CSE 2102 - Lab-04

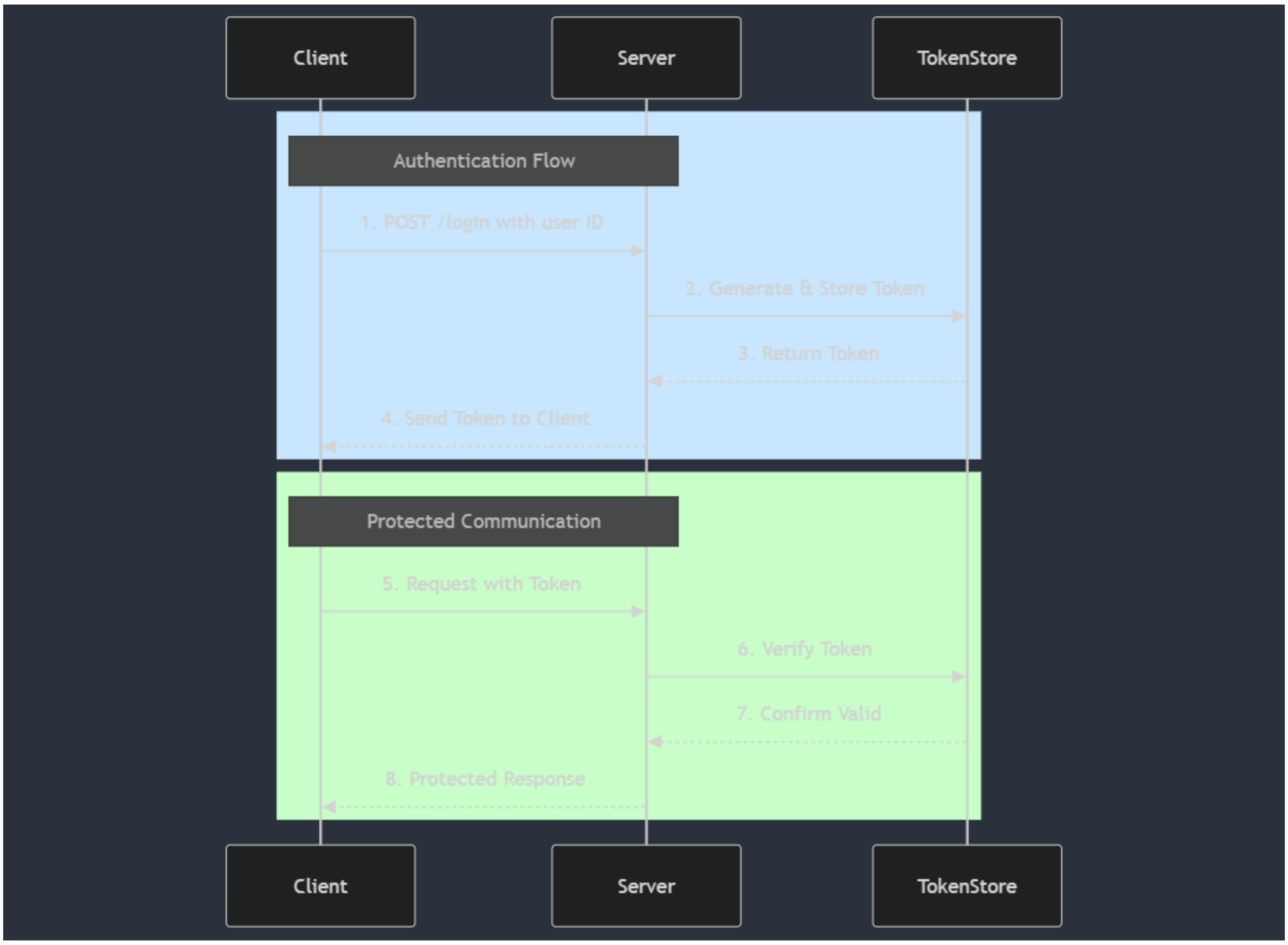
Ahmed Abdulghany

Lab-04

Authentication System with Web Tokens

This system demonstrates a basic implementation of token-based authentication using Flask and HTTP requests. The system consists of three main components that work together to provide secure communication between client and server.

System Architecture



Components Overview

1. Server (`my-server.py`)

The server component is built using Flask and handles:

- User authentication through the `/login` endpoint
- Token generation and validation
- Protected resource access through `/echo` endpoint
- Token storage and management

Key features:

```
# Token generation
def generate_token():
    return secrets.token_hex(16)

# Protected endpoint example
@app.route("/echo", methods=['POST'])
def echo():
    # Verify token before processing
    if valid_token():
        return "You said: " + request.form['text']
```

2. Client (`my-calls.py`)

The client component uses the `httpx` library to:

- Initiate login requests
- Store received tokens
- Make authenticated requests to protected endpoints
- Handle server responses

Key features:

```
# Login request
auth_data = {"id": "user@email.com"}
response = httpx.post(url + "login", data=auth_data)

# Protected request with token
protected_data = {
    "id": user_id,
    "token": token,
    "text": "Hello!"
}
response = httpx.post(url + "echo", data=protected_data)
```

3. Token Store (In-Memory Dictionary)

The token storage system:

- Maintains active user sessions
- Associates tokens with user IDs
- Provides token validation services

How They Work Together

1. **Authentication Flow**
    - Client sends login request with user ID
    - Server generates a unique token
    - Token is stored in server's memory
    - Token is sent back to client
2. **Protected Communication**
    - Client includes token in requests
    - Server validates token before processing
    - If token is valid, request is processed
    - If token is invalid, request is rejected
3. **Security Features**
    - Cryptographically secure token generation
    - Token validation on every protected request
    - Clear error handling for invalid tokens
    - Proper HTTP status codes for different scenarios

Testing the System

The system includes comprehensive tests:

1. Basic server connectivity
2. Login and token generation
3. Protected requests with valid tokens
4. Invalid token handling

Example response:

```
Test 1: Basic server connection
Status code: 200
Response: Authentication server running

Test 2: Login attempt
Status code: 200
Response: {"message":"Login successful","token":"6ebd2cc8..."}

Test 3: Protected request with valid token
Status code: 200
Response: You said: Hello from authenticated user!

Test 4: Protected request with invalid token
Status code: 401
Response: {"error":"Invalid token"}
```

Setup Instructions

1. Start the server:

```
pip3 install Flask
python3 my-server.py
```

2. Make port public in GitHub Codespace:
    - Open Ports tab
    - Right-click port 5000
    - Set visibility to "Public"
3. Run the client:

```
pip3 install httpx
python3 my-calls.py
```

Note: Update the URL in `my-calls.py` to match your Codespace's forwarded address.