

# LEARNINGS FROM MIGRATING A FLASK APP TO FASTAPI

PyCon DE & PyData

*Orell Garten*

24.04.2025



[Presentation on GitHub](#)

# LET'S START WITH SOME QUESTIONS



## LET'S START WITH SOME QUESTIONS

Who has used flask?





## LET'S START WITH SOME QUESTIONS

Who has used flask?

Who has used FastAPI?



## LET'S START WITH SOME QUESTIONS

Who has used flask?

Who has used FastAPI?

Has anyone migrated an app?



**/WHOAMI**



## /WHY

Are there any good reasons to migrate from flask to fastAPI?

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**Performance?**

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Are there any good reasons to migrate from flask to fastAPI?

**Performance?**

**Data Validation?**

**Async?**

**Developer Experience?**

## GOALS

*Migration from Flask to FastAPI was not the main goal.*

- We wanted:
  - Database integration
  - better code quality
  - Better testability

Migration to FastAPI was helping us achieve this.

## DISCLAIMER

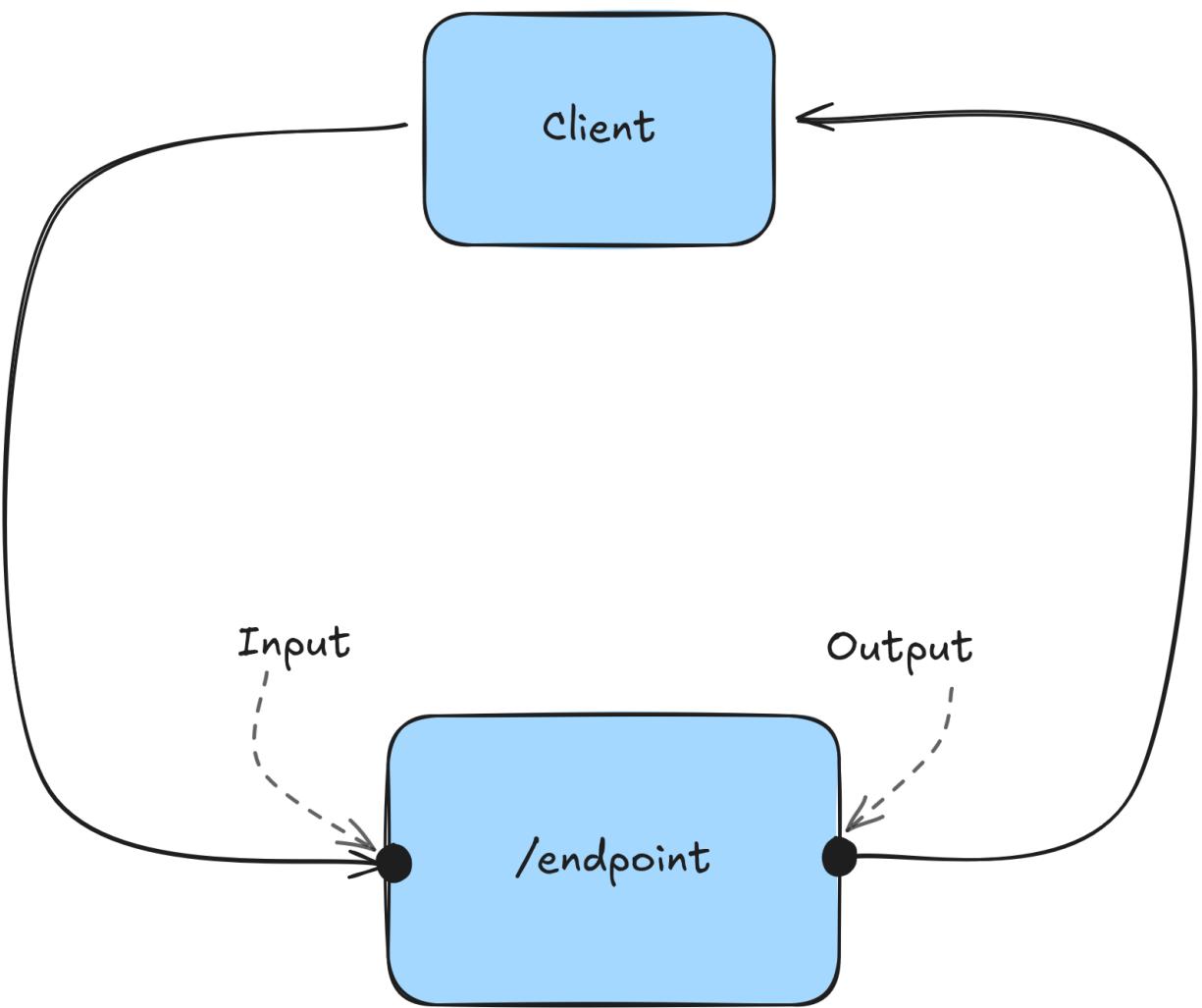
- This talk is about **my** experiences.
- Your experience might be different

# /AGENDA

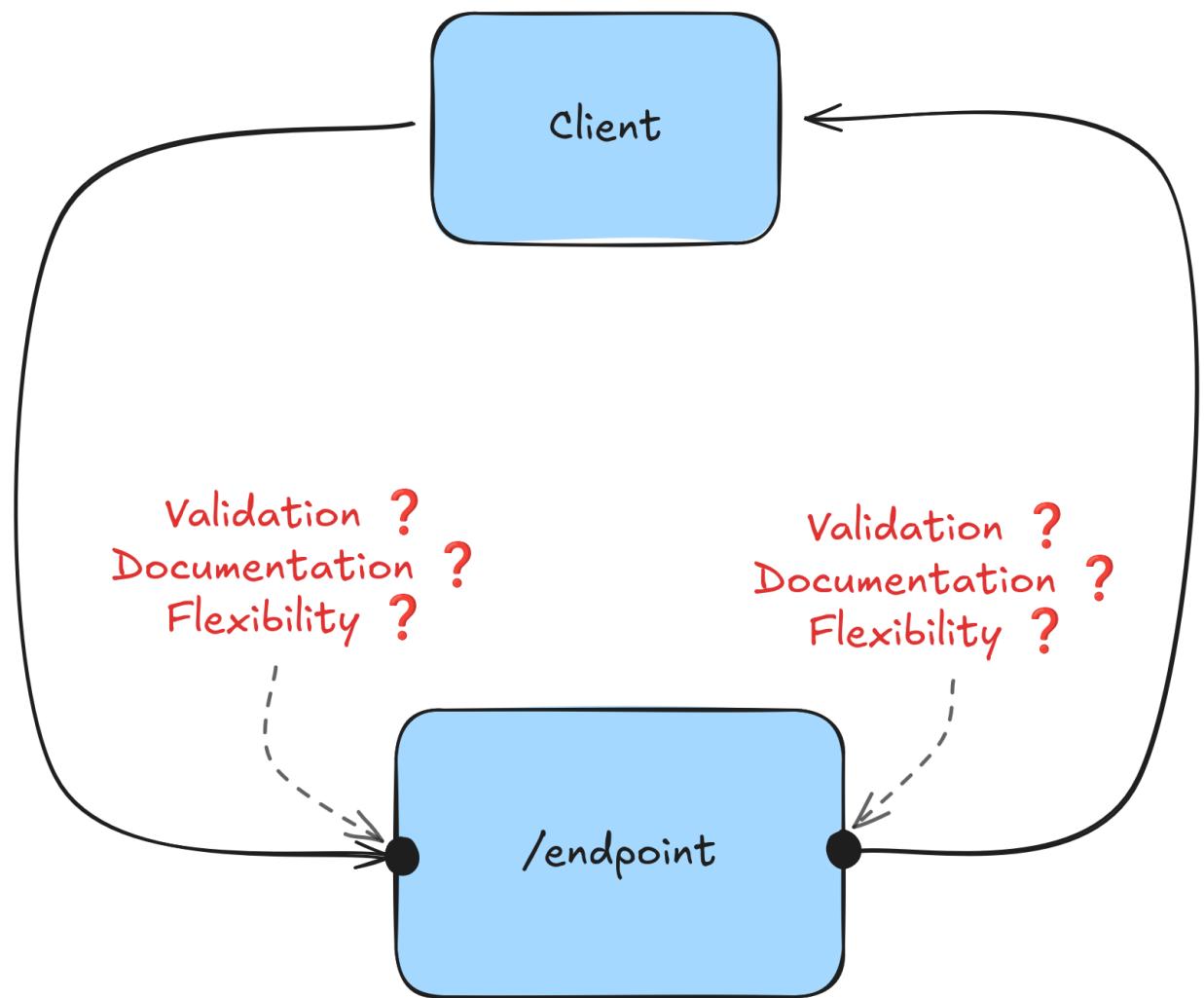
1. Data modeling
2. To async or not to async
3. Problems you will encounter
4. Migration strategy
5. Q&A

# DATA MODELING

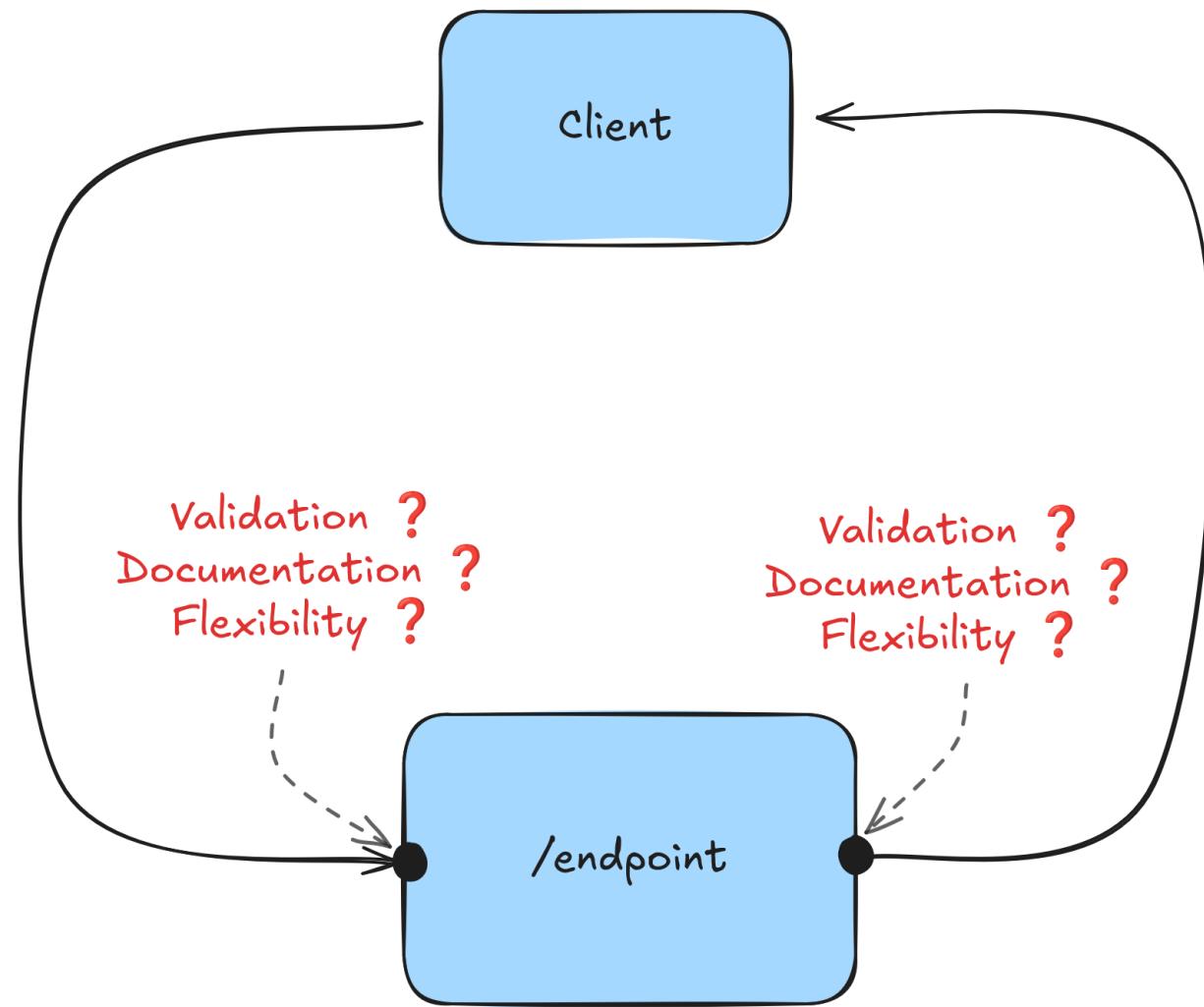
# THE SITUATION



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How do we deal with input and outputs in a good way?

# INPUTS WITH FLASK

```
1 @app.route('/user', methods=['POST'])
2 def create_user():
3     data = request.get_json()
4     username = data.get('name')
5     email = data.get('email')
6     password = data.get('password')
7
8     # Create user in DB
9     db[1] = {"name": username, "email": email, "password": password}
10
11    return jsonify({'message': 'User created successfully', 'id': 1}), 201
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11.1

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```
$ curl -X 'POST' \
  'http://localhost:8000/user' \
  -H 'accept: application/json' \
  -H 'Content-Type: application/json' \
  -d '{"name": "Orell", "email": "hello@orellgarten.com", "password": "test"}'

{"id":1,"message":"User created successfully"}
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# OUTPUTS WITH FLASK

```
1 @app.route("/user/<int:id>", methods=['GET'])
2 def get_user(id: int):
3     # do something, e.g. create user in database
4     user = db.get(id)
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$ curl -X 'GET' 'http://localhost:8000/user/1'

{"email":"hello@orellgarten.com","name":"Orell","password":"test"}
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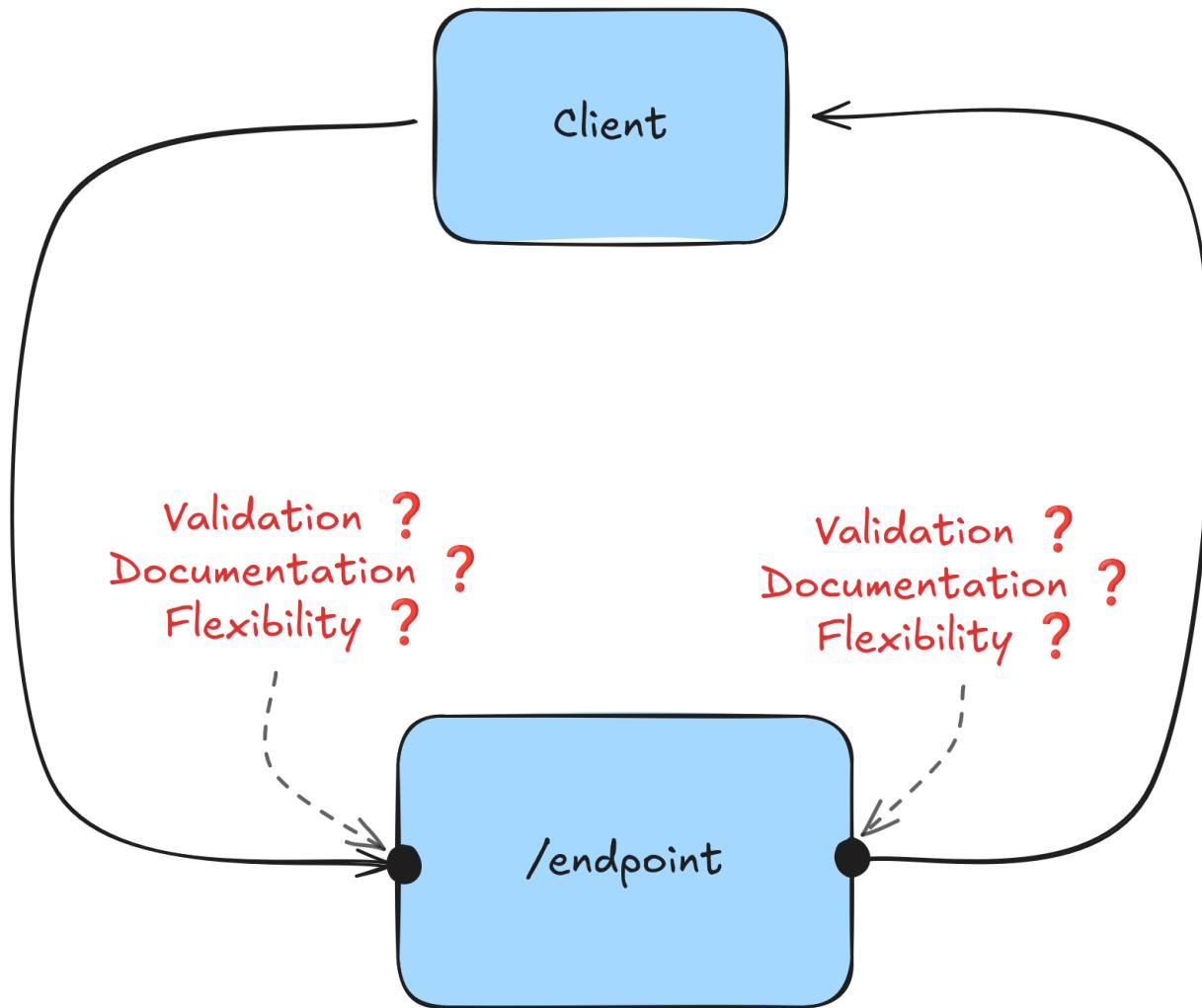
*Oops, password in response!*

# FLASK IN/OUT

- Work with `request` object
- Typing not required

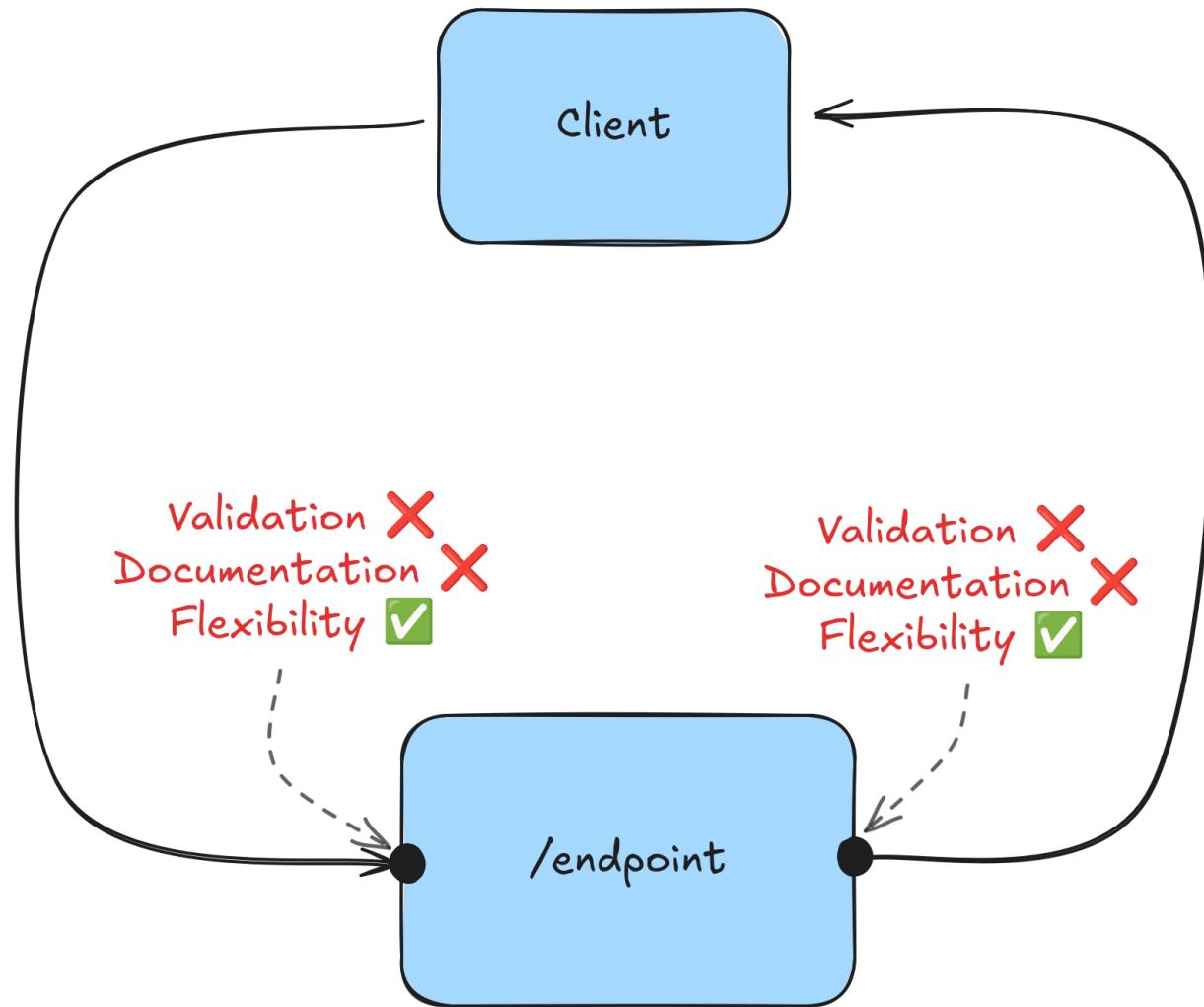
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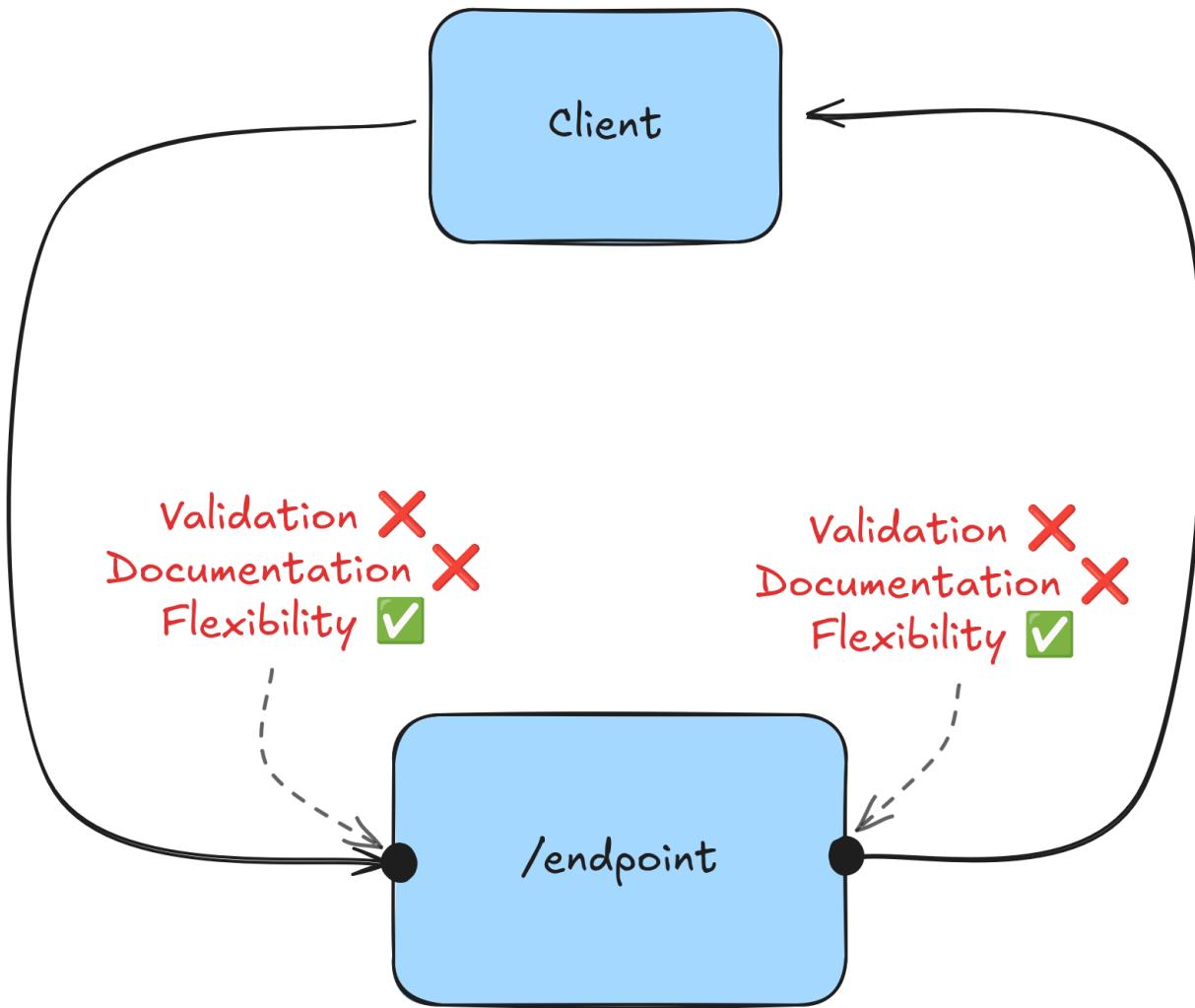
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- No automatic input validation
- Manual data validation requires more boilerplate/libraries

# INPUTS WITH FASTAPI

```
27 class UserIn(BaseModel):
28     name: str
29     email: str
30     password: str
31
32 @app.post("/user", status_code=status.HTTP_201_CREATED)
33 def create_user(
34     user: UserIn,
35     db: Annotated[Dict, Depends(get_db)]
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# OUTPUTS WITH FASTAPI

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42 class UserOut(BaseModel):
43     name: str
44     email: str
45
46 @app.get("/user/{id}",
47         response_model=UserOut,
48         status_code=status.HTTP_200_OK
49     )
50 def get_user(
51     id: int,
52     db: Annotated[Dict, Depends(get_db)]
53 ):
54     # get user from database
55     user = db.get(id)
56
57     return UserOut.model_validate(user, from_attributes=True)
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## OUTPUTS WITH FASTAPI

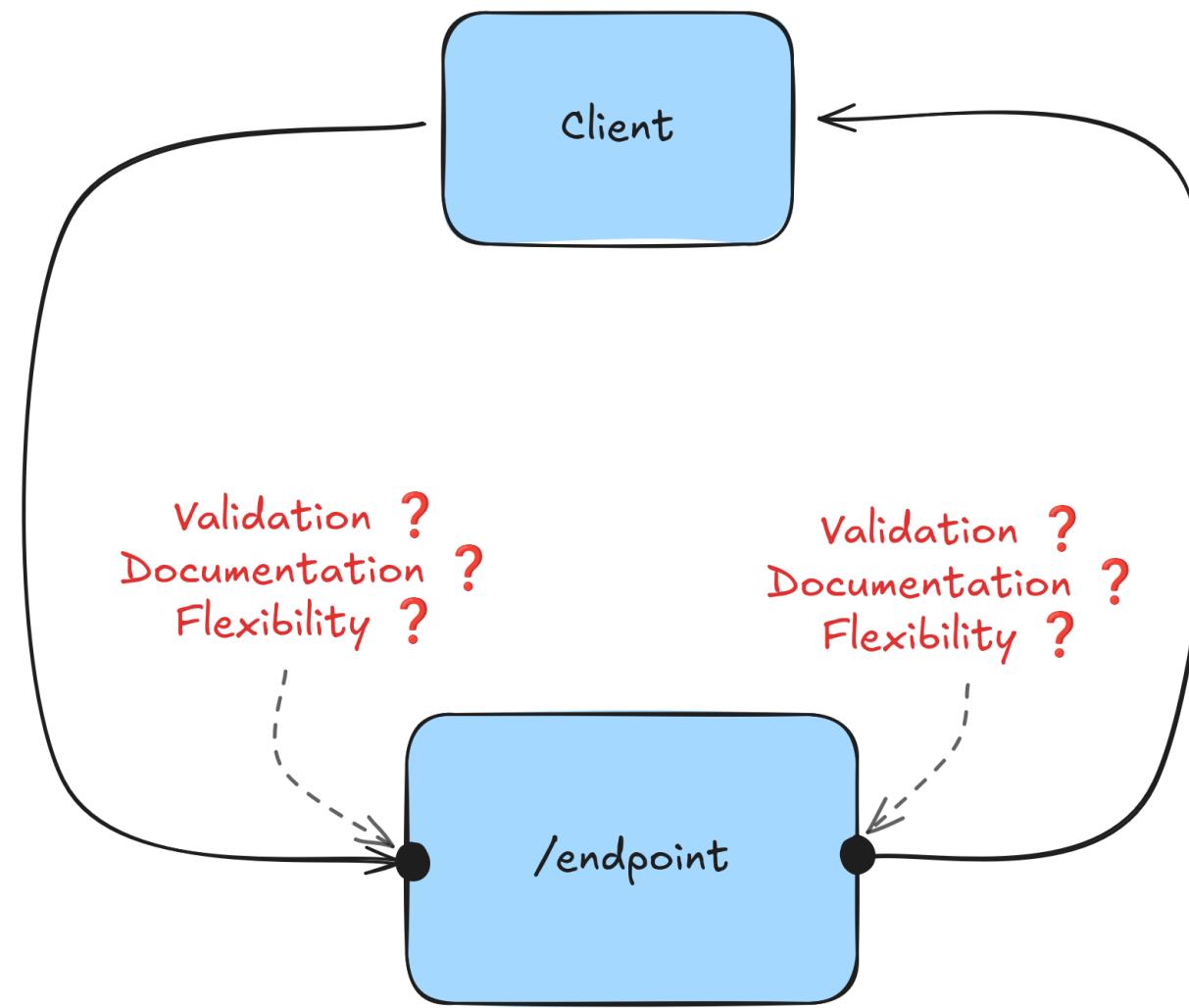
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```

*Data Transfer Object: Password not leaked*

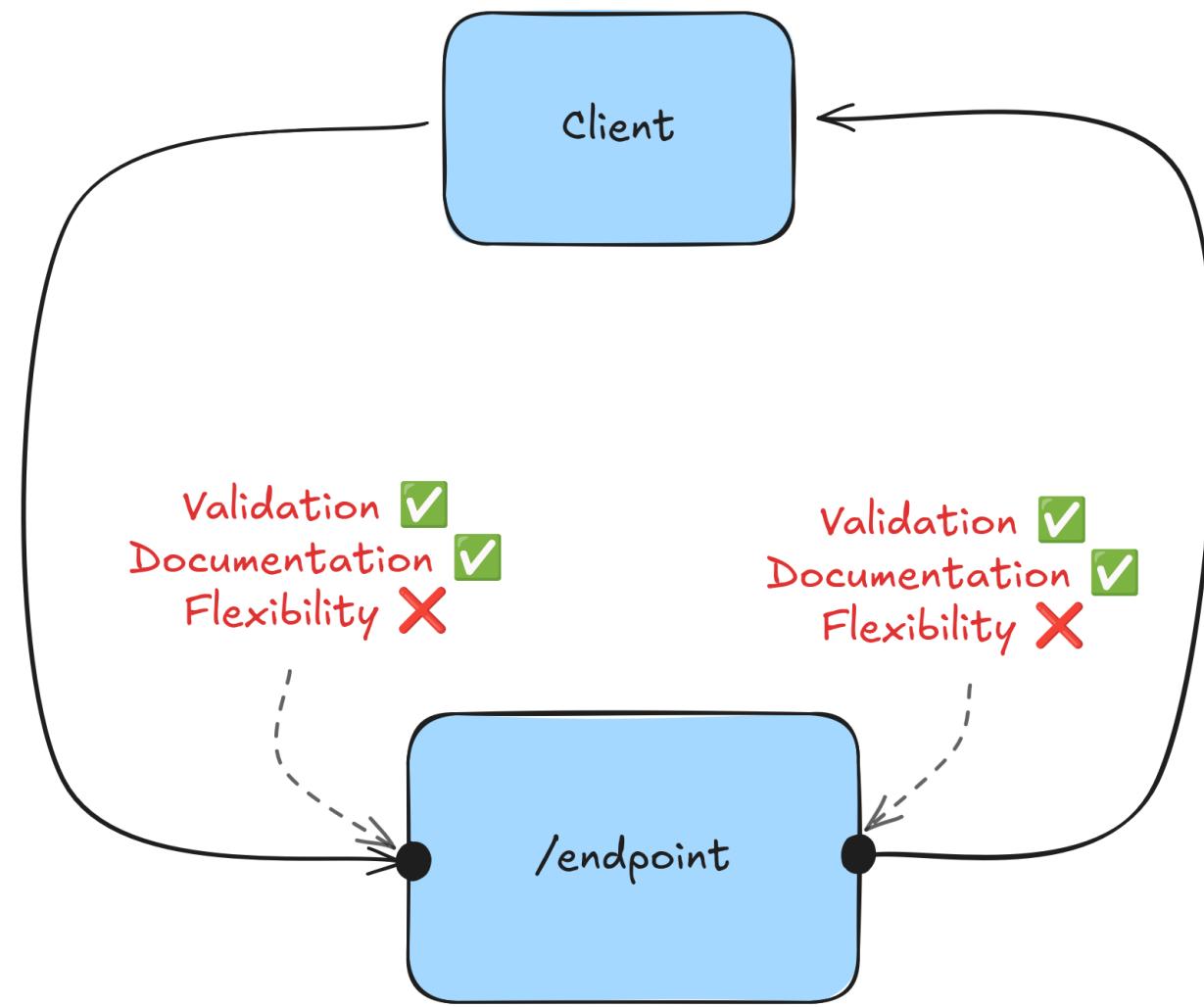
# REMARKS

- Works with Pydantic Models
- Automatic OpenAPI docs



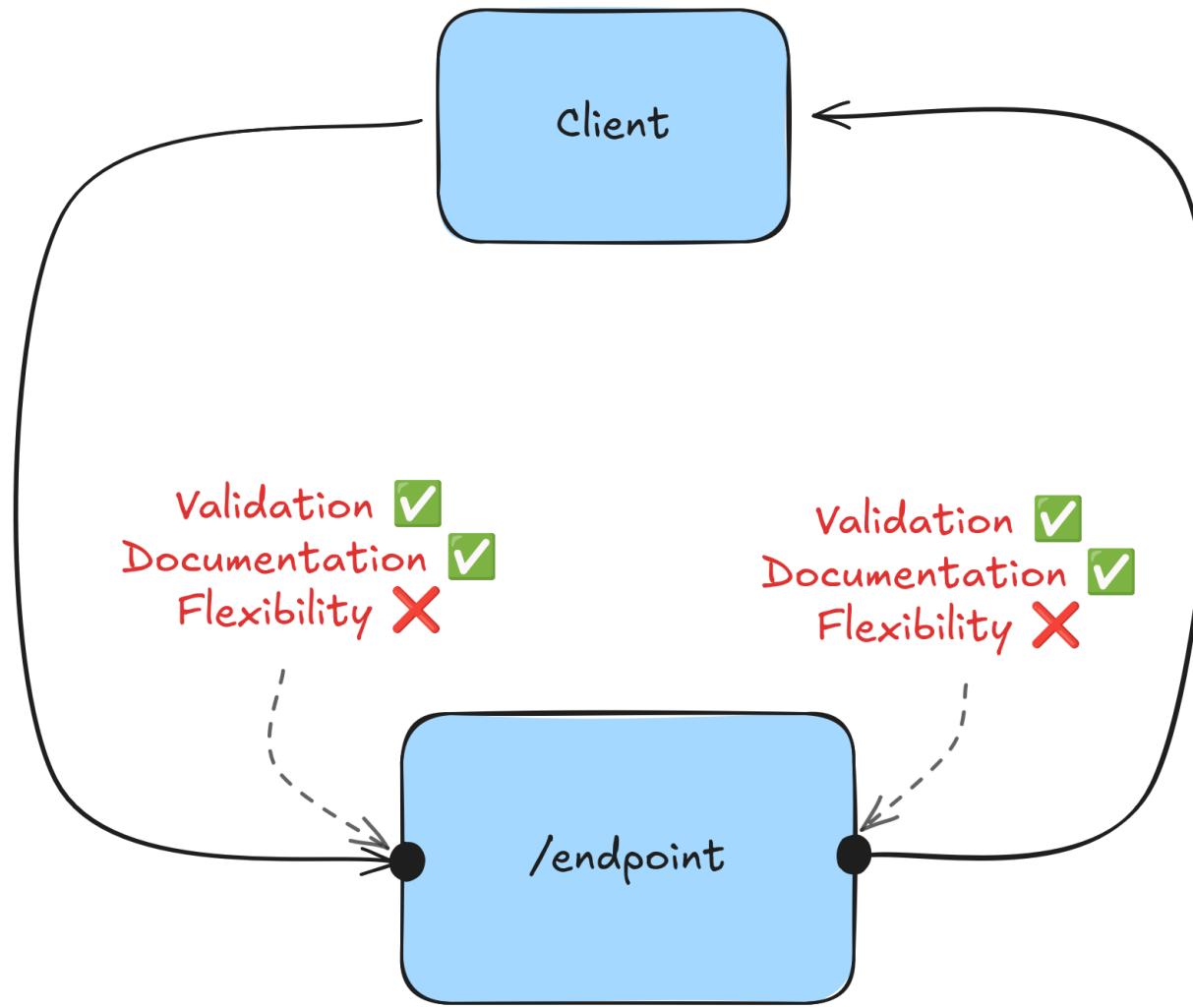
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## REMARKS

- Works with Pydantic Models
- Automatic OpenAPI docs



- Data modeling forces you to think about your application



## LEARNING 1

Data modeling is not something you can do, it's something you must do.



# ASYNC IS OVERRATED



## ASYNC MEANS HIGH PERFORMANCE





## ASYNC MEANS HIGH PERFORMANCE?



19.1

# THE PROBLEM

Code in tutorials usually looks like this:

```
1 from fastapi import FastAPI
2
3 app = FastAPI()
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5 @app.get("/")
6 async def root():
7     return {"message": "Hello World"}
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# ASYNC



- Single-threaded event loop
- Async runtime makes sure event loop is busy

# THE PROBLEM

```
1 from fastapi import FastAPI
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3 app = FastAPI()
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5 @app.get("/")
6 async def root():
7     time.sleep(5) # Simulate long-running blocking op
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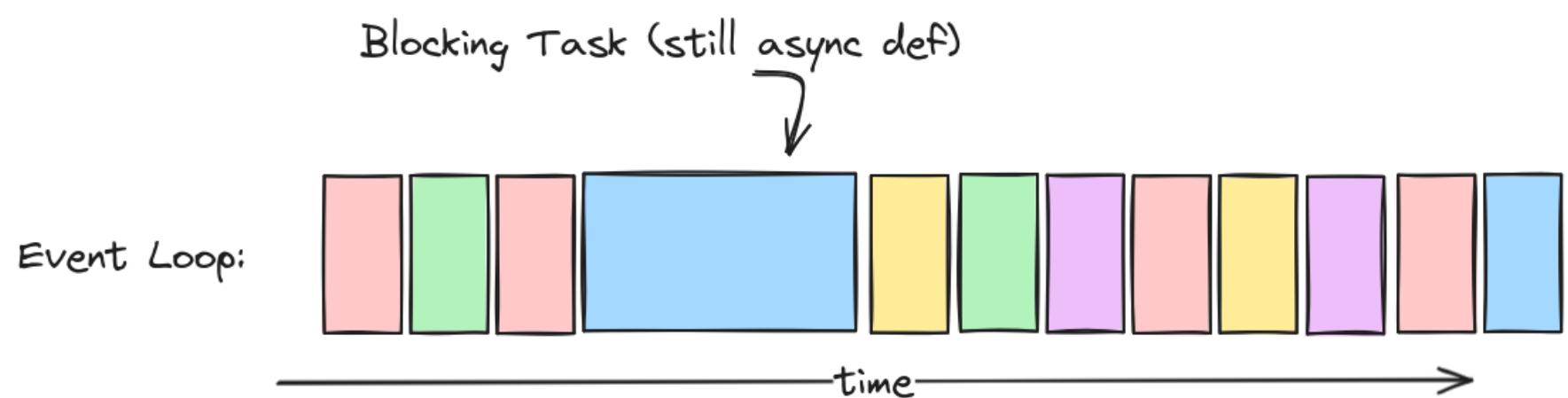
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# ASYNC



# ASYNC



# THE SOLUTION

```
1 from fastapi import FastAPI
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3 app = FastAPI()
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6 async def root():
7     await asyncio.sleep(5) # long-running non-blocking operation
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```

- Only use awaitable functions (coroutines)
- Blocking calls block everything!

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## THE OTHER SOLUTION

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```

- do not use `async` and `fastAPI` knows what to do
- path operation runs in thread-pool and is awaited

## THE OTHER SOLUTION

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```

- do not use `async` and `fastAPI` knows what to do
- path operation runs in thread-pool and is awaited

## LEARNING 2: ASYNC DOES NOT MEAN HIGH PERFORMANCE

## REMARKS

- Async require a different mental model of programming
- Easy to make mistakes, e.g. blocking the event loop
- Async is not the silver bullet for performance

## WHEN TO USE `async`?

- Only if you are sure it's non-blocking
- Middleware and dependencies
- Trivial code

## LEARNING 3:

Use `def` instead of `async def` unless you are certain it does not hurt.

# PROBLEMS YOU WILL ENCOUNTER

# OVERVIEW

- Problem 1) Global objects vs dependency injection
- Problem 2) Sessions
- Problem 3) Flask plugins

# 1) FLASK - GLOBAL OBJECTS

Not-untypical deep inside the call stack in a Flask application:

```
1 # core/processing/files.py
2 def enrich_file(file):
3
4     # TODO: don't use request here
5     tag = request.args.get('tag', 'unidentified')
6     timestamp = datetime.utcnow().isoformat()
7
8     # do more things
9
10    return file
```

PROBLEMS?

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## PROBLEMS?

- `request` being used in modules relatively unrelated to actual API
- `tag` is a query parameter!

## 1) FLASK - GLOBAL OBJECTS

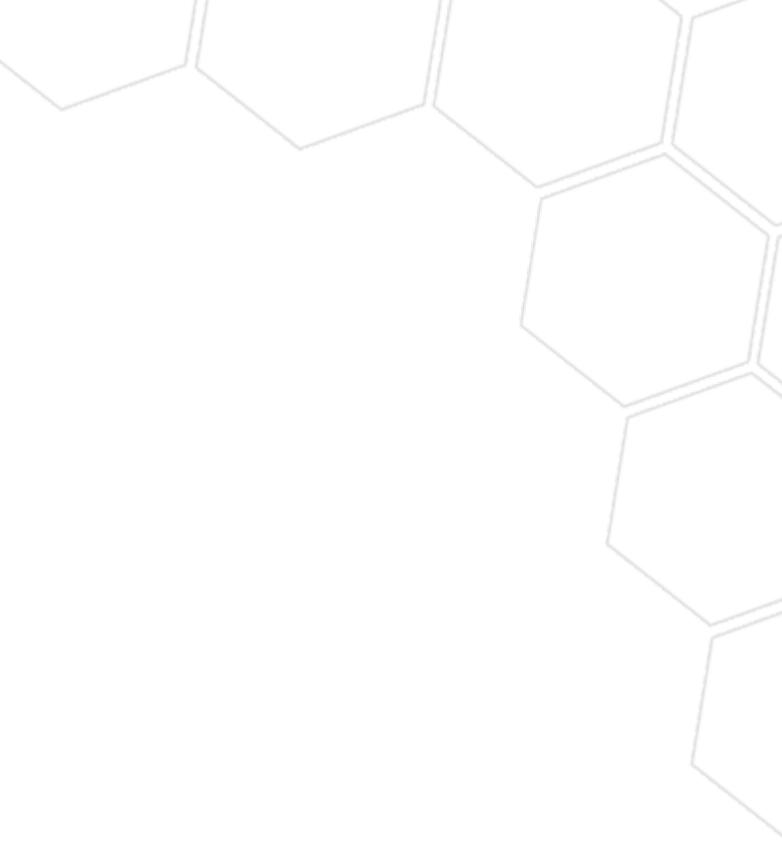
- request and g are global states
- Find use of global state in your application
  - grep -nri request (request context)
  - grep -nri 'import g' for application context



## 1) FASTAPI - DEPENDENCY INJECTION

- Solution in FastAPI:
  - Pydantic data models for `flask.request`
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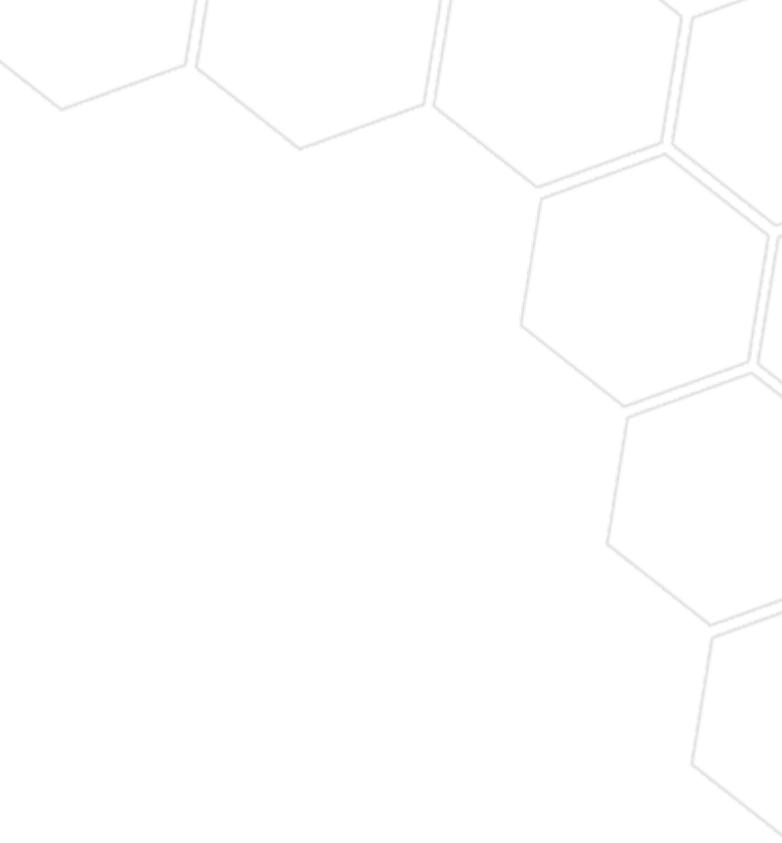




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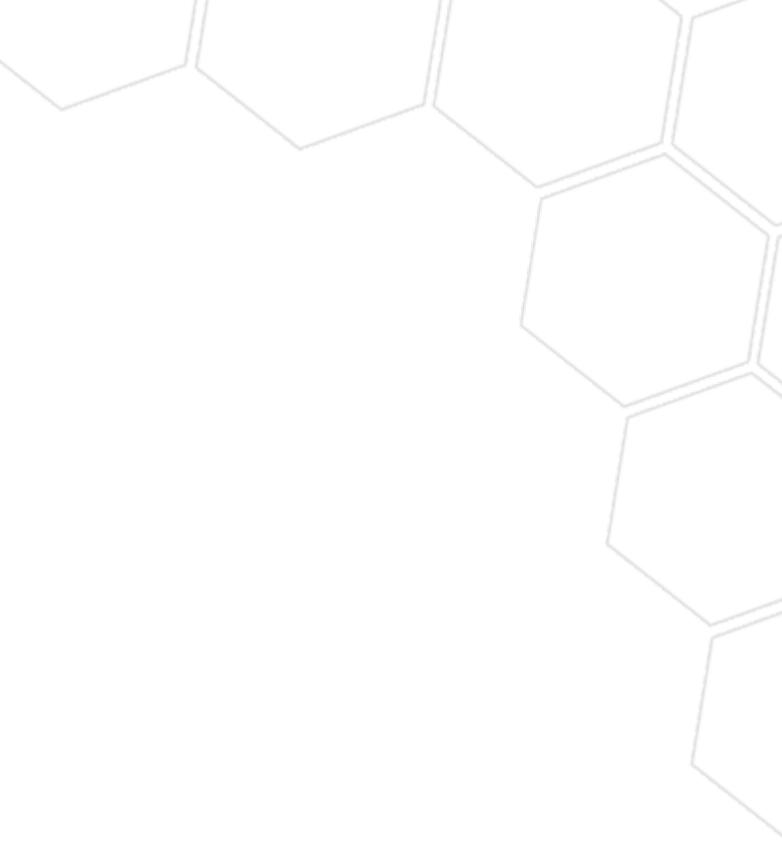
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- Provided by the `flask-session` package
- Supports various backends for session storage
- Use like a key-value storage object
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- Supports various backends for session storage
- Use like a key-value storage object
- Automatically sets cookies

**No equivalent solution in FastAPI:**

- Session management needs to be done manually
- Ideally, you don't want server-side session anyway
- MSAL auth is session based

## 3) PLUGINS

**Flask:**

- Has plugins for everything
- Install a flask-specific Python package
- Understand how to use that package
- Connect the app and the plugin

**FastAPI:**

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**Flask:**

- Has plugins for everything
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- Understand how to use that package
- Connect the app and the plugin

**FastAPI:**

- Very few plugins available
- Dependency injection to extent function
- "plug'n'play" with normal packages

# MIGRATION STRATEGY

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## Migration Strategy

1. Create test cases for all routes
2. Create endpoints in FastAPI app
3. Identify locations where global state is used
4. Move that state to endpoint and explicitly call functions with required information
5. Identify input and output models and create Pydantic models
6. Implement fastAPI endpoint

## THANK YOU & LET'S CONNECT



[hello@orellgarten.com](mailto:hello@orellgarten.com)



[linkedin.com/in/ogarten](https://linkedin.com/in/ogarten)



Material