Writing a WSGI Web Framework from Scratch

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Workshop Outline

Introduction and Objectives

- Understand the evolution of Python web application deployment.

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- Build a simple WSGI application.
- Explore libraries that simplify development.
- Examine popular frameworks' WSGI implementations.

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- Code example

Handling File Uploads in CGI

```
env SCRIPT_NAME=/my_cgi_script.sh \
QUERY_STRING="param1=value1&param2=value2" \
REQUEST_METHOD=GET \
./my_cgi_script.sh
```

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  - Scaling Challenges

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- Introduction of WSGI to provide a standard interface.

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- Defined in PEP 3333.

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- Encourages the development of middleware and reusable components.

Hello World WSGI Application

Code Example:

```
def application(environ, start_response):
    status = '200 OK'
    headers = [('Content-type', 'text/plain; charset=utf-8')]
    start_response(status, headers)
    return [b"Hello, World!"]
```

Explanation of Components

- `environ`: Contains request data.
- `start_response`: Starts the HTTP response.
- **Return Value**: An iterable yielding the response body.

Framework Structure

- Organize code for scalability.
- Separate concerns: routing, handling requests, generating responses.

Implementing URL Routing

Example Route Mapping:

```
routes = {
    '/': home_view,
    '/about': about_view,
}
```

- Map URLs to view functions.
- Handle dynamic URLs with parameters.

Handling Requests and Responses

Manual Parsing:

- Extract query parameters from `environ`.
- Build response headers and body.

Limitations of Pure Python Implementation

- Complexity in parsing and handling data.
- Potential security risks.
- Reinventing the wheel.

Using WebOb

Code Example:

```
from webob import Request, Response

def application(environ, start_response):
    request = Request(environ)
    response = Response()
    response.text = "Hello, World!"
    return response(environ, start_response)
```

Using Werkzeug

Code Example:

```
from werkzeug.wrappers import Request, Response

@Request.application
def application(request):
    return Response('Hello, World!')
```

Benefits of Using Libraries

- Simplify request and response handling.
- Provide robust, tested components.
- Save development time and reduce errors.

Django's WSGI Implementation

- Uses `wsgi.py` file.
- `get_wsgi_application()` function sets up the application.

Flask's WSGI Integration

- The Flask app object is a WSGI application.
- Can access the underlying WSGI application via `app.wsgi_app`.

Bottle's WSGI Approach

- The default Bottle app is a WSGI application.
- Simple and lightweight, ideal for small applications.

What is ASGI?

- **Asynchronous Server Gateway Interface**
- Designed for asynchronous Python web applications.
- Supports long-lived connections like WebSockets.

Why ASGI?

- Modern web applications require asynchronous capabilities.
- WSGI is synchronous and cannot handle async code efficiently.
- ASGI enables high-performance async frameworks like FastAPI.

Recap

- Explored the evolution of Python web deployment.
- Built a simple WSGI application and framework.
- Introduced libraries to simplify development.
- Examined popular frameworks' WSGI implementations.
- Briefly discussed ASGI and asynchronous programming.

Additional Resources

- PEP 3333: WSGI Specification
- ASGI Documentation
- Werkzeug Documentation
- WebOb Documentation

Questions?

Thank you for your attention!

Feel free to ask any questions.

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