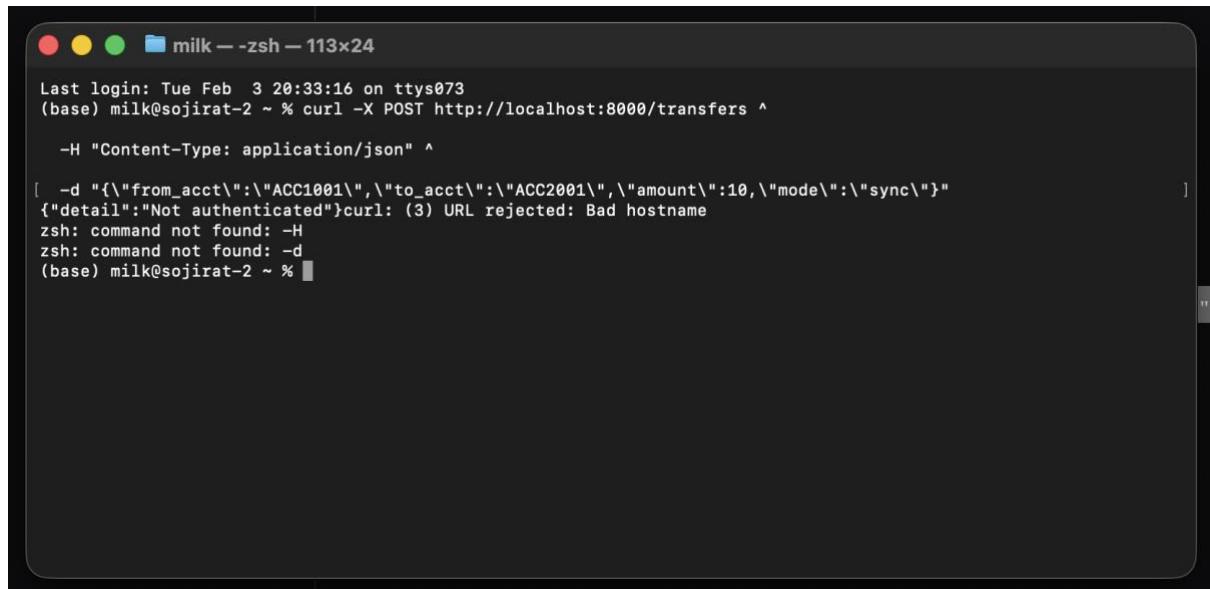
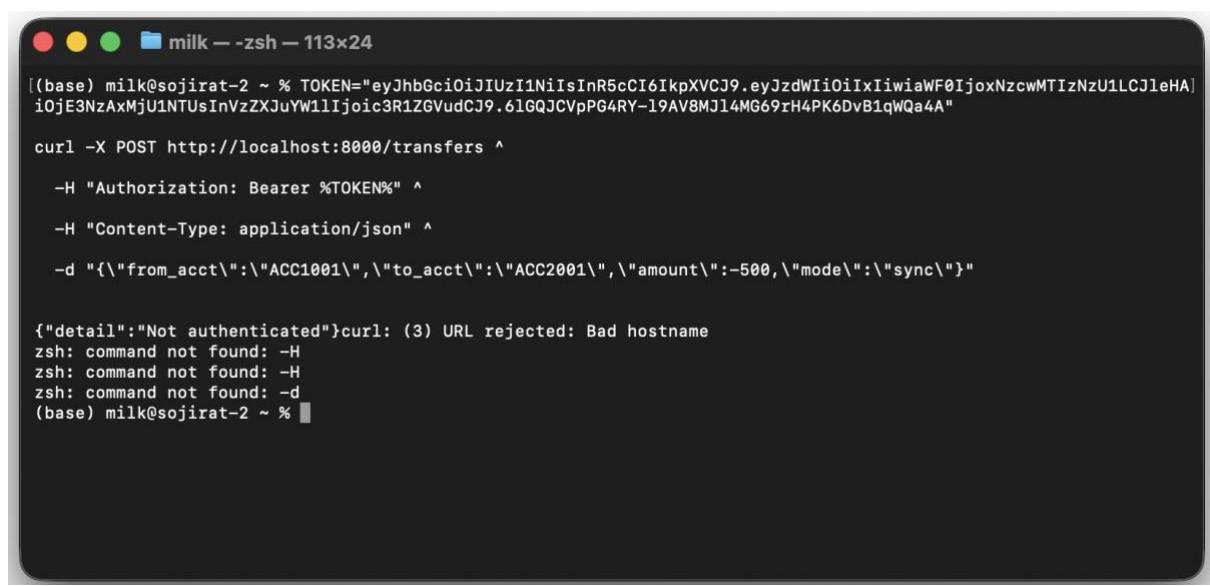


Test 1 — Security Test (401)



```
milk ~ zsh - 113x24
Last login: Tue Feb  3 20:33:16 on ttys073
(base) milk@sojirat-2 ~ % curl -X POST http://localhost:8000/transfers ^
-H "Content-Type: application/json" ^
-d "{\"from_acct\":\"ACC1001\",\"to_acct\":\"ACC2001\",\"amount\":10,\"mode\":\"sync\"}"
{"detail":"Not authenticated"}curl: (3) URL rejected: Bad hostname
zsh: command not found: -H
zsh: command not found: -d
(base) milk@sojirat-2 ~ %
```

Test 2 — Validation Test (422)



```
milk ~ zsh - 113x24
(base) milk@sojirat-2 ~ % TOKEN="eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiIxIiwiaWF0IjoxNzcwMTIzMzU1LCJleHAiOjE3NzAxMjU1NTUsInVzZXJuYW1lIjoic3R1ZGVudCJ9.6lGQJCvpg4RY-l9AV8MJ14MG69rH4PK6DvB1qWQa4A"
curl -X POST http://localhost:8000/transfers ^
-H "Authorization: Bearer %TOKEN%" ^
-H "Content-Type: application/json" ^
-d "{\"from_acct\":\"ACC1001\",\"to_acct\":\"ACC2001\",\"amount\":-500,\"mode\":\"sync\"}"
{"detail":"Not authenticated"}curl: (3) URL rejected: Bad hostname
zsh: command not found: -H
zsh: command not found: -d
(base) milk@sojirat-2 ~ %
```

Test 3 — Idempotency Test (No double debit)

```
milk -- zsh - 132x35
(base) milk@sojirat-2 ~ % curl 'http://localhost:8000/accounts/ACC1001/balance' \
-H 'Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiIxIiwiaWF0IjoxNzcwMTI1OTk5LCJleHAiOjE3NzAxMjc3OTksInVzZXJuYW1lIjoic3R1ZGVudCJ9.mLf1j3VTDeL_nLh_LU7EZscprcRueSWHj5WTz-Z42PA' \
-H 'Connection: keep-alive' \
-H 'Content-Type: application/json' \
-H 'Origin: http://localhost:3000' \
-H 'Referer: http://localhost:3000/' \
{"account_id":"ACC1001","balance":855.0}
(base) milk@sojirat-2 ~ %
```

Test 4 — Rate Limit Test (429)

```
milk -- zsh - 132x35
(base) milk@sojirat-2 ~ % curl 'http://localhost:8000/transfers' \
-H 'Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiIxIiwiaWF0IjoxNzcwMTI1OTk5LCJleHAiOjE3NzAxMjc3OTksInVzZXJuYW1lIjoic3R1ZGVudCJ9.mLf1j3VTDeL_nLh_LU7EZscprcRueSWHj5WTz-Z42PA' \
-H 'Content-Type: application/json' \
-H 'Idempotency-Key: a13d1029-f954-4722-9824-a472f859df90' \
-H 'Origin: http://localhost:3000' \
--data-raw '{"from_acct":"ACC1001","to_acct":"ACC2001","amount":10,"mode":"sync"}' \
{"detail":"Too Many Requests","limit_per_min":10,"route":"transfer"}
(base) milk@sojirat-2 ~ %
```

1. **Docker Compose Running**

- [X] `docker compose ps` showing 4 services up

The screenshot shows the Docker Desktop interface. On the left, there's a sidebar with various options like Ask Gordon, Containers, Images, Volumes, Kubernetes, Builds, Models, MCP Toolkit, Docker Hub, Docker Scout, and Extensions. The main area is titled 'Containers' with a search bar and a button to 'Only show running containers'. It displays five items, with the fifth one being 'Showing 5 items'. Below this, there's a 'Walkthroughs' section with two cards: 'Multi-container applications' (8 mins) and 'Containerize your application' (3 mins). At the bottom, there's a status bar showing RAM, CPU, Disk usage, and a terminal icon.

2. **JWT Authentication**

- [X] 401 error without token

The screenshot shows a browser window with the URL 'localhost:3000/transfer'. The page displays a transfer form with fields for 'From', 'To' (set to 'ACC2001'), 'Amount' (set to '10'), and 'Mode' (set to 'sync (commit immediately)'). To the right of the browser, a Postman interface is open, showing a network request to 'http://localhost:8000/accounts/me'. The response status is '401 Unauthorized' with the message 'Unauthorized' and the header 'WWW-Authenticate: Bearer'. The Postman interface also shows the raw request and response headers.

- [x] 200 success with Bearer token

Login

Demo credentials are pre-seeded.

Username: student

Password: ****

Login

Login success. Go to Dashboard.

Network tab in developer tools showing a successful 200 OK response for the 'login' endpoint. Response headers include:

- Request URL: http://localhost:8000/auth/login
- Request Method: POST
- Status Code: 200 OK
- Remote Address: [:1]:8000
- Referrer Policy: strict-origin-when-cross-origin

Response Headers:

- Access-Control-Allow-Credentials: true
- Access-Control-Allow-Origin: http://localhost:3000
- Content-Length: 210
- Content-Type: application/json
- Date: Tue, 03 Feb 2026 13:02:34 GMT
- Server: uvicorn
- Vary: Origin

Request Headers:

- Accept: */*
- Accept-Encoding: gzip, deflate, br, zstd
- Accept-Language: th-TH;q=0.9
- Connection: keep-alive
- Content-Length: 37
- Content-Type: application/x-www-form-urlencoded
- Host: localhost:8000
- Origin: http://localhost:3000
- Referer: http://localhost:3000/
- Sec-Ch-Ua: "Not(A BRAND";v="8", "Chromium";v="144", "Google Chrome";v="144"
- Sec-Ch-Ua-Mobile: "0"
- Sec-Ch-Ua-Platform: "macOS"
- Sec-Fetch-Dest: empty
- Sec-Fetch-Mode: cors
- Sec-Fetch-Site: same-site
- User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/144.0.0.0 Safari/537.36

3. **Atomic Money Movement**

- [x] Balances updated correctly (debit + credit)

Logout

Account: ACC1001 (active)

Balance

ACC1001: 855.00

Auto-refresh every 4 seconds (polling).

Account Controls

Current status: active

[Freeze Account](#) [Activate Account](#) [Close Account](#)

Network tab in developer tools showing a successful 200 OK response for the 'balance' endpoint. Response headers include:

- Request URL: http://localhost:8000/accounts/ACC1001/balance
- Request Method: GET
- Status Code: 200 OK
- Remote Address: [:1]:8000
- Referrer Policy: strict-origin-when-cross-origin

Response Headers:

- Access-Control-Allow-Credentials: true
- Access-Control-Allow-Origin: http://localhost:3000
- Content-Length: 40
- Content-Type: application/json
- Date: Tue, 03 Feb 2026 13:19:52 GMT
- Server: uvicorn
- Vary: Origin

Request Headers:

- Accept: */*
- Accept-Encoding: gzip, deflate, br, zstd
- Accept-Language: th-TH;q=0.9
- Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eJzdwI0ixlwafWF0joNxzwMTizNzULCJefHAQDE3n2AMdJNTUTUhVZxJuWIIjoc3R1ZGVudCJ9.6fQJCVpPG4RY-1k8wvLqMg9h4PK8DvB1qWQqAA
- Connection: keep-alive
- Content-Type: application/json
- Host: localhost:8000
- Origin: http://localhost:3000
- Referer: http://localhost:3000/
- Sec-Ch-Ua: "Not(A BRAND";v="8", "Chromium";v="144", "Google Chrome";v="144"
- Sec-Ch-Ua-Mobile: "0"
- Sec-Ch-Ua-Platform: "macOS"
- Sec-Fetch-Dest: empty
- Sec-Fetch-Mode: cors
- Sec-Fetch-Site: same-site
- User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/144.0.0.0 Safari/537.36

- [x] Double-entry ledger with DEBIT and CREDIT entries

The screenshot shows a browser window with the URL `localhost:3000/transactions`. The main content area displays a table of transactions with columns: Time, Direction, Amount, Transfer. There are three entries:

- 2/3/2026, 12:55:02 PM DEBIT 20.00 c087ad25-2d7f-4d78-8ceb-0a1955c1a631
- 2/3/2026, 12:54:57 PM DEBIT 20.00 f4d01a83-f659-496c-8466-5995f59e11dd
- 2/3/2026, 12:54:39 PM CREDIT 10.00 272354b2-c2b8-447f-8701-a4b24a351ccf

To the right of the table, the browser's Network tab is open, showing several API requests. One request is highlighted, showing the JSON payload for a transfer:

```

{
  "entry_id": 7,
  "direction": "DEBIT",
  "amount": 20.0,
  "ref_transfer_id": "c087ad25-2d7f-4d78-8ceb-0a1955c1a631",
  "created_at": "2026-02-03T12:55:02.563Z"
},
{
  "entry_id": 5,
  "direction": "DEBIT",
  "amount": 20.0,
  "ref_transfer_id": "f4d01a83-f659-496c-8466-5995f59e11dd",
  "created_at": "2026-02-03T12:55:02.563Z"
},
{
  "entry_id": 3,
  "direction": "CREDIT",
  "amount": 10.0,
  "ref_transfer_id": "272354b2-c2b8-447f-8701-a4b24a351ccf",
  "created_at": "2026-02-03T12:54:39.754Z"
}

```

At the bottom of the Network tab, it says "3 / 14 requests 2.0 kB / 2.5 kB".

4. **Validation**

- [x] 422 for negative amount

The screenshot shows a browser window with the URL `localhost:3000/transfer`. A form is displayed for sending a transfer:

- From: ACC1001
- To: ACC3002
- Amount: -10 (highlighted in red)
- Mode: sync (commit immediately)
- Buttons: Send Transfer, Error: [object Object]

To the right of the form, the browser's Network tab is open, showing an API request for a transfer. The response status is 422 Unprocessable Entity.

Name	Value
transfers	General
Request URL	http://localhost:8000/transfers
Request Method	POST
Status Code	422 Unprocessable Entity
Remote Address	[::]:8000
Referrer Policy	strict-origin-when-cross-origin
Response Headers	Access-Control-Allow-Credentials: true Access-Control-Allow-Origin: http://localhost:3000 Content-Length: 128 Content-Type: application/json Date: Tue, 03 Feb 2026 13:06:38 GMT Server: uvicorn Vary: Origin
Request Headers	Accept: */* Accept-Encoding: gzip, deflate, br, zstd Accept-Language: th-TH,th;q=0.9 Authorization: eyJHAQDcIjUjUjIjNjAinRicCIkRpqVCj8ejyJzZWl0lxewlwWf0joxNzcwMfUzNzULCjIAVBAUj4MD69nH4PK6dVb1qWQa4A Connection: keep-alive Content-Length: 70 Content-Type: application/json Host: localhost:3000 Idempotency-Key: ba116937-9db4-4b80-afdd-09cb70ead7 Origin: http://localhost:3000 Referer: http://localhost:3000/ Sec-Ch-Ua: "Not(A Brand";v="8", "Chromium";v="144", "Google Chrome";v="144" Sec-Ch-Ua-Mobile: 70 Sec-Ch-Ua-Platform: "macOS" Sec-Fetch-Dest: empty Sec-Fetch-Mode: cors Sec-Fetch-Site: same-site User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/144.0.0.0 Safari/537.36

At the bottom of the Network tab, it says "1 / 2 requests 0.4 kB / 0.4 kB tr".

- [x] 400 for insufficient funds

localhost:3000/transfer

Lab 9 — Mock Bank (BaaS) Logout | Dashboard | Transfer | Transfer Status | Recent Transfers | Transactions

Transfer

From
ACC1001

To
ACC2001

Amount
100000

Mode
sync (commit immediately)

Send Transfer

Error: Insufficient funds

Network Tab (Developer Tools):

- Request URL: http://localhost:3000/transfers
- Request Method: POST
- Status Code: 400 Bad Request
- Remote Address: [:1]:8000
- Referrer Policy: strict-origin-when-cross-origin
- Response Headers:
 - Access-Control-Allow-Credentials: true
 - Access-Control-Allow-Origin: http://localhost:3000
 - Content-Length: 48
 - Content-Type: application/json
 - Date: Tue, 03 Feb 2026 13:05:43 GMT
 - Server: uvicorn
 - Vary: Origin
- Request Headers:
 - Accept: */*
 - Accept-Encoding: gzip, deflate, br, zstd
 - Accept-Language: th-TH,th;q=0.9
 - Authorization: eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWI6dXNlcnVFOjoxNzczMTIzMjUzLCJleHAiOiJ3NzAxMjU1NTU3NjNyZXJuYWhljoicSR1ZGVvcCJ9.6iQJCVPg4RY-IBAVMJAMG69H4PK6dVB1qWQs4A
 - Connection: keep-alive
 - Content-Length: 0
 - Content-Type: application/json
 - Host: localhost:8000
 - Idempotency-Key: d5e6d000-b4f1-4b18-996e-007543c
 - Origin: http://localhost:3000
 - Referer: http://localhost:3000/
 - Sec-Ch-Ua: "Not(A Brand";v="8", "Chromium";v="144", "Google Chrome";v="144"
 - Sec-Ch-Ua-Mobile: 10
 - Sec-Ch-Ua-Platform: "macOS"
 - Sec-Fetch-Dest: empty
 - Sec-Fetch-Mode: cors
 - Sec-Fetch-Site: same-site
 - User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_16_7) AppleWebKit/537.36 (KHTML, like Gecko)/537.36 Safari/537.36

- [x] 400 for self-transfer

localhost:3000/transfer

Lab 9 — Mock Bank (BaaS) Logout | Dashboard | Transfer | Transfer Status | Recent Transfers | Transactions

Transfer

From
ACC2001

To
ACC2001

Amount
10

Mode
sync (commit immediately)

Send Transfer

Error: Cannot transfer to the same account

Network Tab (Developer Tools):

- Request URL: http://localhost:8000/transfers
- Request Method: POST
- Status Code: 400 Bad Request
- Remote Address: [:1]:8000
- Referrer Policy: strict-origin-when-cross-origin
- Response Headers:
 - Access-Control-Allow-Credentials: true
 - Access-Control-Allow-Origin: http://localhost:3000
 - Content-Length: 48
 - Content-Type: application/json
 - Date: Tue, 03 Feb 2026 13:05:43 GMT
 - Server: uvicorn
 - Vary: Origin
- Request Headers:
 - Accept: */*
 - Accept-Encoding: gzip, deflate, br, zstd
 - Accept-Language: th-TH,th;q=0.9
 - Authorization: eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWI6dXNlcnVFOjoxNzczMTIzMjUzLCJleHAiOiJ3NzAxMjU1NTU3NjNyZXJuYWhljoicSR1ZGVvcCJ9.6iQJCVPg4RY-IBAVMJAMG69H4PK6dVB1qWQs4A
 - Connection: keep-alive
 - Content-Length: 0
 - Content-Type: application/json
 - Host: localhost:8000
 - Idempotency-Key: d5e6d000-b4f1-4b18-996e-007543c
 - Origin: http://localhost:3000
 - Referer: http://localhost:3000/
 - Sec-Ch-Ua: "Not(A Brand";v="8", "Chromium";v="144", "Google Chrome";v="144"
 - Sec-Ch-Ua-Mobile: 10
 - Sec-Ch-Ua-Platform: "macOS"
 - Sec-Fetch-Dest: empty
 - Sec-Fetch-Mode: cors
 - Sec-Fetch-Site: same-site
 - User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_16_7) AppleWebKit/537.36 (KHTML, like Gecko)/537.36 Safari/537.36

- [x] 403 for frozen account

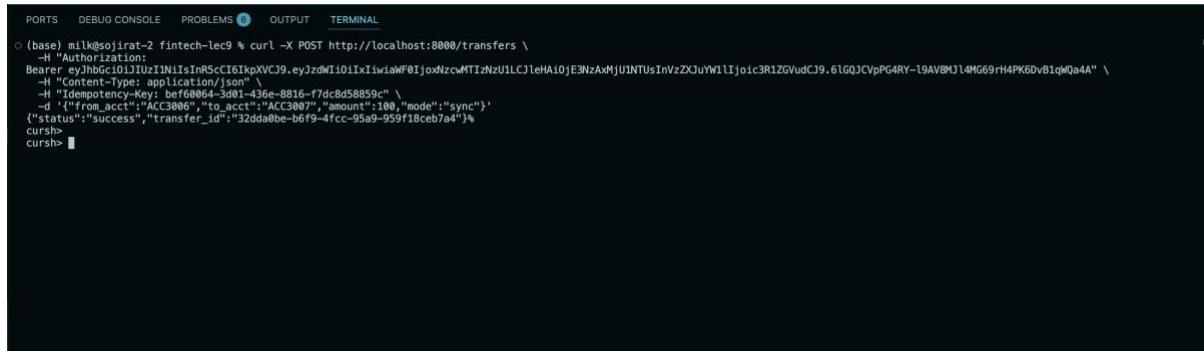
The screenshot shows a web application interface for a bank transfer. On the left, there is a form with fields: 'From' (ACC1001), 'To' (ACC3009), 'Amount' (10), and 'Mode' (sync (commit immediately)). Below the form is an error message: "Error: Destination account is frozen and cannot receive transfers". On the right, a Network tab of a browser developer tools window is open, showing a POST request to http://localhost:8000/transfers. The status code is 403 Forbidden. The response body contains the JSON object: {"status": "error", "message": "Destination account is frozen and cannot receive transfers"}. The request headers include Accept, Accept-Encoding, Accept-Language, Authorization (with a long token), Connection, Content-Length, Content-Type, Host, If-None-Match, Origin, Sec-Ch-Ua, Sec-Ch-Ua-Mobile, Sec-Ch-Ua-Platform, Sec-Fetch-Dest, Sec-Fetch-Mode, Sec-Fetch-Site, and User-Agent.

5. **Idempotency**

- [x] Same transfer_id returned for duplicate requests

The screenshot shows a web application interface for a bank transfer. On the left, there is a form with fields: 'From' (ACC3008), 'To' (ACC3007), 'Amount' (100), and 'Mode' (sync (commit immediately)). Below the form is an OK message: "OK: {"status": "success", "transfer_id": "ab9e6dc9-9bc8-4745-869a-e288767ed5ca"}". On the right, a Network tab of a browser developer tools window is open, showing a POST request to http://localhost:8000/transfers. The status code is 200 OK. The response body contains the JSON object: {"status": "success", "transfer_id": "ab9e6dc9-9bc8-4745-869a-e288767ed5ca"}. The request headers are identical to the previous screenshot, including Accept, Accept-Encoding, Accept-Language, Authorization, Connection, Content-Length, Content-Type, Host, If-None-Match, Origin, Sec-Ch-Ua, Sec-Ch-Ua-Mobile, Sec-Ch-Ua-Platform, Sec-Fetch-Dest, Sec-Fetch-Mode, Sec-Fetch-Site, and User-Agent.

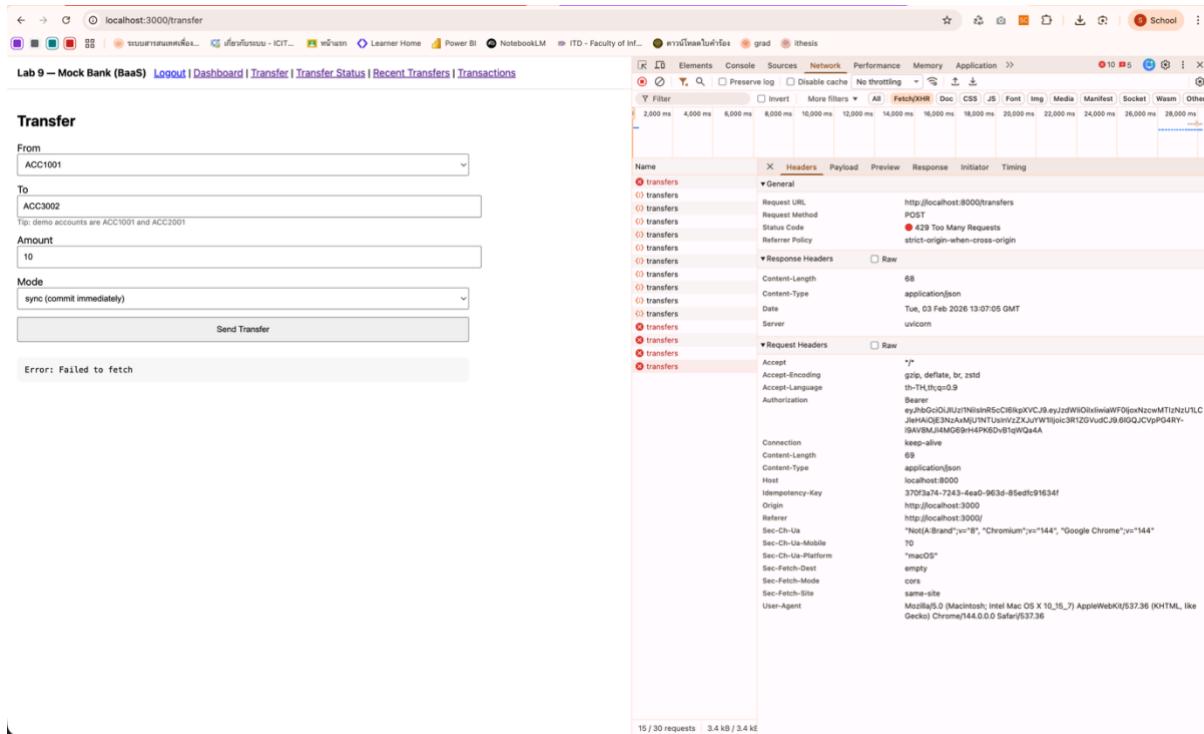
- [x] Balance only deducted once (not twice)



```
POR TS DEBUG CONSOLE PROBLEMS 1 OUTPUT TERMINAL
(base) milk@sojirat-2 fintech-lec9 % curl -X POST http://localhost:8000/transfers \
-H "Authorization: Bearer eyJhbGciOiJIUzI1NiIsInR5cCI6IkpxVCJ9eyJzdWI0IxIiwiawF0IjoxNzcwMTIzNzU1LCjleHAIoJE3NzAxMjU1NTUsInVZXJuYW1ljoic3R1ZGVudCJ9.6lgQJCVpPG4RY-l9AV8MJ4MG69rH4PK6DvB1qWQa4A" \
-H "Content-Type: application/json" \
-d '{"from_acct":"ACC3006","to_acct":"ACC3007","amount":100,"mode":"sync"}' \
{"status":"success","transfer_id": "32dd00be-b6f9-4fcc-959f18ceb7a4"}'
curl> 
```

6. **Rate Limiting**

- [x] 429 error after exceeding request limit



The screenshot shows a web application interface for a mock bank. On the left, there's a 'Transfer' form with fields for 'From' (ACC1001), 'To' (ACC3002), 'Amount' (10), and 'Mode' (sync). Below the form is an error message: 'Error: Failed to fetch'. On the right, the browser's developer tools Network tab is open, showing multiple failed requests for the URL `http://localhost:8000/transfers`. The status code for these requests is 429, indicating 'Too Many Requests'. The 'Request Headers' section shows standard HTTP headers like Accept, Accept-Encoding, Accept-Language, Authorization (Bearer token), Host (localhost:8000), and User-Agent (Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/144.0.0.0 Safari/537.36).