Appendices

Appendix A: Sample API Response Screenshots


```
monicadhieu@m-dhieu:~/alu/summatives/Before/api$ python3 server.py
Server started at http://localhost:8080
127.0.0.1 - - [28/Sep/2025 14:35:03] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:40:58] "GET /transactions/1 HTTP/1.1" 404 -
127.0.0.1 - - [28/Sep/2025 14:41:29] "GET /transactions HTTP/1.1" 401 -
127.0.0.1 - - [28/Sep/2025 14:41:38] "GET /transactions HTTP/1.1" 401 -
127.0.0.1 - - [28/Sep/2025 14:42:04] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:42:31] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:45:28] "POST /transactions HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:45:43] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:47:57] "POST /transactions HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:48:40] "POST /transactions HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:49:27] "POST /transactions HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:50:00] "POST /transactions HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:50:32] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:51:06] "GET /transactions/4 HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:51:22] "GET /transactions HTTP/1.1" 401 -
127.0.0.1 - - [28/Sep/2025 14:52:12] "GET /transactions HTTP/1.1" 200 -
127.0.0.1 - - [28/Sep/2025 14:54:07] "PUT /transactions/1 HTTP/1.1" 400 -
127.0.0.1 - - [28/Sep/2025 14:54:39] "GET /transactions HTTP/1.1" 200 -
```



```
(venv) monicadhieu@m-dhieu:~$ curl http://localhost:8080/transactions
{"error":"Authentication required"}(venv) monicadhieu@m-dhieu:~$ curl -u admin:wrongpassword http://localhost:8080/transactions
{"error":"Invalid credentials"}(venv) monicadhieu@m-dhieu:~$ curl -u admin:password http://localhost:8080/transactions/1
{"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 5000 RWF", "Participants": [{"Name": "Alice", "PhoneNumber": "12345", "UserType": "sender", "UserID": 1}], "TransactionID": 1}(venv) monicadhieu@m-dhieu:~$ curl -u admin:password http://localhost:8080/transactions/1
{"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 5000 RWF", "Participants": [{"Name": "Alice", "PhoneNumber": "12345", "UserType": "sender", "UserID": 1}], "TransactionID": 1}(venv) monicadhieu@m-dhieu:~$ curl -u admin:password http://localhost:8080/transactions/3
{"error": "Transaction not found"}(venv) monicadhieu@m-dhieu:~$ vi new_tx.json
```
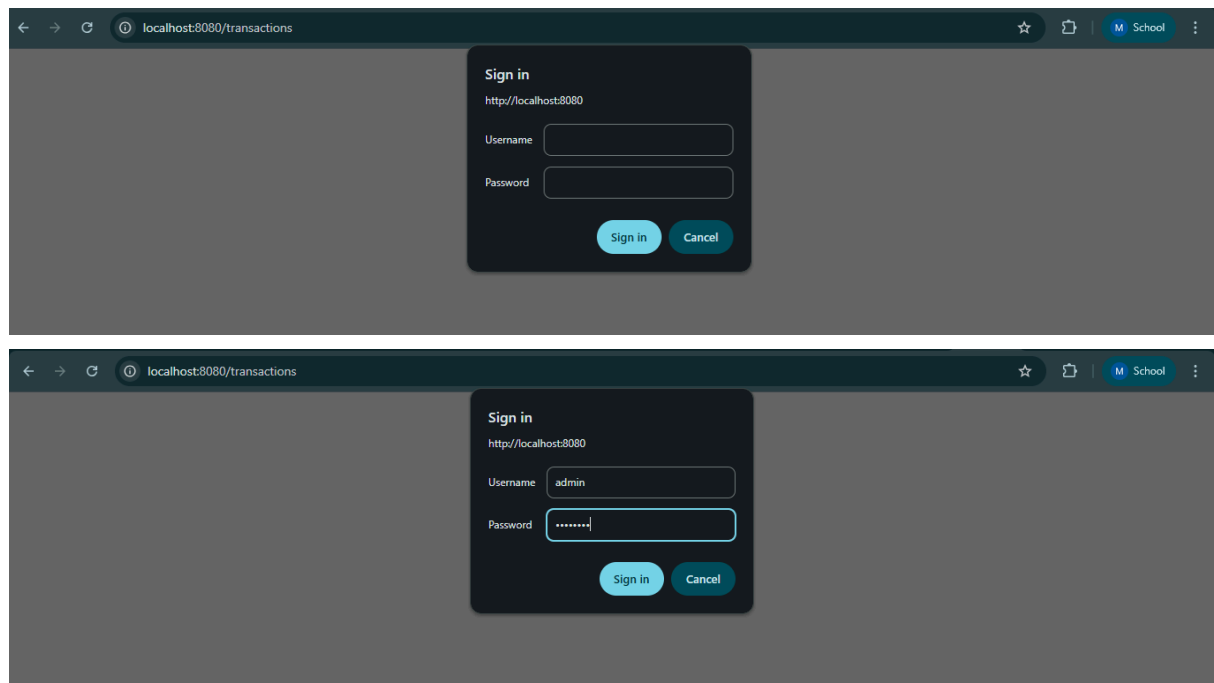


```
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/transactions/1
{"error": "Transaction not found"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl http://localhost:8080/transactions
{"error":"Authentication required"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:wrongpassword http://localhost:8080/transactions
{"error":"Invalid credentials"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/transactions
[](venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X POST http://localhost:8080/transactions \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"deposit","Amount":5000,"Currency":"RWF","DateTime":"2025-09-27 14:00:00","ReferenceNumber":"TX12345","BalanceAfterTransaction":15000,"Status":"confirmed","MessageText":"Deposit 5000 RWF","Participants":[{"Name":"Alice","PhoneNumber":"12345","UserType":"sender"}]}'
{"error": "Invalid JSON data", "details": "[Errno 2] No such file or directory: 'data/processed/transactions.json'"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X POST http://localhost:8080/transactions \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"deposit","Amount":5000,"Currency":"RWF","DateTime":"2025-09-27 14:00:00","ReferenceNumber":"TX12345","BalanceAfterTransaction":15000,"Status":"confirmed","MessageText":"Deposit 15000 RWF","Participants":[{"Name":"Janviere","PhoneNumber":"62345","UserType":"sender"}]}'
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X POST http://localhost:8080/transactions \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"deposit","Amount":5000,"Currency":"RWF","DateTime":"2025-09-27 14:00:00","ReferenceNumber":"TX12345","BalanceAfterTransaction":15000,"Status":"confirmed","MessageText":"Deposit 15000 RWF","Participants":[{"Name":"Thierry","PhoneNumber":"62345","UserType":"sender"}]}'
{"error": "Invalid JSON data", "details": "[Errno 2] No such file or directory: 'data/processed/transactions.json'"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X POST http://localhost:8080/transactions \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"deposit","Amount":5000,"Currency":"RWF","DateTime":"2025-09-27 14:00:00","ReferenceNumber":"TX12345","BalanceAfterTransaction":15000,"Status":"confirmed","MessageText":"Deposit 15000 RWF","Participants":[{"Name":"Santhiana","PhoneNumber":"62345","UserType":"sender"}]}'
{"error": "Invalid JSON data", "details": "[Errno 2] No such file or directory: 'data/processed/transactions.json'"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X POST http://localhost:8080/transactions \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"deposit","Amount":5000,"Currency":"RWF","DateTime":"2025-09-27 14:00:00","ReferenceNumber":"TX12345","BalanceAfterTransaction":15000,"Status":"confirmed","MessageText":"Deposit 15000 RWF","Participants":[{"Name":"Dhieu","PhoneNumber":"62345","UserType":"sender"}]}'
{"error": "Invalid JSON data", "details": "[Errno 2] No such file or directory: 'data/processed/transactions.json'"}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$
```
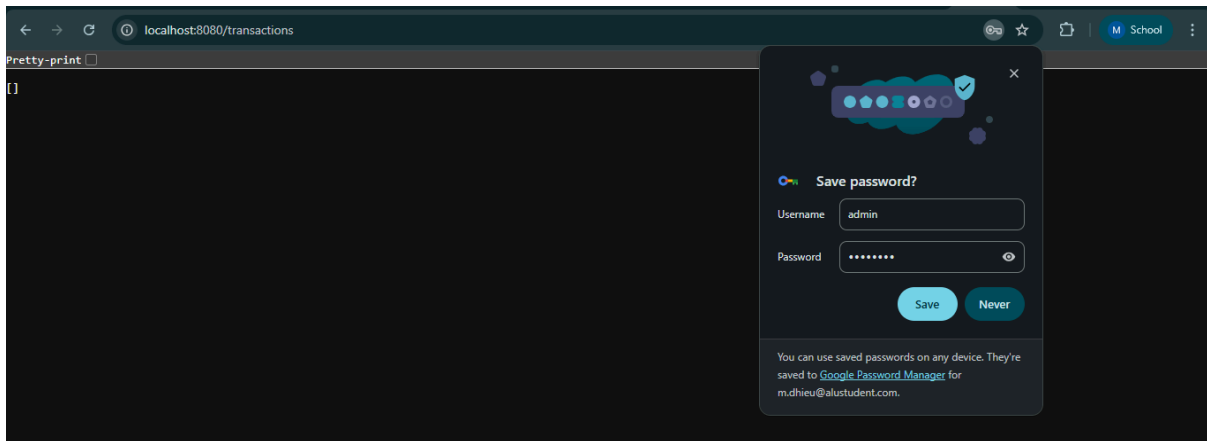
```
/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/transactions/4
{"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTran
saction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Santhiana", "PhoneNumber": "62345", "UserType
": "sender"}], "TransactionID": 4}(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/tr
ansactions
[{"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTra
nsaction": 15000, "Status": "confirmed", "MessageText": "Deposit 5000 RWF", "Participants": [{"Name": "Alice", "PhoneNumber": "12345", "UserType": "
sender"}], "TransactionID": 1}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumbe
r": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Janviere", "P
honeNumber": "62345", "UserType": "sender"}], "TransactionID": 2}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "20
25-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Part
icipants": [{"Name": "Thierry", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 3}, {"TransactionType": "deposit", "Amount": 5000,
"Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "Messag
eText": "Deposit 15000 RWF", "Participants": [{"Name": "Santhiana", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 4}, {"Transacti
onType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 1
5000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Dhieu", "PhoneNumber": "62345", "UserType": "sender"}],
"TransactionID": 5}](venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X PUT http://localhost:8080/transacti
ons/1 \
> -H "Content-Type: application/json" \
> -d '{"TransactionType":"payment","Amount":1000,"Currency":"RWF","DateTime":"2025-09-27 15:00:00","ReferenceNumber":"TX12345","BalanceAfterTransact
ion":14000,"Status":"confirmed","MessageText":"Payment 1000 RWF","Participants":[{"Name":"Bob","PhoneNumber":"67890","UserType":"sender"}]}'
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/transactions
[{"TransactionType": "payment", "Amount": 1000, "Currency": "RWF", "DateTime": "2025-09-27 15:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTra
nsaction": 14000, "Status": "confirmed", "MessageText": "Payment 1000 RWF", "Participants": [{"Name": "Bob", "PhoneNumber": "67890", "UserType": "se
nder"}], "TransactionID": 1}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber"
: "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Janviere", "Pho
neNumber": "62345", "UserType": "sender"}], "TransactionID": 2}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025
-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Partic
ipants": [{"Name": "Thierry", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 3}, {"TransactionType": "deposit", "Amount": 5000, "C
urrency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageT
ext": "Deposit 15000 RWF", "Participants": [{"Name": "Santhiana", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 4}, {"Transaction
Type": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 150
00, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Dhieu", "PhoneNumber": "62345", "UserType": "sender"}], "T
ransactionID": 5}](venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$
```

```
ransactionID": 5}](venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password -X DELETE http://localhost:8080/transact
ions/1
curl: (52) Empty reply from server
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/data/processed$ curl -u admin:password http://localhost:8080/transactions
[{"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTra
nsaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Janviere", "PhoneNumber": "62345", "UserType
": "sender"}], "TransactionID": 2}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceN
umber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "Participants": [{"Name": "Thierry",
 "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 3}, {"TransactionType": "deposit", "Amount": 5000, "Currency": "RWF", "DateTime":
"2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "MessageText": "Deposit 15000 RWF", "P
articipants": [{"Name": "Santhiana", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 4}, {"TransactionType": "deposit", "Amount": 5
000, "Currency": "RWF", "DateTime": "2025-09-27 14:00:00", "ReferenceNumber": "TX12345", "BalanceAfterTransaction": 15000, "Status": "confirmed", "M
essageText": "Deposit 15000 RWF", "Participants": [{"Name": "Dhieu", "PhoneNumber": "62345", "UserType": "sender"}], "TransactionID": 5}](venv) moni
cadhieu@m-dhieu:~/alu/summatives/Before/data/processed$
```

Appendix B: Basic Authentication Screenshots

Sign in
http://localhost:8080
Username
Password
Sign in   Cancel

localhost:8080/transactions
M School

Sign in
http://localhost:8080
Username   admin
Password   ••••••••
Sign in   Cancel

localhost:8080/transactions
M School

Appendix C: DSA Comparison Python Test Results Screenshots


```
monicadhieu@m-dhieu:~/alu/summatives/Before/dsa$ python3 -m venv venv
monicadhieu@m-dhieu:~/alu/summatives/Before/dsa$ source venv/bin/activate
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/dsa$ python3 compare_dsa_search.py
Loaded 1699 transactions.
Linear Search took: 0.000922 seconds.
Dictionary Lookup took: 0.000007 seconds.

Reflection:
Dictionary lookup is significantly faster than linear search because dictionaries
use hash tables providing average O(1) time complexity, whereas linear search
requires O(n) time scanning the entire list.
For larger datasets, using efficient data structures like dictionaries greatly
improves performance. Further improvements could include balanced trees or
database indexing for huge datasets where sorted access is beneficial.
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/dsa$
```

Appendix D: XML to JSON Parsing Test Results Screenshots


```
(venv) monicadhieu@m-dhieu:~/alu/summatives/Before/dsa$ python3 parse_xml.py
Loading XML data from ../data/raw/modified_sms_v2.xml ...
Transactions saved to JSON file: ../data/processed/transactions.json
Parsed transactions JSON preview:
[
    {
        "TransactionID": 1,
        "TransactionType": "deposit",
        "Amount": 2000.0,
        "Currency": "RWF",
        "DateTime": "2024-05-10 16:30:51",
        "ReferenceNumber": "76662021700",
        "BalanceAfterTransaction": 2000.0,
        "Status": "confirmed",
        "MessageText": "You have received 2000 RWF from Jane Smith (*********013) on your mobile money account at 2024-05-10 16:30:51. Message from
sender: . Your new balance:2000 RWF. Financial Transaction Id: 76662021700.",
        "Participants": [
            {
                "Name": "Jane Smith",
                "PhoneNumber": "*********013",
                "UserType": "sender",
                "UserID": 1
            }
        ]
    },
    {
        "TransactionID": 2,
        "TransactionType": "payment",
        "Amount": 1000.0,
        "Currency": "RWF",
        "DateTime": "2024-05-10 16:31:39",
        "ReferenceNumber": "73214484437",
        "BalanceAfterTransaction": null,
        "Status": "confirmed",
        "MessageText": "TxId: 73214484437. Your payment of 1,000 RWF to Jane Smith 12845 has been completed at 2024-05-10 16:31:39. Your new balance
```