PYCASCADES 2022

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# Building Elegant API Contracts

## From Zero to Hero

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# Points for discussion

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# Application Programming Interface (API)

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# ELEMENTS AND PRINCIPLES

## PURPOSE

Identify the demands of the end developer, build your service with enough methods to handle the majority of needed requests, and make all parameters discoverable and well-defined in API documentation.

## USABILITY

The API representation should be intuitive, the interactions should be as simple as feasible, and the operations should execute smoothly, allowing for faster and easier attainment of the desired objectives. As a result, the system as a whole must be consistent, adaptive, and discoverable.

## CONSTRAINTS

Impose limits for successful API design if they assist you to develop your product. It's worth examining if one can make appropriate design concessions to optimize product delivery from your end, such as restricting API calls to better scalability or enabling asynchronous returns to improve performance.

# Stateless vs Stateful

STATELESS API DESIGN

Stateless API integration in restful apis is a standard that enforces scalability through interoperability with contemporary architectures and promotes an agile approach. Furthermore, stateless allows for quicker upgrades and version deployments, as well as seamless integration with HTTP protocols.

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# Code First vs API First

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## Code First

DELIVER SIMPLE FAST API'S

A code-first method entails creating an API from business needs and then converting that code into a machine-readable API description. It might also imply defining the API in code and then constructing an API description using comments or annotations, or even manually writing one from start.

## API First

MOCK SERVERS, POSITIVE DEV EXP.

The API is based around a contract stated in an API description language under the API First methodology. It assures the API's consistency, reusability, and broad compatibility. It gives API Design and Development teams a solid source of truth.

# Single Source of Truth

A single source of truth (SSOT) is the practice of structuring information models and associated data schema such that every data element is mastered (or edited) in only one place

~ wikipedia

# API CONTRACTS

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OPEN API, RAML, API BLUEPRINT - APIARY

## API BLUEPRINT

API Blueprint has a Markdown-like syntax, MSON compatibility, and complete support for all Apiary and open-source tooling, making it ideal for an API-first strategy.

## RAML

RAML stands for RESTful API Modeling Language, a YAML-based API modeling language that aids in the creation of API contracts and provides a well-structured and easy-to-understand framework for defining APIs.

## OPEN API (SWAGGER)

The OpenAPI Specification is a framework for defining REST API structure and terminology. OpenAPI documentation have a JSON and YAML format and are machine and human understandable, allowing anybody to quickly figure out how each API works.

## API-Design First

Open API is an API-first strategy that enables enterprises to create APIs that service all apps, allowing for easy development and maintenance across all devices, platforms, and operating systems. It also allows developers to work in parallel, lowering costs and speeding up the development process.

## Tooling

To speed up the development process, it includes documentation and the ability to prototype and work with mock servers, which may anticipate a variety of issues that may arise while using APIs and integrating systems.

## Server Stubs

OpenAPI is the REST standard that has the most code generators that support it. It builds server stubs in our preferred language, which we must then connect to our backend services and databases.

# Open API Specifications

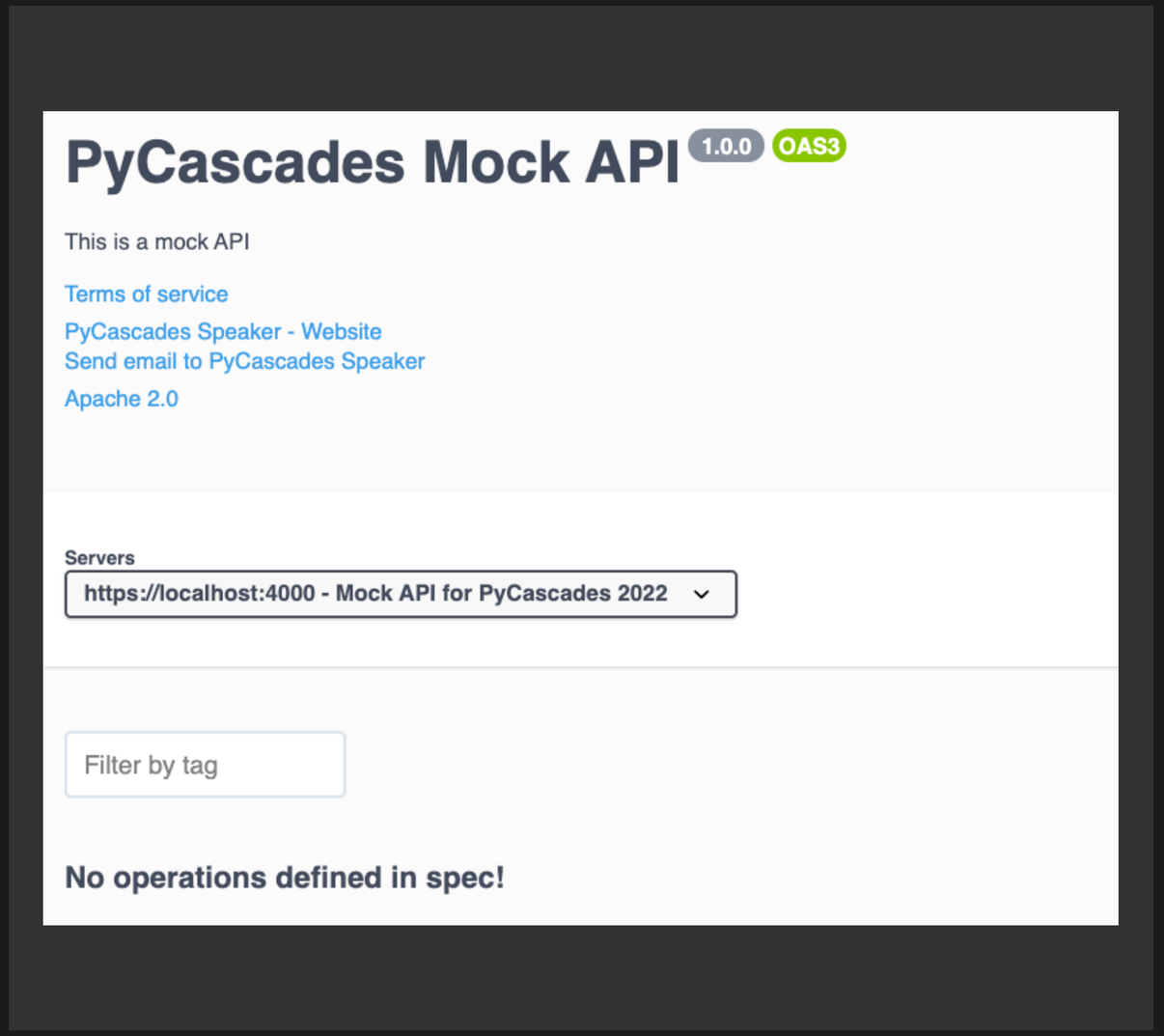
# Metadata

Incorporate basic information about your API within the specification, such as the version number, licensing comments, contact information, documentation links, and so on.

```yaml
openapi: 3.0.0
servers:
  - description: Mock API for PyCascades 2022
    url: https://localhost:4000
info:
  description: This is a mock API
  termsOfService: http://example.com/terms
  version: "1.0.0"
  title: PyCascades Mock API
  contact:
    name: PyCascades Speaker
    email: you@your-company.com
    url: https://example.com/speakeremail
  license:
    name: Apache 2.0
    url: 'http://www.apache.org/licenses/LICENSE-2.0.html'
```

METADATA

# Metadata Output




METADATA OUTPUT

# Path Objects

Each endpoint's relative paths and actions are stored in the Path Object.

```yaml
paths:
  /:
    get:
      operationId: get-talks
      summary: Returns a list of talks.
      description: Returns a list of talks.
      tags:
        - Talks
```

# Parameters

To describe a parameter, you specify its name, location (in), data type (defined by either schema or content) and other attributes, such as description or required.

```yaml
parameters:
    - name: listSize
      in: query
      description: Desired length
      schema:
      type: integer
      format: int32
      default: 1
      minimum: 1
      maximum: 100
```

# $ref object

Allows for a referenced definition of this path item. The referenced structure MUST be in the form of a Path Item Object.

```yaml
# Parameters
parameters:
    - $ref: '#/components/parameters/listSize'


components:
  parameters:
    listSize:
      in: query
      description: Desired length
      name: listSize
      schema:
        type: integer
        format: int32
        default: 1
        minimum: 1
        maximum: 100
```

$REF OBJECT BLOCK

# responses object

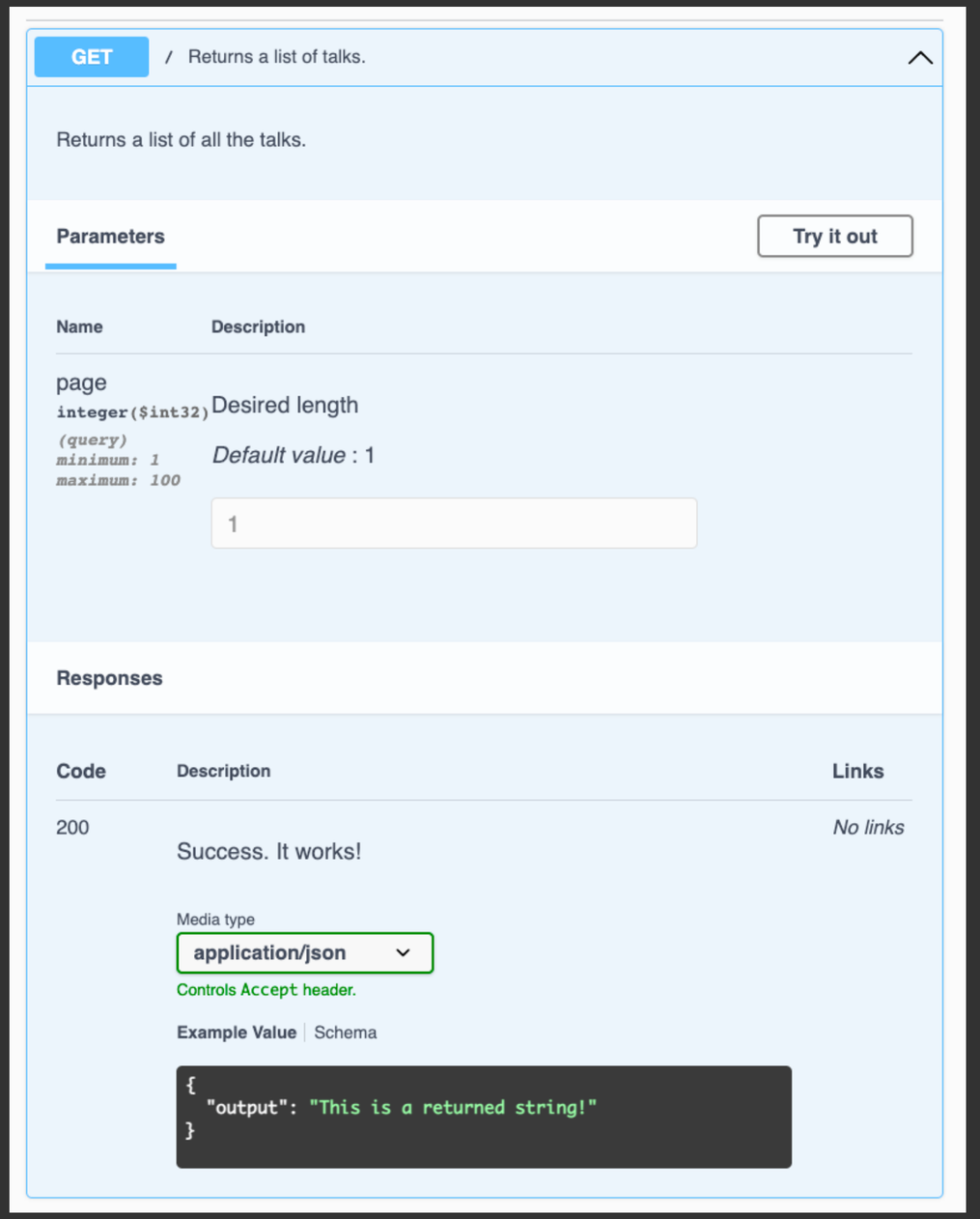
Each operation must have at least one response defined, usually a successful response. A response is defined by its HTTP status code and the data returned in the response body and/or headers

```yaml
responses:
        '200':
          description: Success. It works!
          content:
            application/json:
              schema:
                type: object
                properties:
                  output:
                    type: string
                    example: This is a returned string!
```

# path all-together

```yaml
paths:
  /:
    get:
      operationId: get-talks
      summary: Returns a list of talks.
      description: Returns a list of all the talks.
      tags:
        - Talks
      parameters:
        - $ref: '#/components/parameters/listSize'
      responses:
        '200':
          description: Success. It works!
          content:
            application/json:
              schema:
                type: object
                properties:
                  output:
                    type: string
                    example: This is a returned string!

components:
  parameters:
    listSize:
      in: query
      description: Desired length
      name: page
      schema:
        type: integer
        format: int32
        default: 1
        minimum: 1
        maximum: 100
```

# Path Block Output



# Conference Voting

Mock API

/

/talk/{id}

/vote/{id}

SIMPLE API TO CAST VOTE FOR YOUR FAVOURITE TALK

# Mock Voting App

## Metadata



```yaml
openapi: 3.0.0
info:
    title: PyCascades Voting
    version: ""
    description: Vote for the talks you liked at PyCascades 2022
    contact:
        name: Neeraj Pandey
        email: neerajemail@email.com
        url: https://twitter.com/neerajp99
    license:
        name: XYZ License
        url: https://licence.xyz.com
servers:
    -   url: http://localhost:8000
        description: Local dev server
tags:
    -   name: details
        description: All details of the talks
    -   name: detail_single
        description: Detail of a single talk
    -   name: upvote
        description: Upvote a talk
```

# Mock Voting App

Path

/

```yaml
'/':
    get:
        tags:
            -   details
        summary: fetches talks list
        description: Get all the talks
        parameters:
          - name: talkLimit
            in: query
            description: Number of talks fetched in a single request
            schema:
                type: integer
                minimum: 1
                maximum: 50
                example: 4
        responses:
            '200':
                description: It works!
                content:
                    application/json:
                        schema:
                            type: array
                            items:
                                properties:
                                    talk_id:
                                        type: string
                                        example: pycascades2022-talk01
                                    talk_name:
                                        type: string
                                        example: Talk Title
                                    talk_speaker:
                                        type: string
                                        example: Neeraj Pandey
                                    talk_pitch:
                                        type: string
                                        example: Talk Description goes here

            '404':
                description: No talk found on this url!
```

# Mock Voting App

Path

/talk/{id}

```yaml
'/talk/{id}':
        get:
            tags:
                -   detail_single
            summary: fetch the current talk using talk id
            description: Get details of the current talk
            parameters:
                -   name: id
                    required: true
                    in: path
                    description: ID of the talk
                    schema:
                        type: string
            responses:
                '200':
                    description: It works!
                    content:
                        application/json:
                            schema:
                                type: object
                                properties:
                                    talk_id:
                                        type: string
                                        example: pycascades2022-talk01
                                    talk_name:
                                        type: string
                                        example: Talk Title
                                    talk_speaker:
                                        type: string
                                        example: Neeraj Pandey
                                    talk_pitch:
                                        type: string
                                        example: Talk Description2

                '4XX':
                    description: Talk not found!
                    content:
                        application/http-problems: {}
```

# Mock Voting App

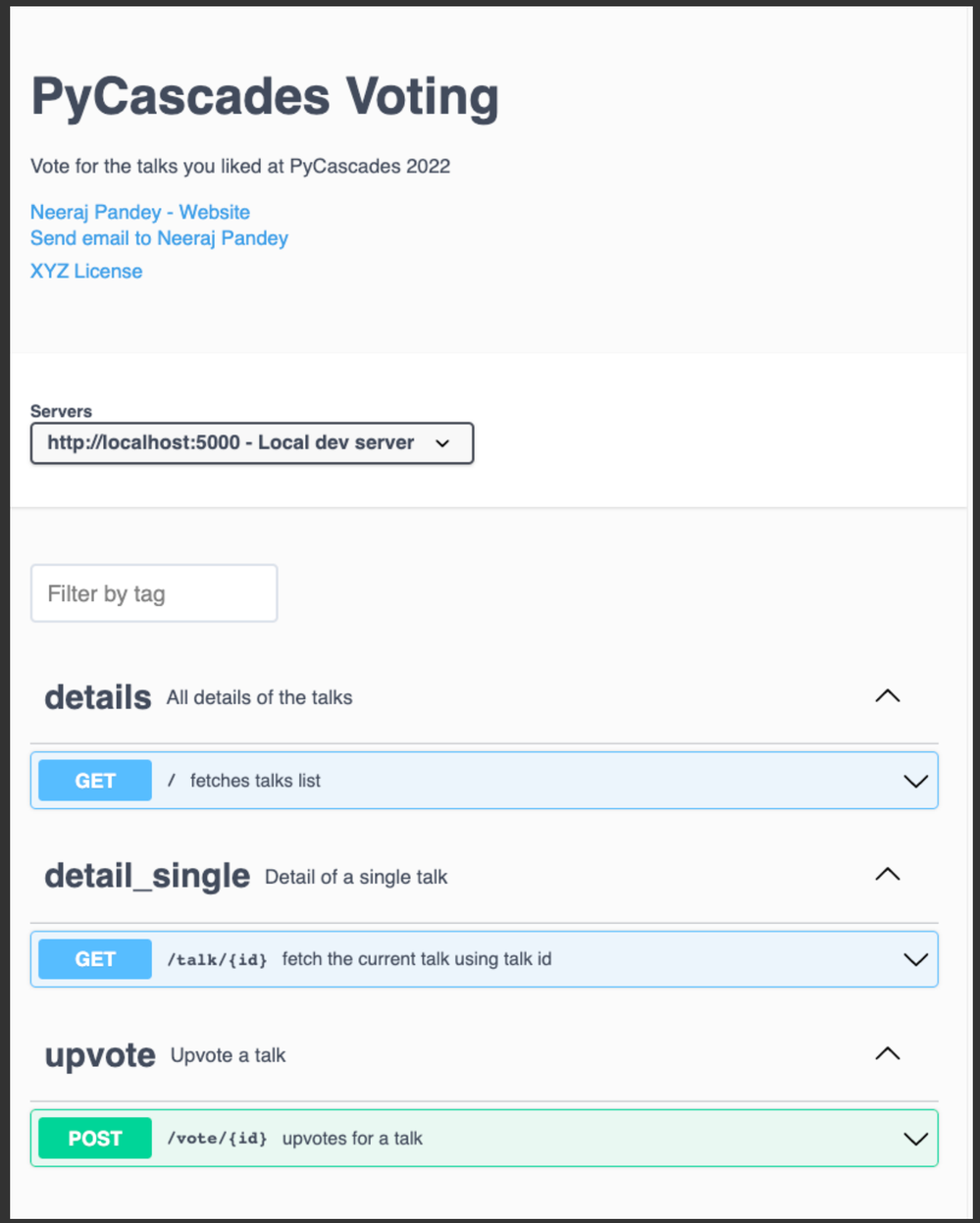
Path

/vote/{id}

```yaml
'/vote/{id}':
    post:
        tags:
            -   upvote
        summary: upvotes for a talk
        description: Cast a vote for the given talk
        parameters:
            -   name: id
                required: true
                in: path
                description: ID of the talk
                schema:
                    type: string
        requestBody:
            required: true
            content:
                application/json:
                    schema:
                        type: object
                        properties:
                            talk_id:
                                type: string
                                example: pycascades2022-talk01
        responses:
            '200':
                description: Your vote has been successfully cast.
            '400':
                description: Invalid input
            '422':
                description: You have already voted for this talk!
            '404':
                description: Talk not found!
```

# Mock Voting App

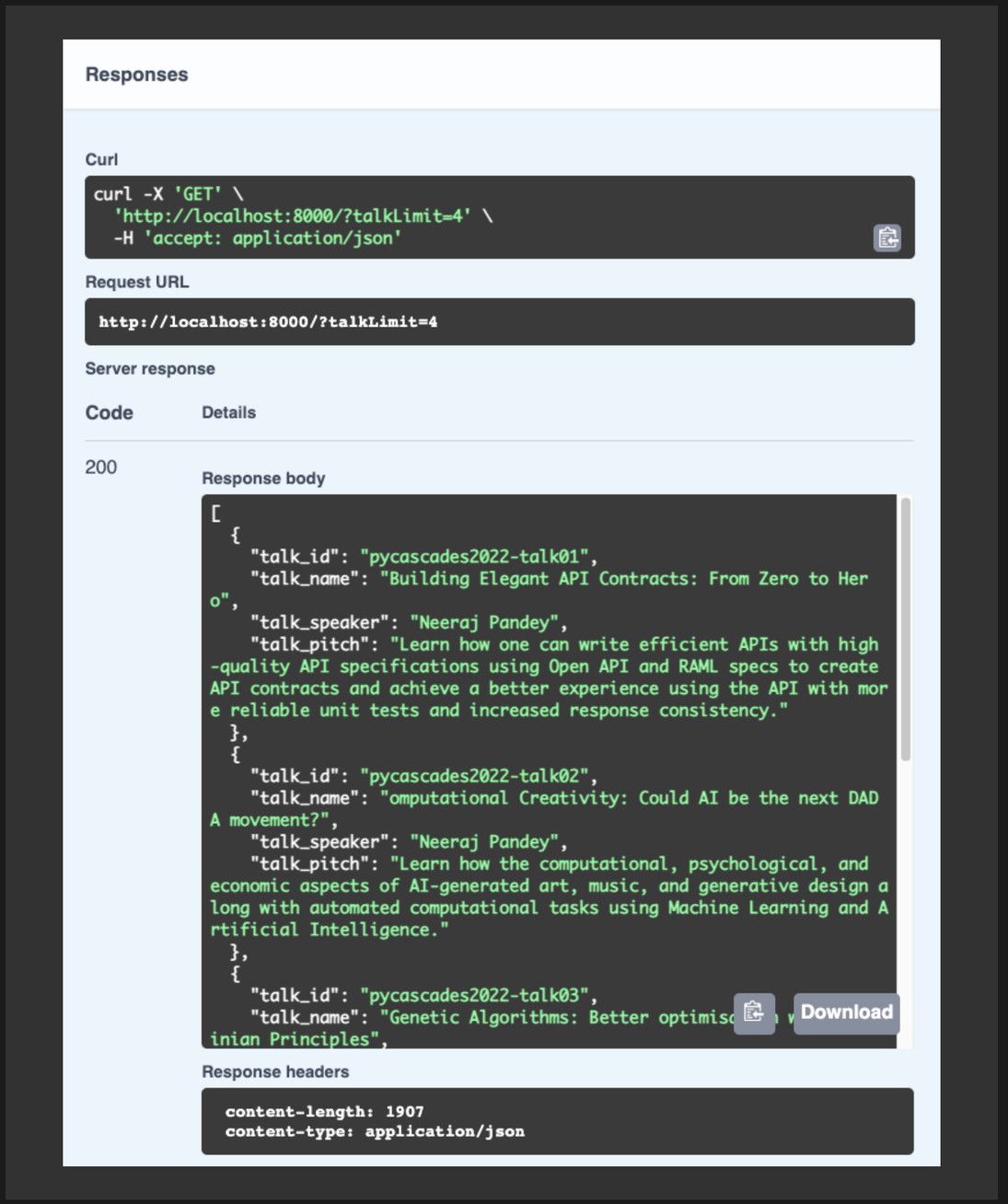
## Swagger UI

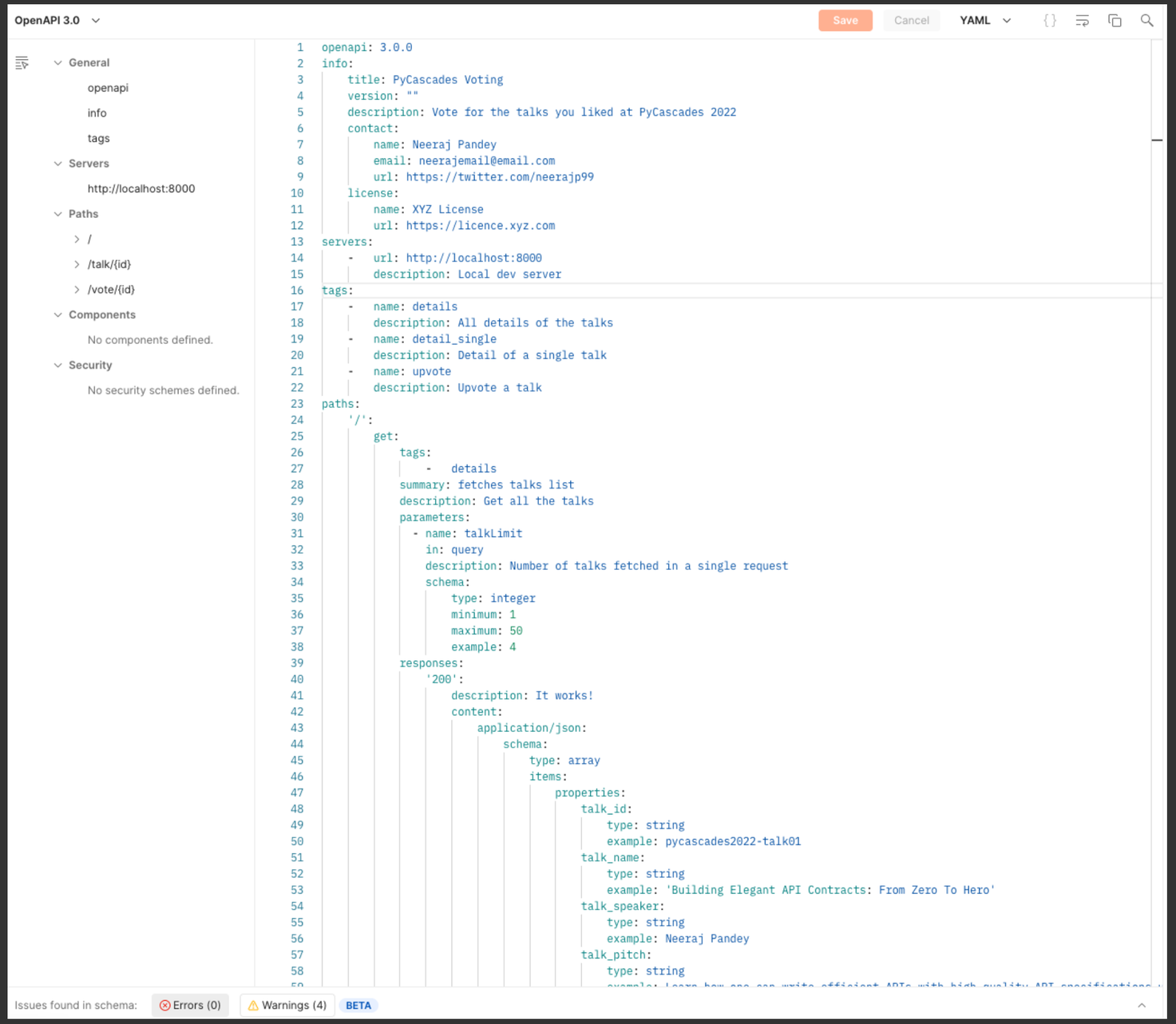


# Mock Voting App

Executing

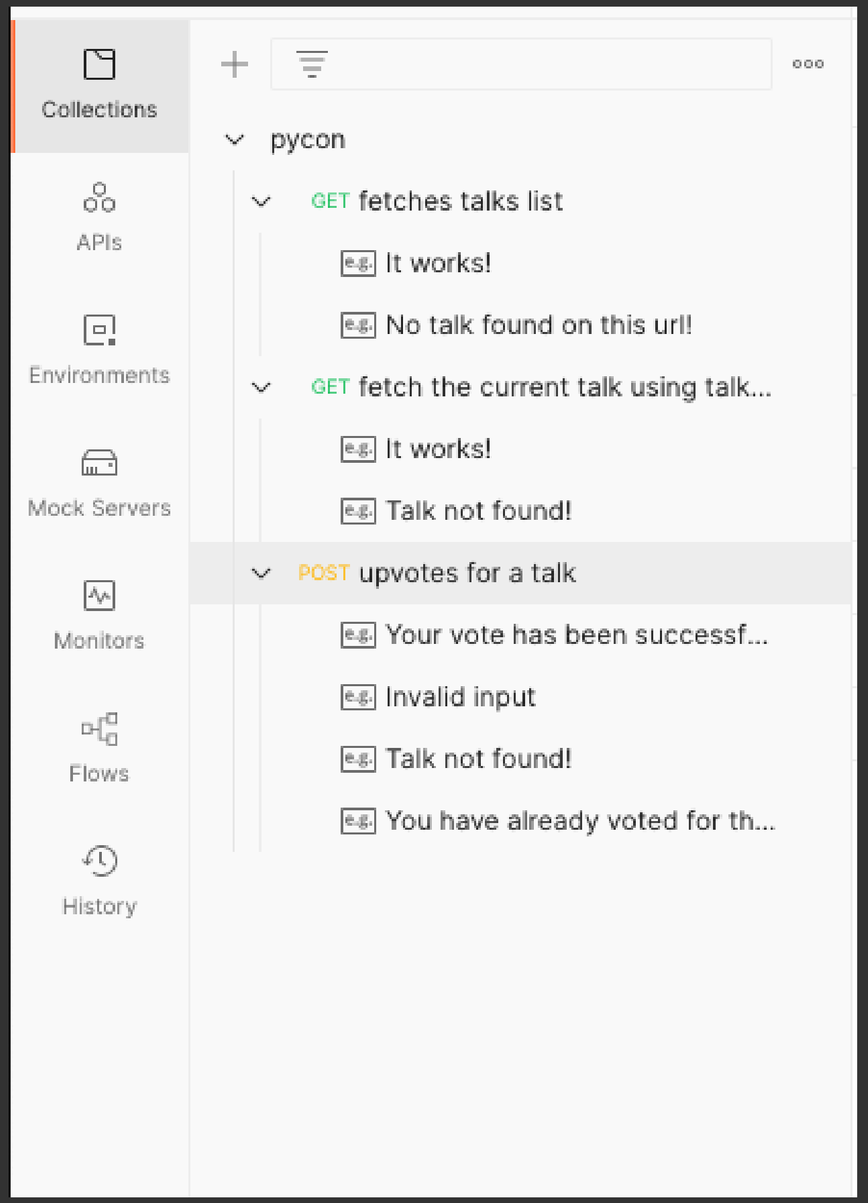
GET /




OpenAPI 3.0
Save
Cancel
YAML
General
openapi
info
tags
Servers
http://localhost:8000
Paths
/
/talk/{id}
/vote/{id}
Components
No components defined.
Security
No security schemes defined.
openapi: 3.0.0
info:
title: PyCascades Voting
version: ""
description: Vote for the talks you liked at PyCascades 2022
contact:
name: Neeraj Pandey
email: neerajemail@email.com
url: https://twitter.com/neerajp99
license:
name: XYZ License
url: https://licence.xyz.com
servers:
- url: http://localhost:8000
description: Local dev server
tags:
- name: details
description: All details of the talks
- name: detail_single
description: Detail of a single talk
- name: upvote
description: Upvote a talk
paths:
'/':
get:
tags:
- details
summary: fetches talks list
description: Get all the talks
parameters:
- name: talkLimit
in: query
description: Number of talks fetched in a single request
schema:
type: integer
minimum: 1
maximum: 50
example: 4
responses:
'200':
description: It works!
content:
application/json:
schema:
type: array
items:
properties:
talk_id:
type: string
example: pycascades2022-talk01
talk_name:
type: string
example: 'Building Elegant API Contracts: From Zero To Hero'
talk_speaker:
type: string
example: Neeraj Pandey
talk_pitch:
type: string
Issues found in schema:
Errors (0)
Warnings (4)
BETA

# Mock Voting App

Mock Sever
Postman



# Fast API

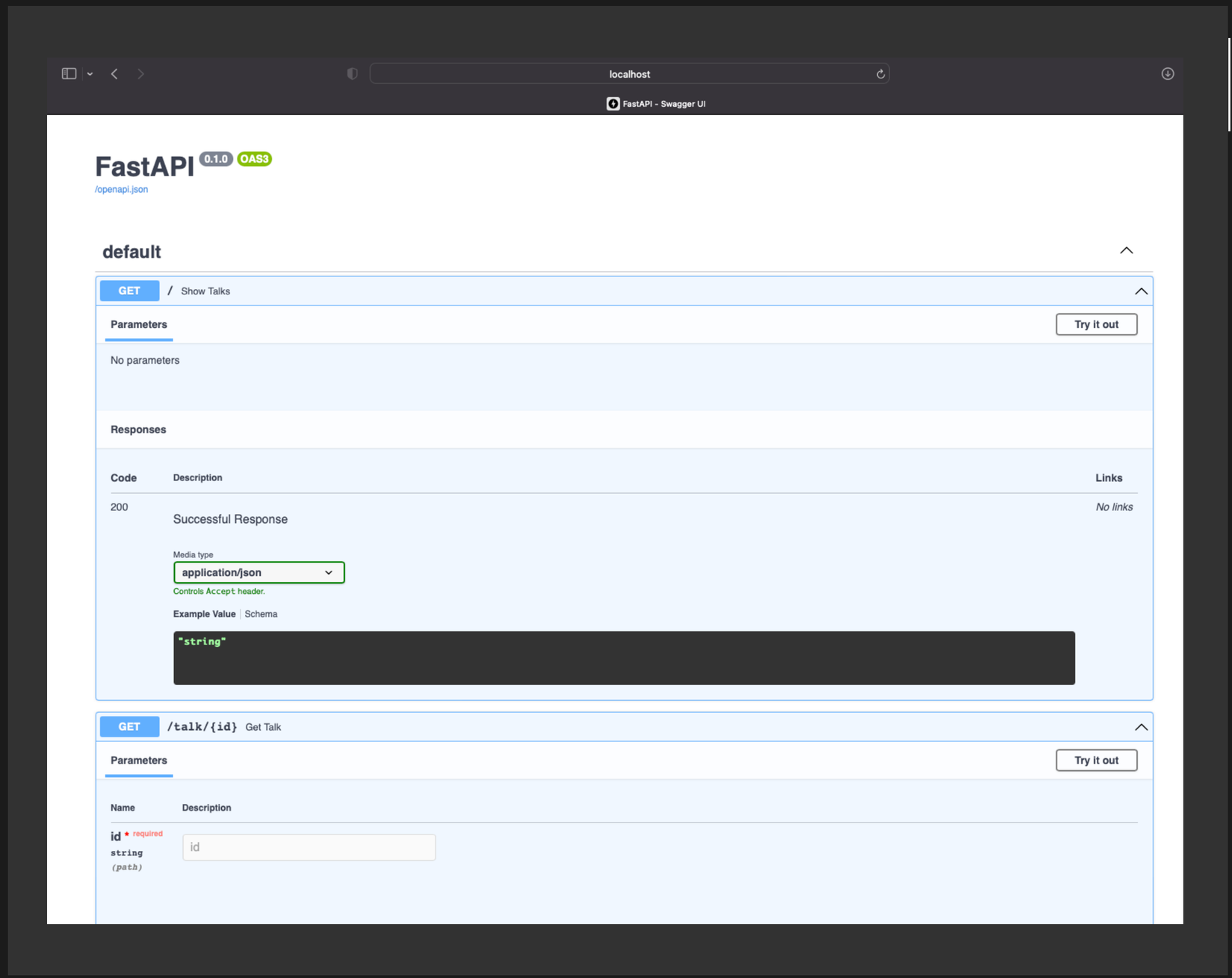


```python
db = json.load(open('db.json'))

@app.get("/", status_code=200)
def show_talks():
    return db

# Create a method that takes in talk id and returns the talk object from the db.json
@app.get("/talk/{id}")
def get_talk(id: str):
    try:
        for talk in db:
            if talk['talk_id'] == id:
                return JSONResponse (
                    status_code = 200,
                    content = {"talk": talk}
                )
        return JSONResponse(status_code=404, content={"Talk not found"})
    except:
        raise HTTPException(status_code=404, detail="Talk not found")
        return {"error": "Talk not found"}
```

ROUTE TO GET A TALK DETAILS BY TALK ID

Fast API comes with pre built Swagger UI based on the open standards for APIs: OpenAPI and JSON Schema.

{baseURL}/docs



# FLASK APP



```
from flask_cors import CORS
from typing import Optional
from apispec import APISpec
from apispec.ext.marshmallow import MarshmallowPlugin
from apispec_webframeworks.flask import FlaskPlugin
from flask import Flask, jsonify, render_template, send_from_directory, Response
from marshmallow import Schema, fields
from werkzeug.exceptions import HTTPException
import json

app = Flask(__name__)

# Import the json object from the db.json
import json
db = json.load(open('db.json'))
print(db[0])


spec = APISpec(
    title="Conference Voting",
    version="1.0.0",
    openapi_version="3.0.0",
    plugins=[FlaskPlugin(), MarshmallowPlugin()]
)
```

ROUTE TO GET A TALK DETAILS BY TALK ID

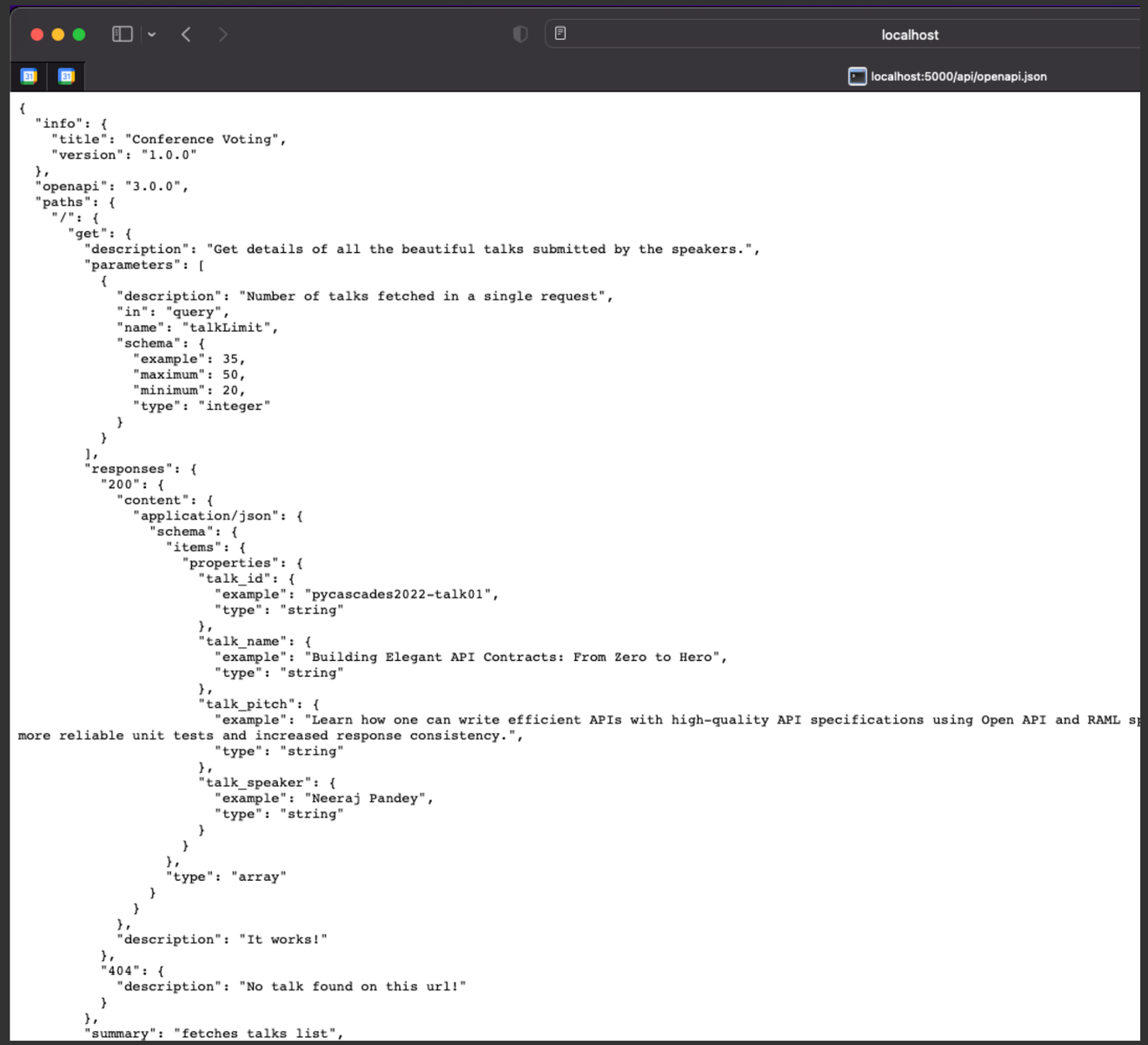
With Flask, we can use multiple external libraries to add the Swagger UI.

```python
@app.route("/talk/<id>", methods=['GET'])
def get_talk(id: str):
    """Get talk by talk id
    ---
    get:
        description: Get talk by talk id
        responses:
            200:
                description: Talk found
                content:
                    application/json:
                        schema:
                            type: object
                            properties:
                                talk_id:
                                    type: string
                                    example: pycascades2022-talk01
                                talk_name:
                                    type: string
                                    example: Talk Title
                                talk_speaker:
                                    type: string
                                    example: Neeraj Pandey
                                talk_pitch:
                                    type: string
                                    example: Talk Description
            '4XX':
                    description: Talk not found!
                    content:
                        application/http-problems: {}


    """
    try:
        for talk in db:
            print('talk: ', talk)
            if talk['talk_id'] == id:
                return Response(
                    response=json.dumps(talk),
                    status=201,
                    mimetype='application/json'
                )
        return Response("Talk not found!", status=404, mimetype='application/json')
    except:
        return Response("Talk not found!", status=404, mimetype='application/json')
```

# Route for the Swagger UI

```python
@app.route('/api/openapi.json')
def create_openapi_json():
    return jsonify(spec.to_dict())

with app.test_request_context():
    spec.path(view=show_talks)
    spec.path(view=get_talk)
    spec.path(view=create_openapi_json)

if __name__ == "__main__":
    CORS(app)
    app.run(debug=True)
```

{baseURL}/api/openapi.json



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# Thank You

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