns an **HTTP response** (output) to the browser
5. The client (the browser) receives the response

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 sections for 'Uddannelser til erhvervslivet' and 'Efteruddannelse og kurser'. The Network tab displays a timeline and a detailed list of network requests.

Name	Method	Status	Type	Initiator	Size	T..	Waterfall
1.gif?dgi=70fb8fd... GET 200 gif uc.js?cbid...							
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

The screenshot shows a web browser window displaying the website of Erhvervsakademi Aarhus. The main content features a large image of a modern building with solar panels on the roof, two flags with the academy's name, and a central text box with the heading "Uddannelser til erhvervslivet". Below this, there is a paragraph about choosing further education and three smaller images illustrating different educational paths: "Videregående uddannelser", "Efteruddannelse og kurser", and "Samarbejde og skoler". The browser's developer tools are open, specifically the Network tab, which lists network requests. One request is selected, showing its details: a video file from Vimeo. The request details include the provider name ("Vimeo"), account type ("starter"), author name ("Erhvervsakademi Aarhus"), author URL ("https://vimeo.com/user209157220"), duration (17 seconds), height (240 pixels), width (426 pixels), and a JSON payload containing the video's metadata.

Name	Headers	Payload	Preview	Response	Initiator	Timing
items						
wa/						
247144?d=eaaa.dk						
oembed.json?url...						
h0r3JOS3pvXaD...						
h0r3JOS3pvXaD...						
master.json?base...						
2b51a972.mp4?r...						
settings.json						
d509129e.mp4?r...						
cf6acf66.mp4?r...						
2b51a972.mp4?r...						
2b51a972.mp4?r...						
cf6acf66.mp4?r=...						
cf6acf66.mp4?r=...						

```
{type: "video", version: "1.0", provider_name: "Vimeo", provider_url: "https://vimeo.com/1765804027-75aaef51", account_type: "starter", author_name: "Erhvervsakademi Aarhus", author_url: "https://vimeo.com/user209157220", description: "", duration: 17, height: 240, html: "<div style=\"padding:56.25% 0 0 0;position:relative;\"><div style=\"position:absolute;right:0;bottom:0;*><span>is_plus: \"0\"</span></div></div>", provider_name: "Vimeo", provider_url: "https://vimeo.com/", thumbnail_height: 166, thumbnail_url: "https://i.vimeocdn.com/video/1765804027-75aaef51", thumbnail_url_with_play_button: "https://i.vimeocdn.com/filter/ovf/1765804027-75aaef51", thumbnail_width: 295, title: "Silent video D4", type: "video", upload_date: "2023-12-08 06:54:18", uri: "/videos/892590144", version: "1.0", video_id: 892590144, width: 426}
```

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

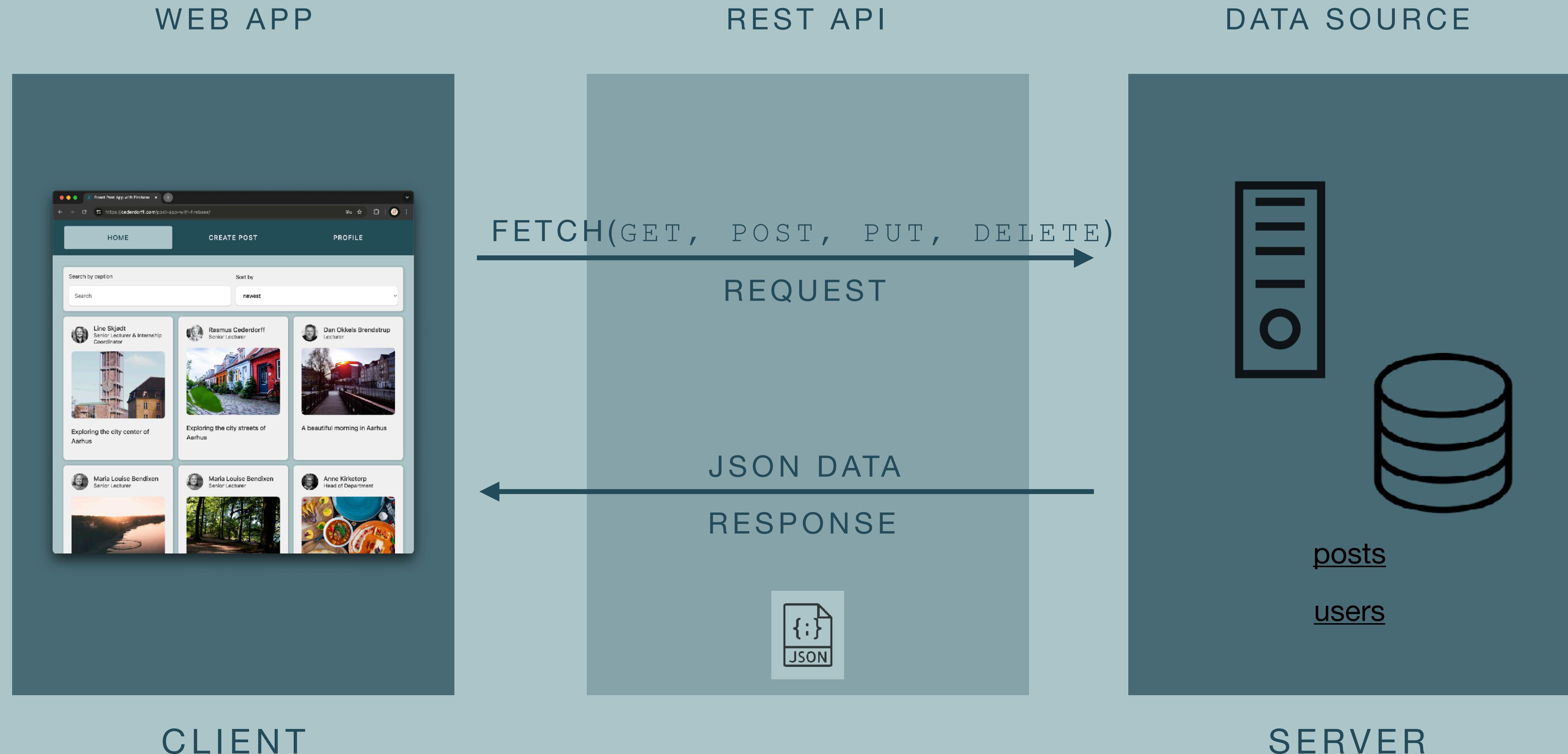
Tal du vælge videregående uddannelse? Eller finde det kursus, der løfter din karriere? Tal med os. Vi er et af landets største erhvervsakademier.

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

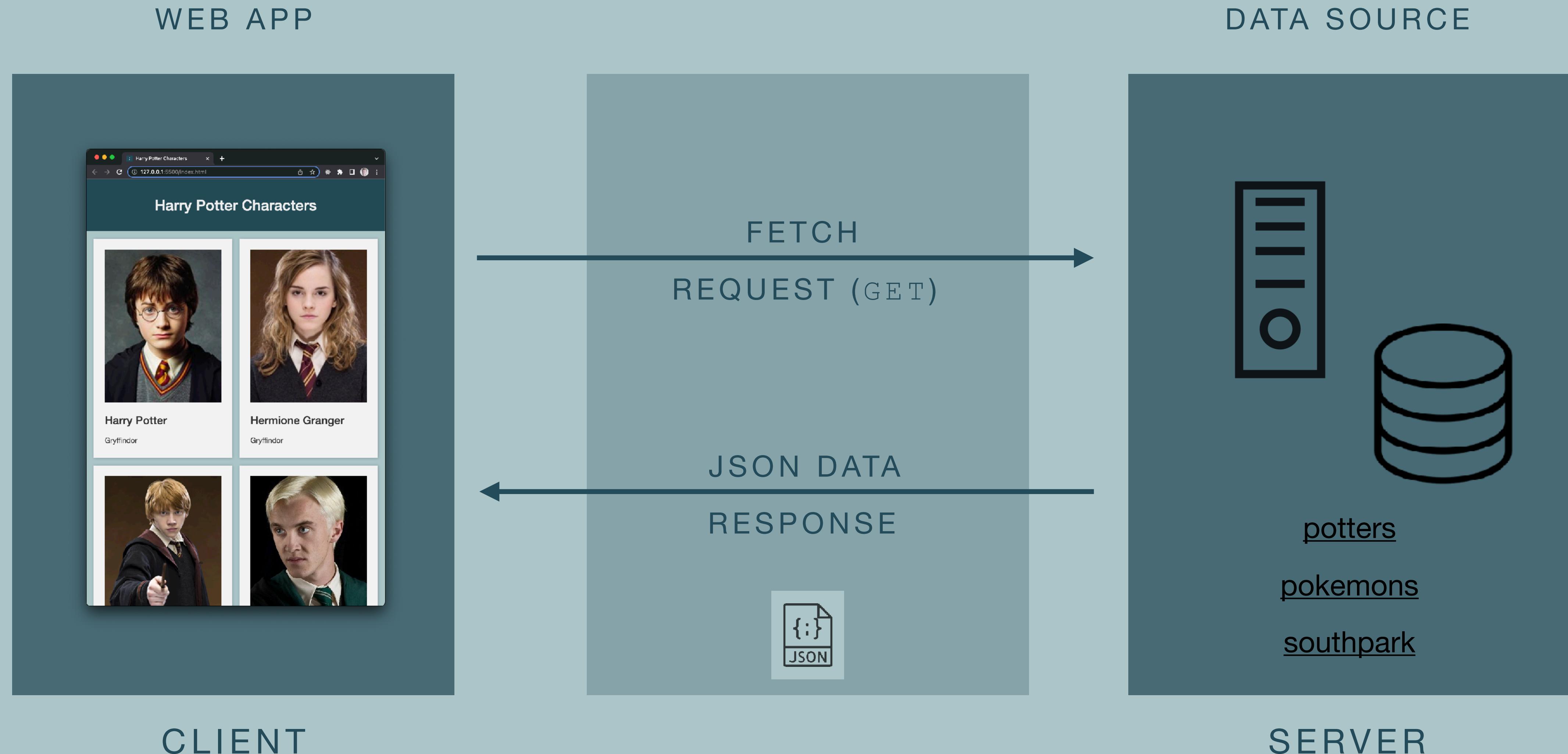
Network Tab

Investigating Network Activity in the Browser

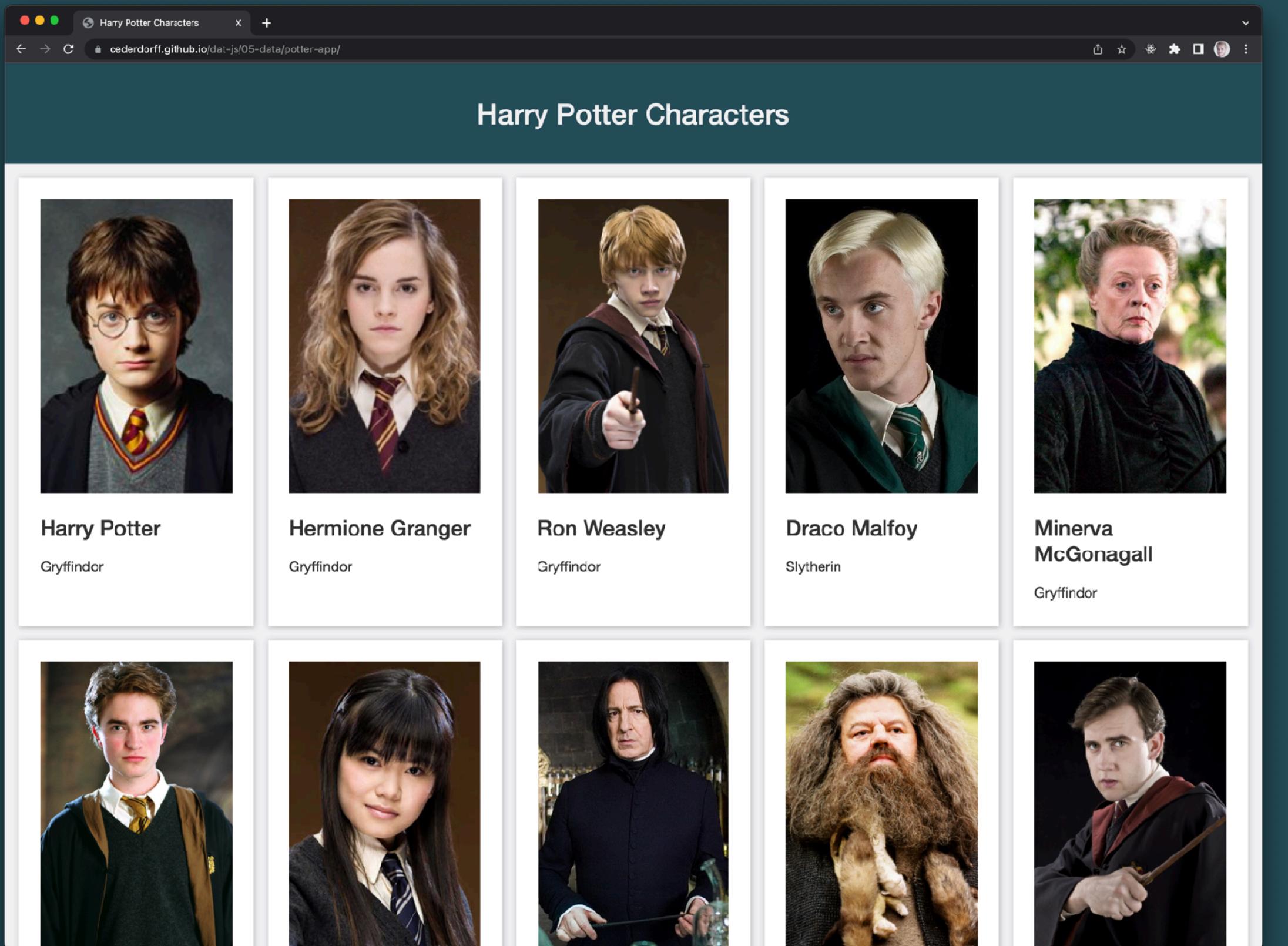
Fetch, HTTP Request & Response



Fetch, HTTP Request & Response



Frontend (client)



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

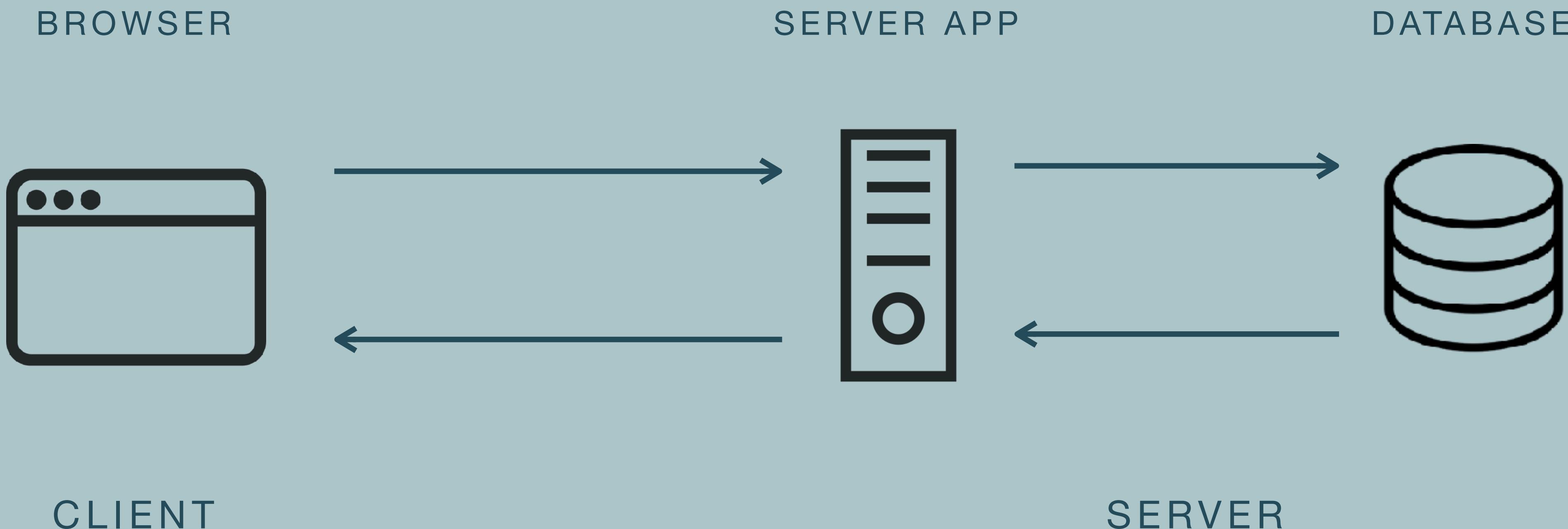
JSON Data Source (Server)

A screenshot of a web browser window showing a JSON object. The JSON represents the Harry Potter characters from the application. It uses the 'Raw' tab to show the unformatted JSON code, which is color-coded for readability. The 'Parsed' tab shows the JSON structure as a tree. The JSON includes detailed character information such as name, species, gender, house, date of birth, year of birth, ancestry, eye color, hair color, and wand details (wood, core, length, patronus, etc.).

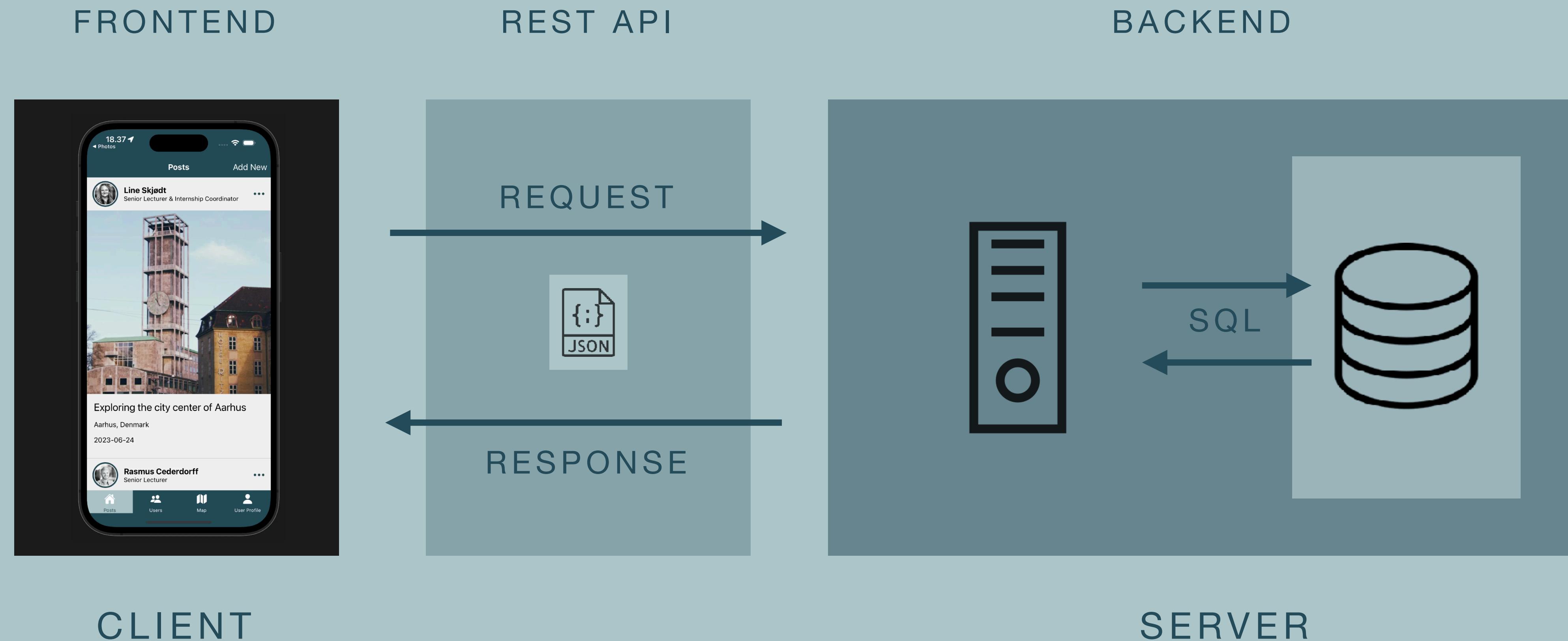
```
name: "Harry Potter",
species: "human",
gender: "male",
house: "Gryffindor",
dateOfBirth: "31-07-1980",
yearOfBirth: 1980,
ancestry: "half-blood",
eyeColour: "green",
hairColour: "black",
wand: {
  wood: "holly",
  core: "phoenix feather",
  length: 11
},
patronus: "stag",
hogwartsStudent: true,
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
},
patronus: "raven",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Rupert Grint",
alive: true,
image: "http://hp-api.herokuapp.com/images/ron.jpg"
}, {
name: "Draco Malfoy",
species: "human",
gender: "male",
house: "Slytherin",
dateOfBirth: "15-07-1980",
yearOfBirth: 1980,
ancestry: "pure-blood",
eyeColour: "grey",
hairColour: "blonde",
wand: {
  wood: "yew",
  core: "serpent fang",
  length: 13
},
patronus: "owl",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Tom Felton",
alive: true,
image: "http://hp-api.herokuapp.com/images/draco.jpg"
}, {
name: "Neville Longbottom",
species: "human",
gender: "male",
house: "Gryffindor",
dateOfBirth: "16-07-1980",
yearOfBirth: 1980,
ancestry: "muggleborn",
eyeColour: "brown",
hairColour: "brown",
wand: {
  wood: "willow",
  core: "dragon heartstring",
  length: 12
},
patronus: "dove",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Matthew Lewis",
alive: true,
image: "http://hp-api.herokuapp.com/images/neville.jpg"
}, {
name: "Ginny Weasley",
species: "human",
gender: "female",
house: "Gryffindor",
dateOfBirth: "15-08-1981",
yearOfBirth: 1981,
ancestry: "pure-blood",
eyeColour: "brown",
hairColour: "brown",
wand: {
  wood: "willow",
  core: "unicorn hair",
  length: 12
},
patronus: "owl",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Watson",
alive: true,
image: "http://hp-api.herokuapp.com/images/ginny.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
},
patronus: "raven",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Rupert Grint",
alive: true,
image: "http://hp-api.herokuapp.com/images/ron.jpg"
}, {
name: "Draco Malfoy",
species: "human",
gender: "male",
house: "Slytherin",
dateOfBirth: "15-07-1980",
yearOfBirth: 1980,
ancestry: "pure-blood",
eyeColour: "grey",
hairColour: "blonde",
wand: {
  wood: "yew",
  core: "serpent fang",
  length: 13
},
patronus: "owl",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Tom Felton",
alive: true,
image: "http://hp-api.herokuapp.com/images/draco.jpg"
}, {
name: "Neville Longbottom",
species: "human",
gender: "male",
house: "Gryffindor",
dateOfBirth: "16-07-1980",
yearOfBirth: 1980,
ancestry: "muggleborn",
eyeColour: "brown",
hairColour: "brown",
wand: {
  wood: "willow",
  core: "dragon heartstring",
  length: 12
},
patronus: "dove",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Matthew Lewis",
alive: true,
image: "http://hp-api.herokuapp.com/images/neville.jpg"
}, {
name: "Ginny Weasley",
species: "human",
gender: "female",
house: "Gryffindor",
dateOfBirth: "15-08-1981",
yearOfBirth: 1981,
ancestry: "pure-blood",
eyeColour: "brown",
hairColour: "brown",
wand: {
  wood: "willow",
  core: "unicorn hair",
  length: 12
},
patronus: "owl",
hogwartsStudent: true,
hogwartsStaff: false,
actor: "Watson",
alive: true,
image: "http://hp-api.herokuapp.com/images/ginny.jpg"
}
```

<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()
```

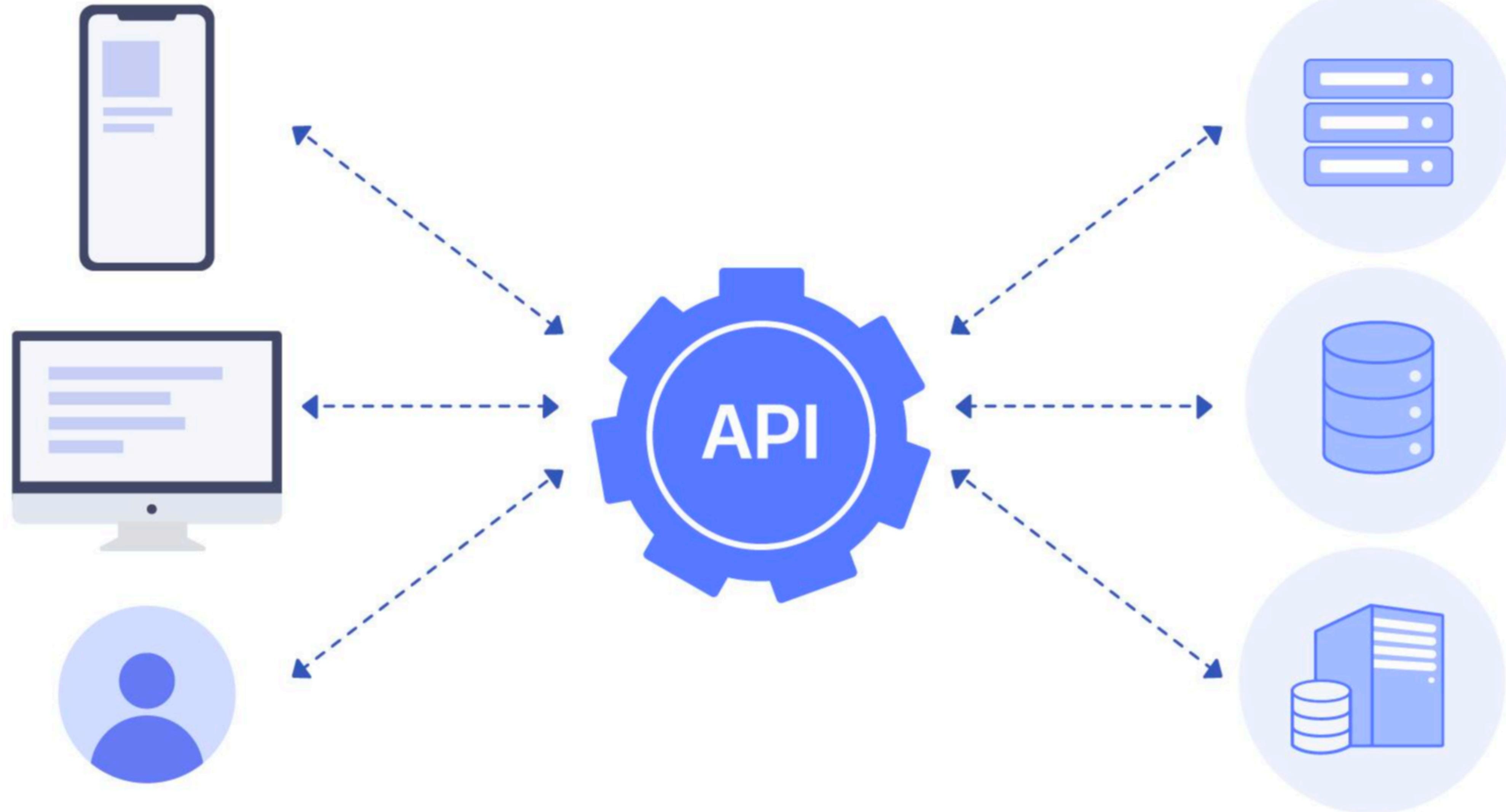
The right tab shows the 'Dashboard / Python with flask' interface with a 'No Environment' section. It lists three routes: 'GET /listar_usuarios', 'POST /cadastrar_usuario', and 'GET /olamundo'. Below this, there's a JSON response example:

```
[{"name": "Douglas", "lastName": "Lopes"}, {"name": "Luis", "lastName": "Silva"}, {"name": "Luis", "lastName": "Silva"}]
```

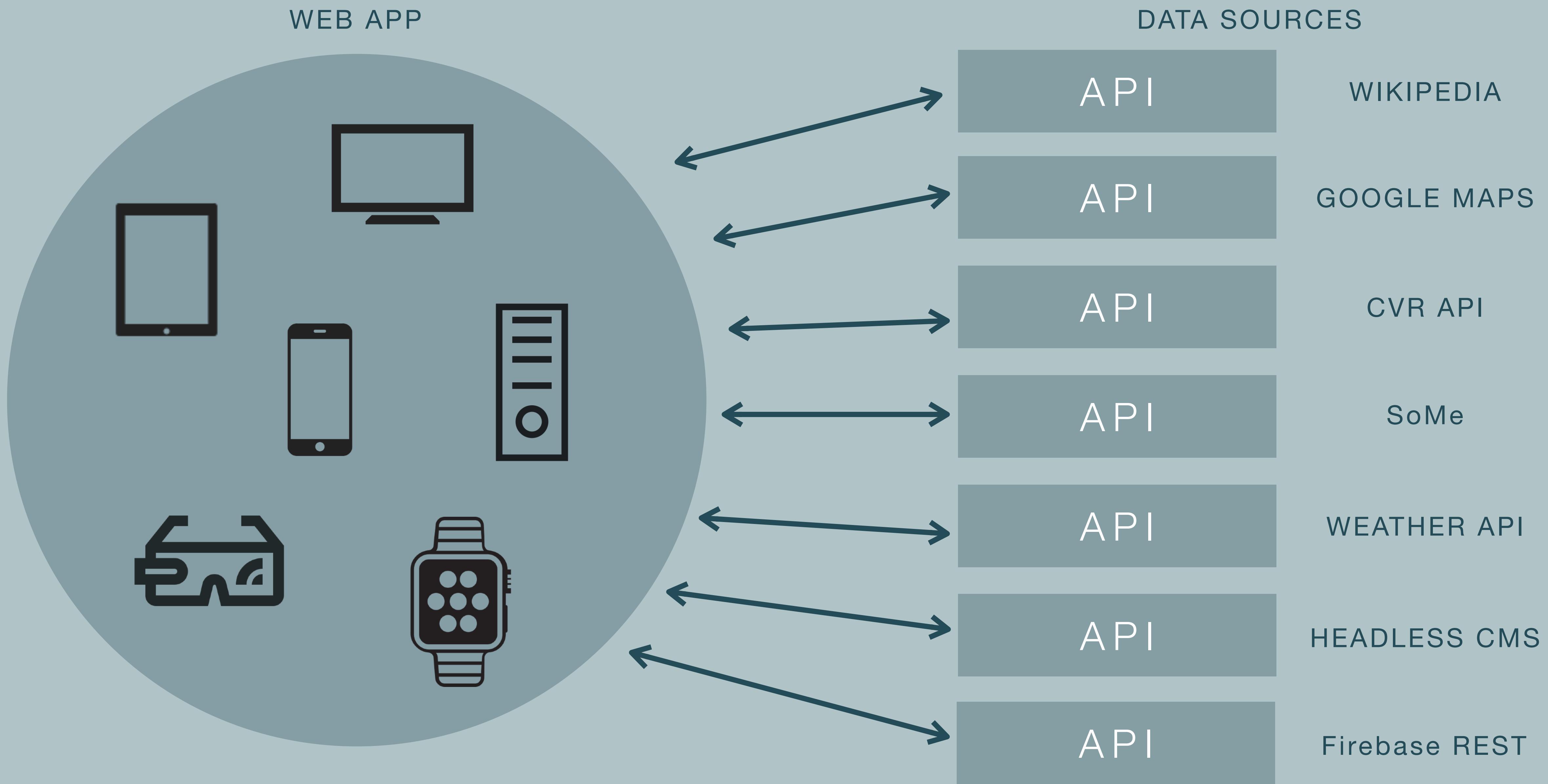
At the bottom, there's a terminal window with the title 'Python 3.8.5 64-bit (base': conda)'. It shows the command 'python routes.py' being run and the output of the application running on port 5000.

- 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

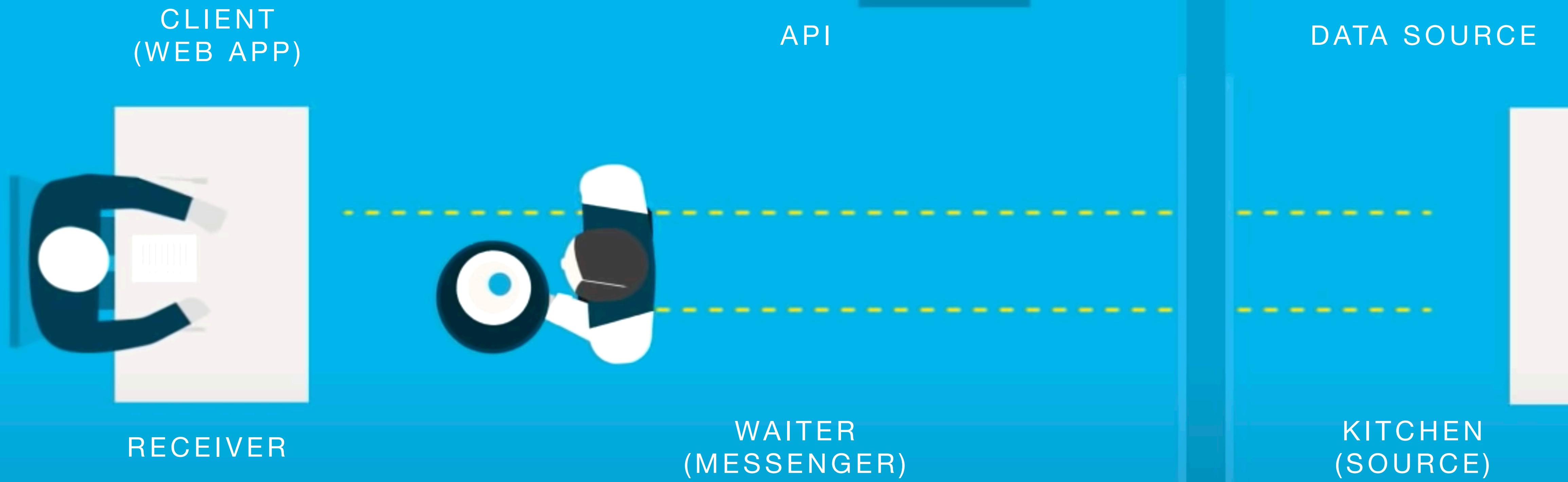


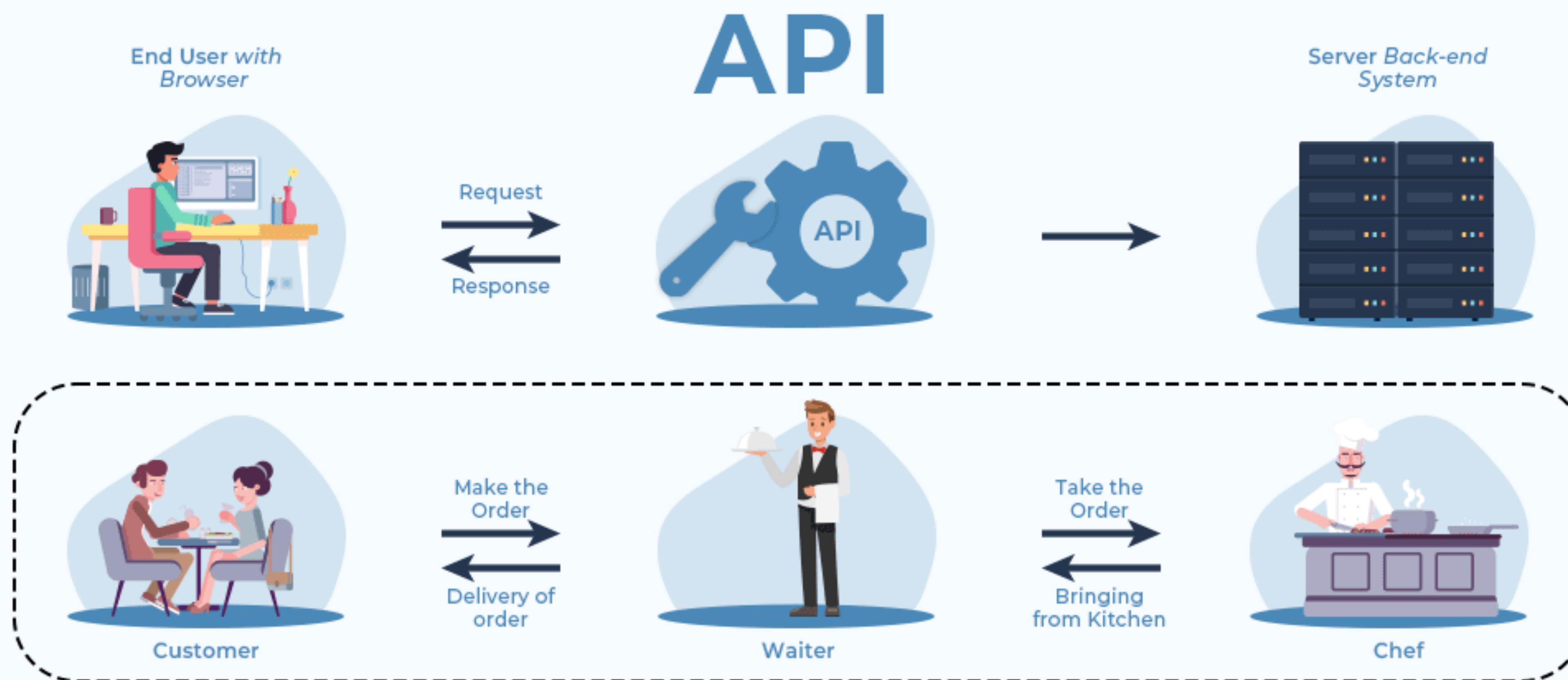
API





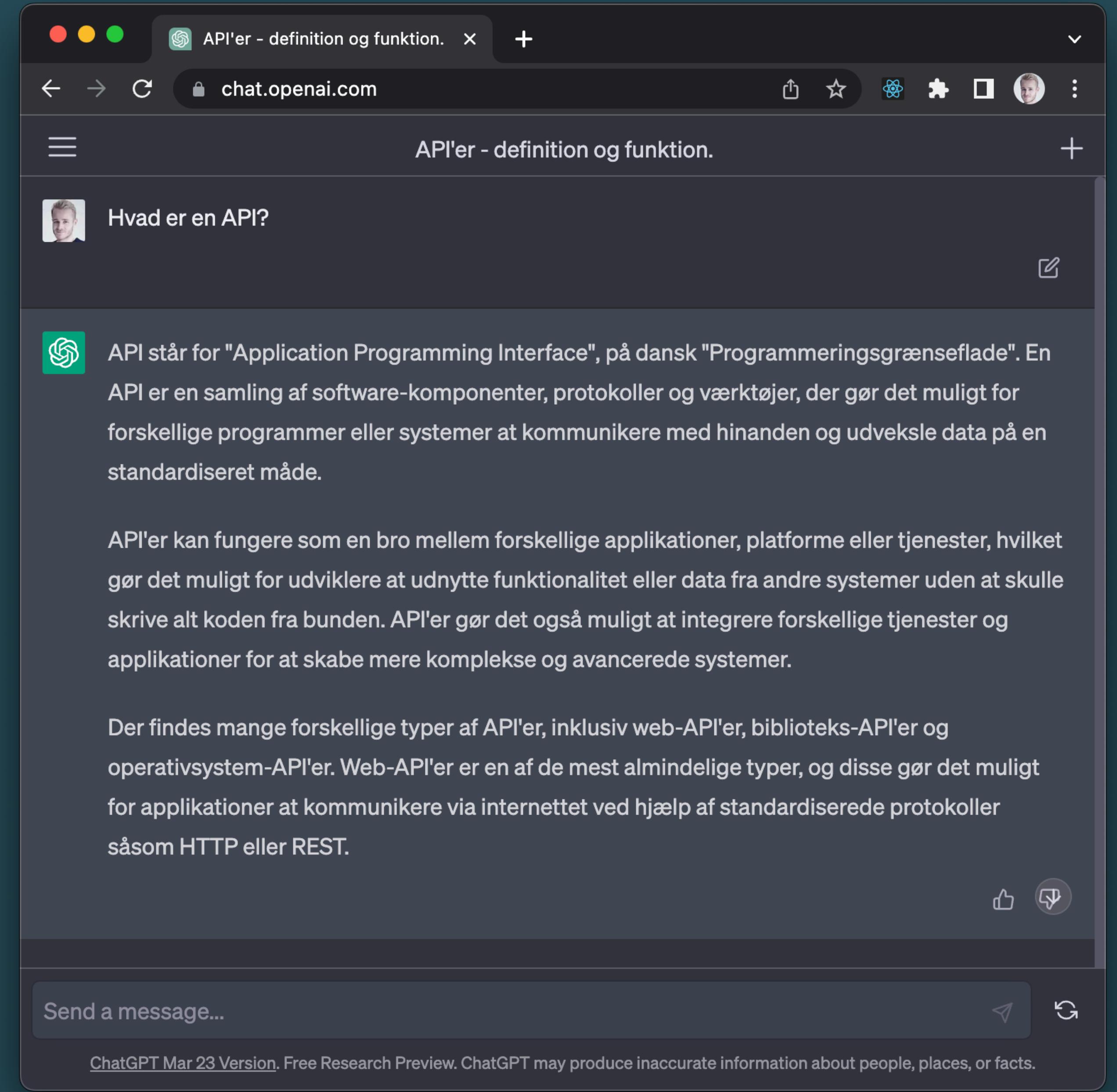
<https://www.youtube.com/watch?v=s7wmiS2mSXY>





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 a detailed AI response explaining what an API is and its functions. Below the response, there's a paragraph about the versatility of APIs and how they facilitate integration between different systems. At the bottom, there's a message input field and a note about the ChatGPT version.

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.

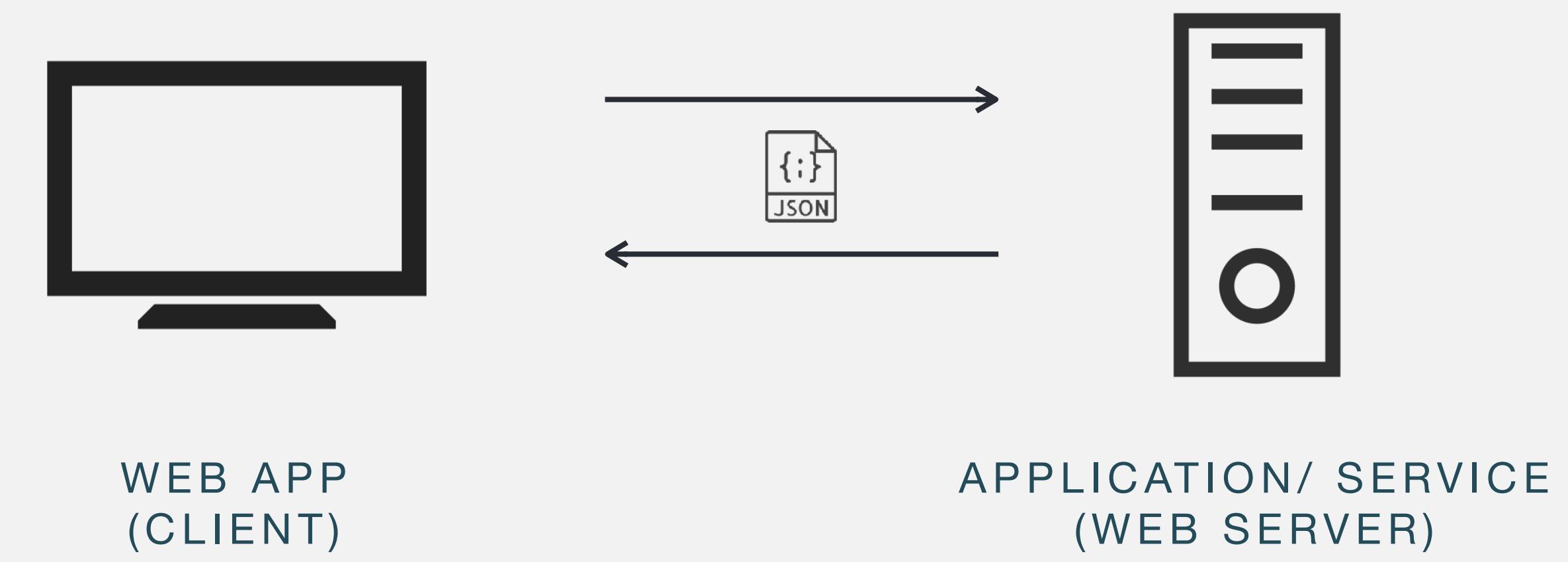
API'er kan fungere som en bro mellem forskellige applikationer, platforme eller tjenester, hvilket gør det muligt for udviklere at udnytte funktionalitet eller data fra andre systemer uden at skulle skrive alt koden fra bunden. API'er gør det også muligt at integrere forskellige tjenester og applikationer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

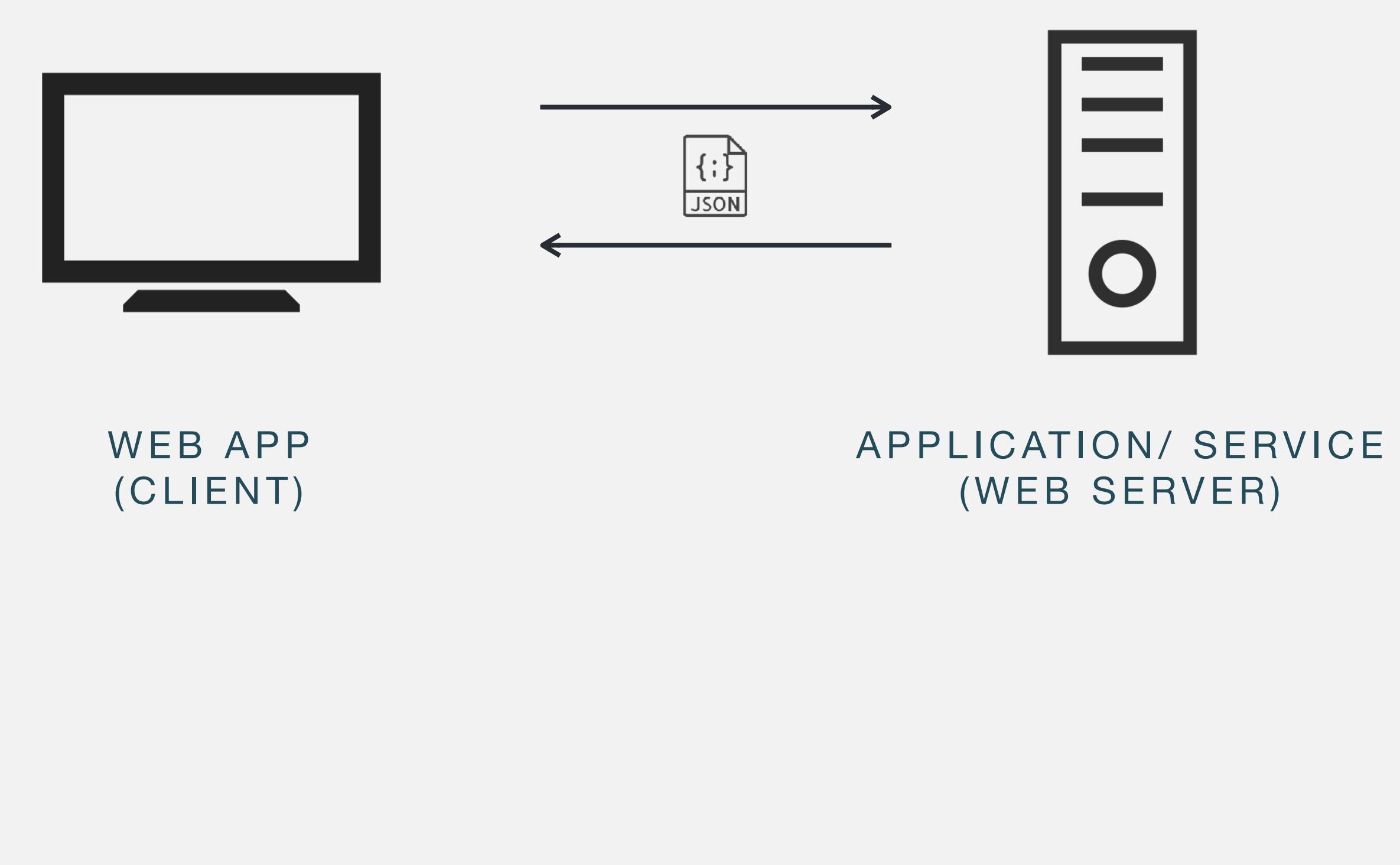
Application Programming Interface

- **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



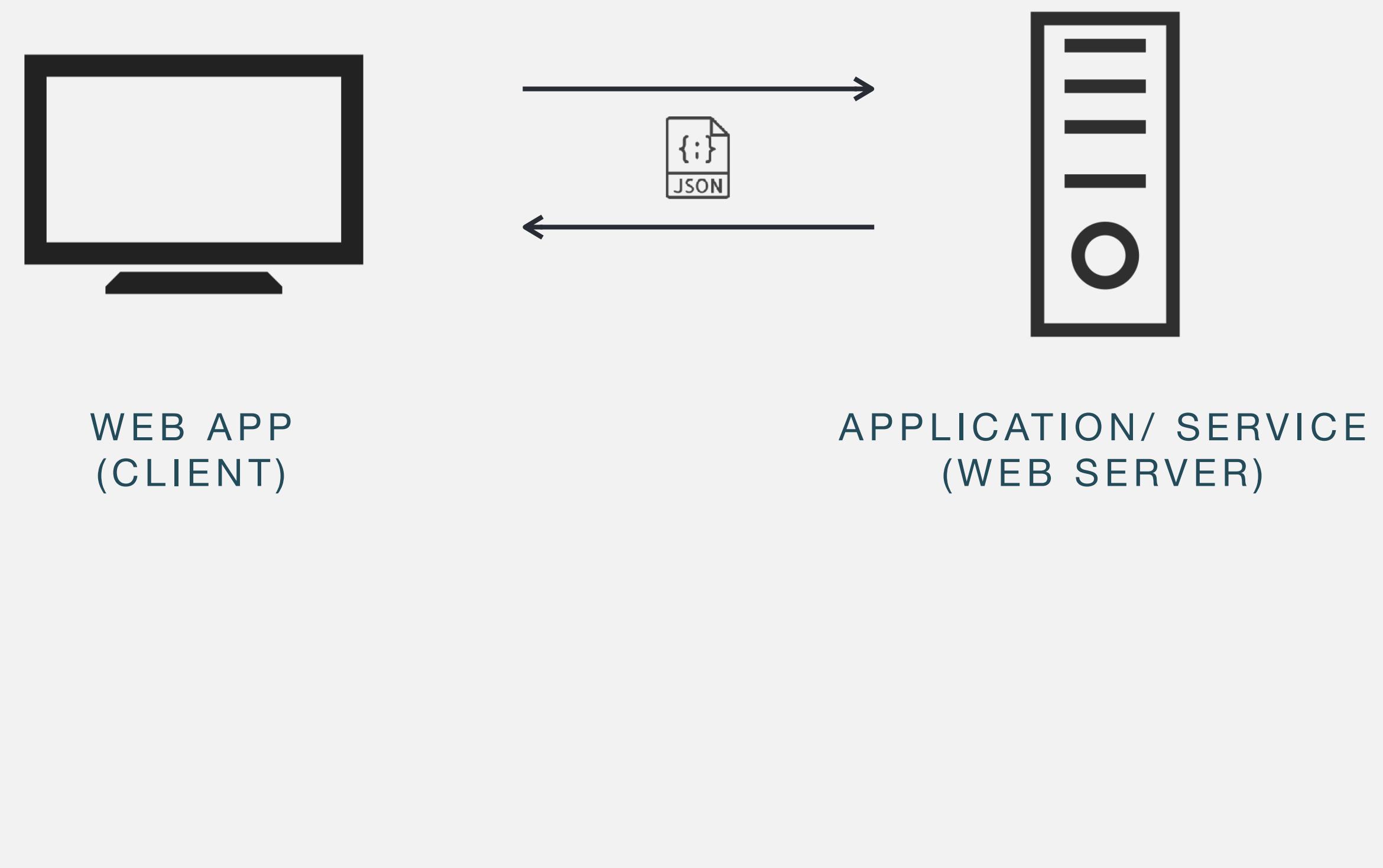
Application Programming Interface

- **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.

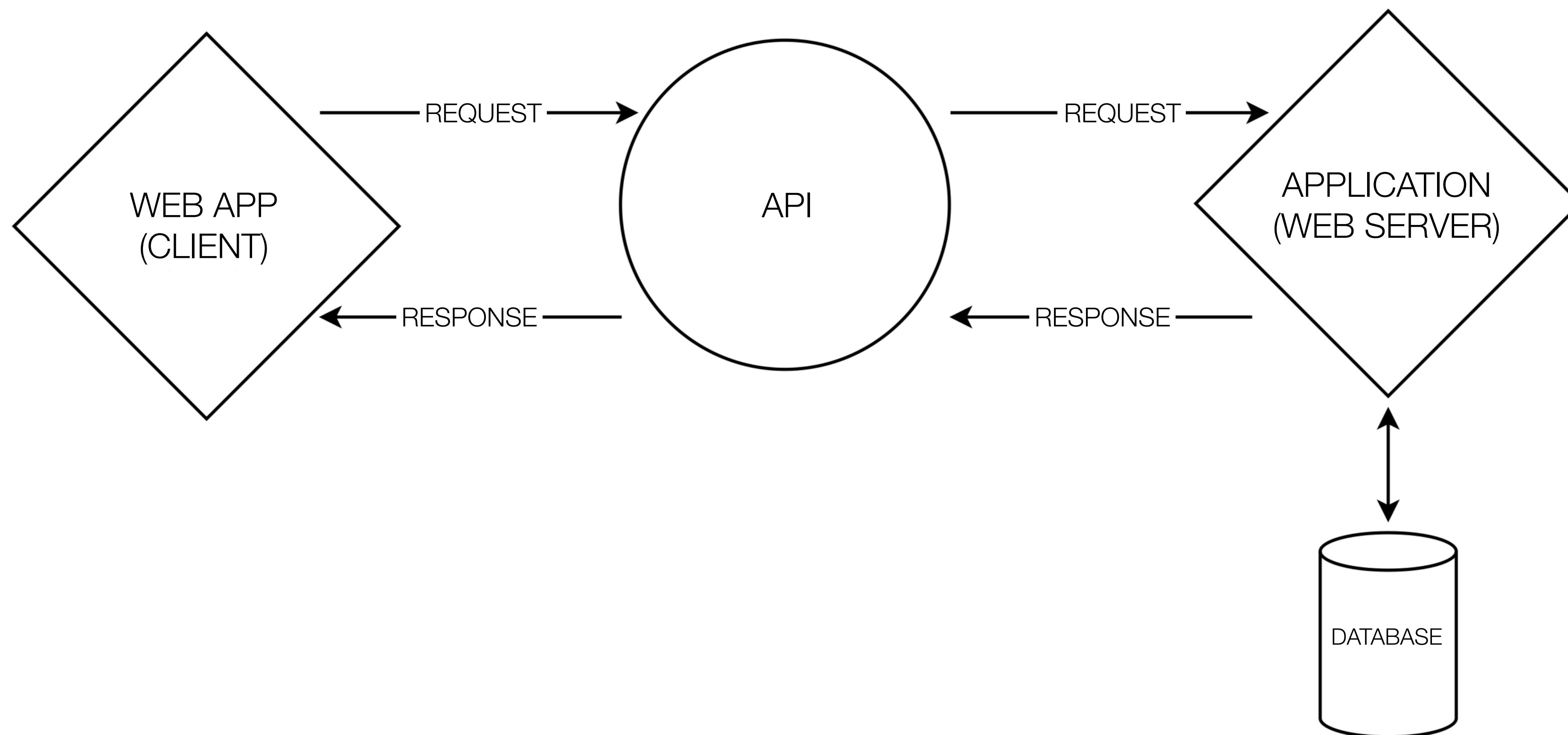


Application Programming Interface

- **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 body containing user data.

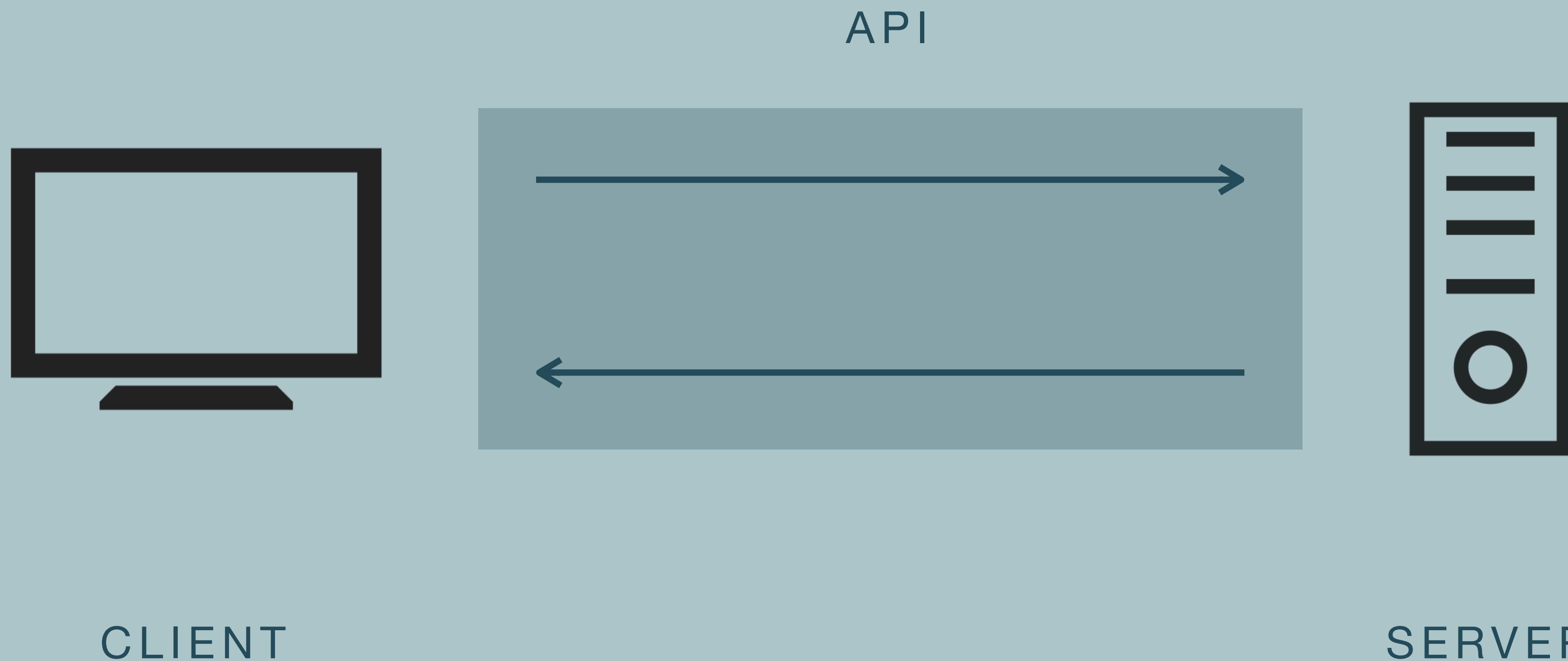
Name	Login ID	SIS ID	Section	Role	Last Activity	Total Activity
Clara Juul Birk	eaacibi@students.eaaa.dk	WU-E22a - 1.	Student	24 Aug semester	at 13:16	01:04:21
Martin Rieper Boesen	eaamrbo@students.eaaa.dk	WU-E22a - 1.	Student	24 Aug at 7:54	01:07:06	
Dan Okkels Brendstrup	dob@eaaa.dk	WU-E22a - 1.	Teacher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

```
[{"id": "23974", "name": "Clara Juul Birk", "created_at": "2020-08-01T13:16:21Z"}, {"id": "23974", "name": "Clara Juul Birk", "created_at": "2020-08-01T13:16:21Z"}, {"id": "36267", "name": "Martin Rieper Boesen", "created_at": "2020-08-01T07:54:06Z"}, {"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": "2021-08-01T09:28:00Z"}, {"id": "41", "name": "Jeffrey David Serio", "created_at": "2021-08-01T16:39:00Z"}, {"id": "24043", "name": "Chalotte Meng Emanuel Dyrholm", "created_at": "2021-08-01T16:39:00Z"}, {"id": "23978", "name": "Jeppe Friki", "created_at": "2020-08-07T17:00:00Z"}, {"id": "23963", "name": "Daniel Tjerrild Gamborg", "created_at": "2021-08-07T17:00:00Z"}, {"id": "23992", "name": "Casper Hedegaard Hansen", "created_at": "2021-08-08T17:00:00Z"}, {"id": "36266", "name": "Morten Gedsted Hansen", "created_at": "2021-08-08T17:00:00Z"}, {"id": "23980", "name": "Anders Husted", "created_at": "2020-08-10T17:00:00Z"}, {"id": "23531", "name": "S\u00f8ren Bo J\u00f8rgensen", "created_at": "2021-08-11T17:00:00Z"}]
```



Application Programming Interface

Communication between two systems



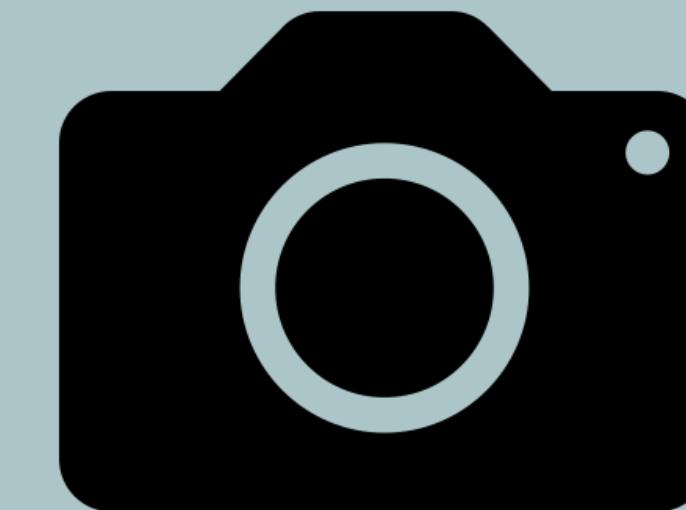
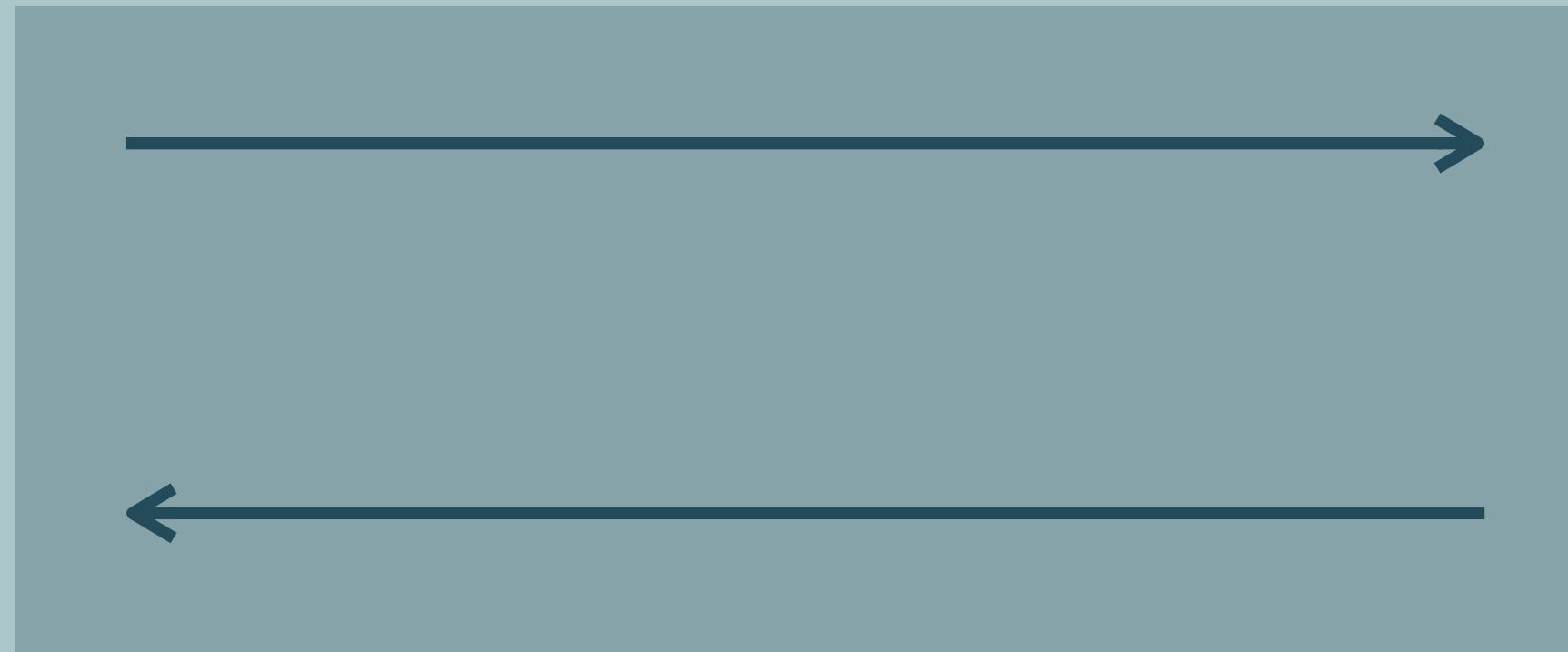
Application Programming Interface

Communication between two systems



Web App

Camera API



Camera

Rasmus Cederdorff - Nybygg

https://www.instagram.com/p/DGBr7EbOyh9/?img_index=2

cederdorff Edit profile View archive

196 posts 5,374 followers 808 following

Rasmus Cederdorff - Nybyggerne ham/him

cederdorff

Nybyggerne 2025 – Rødt Hus

Lektor & Web App Udvikler

Aarhus med @matias.vase

Far til Alicia & Ida

Født og... more

cederdorff.com/links

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

View replies (3)

Liked by aniacederdorff and others

5 days ago

Add a comment... Post

Nybyggevej

Network

Elements Console Sources Network Performance Memory >

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

Filter Invert More filters

Preserve log Disable cache No throttling

Timing

Name Headers Payload Preview Response Initiator 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

cederdorff Edit profile View archive

196 posts 5,374 followers 808 following

Rasmus Cederdorff - Nybyggerne ham/him

Nybyggerne 2025 – Rødt Hus
Lektor & Web App Udvikler
Aarhus med @matias.vase
Far til Alicia & Ida
Født og... more
cederdorff.com/links

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

View replies (3)

Liked by aniacederdorff and others
5 days ago

Add a comment... Post

Nybyggevej

Network Tab

Fetch/XHR

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: "QVFCcHB2WjBj0UtobkIvMHFScGJrZkNEYWJ6M1l6am5uLUUpJbVZkSDBCVmNhc3k0RBUUXNjU2EwakFrUTQwa...
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>

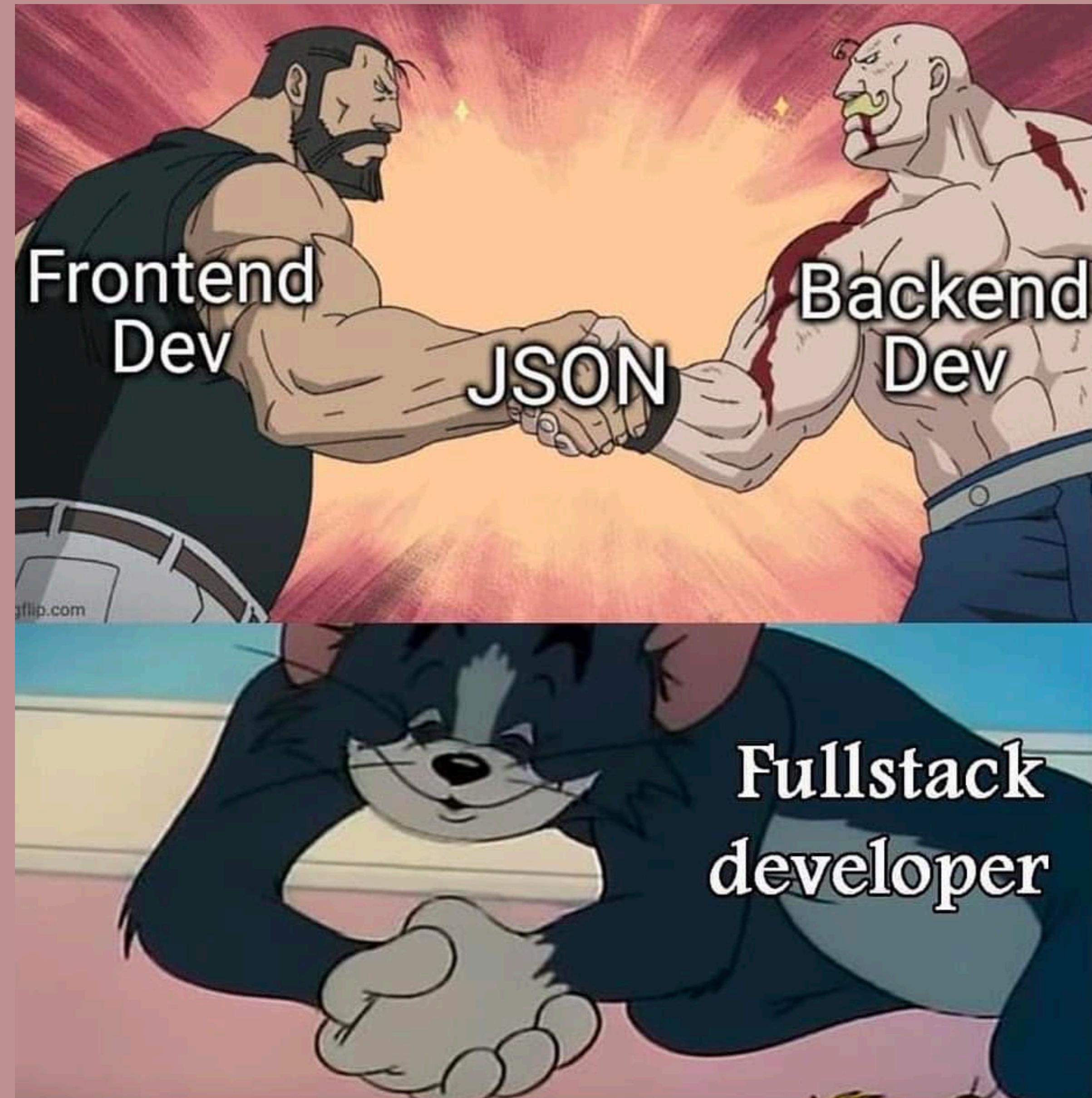
JSON

JavaScript Object Notation

JSON

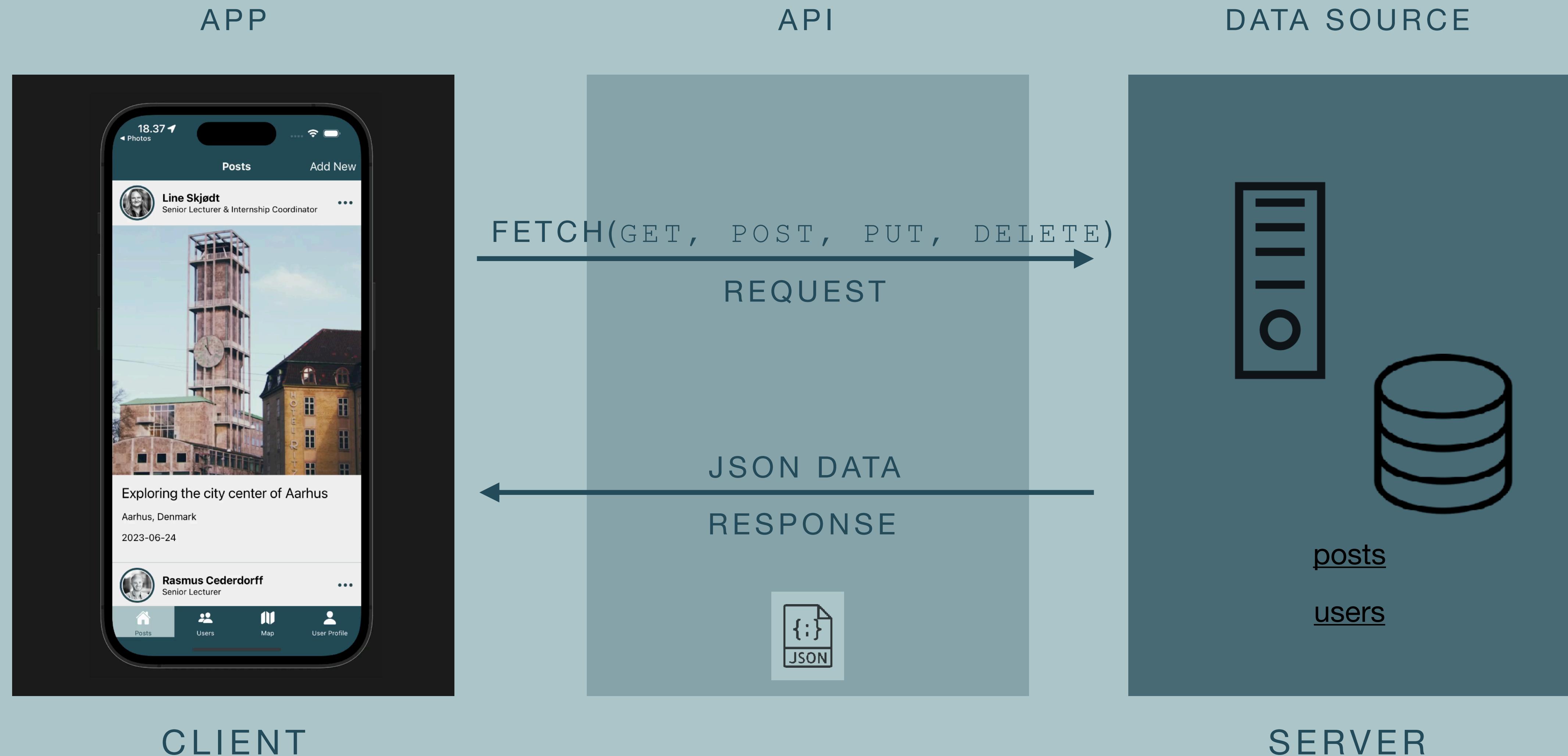
JavaScript Object Notation

... 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

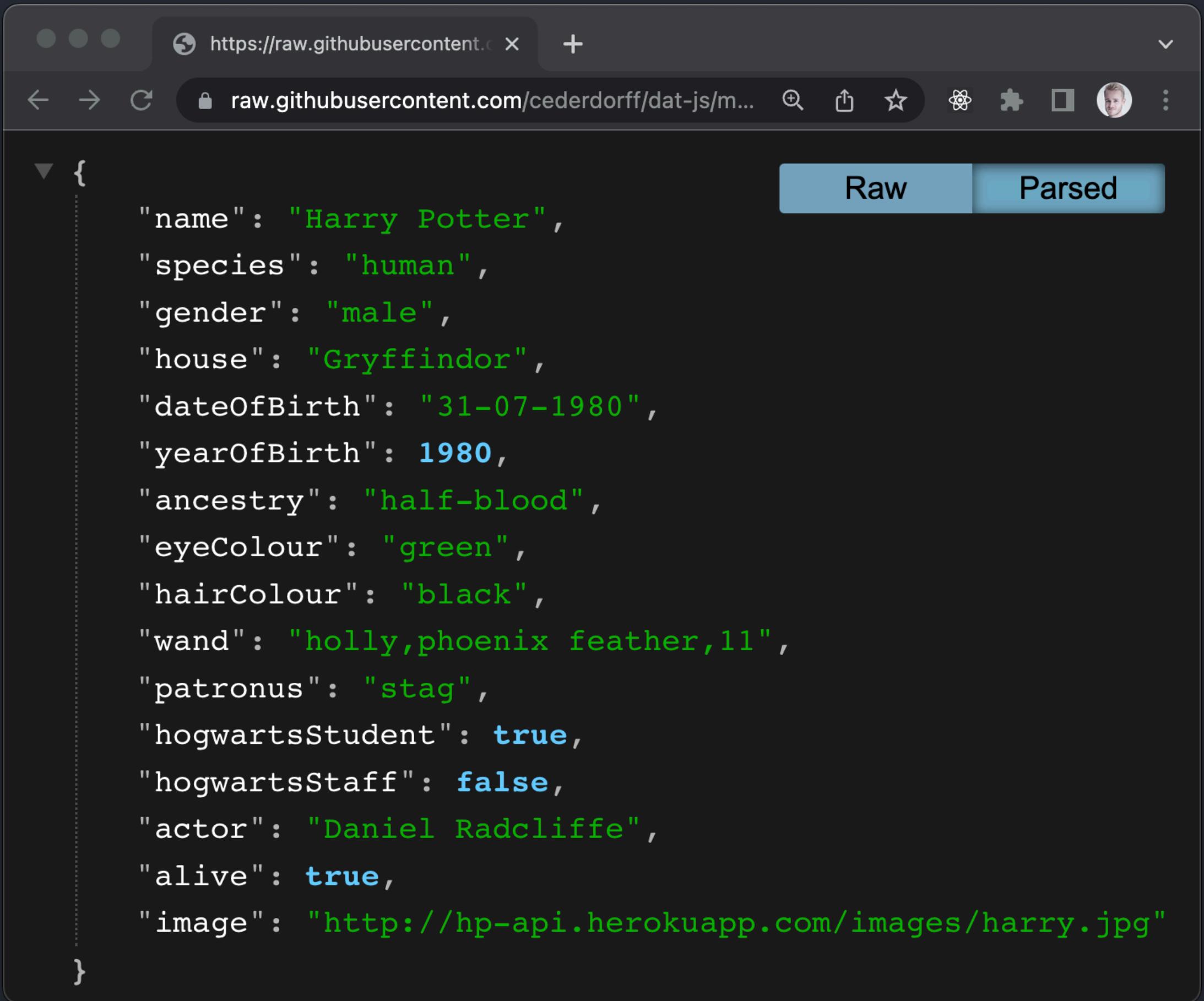
```
{  
  "name": "Alicia",  
  "age": 6  
}
```

JSON OBJECT

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

LIST OF JSON OBJECTS

JSON

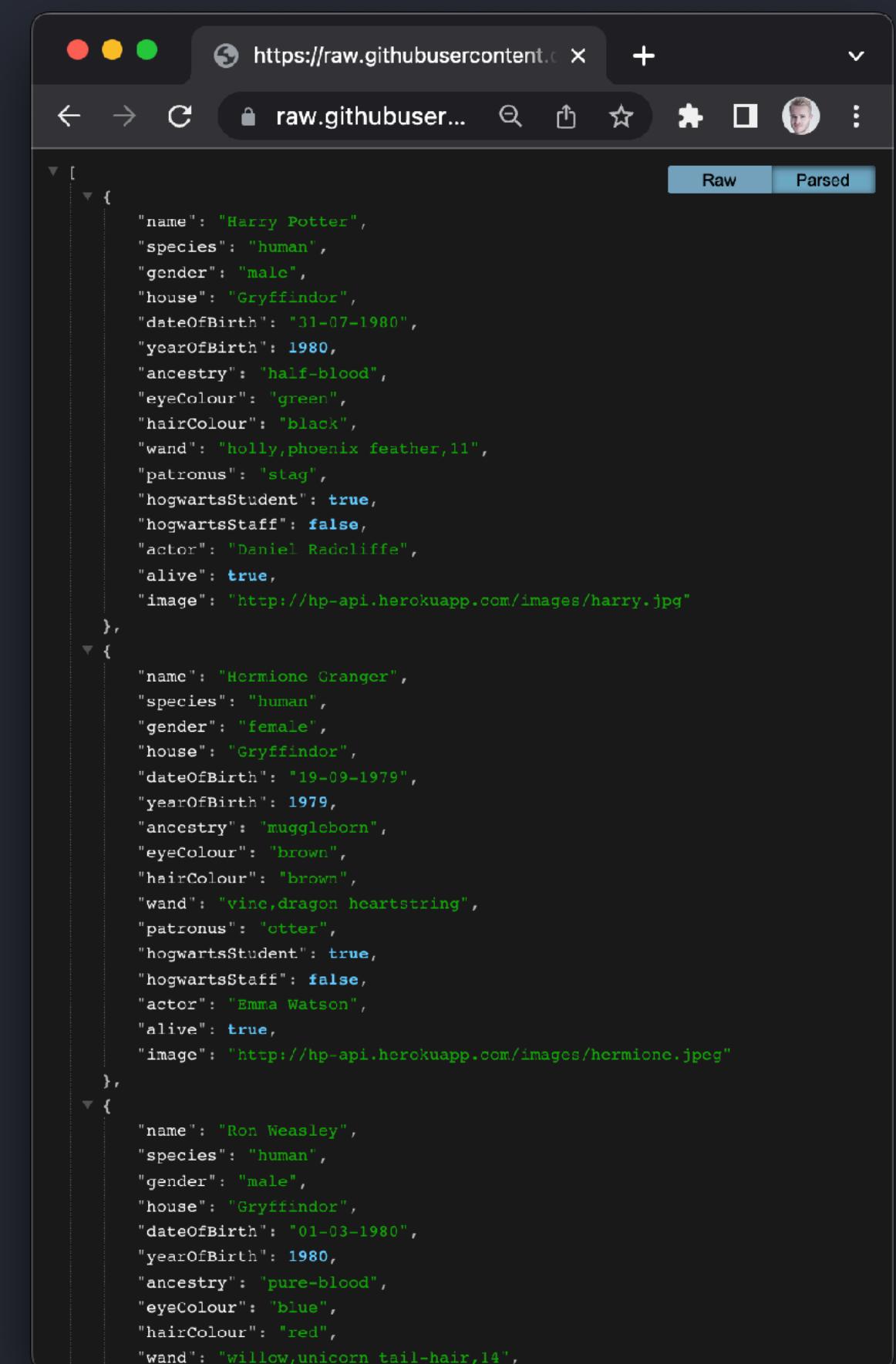


A screenshot of a web browser window displaying a single JSON object. The URL is <https://raw.githubusercontent.com/cederdorff/dat-js/master/data/harry.json>. The JSON structure is as follows:

```
{  
  "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"  
}
```

The browser has two tabs: "Raw" and "Parsed". The "Raw" tab is selected.

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 structure is as follows:

```
[  
  {  
    "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"  
  },  
  {  
    "name": "Hermione Granger",  
    "species": "human",  
    "gender": "female",  
    "house": "Gryffindor",  
    "dateOfBirth": "19-09-1979",  
    "yearOfBirth": 1979,  
    "ancestry": "muggleborn",  
    "eyeColour": "brown",  
    "hairColour": "brown",  
    "wand": "vine,dragon heartstring",  
    "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": "willow,unicorn tail-hair,14",  
  }  
]
```

The browser has two tabs: "Raw" and "Parsed". The "Parsed" tab is selected.

LIST OF JSON OBJECTS

JSON Object

The diagram illustrates the connection between a JSON object and a web application displaying Harry Potter characters.

Left Side: Web Application

A screenshot of a web browser window titled "Harry Potter Characters". The page displays three cards, each representing a character:

- Harry Potter**: Gryffindor. Shows a portrait of a young boy with glasses and a yellow and red striped tie.
- Hermione Granger**: Gryffindor. Shows a portrait of a girl with long brown hair and a yellow and red striped tie.
- Ron Weasley**: Gryffindor. Shows a portrait of a boy with red hair and a yellow and red striped tie, holding a wand.

Right Side: JSON Object

A screenshot of a web browser window showing the JSON representation of the Harry Potter character data. The JSON is displayed in a collapsible tree view with the "Parsed" tab selected. The data for Harry Potter is as follows:

```
{  
  "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"  
}
```

Red arrows point from the character cards in the application to their corresponding entries in the JSON object, indicating the mapping between the visual representation and the data structure.

<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>

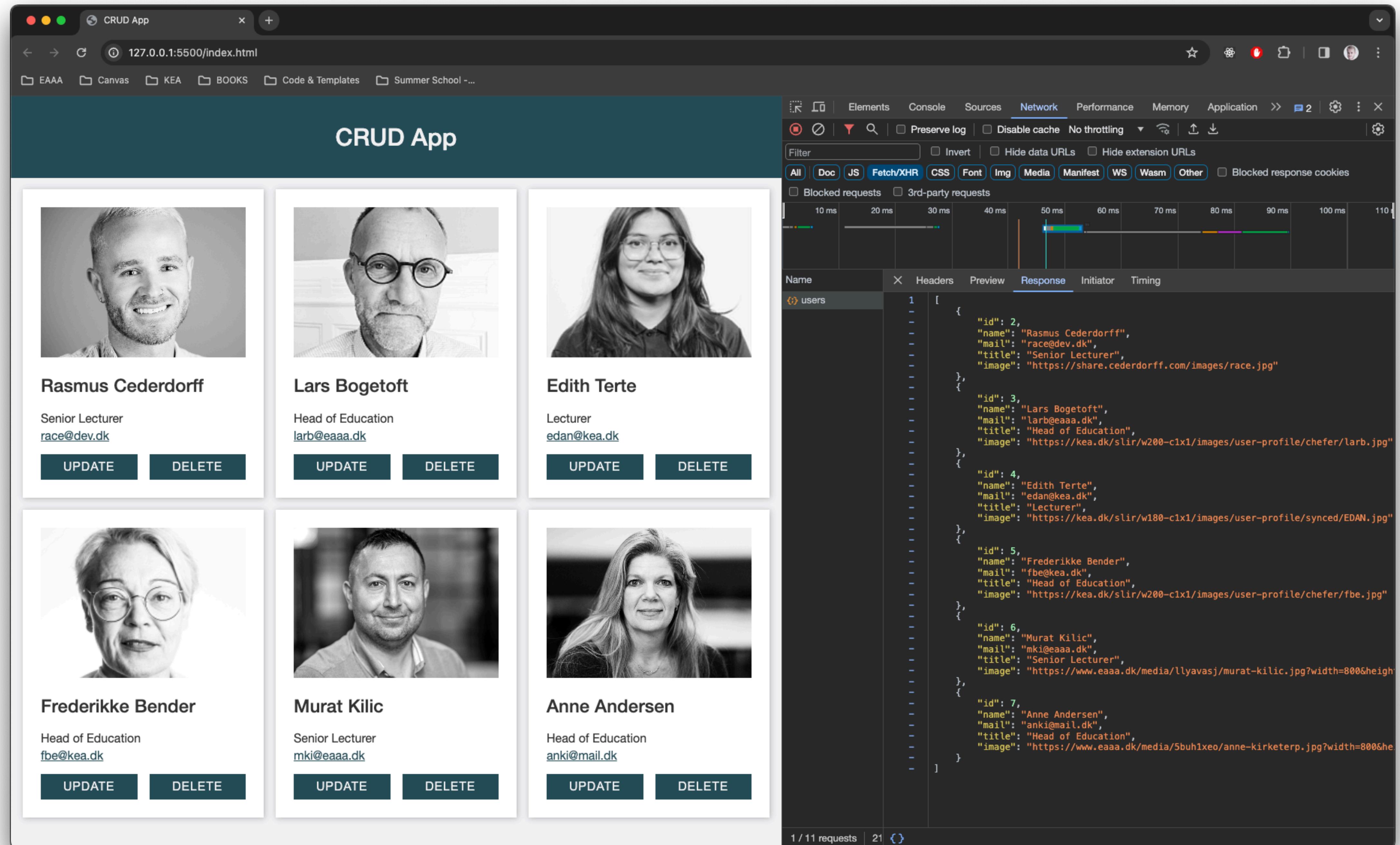
JAVASCRIPT OBJECT NOTATION

- 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)

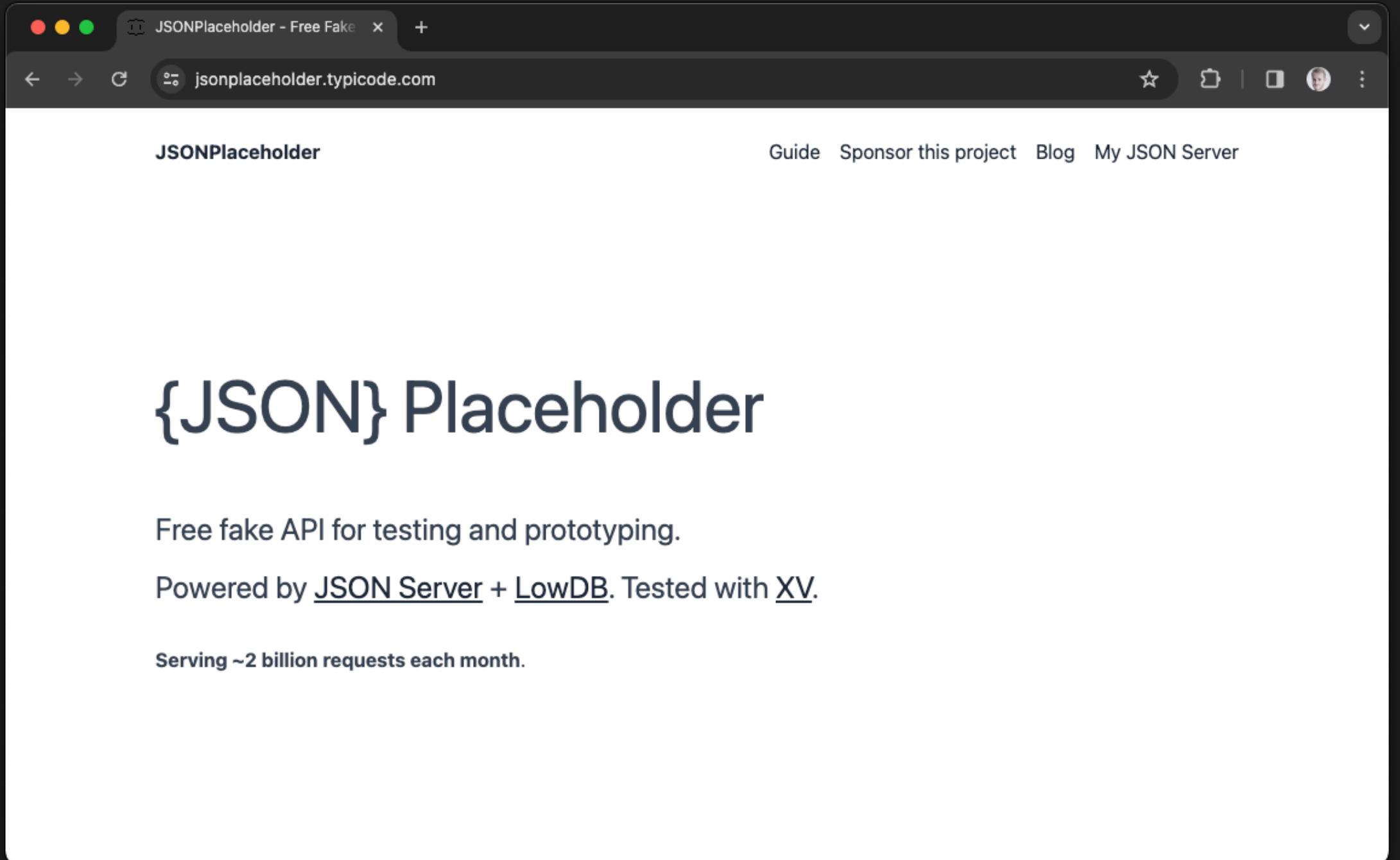
```
[  
 {  
   "id": "1",  
   "firstname": "Kasper",  
   "lastname": "Topp",  
   "age": "34",  
   "haircolor": "Dark Blonde",  
   "countryName": "Denmark",  
   "gender": "Male",  
   "lookingFor": "Female"  
 },  
 {  
   "id": "2",  
   "firstname": "Nicklas",  
   "lastname": "Andersen",  
   "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>

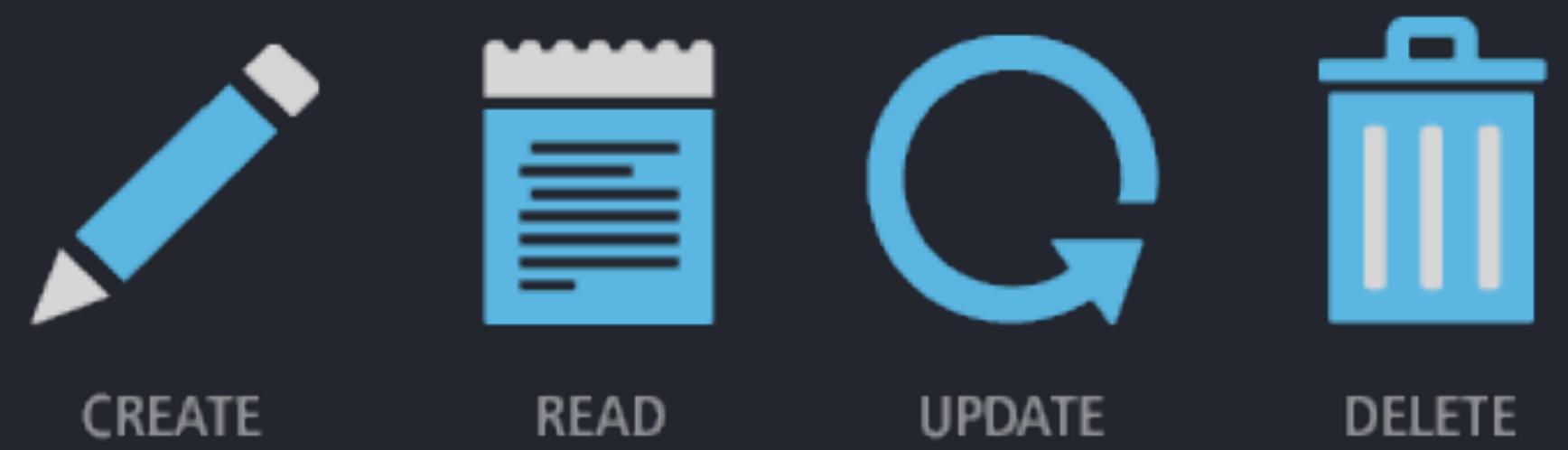
```
{  
  "name": "Rasmus Cederdorff",  
  "birthday": "1990-03-12",  
  "title": "Experienced JavaScript Developer",  
  "experienceYears": 10,  
  "education": {  
    "degree": "Master of Science in IT - Web Communication",  
    "specialization": "Web Architecture"  
  },  
  "skills": ["JavaScript", "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.

100 *SECONDS OF* node



https://www.youtube.com/watch?v=-MTSQjw5DrM&ab_channel=Fireship

REST

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

REST

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

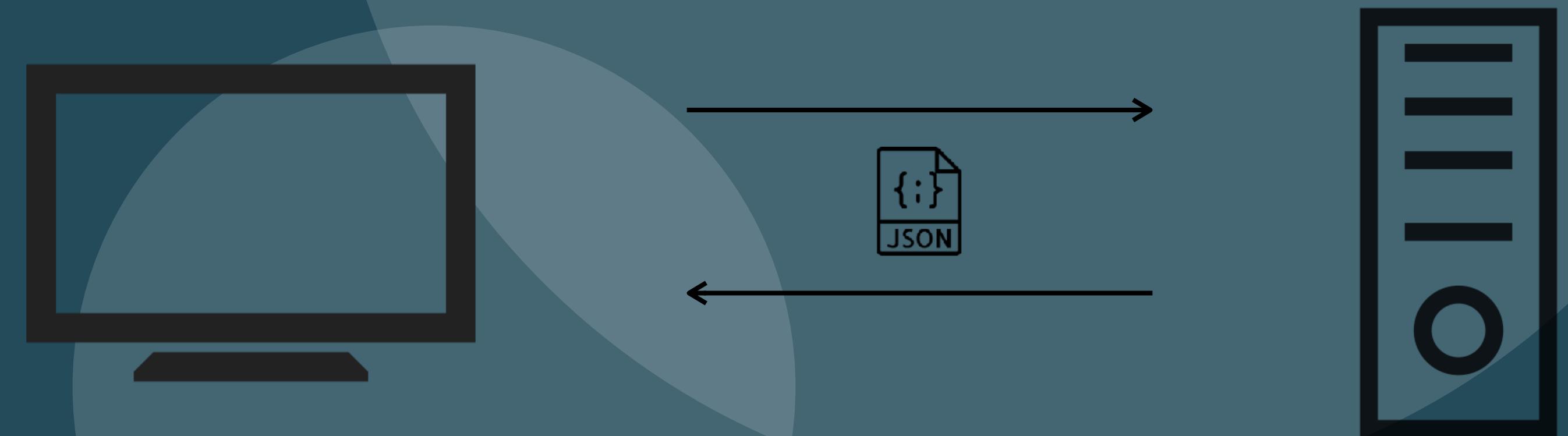
REST

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

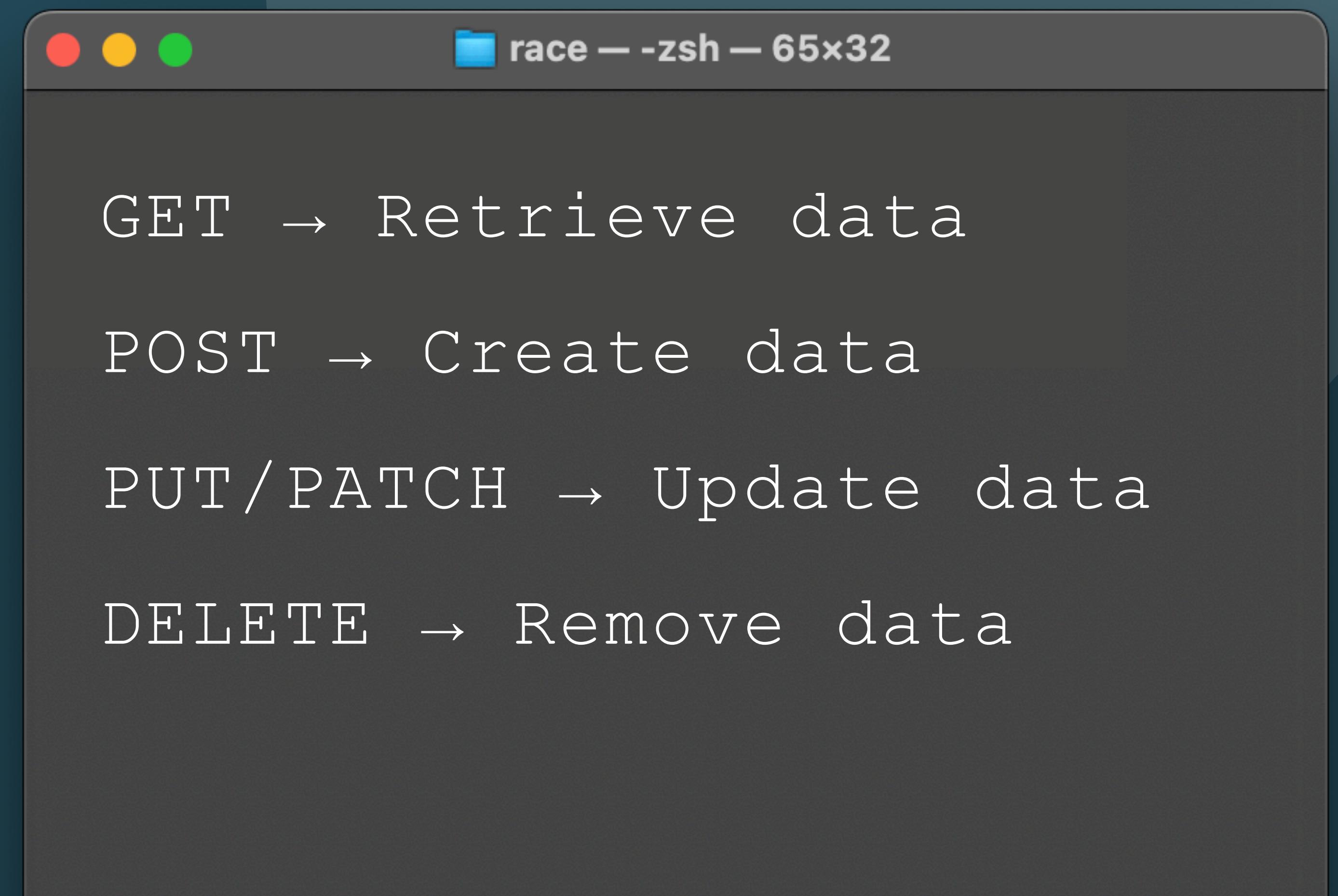
1. Stateless Communication

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

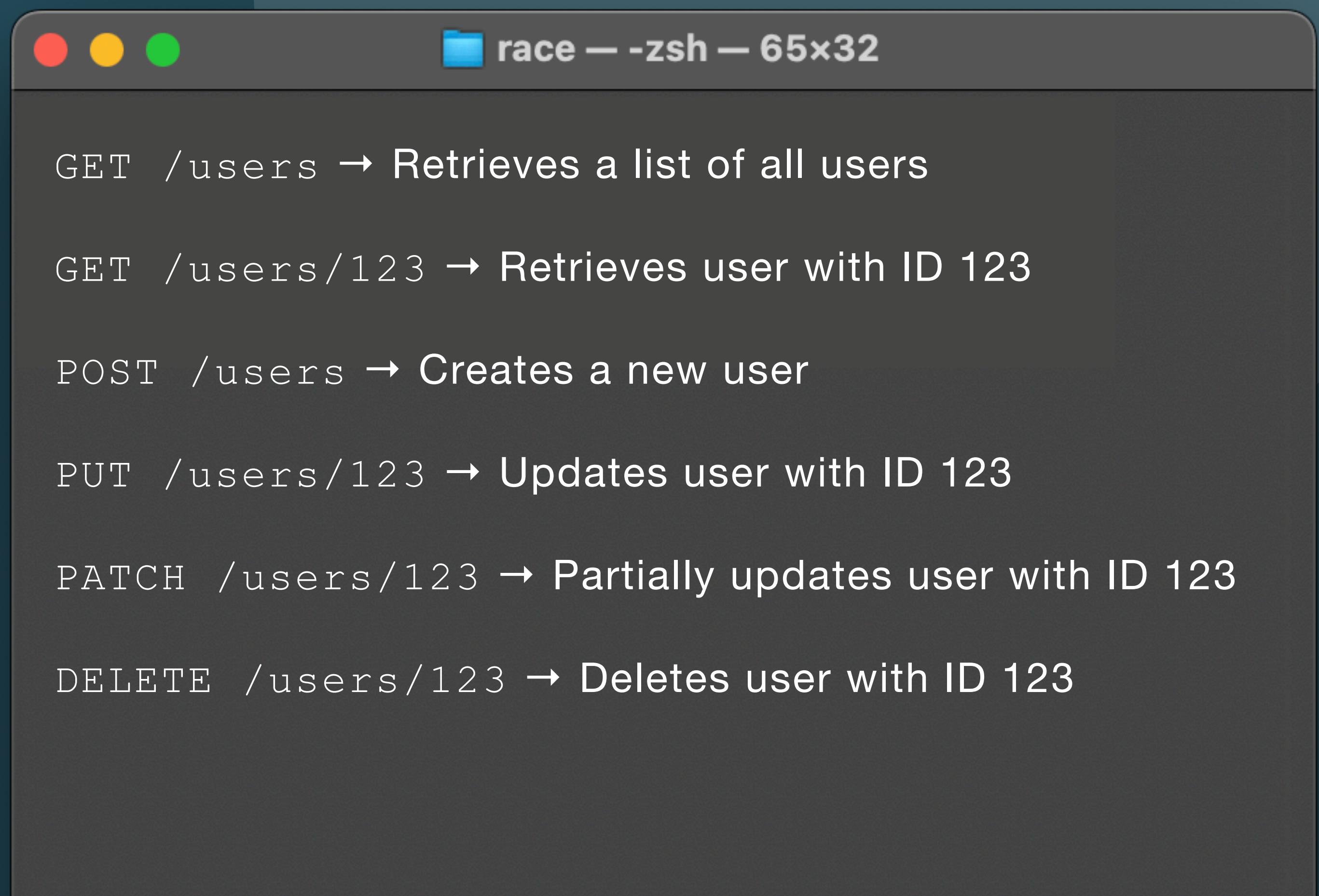


The image shows a dark-themed macOS terminal window. At the top, there are three colored window control buttons (red, yellow, green) and the title bar which reads "race -- zsh -- 65x32". The main area of the terminal contains four lines of text, each mapping an HTTP method to a CRUD operation:

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

3. Resource-Based Design

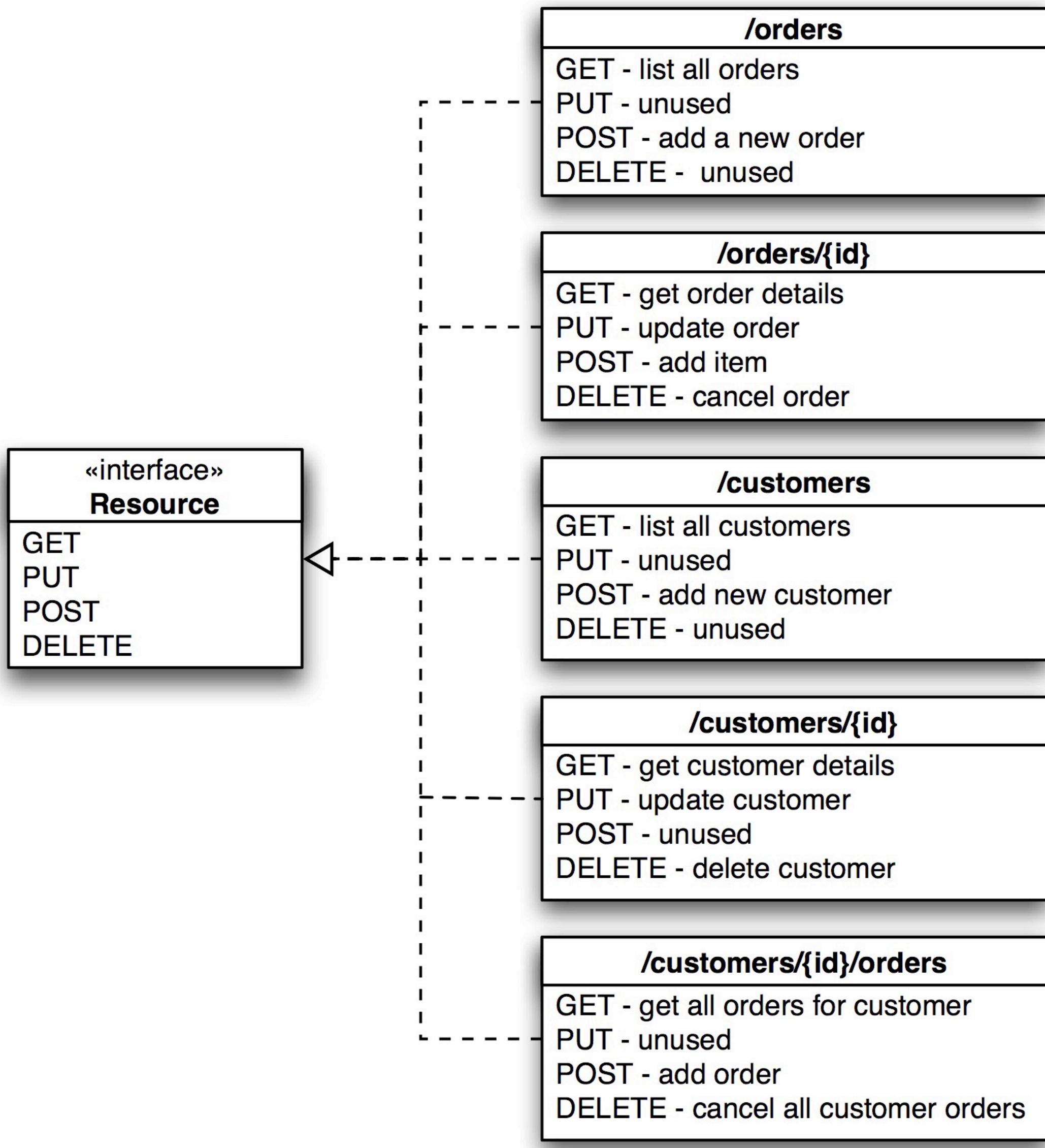
- In REST, everything is considered a resource.
- REST APIs are structured around uniquely identifiable resources, accessed via specific URLs.
- Each resource is represented as a URI and can be manipulated using standard HTTP methods (GET, POST, PUT, DELETE).



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>

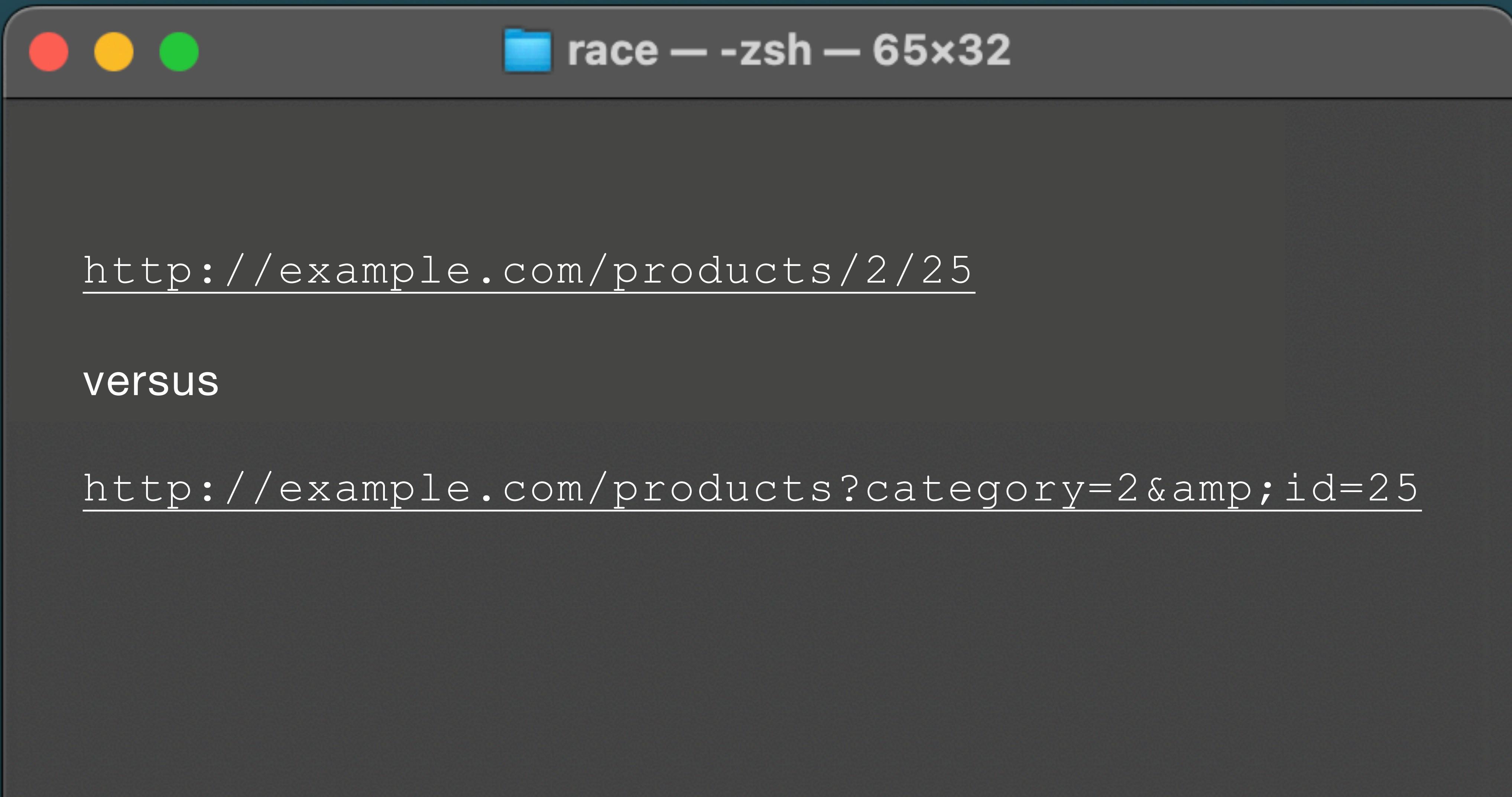
• Resource Identifiers (IDs)

- **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>

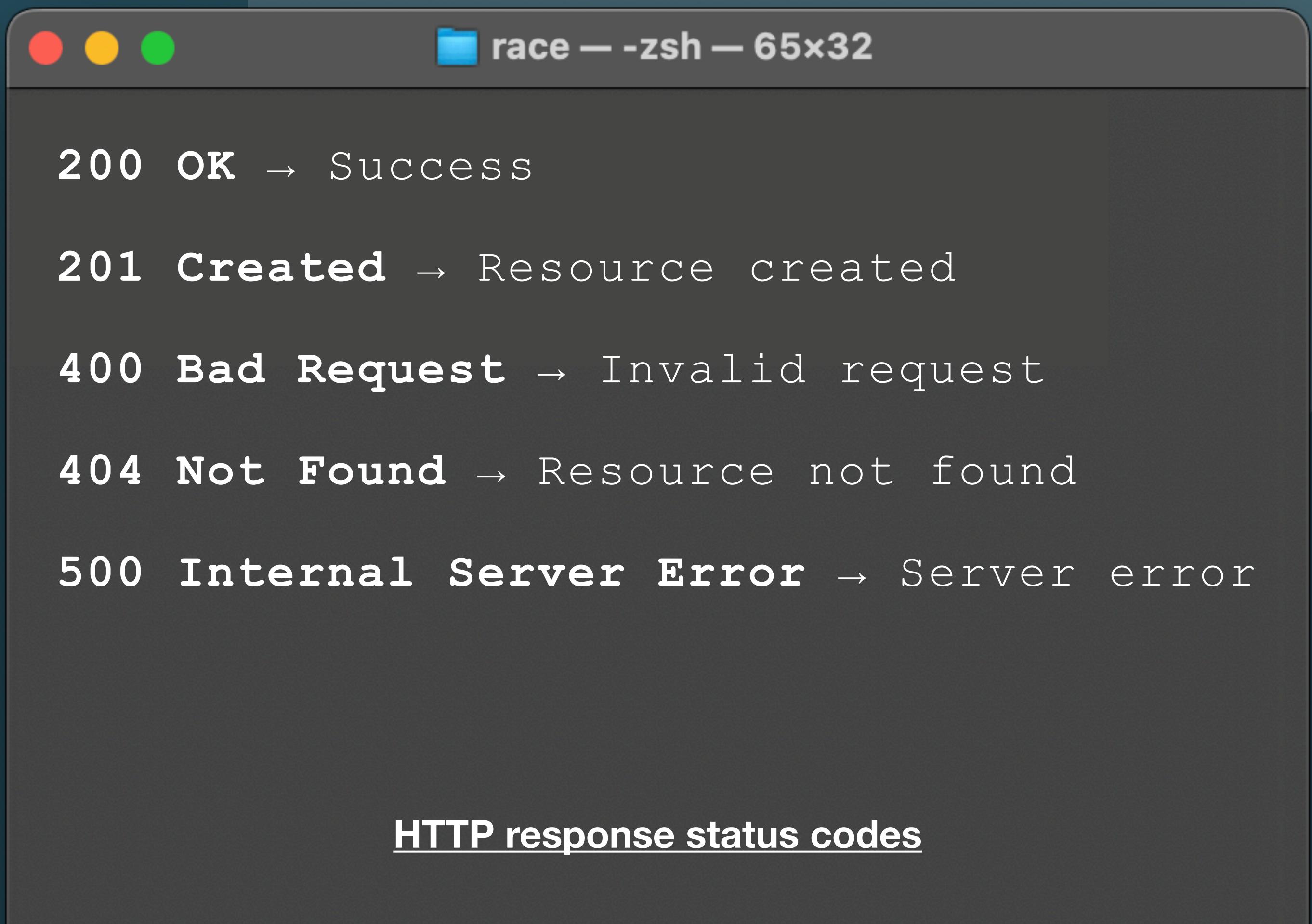
Clean and Semantic URL



versus

4. Using HTTP Status Codes

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



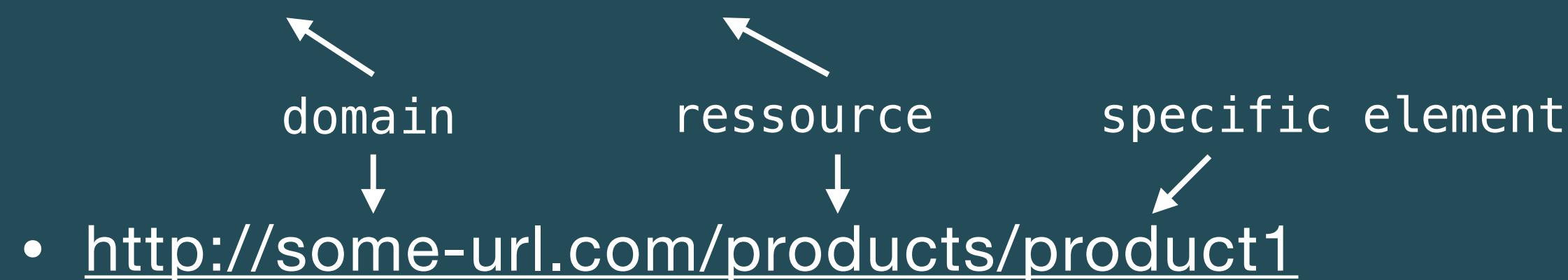
The image shows a terminal window with a dark background and light-colored text. The title bar reads "race -- zsh -- 65x32". The window contains the following text:

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

At the bottom right of the terminal window, the text "HTTP response status codes" is displayed.

RESTful API

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

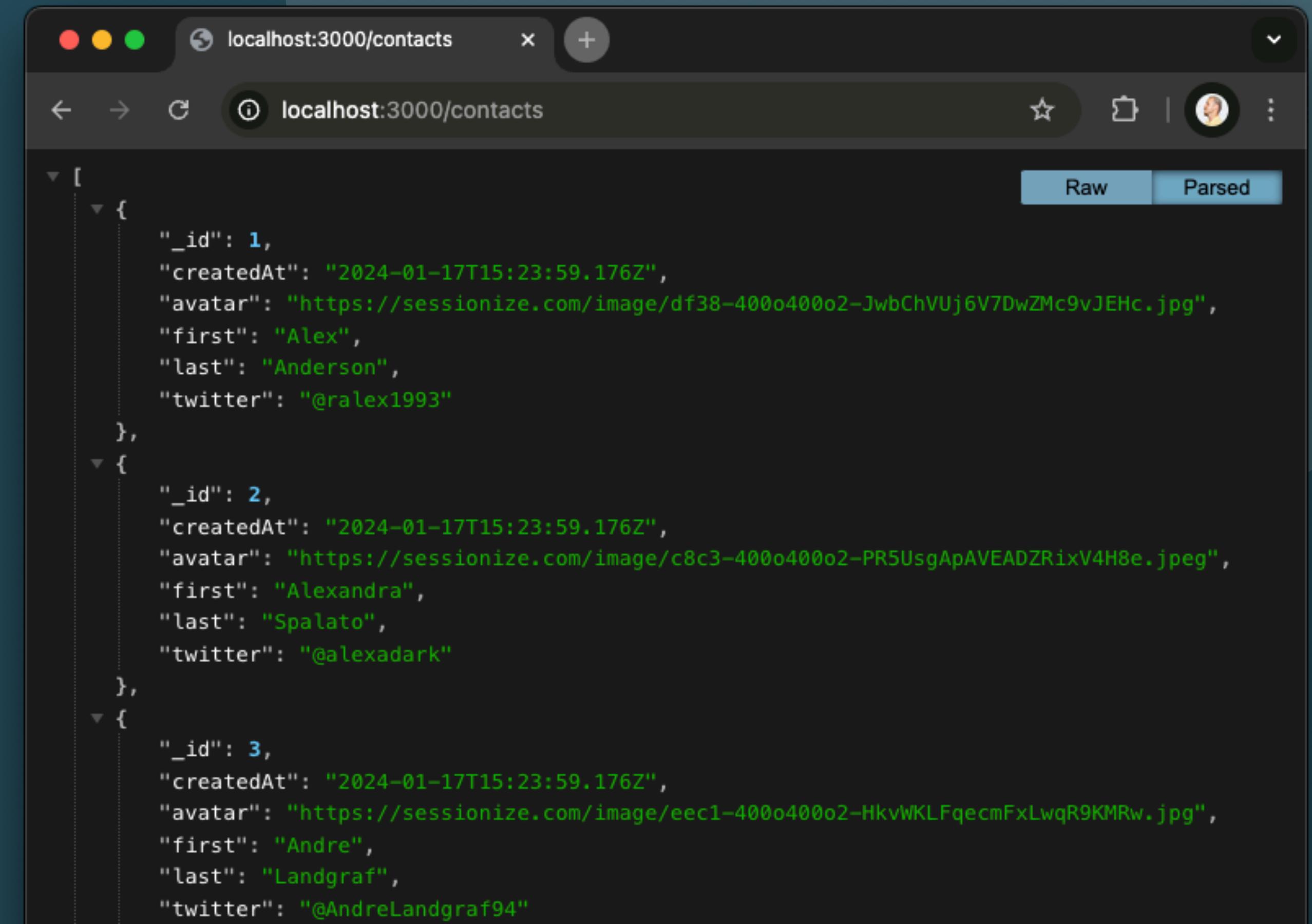


- Data type → JSON

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"}]
```

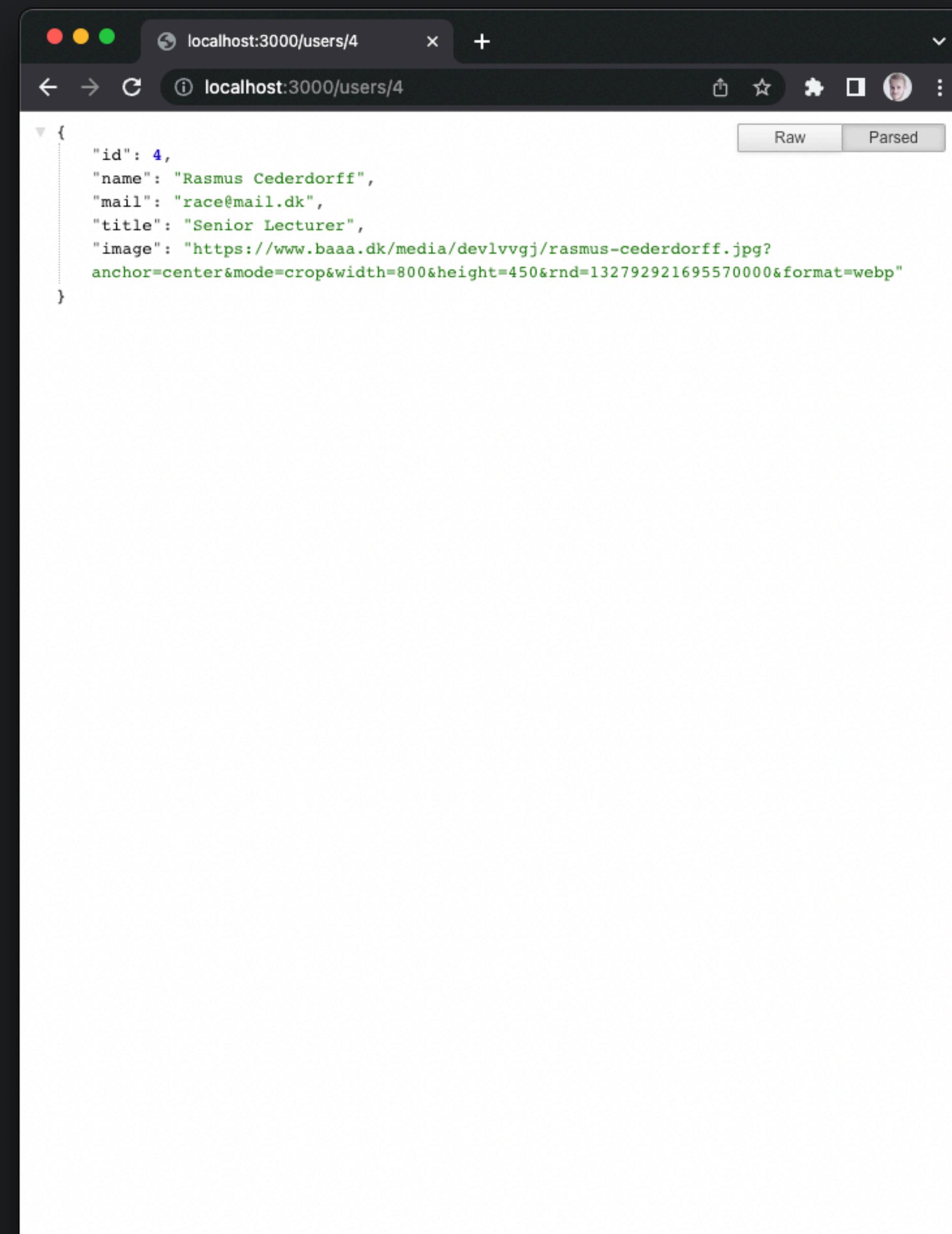
Collections (JSON Array)



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)

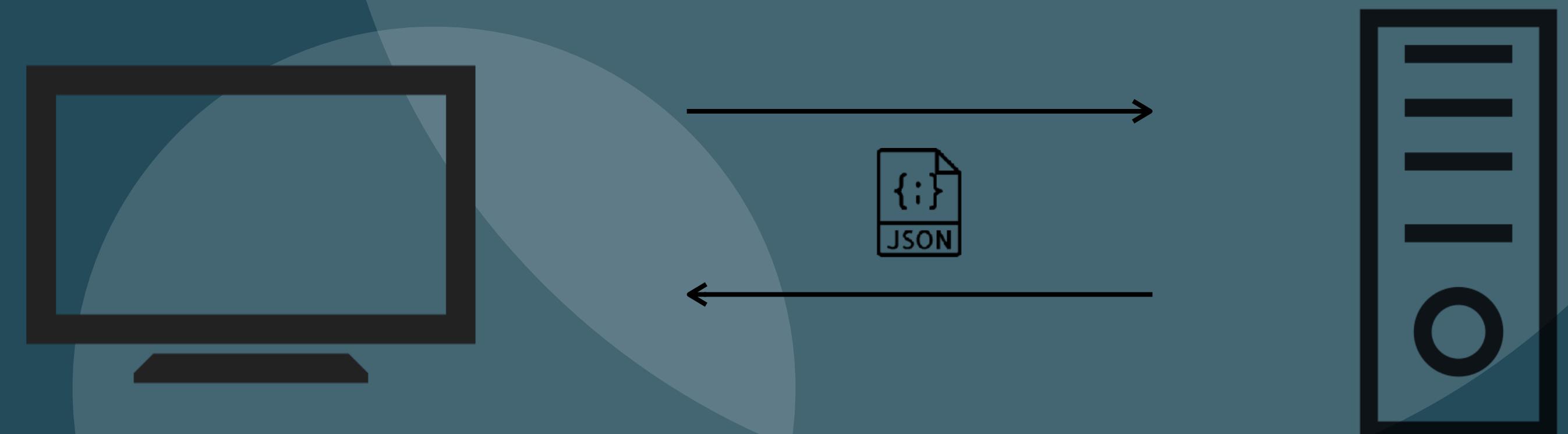


A screenshot of a web browser window titled "localhost:3000/users/4". The page displays a single JSON object representing a user with id 4. The object includes fields: id, name, mail, title, and image. The image field includes a URL and a query string for image processing. The browser interface shows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

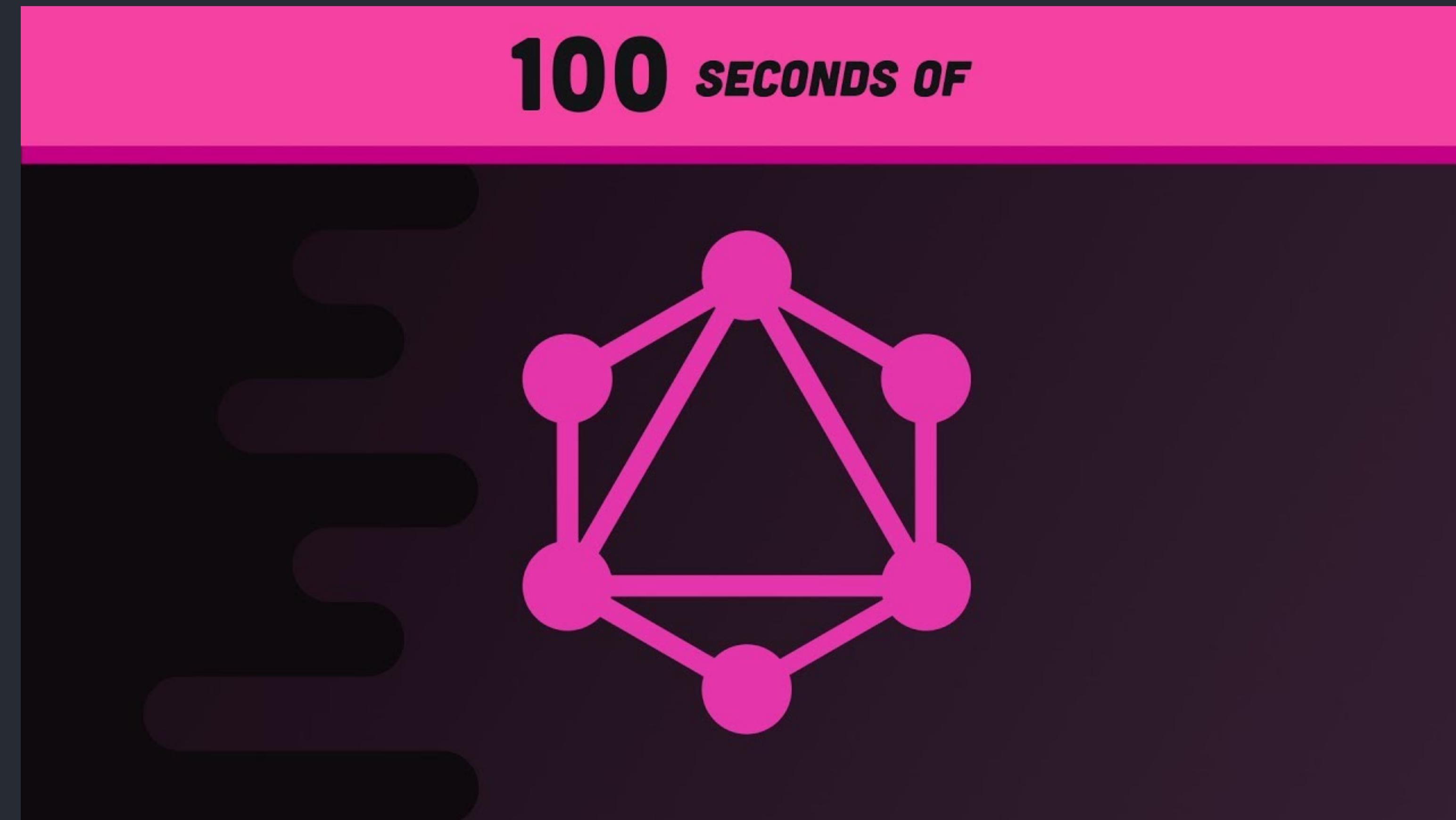
Rest API Explained

(in 2 minutes)



https://www.youtube.com/watch?v=WRsKs-K6ill&ab_channel=Warp

GraphQL - REST Alternative



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?



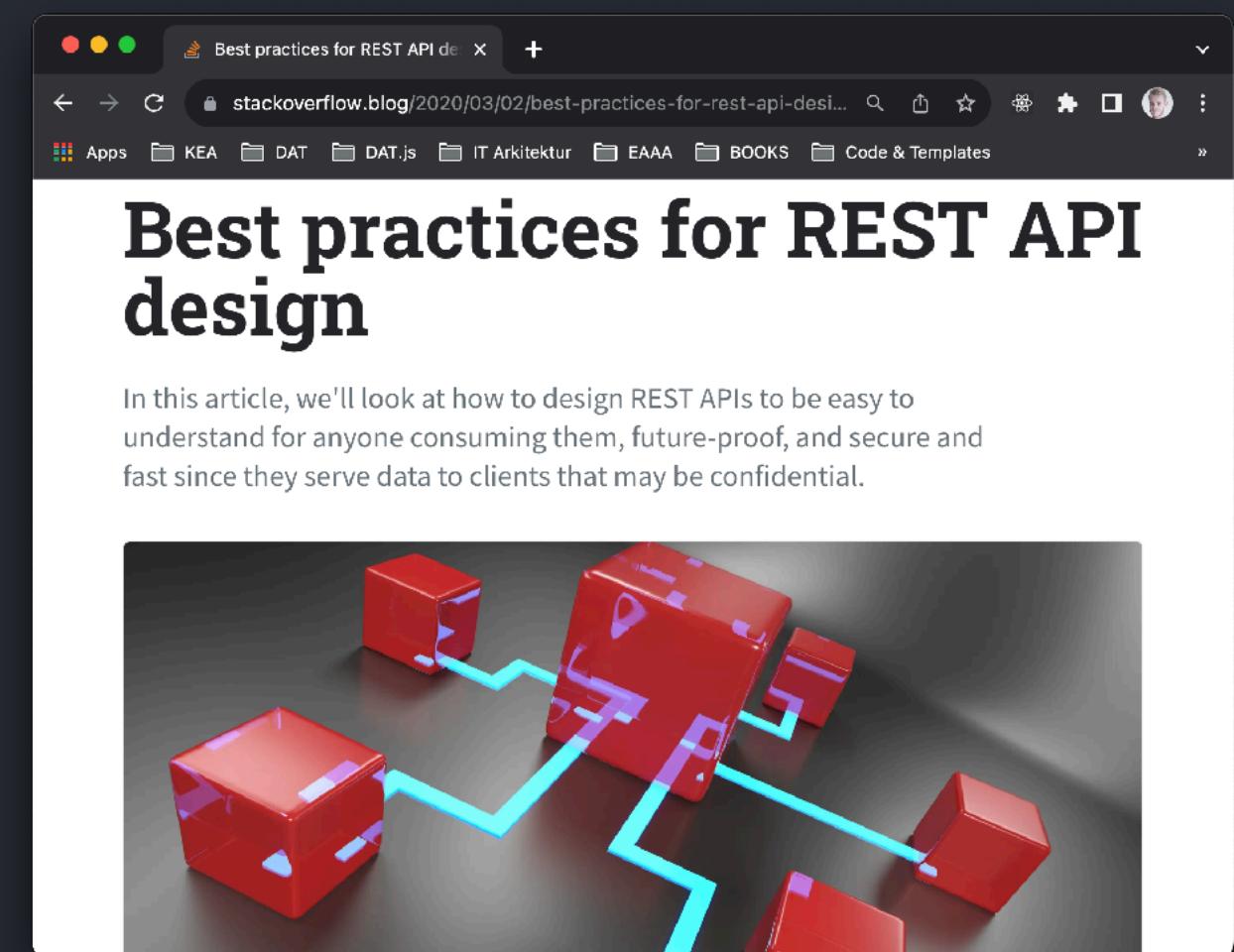
<https://dataforsyningen.dk/>

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>.

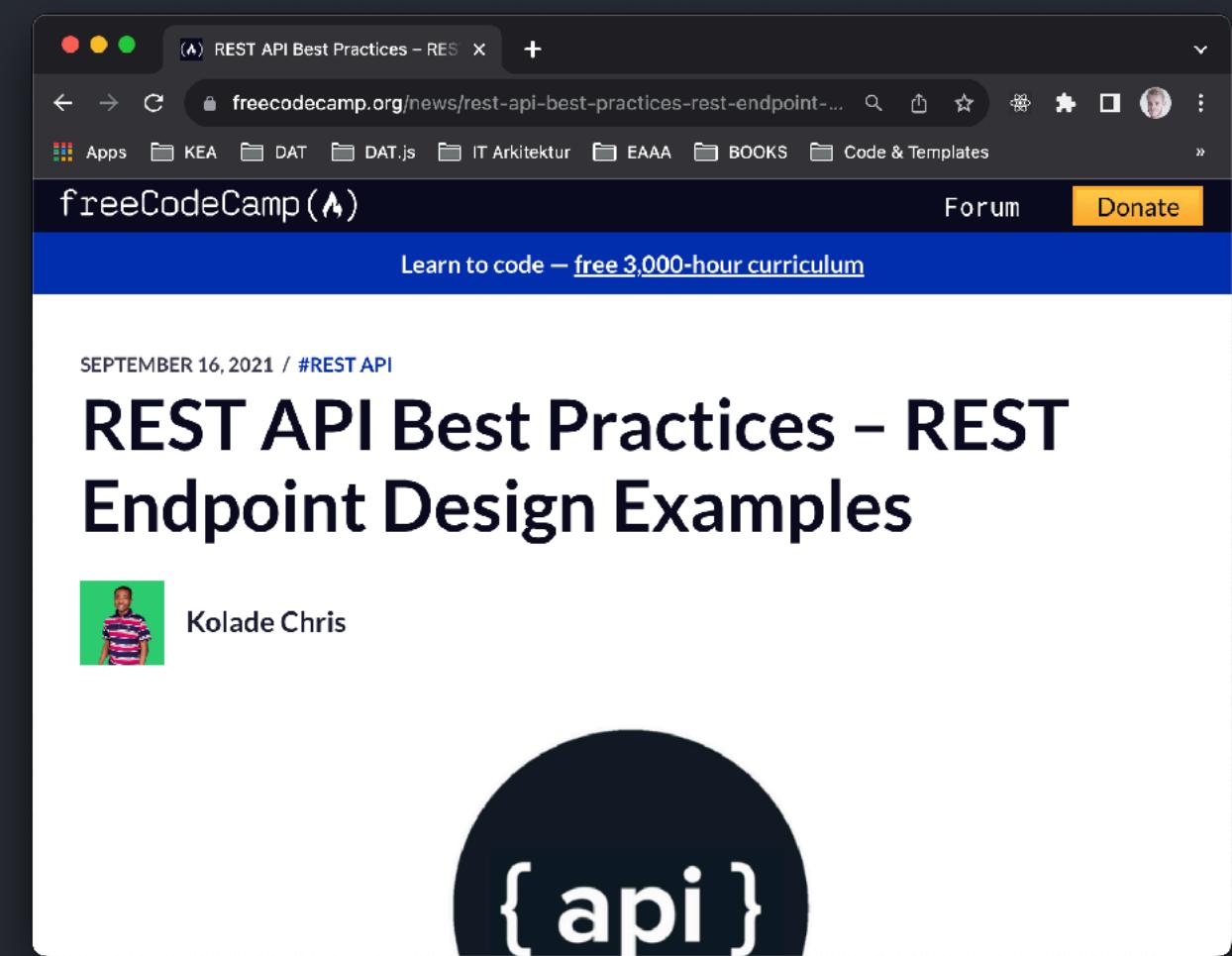
[Dataforsyningen REST API](#)

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

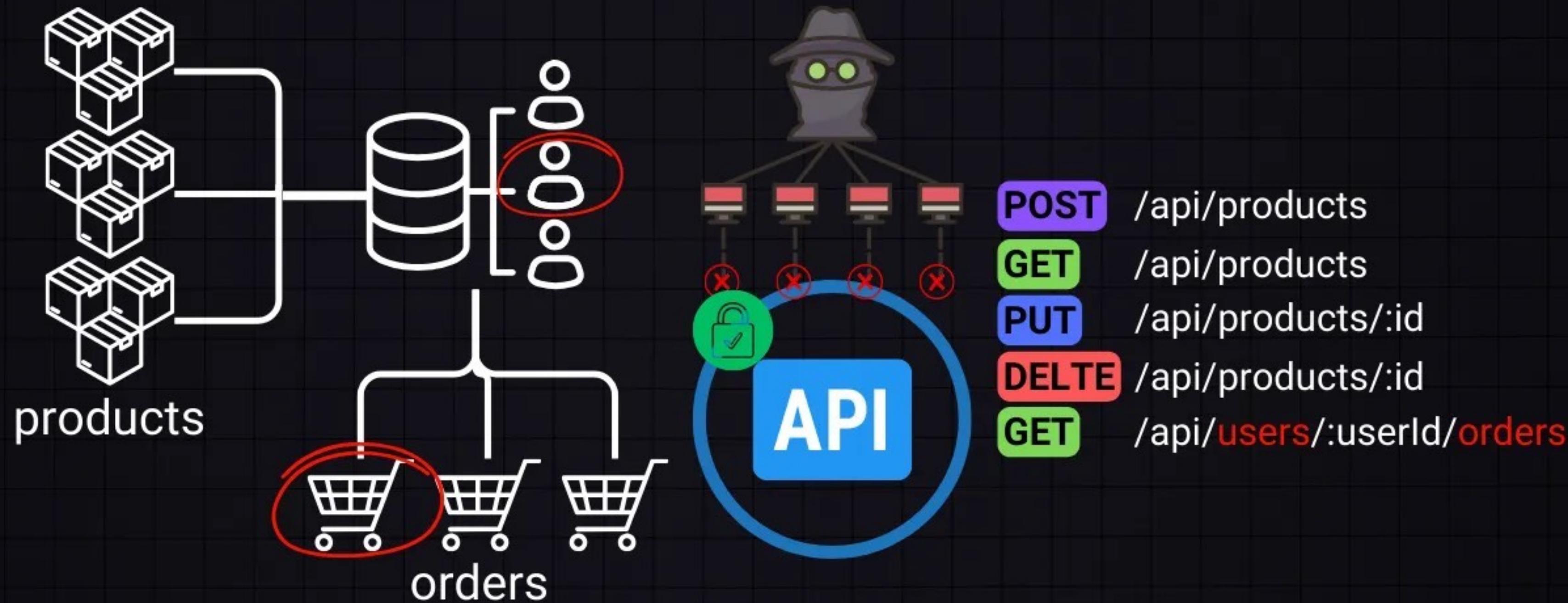


<https://stackoverflow.blog/2020/03/02/best-practices-for-rest-api-design/#h-cache-data-to-improve-performance>



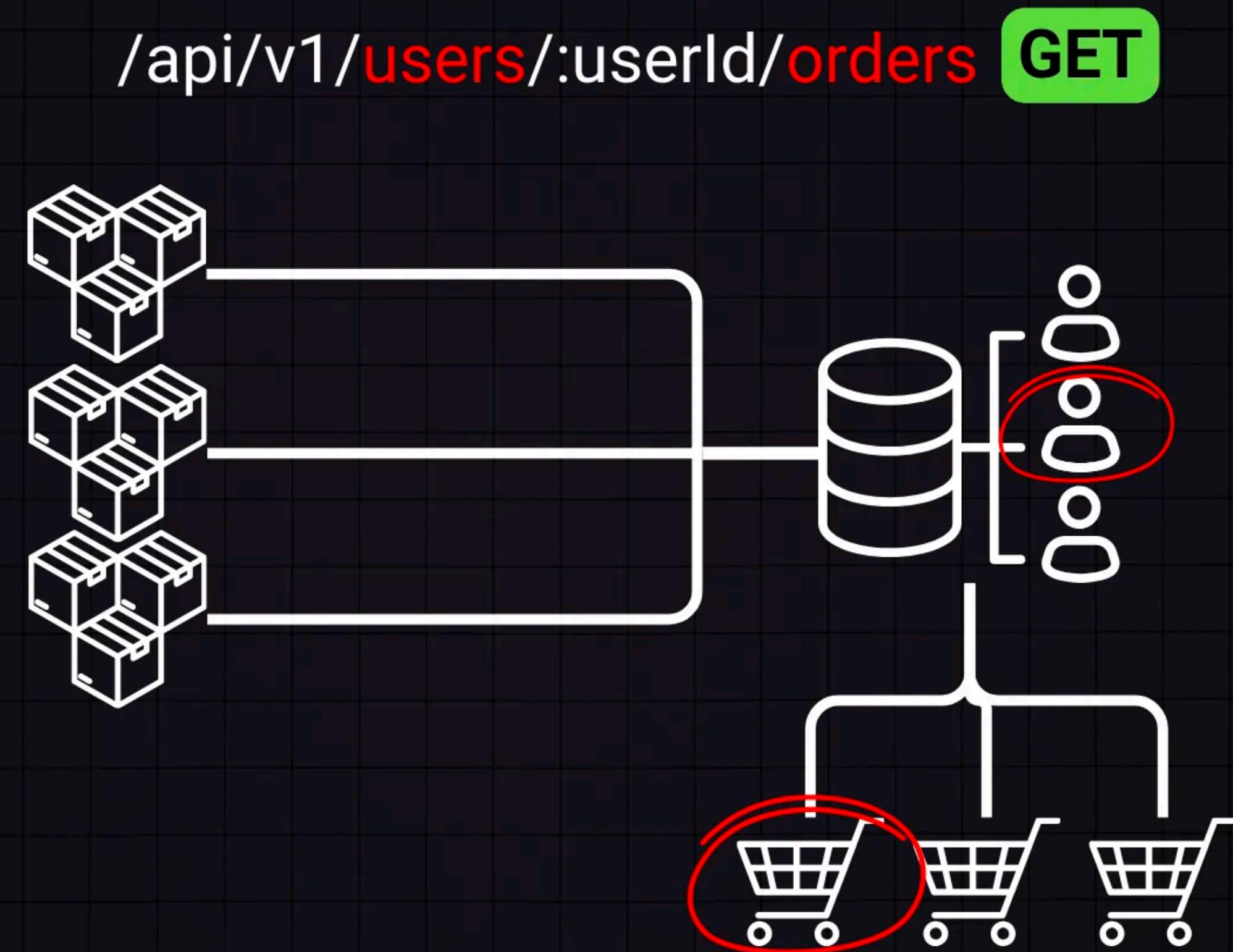
<https://www.freecodecamp.org/news/rest-api-best-practices-rest-endpoint-design-examples/>

API DESIGN



API Design 101: From Basics to Best Practices

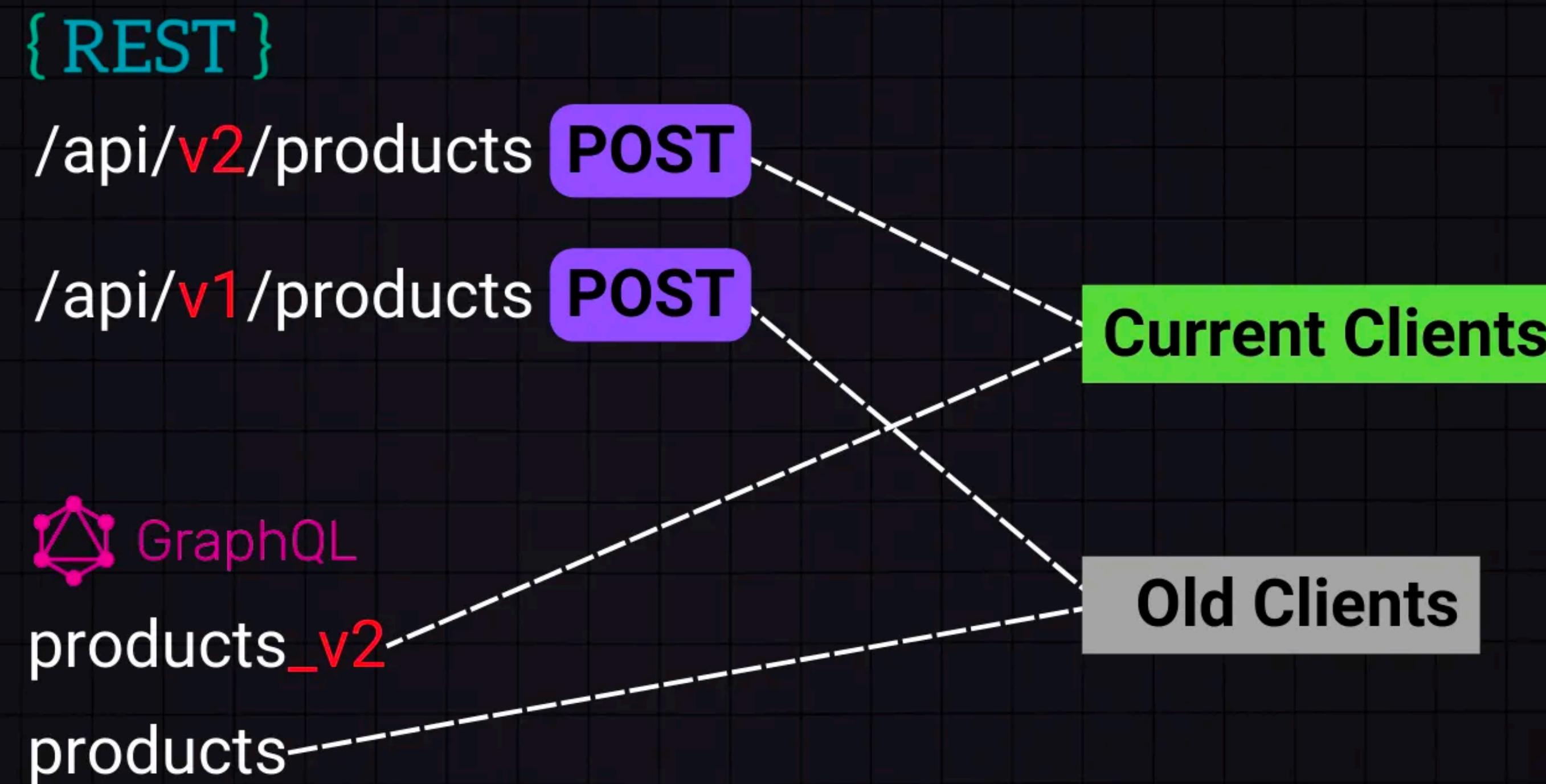
Relationships in API Design



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

CRUD vs REST & HTTP Verbs

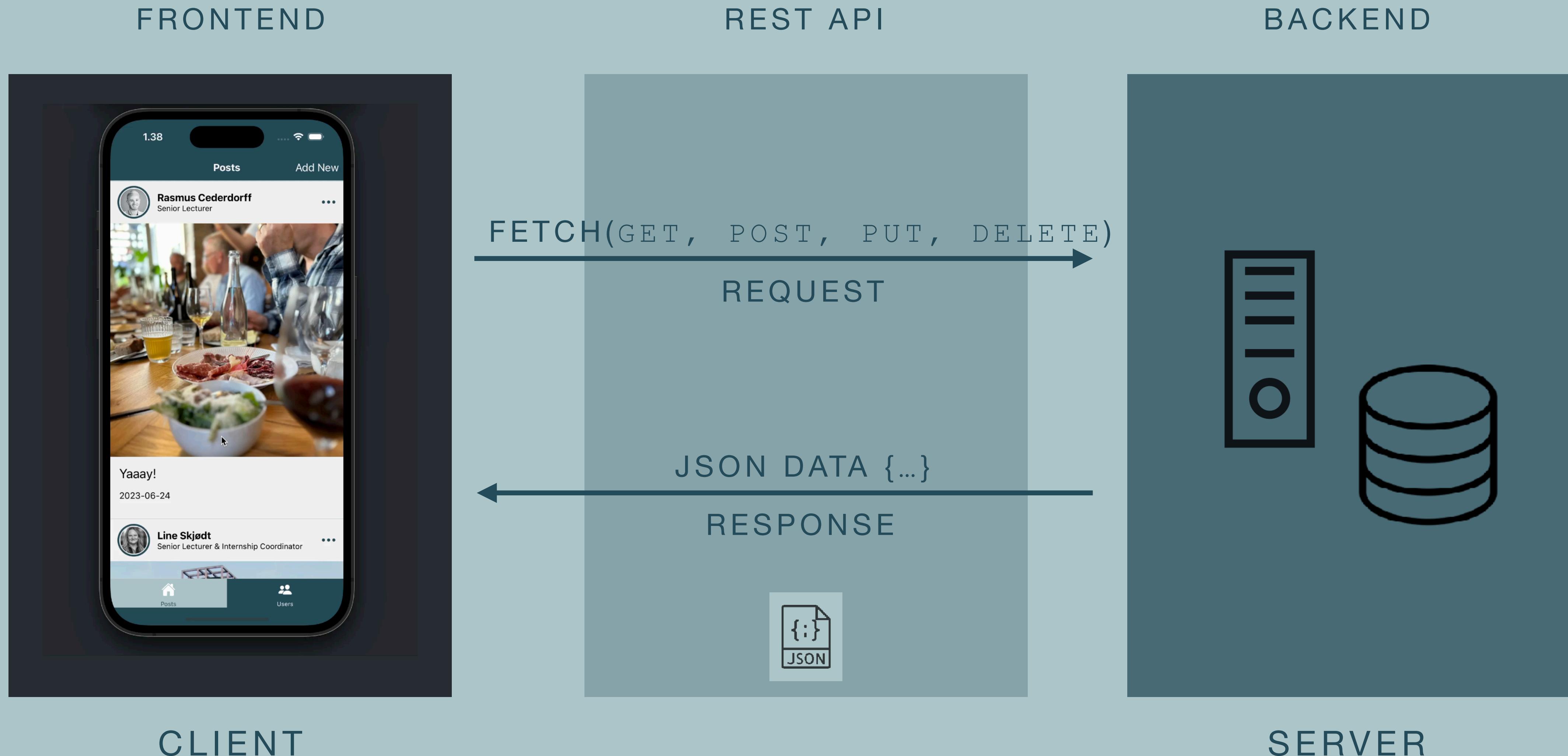
CREATE -> POST: create a new resource (object)

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

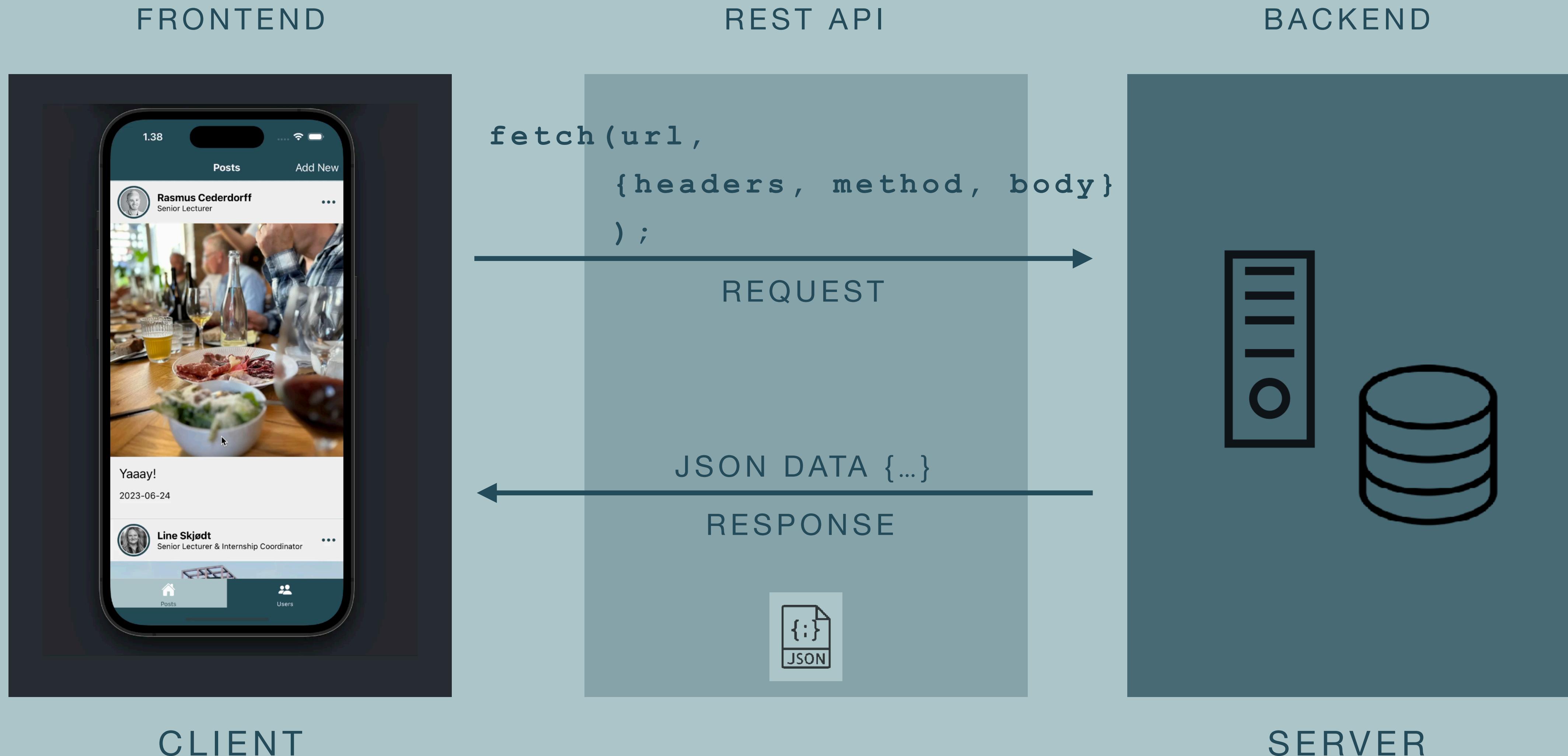
UPDATE -> PUT: update a specific resource (by id)

DELETE -> DELETE: remove a specific resource by id

HTTP Request & Response



HTTP Request & Response

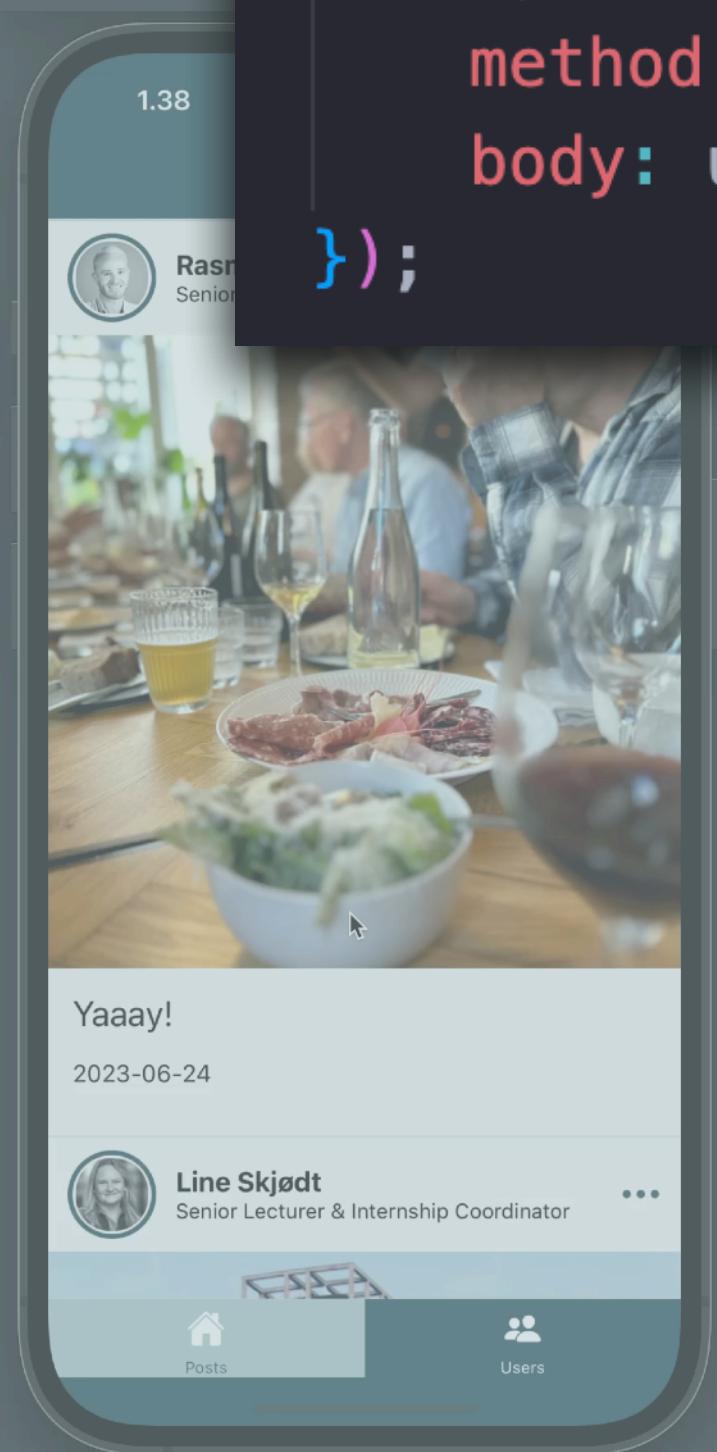


HTTP Requests & Response

```
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
});
```

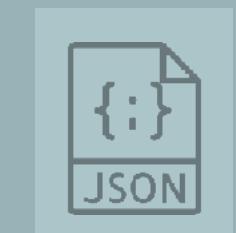
FR



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

REQUEST headers

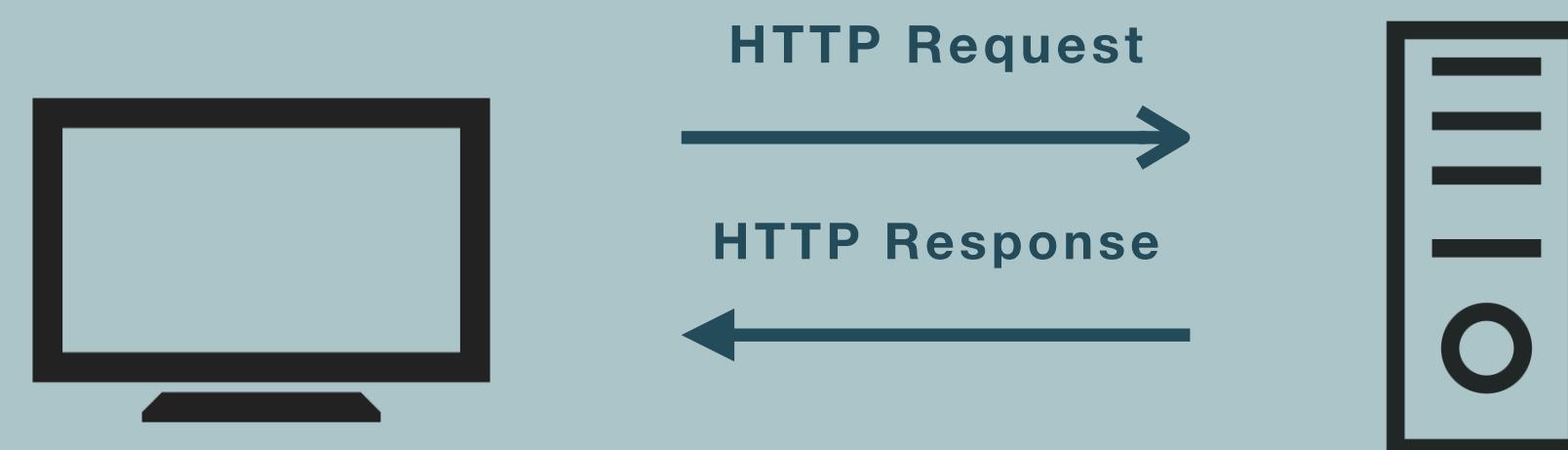
```
const response = await fetch("http://localhost:3333/users", {
  headers: {
    "Content-Type": "application/json"
  },
  method: "POST",
  body: userAsJson
});
```

```
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

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 representing one of the JSON objects. Each component includes a small profile picture, the name, job title, and email address.

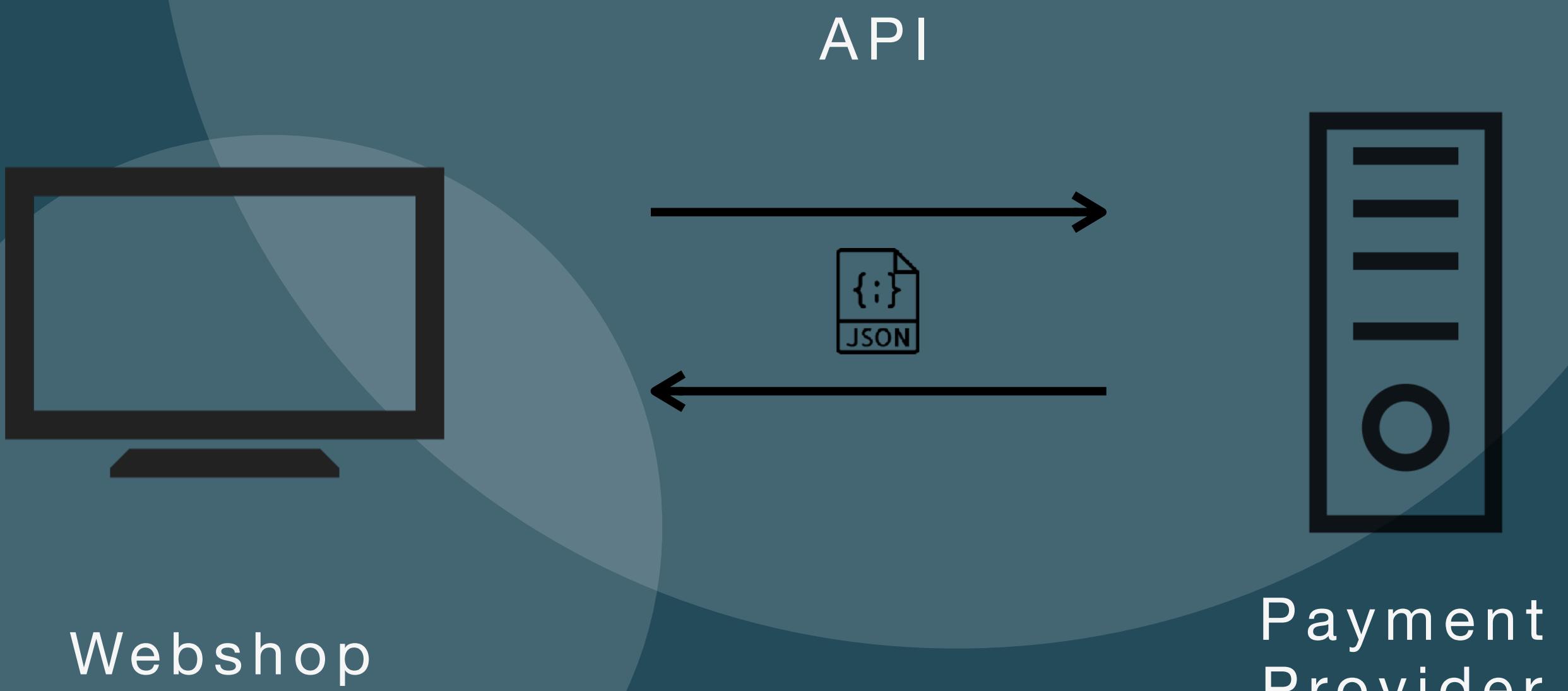
- Cecil Mccallum**
Operations
cecil@mail.com
- Romy Brandt**
Lead of Engineering
romy@mail.com
- Iona Cherry**
Developer
iona@mail.com

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.

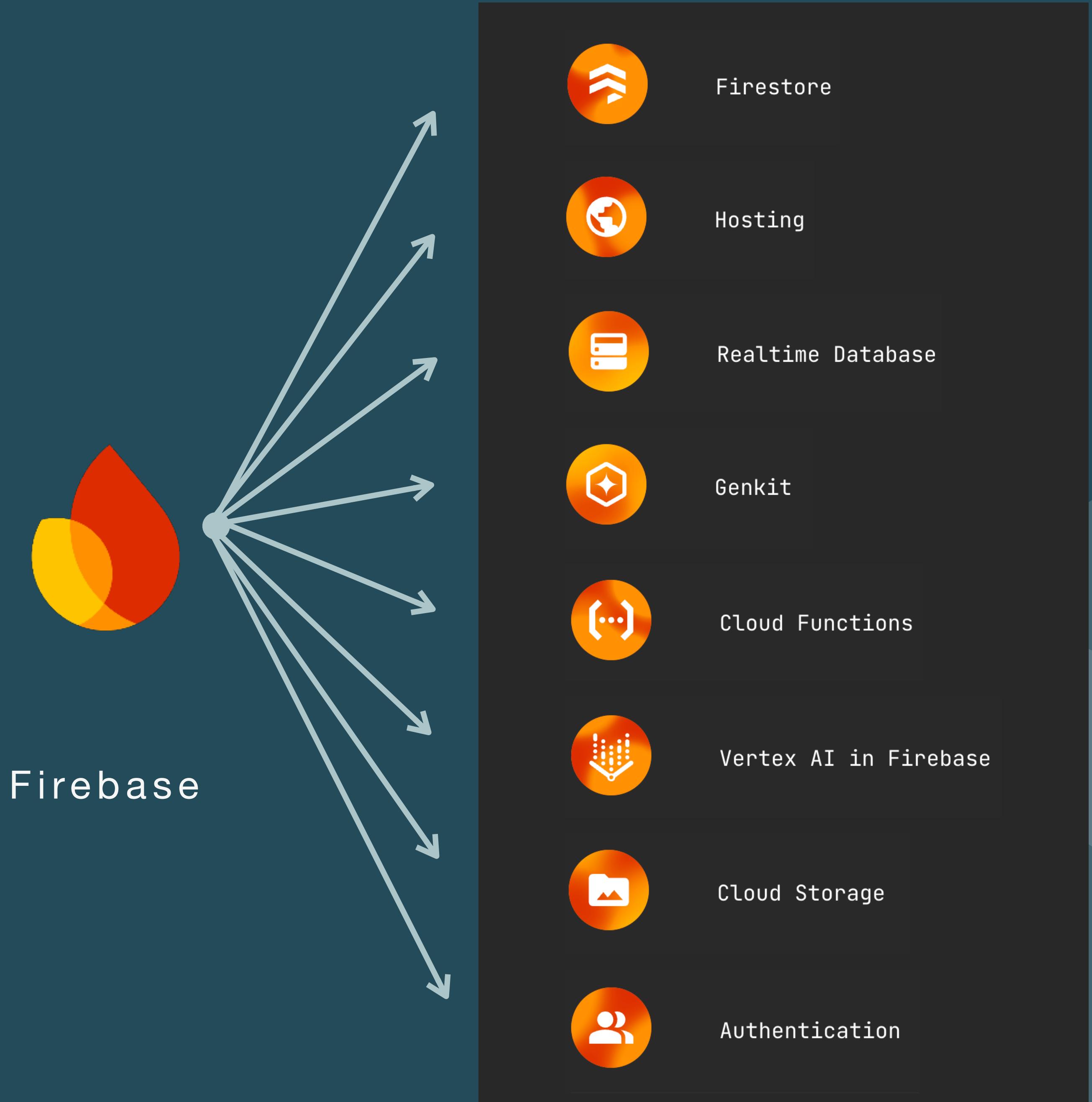
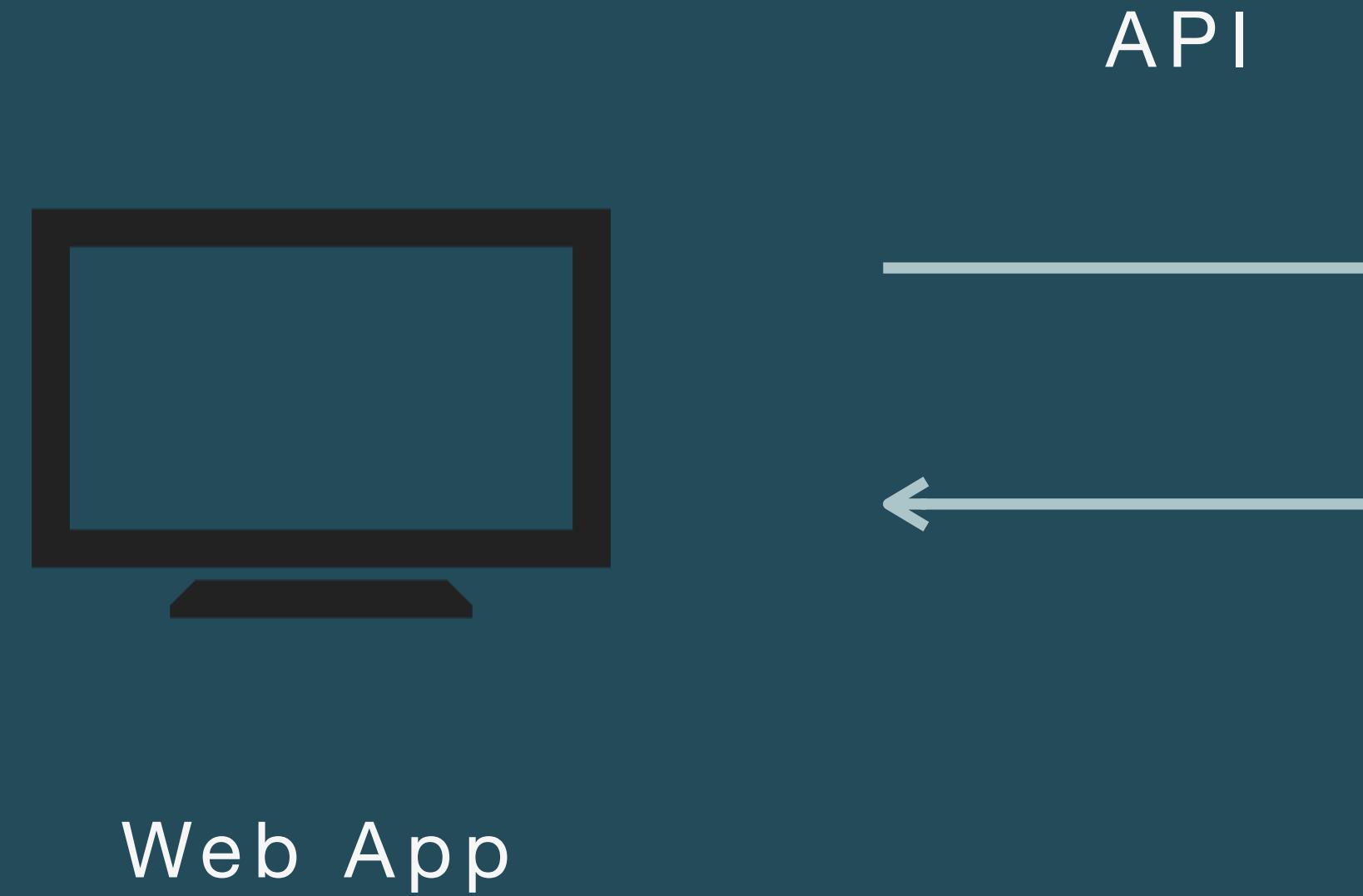


Web App

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

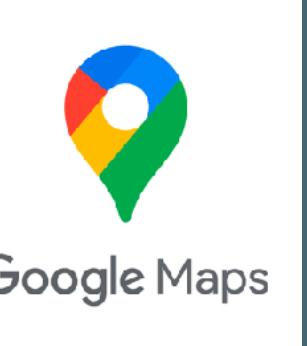
- Companies monetize APIs as products (e.g., Twilio for messaging, Google Maps for location services).
- Shift from standalone software to interconnected digital ecosystems.
- Key insight: APIs create new revenue streams and business opportunities.



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

