Web / BD

Introduction to Web Programming

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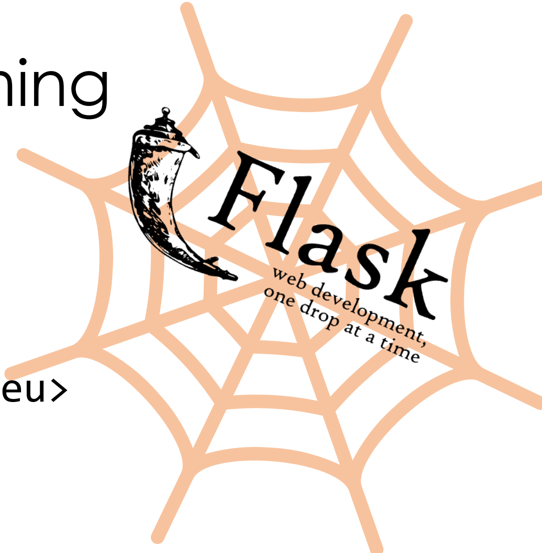
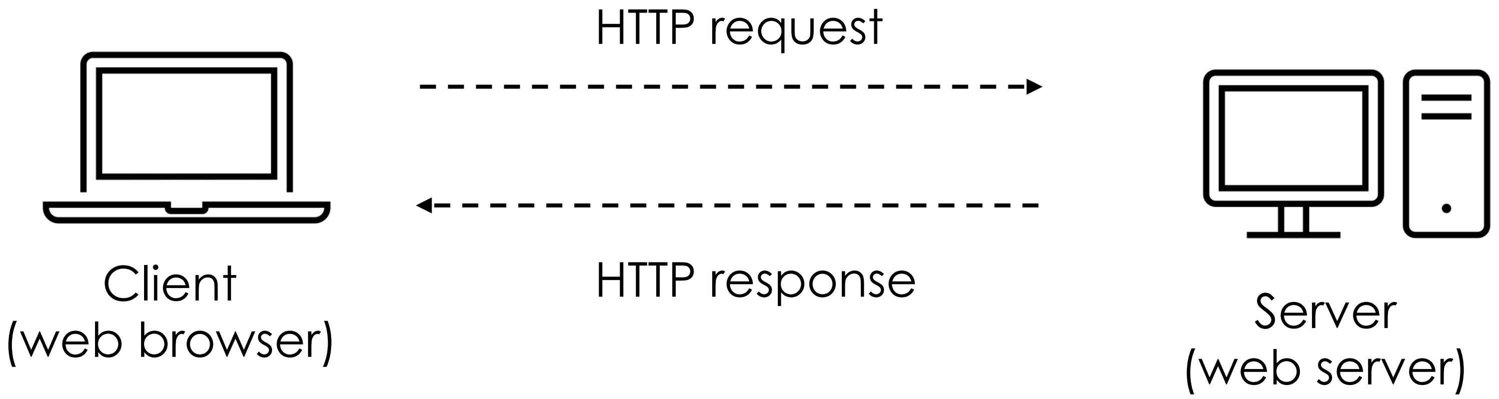


Client / Server Model



HTML / CSS / (JavaScript)

Python / Flask

Flask

- Micro framework: Flask https://flask.palletsprojects.com/en/stable/
  - **Lightweight Micro-framework**: Minimal core (request handling, routing) with flexible expansion options
  - **Built-in Development Tools**: Integrated server and debugger for easy testing.
  - **Jinja2 Templating**: Dynamic HTML rendering with a powerful template engine.
  - **Modular Design**: Choose libraries and tools as needed, with no rigid structure.
  - **Extensible**: Add features like databases or authentication via extensions.

```
$ python3 -m venv venv
$ source venv/bin/activate
$ pip install Flask
```

Flask– First web application

In a file named `app.py`

```python
from flask import Flask

app = Flask(__name__)

@app.route('/')
def index():
    return 'Hello Web/BD'
```

In the terminal:

```
$ flask run
 * Environment: production
   WARNING: This is a development
   server. Do not use it in a
   production deployment.
   Use a production WSGI server
   instead.
* Debug mode: off
* Running on http://127.0.0.1:5000/
  (Press CTRL+C to quit)
```

Flask – How to run/configure the server

```
$ flask run
$ python -m flask run                         // alternatives
$ flask run --host=0.0.0.0 --port=8080        // passing options

// configuration using environment variables

$ export FLASK_APP=app.py
$ export FLASK_DEBUG=True               // debug + autorefresh
$ export FLASK_RUN_HOST=localhost
$ export FLASK_RUN_PORT=8080


$ pip install python-dotenv // then put all env variables
                             // in a file named .env
```

```
FLASK_APP=app.py
FLASK_DEBUG=True
FLASK_RUN_HOST=localhost
FLASK_RUN_PORT=8080
```

```
// or in the code of your main file

if __name__ == '__main__':
    app.run(host='0.0.0.0', port=8080, debug=True)
```

Routing - Decorators

```
@app.route("/halloween")

@app.route("/halloween/")

@app.route("/monsters/<int:monster_id>")

@app.route("/some_full_path/<converter:variable_name>")
```

`string (default):`	accepts any text without a slash
`int:`	accepts positive integers
`float:`	accepts positive floating point values
`path:`	like string but also accepts slashes
`uuid:`	accepts UUID strings

Routing - Example

```
@app.route("/monsters/<string:category>/<int:monster_id>")
def monster_by_id(category: str, monster_id: int):
    if category == "curcubitaceous" and monster_id == 666:
        return { "name": "Jack O'Lantern",
                 "id":666, "category": "curcubitaceous" }
    else:
        return {}
```

```
>>> GET /monsters/curcubitaceous/666 HTTP/1.1
```

Routing - Example

```
@app.route("/monsters/<string:category>/<int:monster_id>")
def monster_by_id(category: str, monster_id: int):
    if category == "curcubitaceous" and monster_id == 666:
        return { "name": "Jack O'Lantern",
          "id":666, "category": "curcubitaceous" }
    else:
        return {}
```

automatically serialised as JSON Object

```
>>> GET /monsters/curcubitaceous/666 HTTP/1.1
```

JSON (JavaScript Object Notation)

- Lightweight text-based data-interchange format
- Completely (programming) language independent
- Easy to understand, manipulate and generate
- Data types:
    - Strings (“hello”), numbers (integers, real), booleans (true of false), null
    - Arrays: ordered values wrapped in [and]
    - (JSON) object: Unordered key-value pairs wrapped in { }

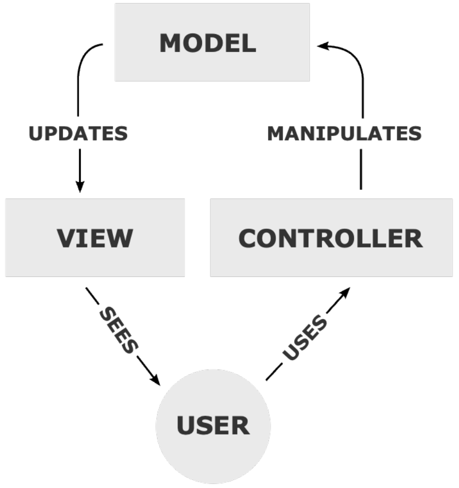
```
{ "name": "Alice",
  "age": 30,
  "email": "alice@example.com",
  "is_active": true,
  "skills": ["Python", "Flask"],
  "address": {
    "street": "123 Main St",
    "city": "Wonderland",
    "zip": "12345"
  }
}
```

Of course, Python provides a built-in `json` module.

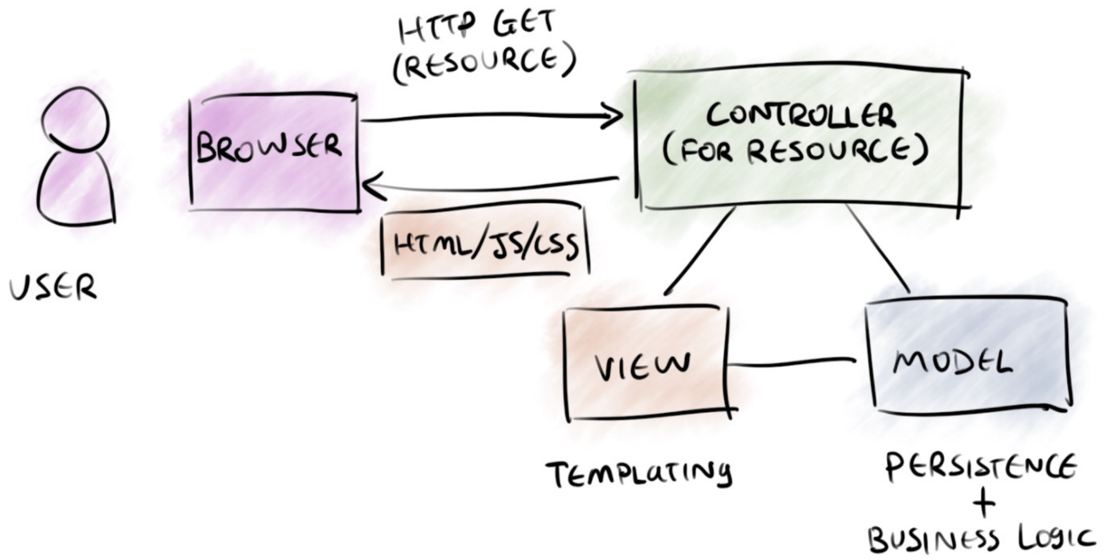
What Not To Do

```
@app.route("/halloween")
def halloween():
    return """
<html>
<head>
<title>Halloween</title>
<style>
body { background: #000000; text-align:center;}
</style>
</head>
<body>
<img alt="jackolantern" width="100%" src="./static/halloween.jpg"/>
</body>
</html>
"""
```

Model-View-Controller Pattern (MVC)



[Source: Wikipedia]



[Source: Medium, Robert Zhu]

https://jinja.palletsprojects.com/en/stable/

Templates (powered by Jinja2)

In a file `templates/hello.html`

```
<!doctype html>
<html>
<title>Hello from Flask</title>
<body>
{% if name %}
   <h1>Hello {{ name }}!</h1>
{% else %}
   <h1>Hello, World!</h1>
{% endif %}
</body>
</html>
```

```
from flask import render_template

@app.route('/hello/')
@app.route('/hello/<login>')
def hello(login=None):
    return render_template('hello.html', name=login)
```

HTTP Methods

```python
from flask import request

@app.route('/whois', methods=['GET'])
def whois():
   if request.method == 'GET':
      return request.args.get('name', 'John Doe')
   else:
      return '' # do something else
```

```
>>> GET /whois?name=TheBoss HTTP/1.1
```

Forms (basic way of managing)

```
@app.route("/search", methods=["GET", "POST"])
def search():
   if request.method == "GET":
      return """<form action="/search" method="post">
                   <input name="q" type="search"/>
                   <input type="submit" value="Search"/>
                </form>"""
   elif request.method == "POST":
      return do_the_job(request.form['q'])
   else:
     return {}
```

Static Resources / Redirect

- (by default) `'/static'` route is used for **static resources** (images, files, etc.) and associated with **`static/`** directory.

- The url of a resource can be obtained using the following code:

```
url_for('static', filename='style.css')
```

Redirection and Errors

```
from flask import abort, redirect, url_for

@app.route('/')
def index():
   return redirect(url_for('login'))

@app.route('/login')
def login():
   abort(401)
   this_is_never_executed()


from flask import render_template
@app.errorhandler(404)
def page_not_found(error):
   return render_template('page_not_found.html'), 404
```

Coming next…

I THINK WE SHOULD BUILD AN SQL DATABASE.
UH-OH
E-mail: SCOTTADAMS@AOL.COM
S.Adams
DOES HE UNDERSTAND WHAT HE SAID OR IS IT SOMETHING HE SAW IN A TRADE MAGAZINE AD?
© 1995 United Feature Syndicate, Inc.(NYC)
WHAT COLOR DO YOU WANT THAT DATABASE?
I THINK MAUVE HAS THE MOST RAM.

- Persistence
- Sessions