Why FastAPI?

INTRODUCTION TO FASTAPI

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What is FastAPI?

Let's start with some terminology

1. **API:** Application Programming Interface - refers to web applications using the HTTP protocol to transmit structured data
2. **Web Application:** application that serves traffic over the web
3. **Web Framework:** software framework that helps build web applications

FastAPI is a fast way to build high-performance APIs using Python

FastAPI key features

- **Fast:** Very high performance
- **"Low code" and easy to learn:** Python annotations and type hints
- **Robust:** Production-ready code with autodoc
- **Standards-based:** Based on OpenAPI and JSON Schema

JSON Schema

[1] https://fastapi.tiangolo.com/

FastAPI vs. other Python web frameworks

Flask

- Build web-based (GUI) apps
- ORM optional

FastAPI

- Build APIs
- ORM optional

Django

- Build web-based (GUI) apps
- ORM built in

Key differences

- For APIs without database operations
- Data and machine learning transactions

Building our first web application with FastAPI

1. Install FastAPI

```
pip install fastapi
```

2. Create your app in `main.py`

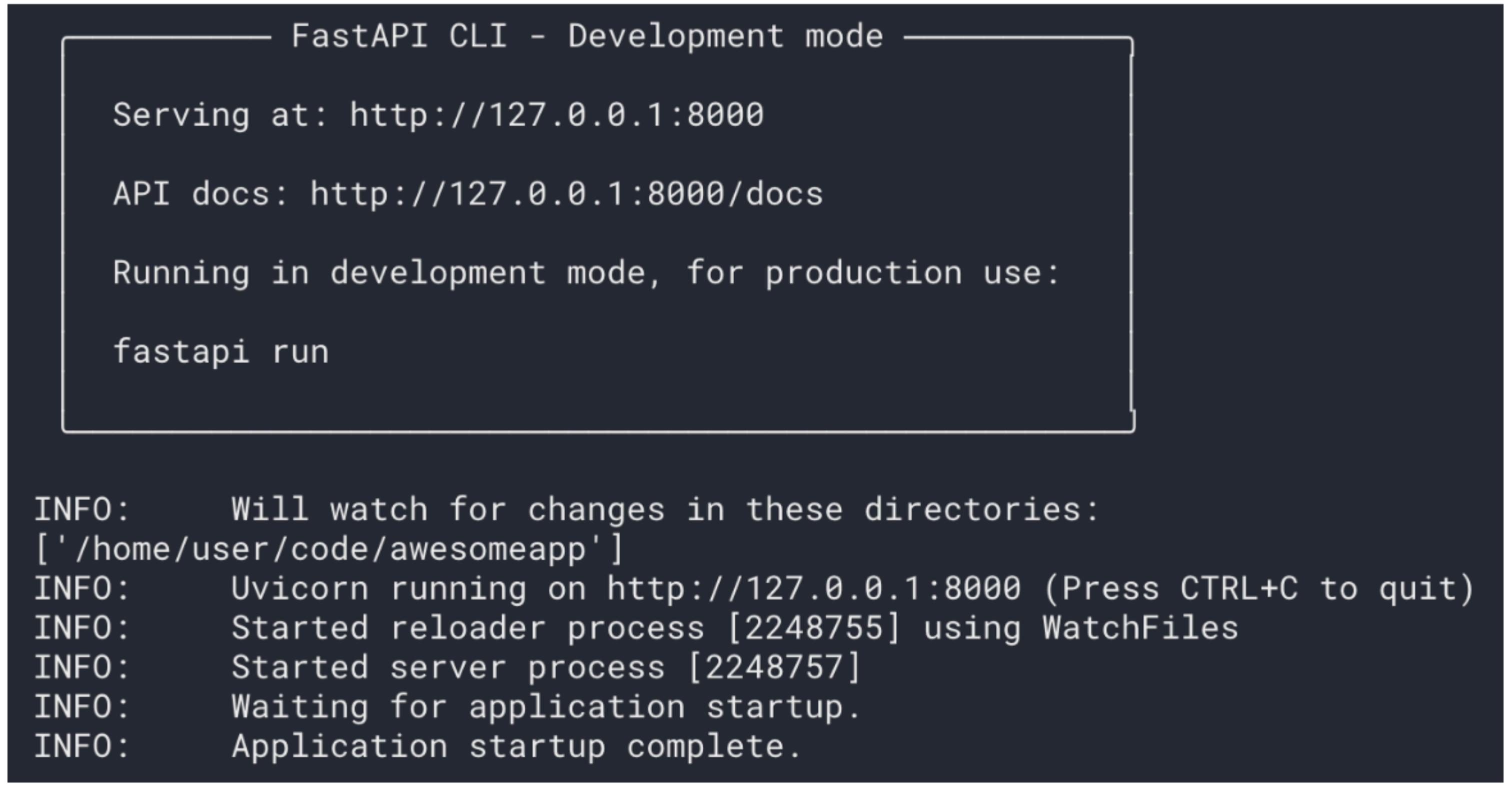
```python
from fastapi import FastAPI

app = FastAPI()

@app.get("/")
def read_root():
    return {"message": "Hello World"}
```

3. Run the server

```
fastapi dev main.py
```



```
 ┌────────── FastAPI CLI - Development mode ──────────┐
 │                                                     │
 │  Serving at: http://127.0.0.1:8000                  │
 │                                                     │
 │  API docs: http://127.0.0.1:8000/docs               │
 │                                                     │
 │  Running in development mode, for production use:   │
 │                                                     │
 │  fastapi run                                        │
 │                                                     │
 └─────────────────────────────────────────────────────┘

INFO:     Will watch for changes in these directories:
['/home/user/code/awesomeapp']
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     Started reloader process [2248755] using WatchFiles
INFO:     Started server process [2248757]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
```

Before we practice with FastAPI

Some notes

1. Can't run the FastAPI server with the "Run this code" button
2. Define server code in the Python editor as `main.py` instead
3. Run it from the terminal using the command `fastapi dev main.py`
4. Verify that the logs in the terminal show `Application startup complete.`
5. Stop the live server by pressing `Control + C` in the same terminal
6. You should install FastAPI in your own Python environment to get used to practicing there as well

Let's practice!

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GET operations

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GET operation review

HTTP protocol - several types of operations

- GET is the most common

Example: `https://www.google.com:80/search?q=fastapi`

The key parts of a GET request are:

- Host, e.g. `www.google.com`
- Port, e.g. `80` (default)
- Path, e.g. `/search`
- Query String, e.g. `?q=fastapi`

FastAPI GET operation

The simplest FastAPI application:

```python
from fastapi import FastAPI

# Instantiate app
app = FastAPI()

# Handle get requests to root
@app.get("/")
def root():
    return {"message": "Hello World"}
```

[1] https://fastapi.tiangolo.com/tutorial/first-steps/

Using the cURL web client

Key cURL options:

```
$ curl -h
Usage: curl [options...] <url>
 -v, --verbose                Make the operation more talkative
 -H, --header <header/@file> Pass custom header(s) to server
 -d, --data <data>            HTTP POST data
```

Example usage:

```
$ curl http://localhost:8000
{"message":"Hello World"}
```

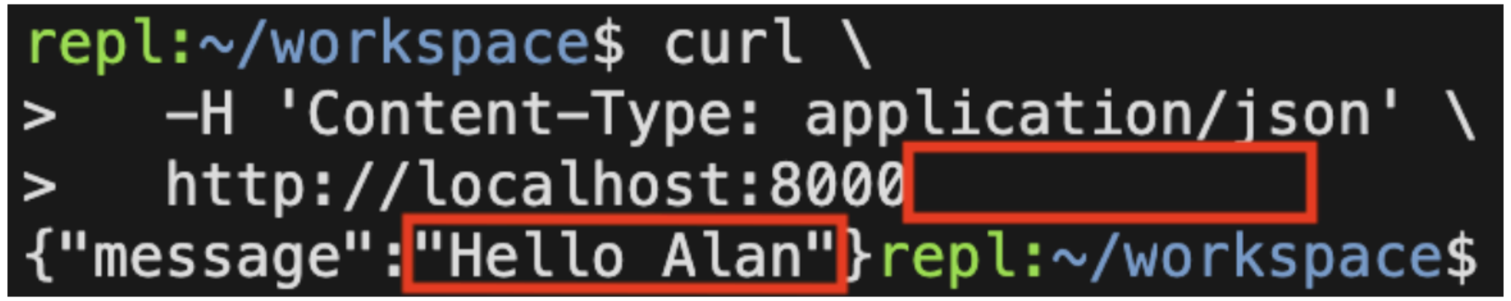
Query Parameters

New endpoint:

- Path: "/hello"
- Query parameter: "name"
    - Default value: "Alan"

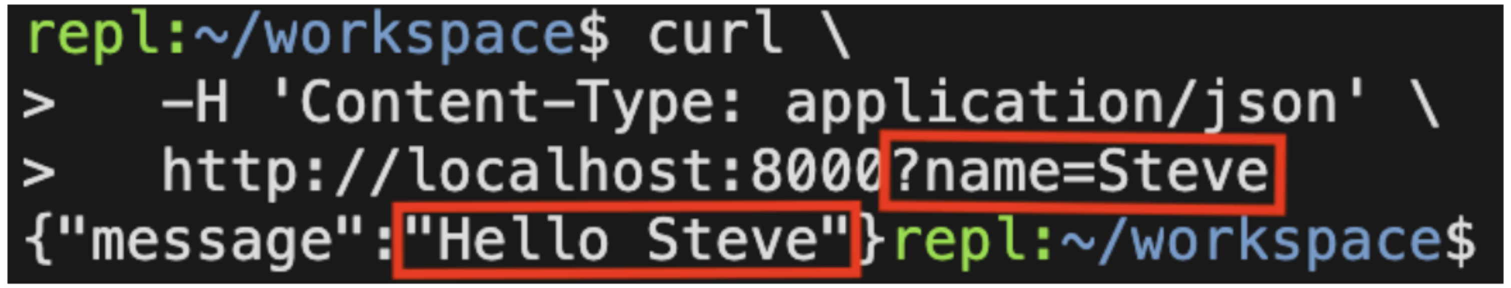
```python
@app.get("/hello")
def hello(name: str = "Alan"):
    return {"message": f"Hello {name}"}
```

Name not in request:



```
repl:~/workspace$ curl \
>    -H 'Content-Type: application/json' \
>    http://localhost:8000
{"message":"Hello Alan"}repl:~/workspace$
```

Name in request:



```
repl:~/workspace$ curl \
>    -H 'Content-Type: application/json' \
>    http://localhost:8000?name=Steve
{"message":"Hello Steve"}repl:~/workspace$
```

Let's practice!

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POST operations

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GET vs. POST Operations

GET Operations

- Traditional use: request info about an object
- Parameters sent via query string
- Can be sent from a web browser

```
api = "http://moviereviews.co/reviews/1"
response = requests.get(api)
```

POST Operations

- Traditional use: create a new object
- Parameters sent via query string as well as request body
- Requires an application or framework
  - e.g. `cURL` , `requests`

```
api = "http://moviereviews.co/reviews/"
body = {"text": "A great movie!"}
response = requests.post(api, json=body)
```

HTTP Request Body

- Data sent after the HTTP request header
- Header specifies body encoding
- Supports nested data structures
- JSON and XML are the most common encodings for APIs
- JSON is FastAPI default encoding

JSON Example

```
# Create a record for a movie review
{"movie": "The Neverending Story",
 "review": {"num_stars": 4,
            "text": "Great movie!",
            "public": true}}
```

Using pydantic's BaseModel

`pydantic` : interface to define request and response body schemas

> **Note**
>
> We are nesting `Review` inside `MovieReview`

```python
from pydantic import BaseModel

class Review(BaseModel):
    num_stars: int
    text: str
    public: bool = False

class MovieReview(BaseModel):
    movie: str
    # Nest Review in MovieReview
    review: Review
```

Handling a POST Operation

POST endpoint to create a new movie review:

- Endpoint: `/reviews`
- Input: `MovieReview` (from previous slide)
- Output: `db_review` (defined elsewhere)

```python
@app.post("/reviews", response_model=DbReview)
def create_review(review: MovieReview):
    # Persist the movie review to the database
    db_review = crud.create_review(review)
    # Return the review including database ID
    return db_review
```

[1] https://fastapi.tiangolo.com/tutorial/sql-databases/#crud-utils

Let's practice!

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