Python API Development with Flask and Heroku

Pertemuan 11

MK Algoritma Pemrograman II

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Outline

- Flask Recap
- Heroku as a Platform (PaaS)
- API Recap
- Making RESTful API with Flask
- Deploying to Heroku!

- **FINAL PROJECT ANNOUNCEMENT**

Flask Recap

- Flask is a web framework, written in Python
- Flask can be used as a base for any web application with user interface, or even headless webapp/webservice

```python
from flask import Flask, redirect, url_for, request
app = Flask(__name__)

@app.route('/success/<name>')
def success(name):
   return 'welcome %s' % name

@app.route('/login',methods = ['POST', 'GET'])
def login():
   if request.method == 'POST':
      user = request.form['nm']
      return redirect(url_for('success',name = user))
   else:
      user = request.args.get('nm')
      return redirect(url_for('success',name = user))
```

```html
<html>
   <body>
      <form action = "http://localhost:5000/login" method = "post">

<p>Enter Name:</p>


<p><input type = "text" name = "nm" /></p>


<p><input type = "submit" value = "submit" /></p>

      </form>
   </body>
</html>
```

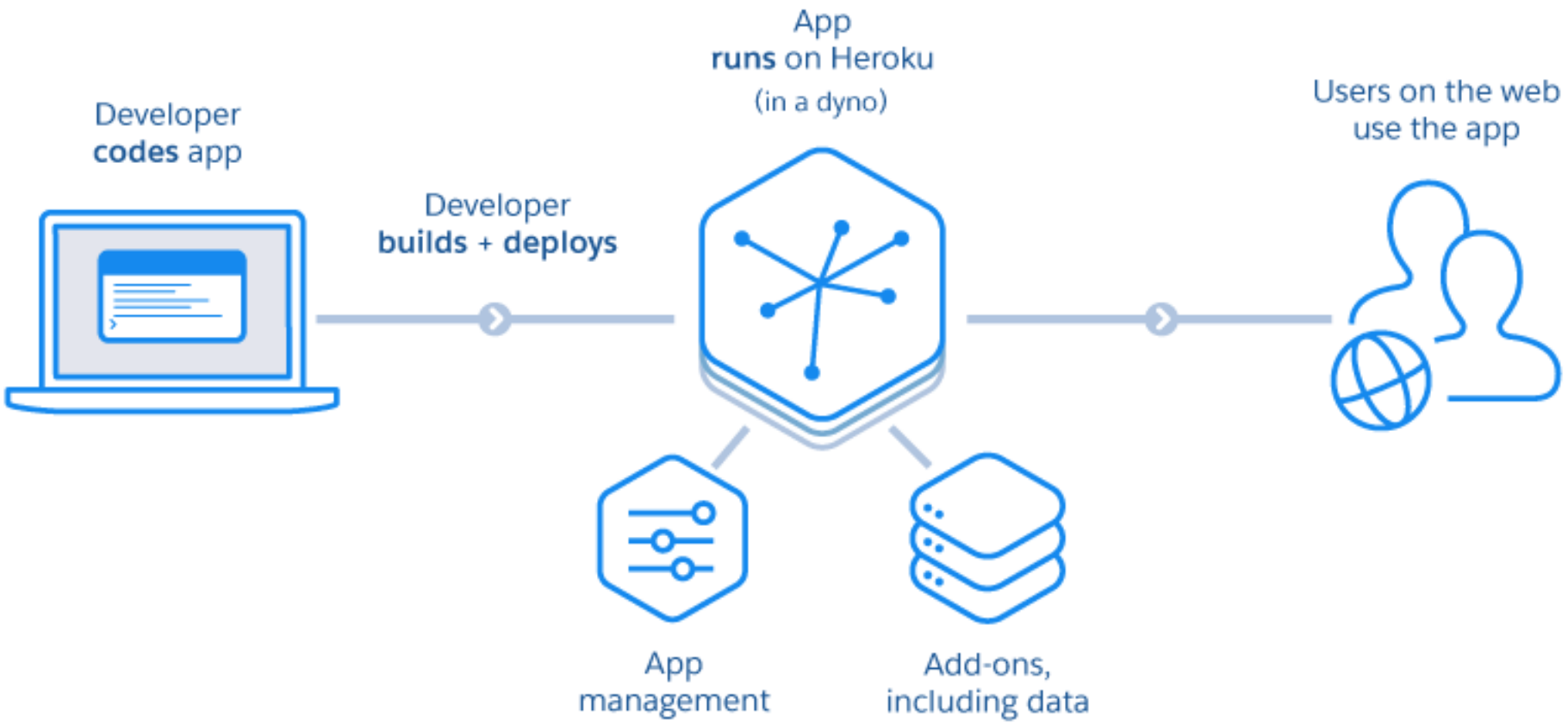
Another trials

- Left for controller
- Right for view / UI

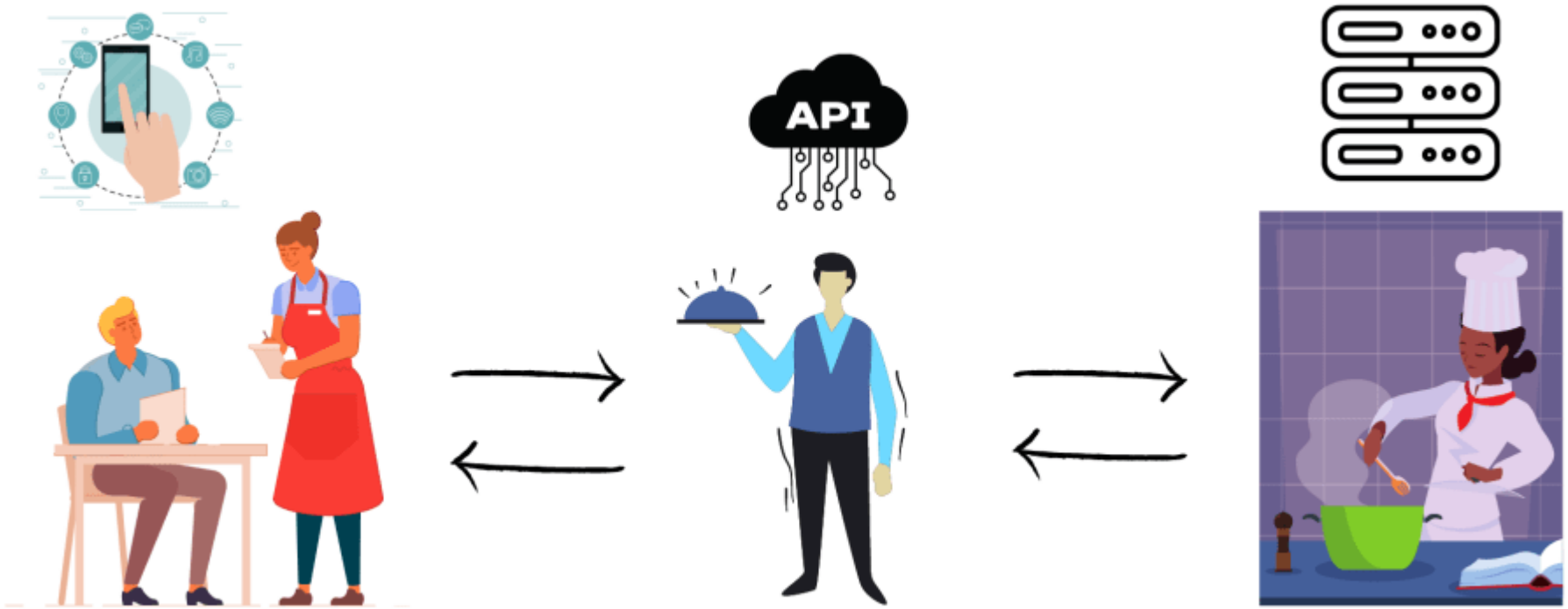
Heroku

- Heroku is a container-based cloud Platform as a Service (PaaS)
- Developers use Heroku to deploy, manage, and scale modern apps
- Free option, with limits of dynos (compute hours) per month
- Good alternative to learn cloud computing and MLOps

Heroku: Platform as a Service

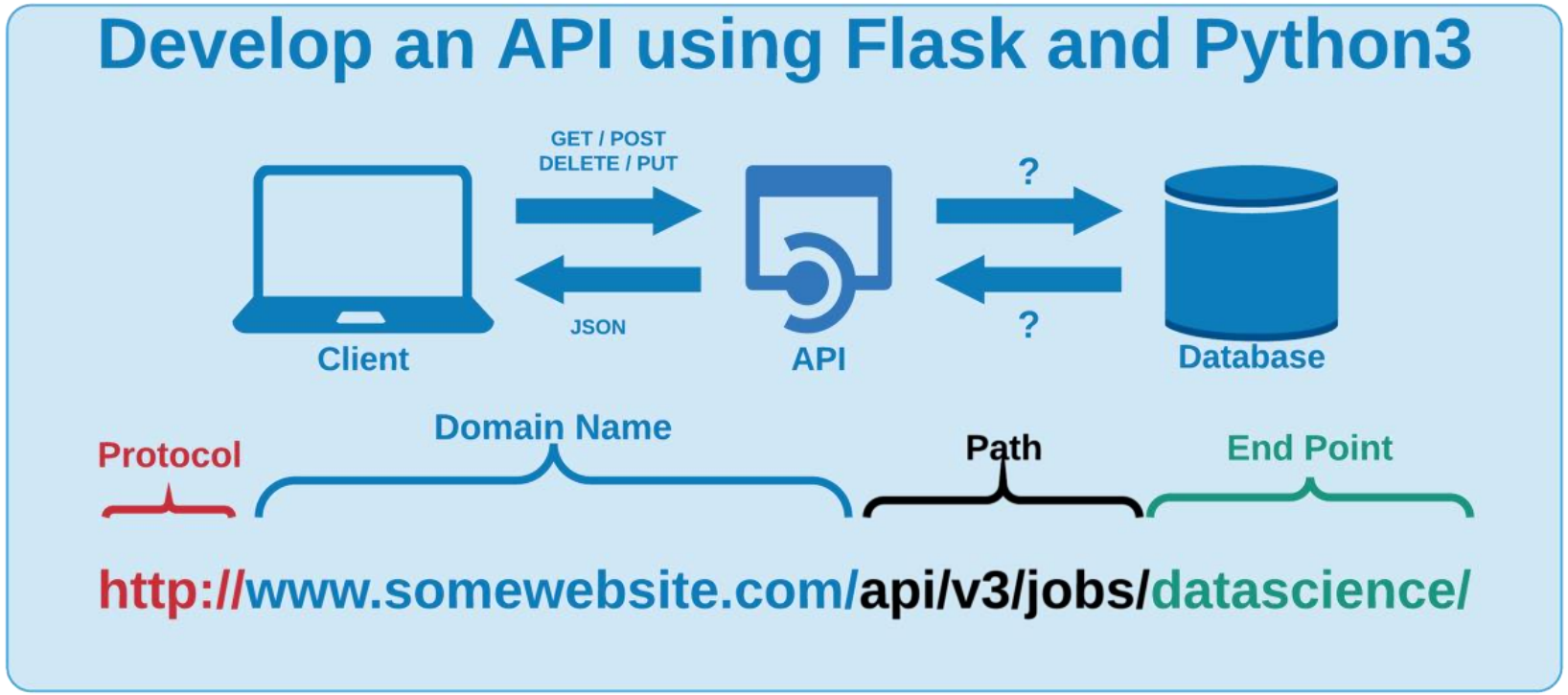


API Recap



RESTful API with Flask

- Flask offers easy to use framework for routing
- Flask can understand HTTP requests
- Flask can be made as an API



RESTful Flask

- Activate / create a new virtual environment for API (covered in previous lecture)
- Install Flask, FlaskRestful, and gunicorn (WSGI)

```
$ pip install Flask
$ pip install flask-restful
```

```
$ pip install gunicorn
```

- Main.py is the boilerplate for flask API
- Wsgi.py is required to run flaskapi through wsgi (serving locally)

FlaskAPI

- Note that the function name is get, which is a specific HTTP Request for GET
- Try to modify the API by adding a new class

```
class Sum(Resource):
    def get(self, a, b):
        return jsonify({'data': a+b})
```

- Class sum, has a GET function requiring a & b as a GET Query / parameters to be returned by the API as the sum of a & b
- Don’t forget to assign resource / route

```
api.add_resource(Sum,'/add/<int:a>,<int:b>')
```

CORS

- CORS stands for Cross-Origin Resource Sharing
- Needed to be stated to allow API created with python to be accessible by other language, such as Javascript

```
pip install Flask-Cors
```

- Don’t forget to import flask cors, and “corsify” the app

```
from flask import Flask, jsonify
from flask_restful import Resource, Api
from flask_cors import CORS

app = Flask(__name__)
api = Api(app)
CORS(app)
```

FlaskAPI without Flask-restful (alternative)

- Flask can still create API without Flask-restful
- Using traditional flask routing, we can utilize into a FlaskAPI (also RESTful)

```python
import flask
from flask import request, jsonify

app = flask.Flask(__name__)
app.config["DEBUG"] = True

matkul = [
    {'id': 0,
     'course': 'Algoritma Pemrograman 1',
     'lect': 'MN Fakhruzzaman',
     'code': 'SIA107'},
    {'id': 1,
     'course': 'Algoritma Pemrograman 2',
     'lect': 'MN Fakhruzzaman',
     'code': 'SIA206'},
    {'id': 2,
     'course': 'Metodologi Penelitian dan Statistik',
     'lect': 'MN Fakhruzzaman',
     'code': 'PNG687'}
]


@app.route('/', methods=['GET'])
def home():
    return '''<h1>THIS API WORKS!!!!</h1>
<p>selamat ya..</p>'''


# A route to return all of the available entries in our catalog.
@app.route('/api/v1/resources/matkul/all', methods=['GET'])
def api_all():
    return jsonify(matkul)

app.run()
```

GET API with Query?

```python
@app.route('/api/v1/resources/matkul', methods=['GET'])
def api_id():
    # Check if an ID was provided as part of the URL.
    # If ID is provided, assign it to a variable.
    # If no ID is provided, display an error in the browser.
    if 'id' in request.args:
        id = int(request.args['id'])
    else:
        return "Error: No id field provided. Please specify an id."

    # Create an empty list for our results
    results = []

    # Loop through the data and match results that fit the requested ID.
    # IDs are unique, but other fields might return many results
    for mk in matkul:
        if matkul['id'] == id:
            results.append(matkul)

    # Use the jsonify function from Flask to convert our list of
    # Python dictionaries to the JSON format.
    return jsonify(results)
```

To test, serve it first, then navigate to the API
http://127.0.0.1:5000/api/v1/resources/matkul?id=2

HTTP POST

- What if you want to send a ‘secret’ query (can’t be seen on URLs)
- You send a POST Request
- Traditionally used to create new item in database via HTTP, also can be used to deliver ‘invisible’ payload

- To configure your API to process POST requests, simply change the methods to POST. Or name your function with post (flask-restful)

```python
@app.route('/api/v1/resources/matkul', methods=['POST'])
def req_matkul():
    if not request.json or not 'id' in request.json:
        abort(400)
    else:
        results = []
        data = request.get_json()
        for mk in matkul:
            if matkul['id'] == data['id']:
                results.append(matkul)
        return jsonify(results), 201
```

How to invoke POST?

- Use HTML Forms (for button)

```
<form action="http://127.0.0.1:5000/api/v1/resources/matkulsecret" method="post">
  <label for="id">First name:</label>
  <input type="text" id="id" name="id"><br><br>
  <input type="submit" value="Submit">
</form>
```

- Or Javascript (AJAX / Axios)

Using Javascript and Axios

```
<p>ID Matkul:</p>
<input type="text" id="id"></br>
<button id="submit" onclick="reqmatkul()">Submit</button>

<!-- Tempat untuk menerima hasil request axios/ajax -->
<p>Result: <span id="result">No request yet</span></p>
```

```
<!-- axios -->
    <script src="https://unpkg.com/axios/dist/axios.min.js"></script>
    <script type="text/javascript">
        // base url
        var base_url = "<your API baseurl>";

        function reqmatkul() {

            // get ID
            var idmatkul = document.getElementById('id').value;

            // predicting msg
            document.getElementById('result').innerHTML = "Searching from Matkuls ..."

            // send post request
            axios({
                method: 'post',
                url: base_url + "/matkulsecret",
                data: {
                    id: idmatkul
                }
            })
            .then(function (response){
                var uuid = response.data.id;
                var course = response.data.course;


                document.getElementById('result').innerHTML = course;


        })
        .catch(function (error) {
            try {
                if (error.response.status == 429){
                document.getElementById('result').innerHTML = "Error!";
                } else {
                    document.getElementById('result').innerHTML = "Error. Try again later";
                }
            } catch {
                document.getElementById('result').innerHTML = "Error. Timeout";
            }
        });}
```

Deploying to HEROKU

- Create Heroku account
- Set up a new app, name it as you wish
- To deploy, we have to create Procfile

```
web: gunicorn  main:app
```

- Create runtime.txt

```
python-3.7.3
```

- Then on your current terminal (with active virtual env)

```
pip freeze > requirements.txt
```

Deploying to Heroku

- Install Heroku CLI
- Open terminal and invoke `heroku login`
- Create your app `heroku create flask-heroku1 --buildpack heroku/python`
- Navigate to your flask project directory, and git init, git add .
- Make your first commit
- `heroku git:remote -a flask-heroku1`
- And Deploy! `git push heroku master`
- Your app will be accessible through https://<appname>.herokuapp.com/
- This will be your API's Base URL

Headless app is Live

- Your API is live on Heroku
- You can access through the browser
- You can add user interface to different python file with different Flask routes
- You can even send post request through your github page!

Refer

https://programminghistorian.org/en/lessons/creating-apis-with-python-and-flask

https://medium.com/analytics-vidhya/flask-restful-api-with-heroku-da1ecf3e04bv