

PDF Report

Introduction to API security

The MoMo SMS API uses Basic Authentication to restrict access to endpoints. Each request must include a username and password encoded in base64.

- Username: admin
- Password: secret
- Purpose: Prevent unauthorized access to sensitive transaction data.

Documentation of endpoints

1. Get all transactions

- URL: `/transactions`
- Method: GET
- Description: Retrieves a list of all momo transactions in the system.

- Request Example

curl command:

```
curl -u admin:secret "http://localhost:8000/transactions"
```

where:

- admin: username
- secret: password

- Response Example

```
1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691]
<generator object TransactionHandler.do_GET.<locals>.<genexpr> at 0x7F3d3e4d8f90>
127.0.0.1 - - [02/Oct/2025 05:30:10] "GET /transactions HTTP/1.1" 200 -

{"service_center": "+250788110383", "transaction_id": null, {"id": 1680, "address": "M-Money", "date": "1736772459072", "type": "1", "body":
": "+165*S*820000 RWF transferred to Jane Smith (250790777777) from 36521838 at 2025-01-13 14:47:32 . Fee was: 1500 RWF. New balance: 157350
RWF. Kugura ama inite cg interineti kuri MoMo, Kanda *182*2*1# .*EN#", "readable_date": "2025-01-13 04:47:39", "contact_name": "(Unknown)",
"service_center": "+250788110383", "transaction_id": null, {"id": 1681, "address": "M-Money", "date": "1736792566151", "type": "1", "body":
": "TxId: 33961366964. Your payment of 35,300 RWF to Jane Smith 23980 has been completed at 2025-01-13 20:22:16. Your new balance: 122,050 RW
F. Fee was 0 RWF.", "readable_date": "2025-01-13 10:22:46", "contact_name": "(Unknown)", "service_center": "+250788110383", "transaction_id":
null, {"id": 1682, "address": "M-Money", "date": "1736849812482", "type": "1", "body": "": "+165*S*20000 RWF transferred to Jane Smith (25078
9888888) from 36521838 at 2025-01-14 12:16:45 . Fee was: 250 RWF. New balance: 101800 RWF. Kugura ama inite cg interineti kuri MoMo, Kanda *
182*2*1# .*EN#", "readable_date": "2025-01-14 02:16:52", "contact_name": "(Unknown)", "service_center": "+250788110383", "transaction_id": n
ull, {"id": 1683, "address": "M-Money", "date": "1736852580720", "type": "1", "body": "TxId: 36439238929. Your payment of 3,800 RWF To Jane
Smith 46055 has been completed at 2025-01-14 13:02:52. Your new balance: 98,000 RWF. Fee was 0 RWF.", "readable_date": "2025-01-14 03:03:00
", "contact_name": "(Unknown)", "service_center": "+250788110383", "transaction_id": null, {"id": 1684, "address": "M-Money", "date": "1736
868583669", "type": "1", "body": "": "+164*S*Y'ello, A transaction of 10000 RWF by Data Bundle MTN on your MOMO account was successfully complete
d at 2025-01-14 17:29:36. Message from debit receiver: . Your new balance: 88000 RWF. Fee was 0 RWF. Financial Transaction Id: 18087757600. E
xternal Transaction Id: 17368685383021954.*EN#", "readable_date": "2025-01-14 07:29:43", "contact_name": "(Unknown)", "service_center": "+25
0788110383", "transaction_id": "18087757600.", {"id": 1685, "address": "M-Money", "date": "1736878131643", "type": "1", "body": "TxId: 3080
1532894. Your payment of 1,000 RWF to Jane Smith 61758 has been completed at 2025-01-14 20:08:44. Your new balance: 87,000 RWF. Fee was 0 RW
F.", "readable_date": "2025-01-14 10:08:51", "contact_name": "(Unknown)", "service_center": "+250788110383", "transaction_id": null, {"id":
1686, "address": "M-Money", "date": "1736882759238", "type": "1", "body": "TxId: 55109401801. Your payment of 14,500 RWF to Samuel Carter 3
9233 has been completed at 2025-01-14 21:25:51. Your new balance: 72,500 RWF. Fee was 0 RWF.", "readable_date": "2025-01-14 11:25:59", "cont
act_name": "(Unknown)", "service_center": "+250788110383", "transaction_id": null, {"id": 1687, "address": "M-Money", "date": "173694191225
9", "type": "1", "body": "": "+165*S*8000 RWF transferred to Samuel Carter (250791666666) from 36521838 at 2025-01-15 13:51:46 . Fee was: 100 RW
F. New balance: 64400 RWF. Kugura ama inite cg interineti kuri MoMo, Kanda *182*2*1# .*EN#", "readable_date": "2025-01-15 03:51:52", "contac
t_name": "(Unknown)", "service_center": "+250788110383", "transaction_id": null, {"id": 1688, "address": "M-Money", "date": "1736954506185",
"service_center": "+250788110383", "transaction_id": null, {"id": 1689, "address": "M-Money", "date": "1736954506185", "type": "1", "body": "": "+165*S*6000 RWF transferred to Jane Smith (250788999999) from 36521838 at 2025-01-15 17:21:35 . Fee was: 100 RWF. Ne
```

- Error Codes

- 200 OK: successfully retrieved data
- 401 Unauthorised: for invalid credentials

- 500 Internal server error

1. Retrieve Single Transaction

- Endpoint & Method

- URL: `/transactions/{id}`
- Method: GET
- ID: Transaction_id
- Authentication: Basic authentication
- Description: Retrieves a specific transaction using its id

- Request Example

curl command:

curl -u admin:secret "http://localhost:8000/transactions/1"

- Response Example

```
00/transactions/1
{"id": 1, "address": "M-Money", "date": "1715351458724", "type": "1", "body": "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.", "readable_date": "2024-05-10 07:30:58", "contact_name": "(Unknown)", "service_center": "+250788110381", "transaction_id": "76662021700."}root@4de2186cc2cc:/MoMo-SMS-data/api#
```

- Error Codes

- 404 Not Found: Transaction with specific id not found/ doesn't exist
- 200 OK: successfully retrieved data
- 401 Unauthorised: for invalid credentials
- 500 Internal server error

3. POST (Create new transaction)

- Endpoint & Method

- URL: `/transactions`
- Method: POST
- Authentication: Basic authentication
- Description: Creates a new transaction record.

- Request Example

curl command:

**curl -u admin:secret -X POST -H "Content-Type: application/json" **
**-d '{"address":"12345","body":"Test transaction"}' **
http://localhost:8000/transactions

- Response Example

```
root@4de2186cc2cc:/MoMo-SMS-data/api# curl -u admin:secret -X POST http://localhost:8000/transactions \
> -H "Content-Type: application/json" \
> -d '{"address":"M-Money","date":"1715351459000","type":"1","body":"Test transaction","readable_date":"2025-10-02","contact_name":"Tester",
"service_center":"+250700000000","transaction_id":"999999"}'
{"address": "M-Money", "date": "1715351459000", "type": "1", "body": "Test transaction", "readable_date": "2025-10-02", "contact_name": "Tes
ter", "service_center": "+250700000000", "transaction_id": "999999", "id": 1692}root@4de2186cc2cc:/MoMo-SMS-data/api#
```

- Error codes

- 201 Created: Transaction successfully created
- 400 Bad Request: Invalid JSON format or missing required fields
- 401 Unauthorized: Invalid or missing authentication credentials
- 500 Internal Server Error: Server error occurred

4. PUT (Update existing transaction)

- Endpoint & Method

- URL: `/transactions/{id}`
- Method: PUT
- Authentication: Basic authentication
- ID: Transaction_id (for record to be updated)
- Description: Update an already existing transaction with new or added data.

- Request Example

curl command:

```
curl -u admin:secret -X PUT -H "Content-Type: application/json" \
-d '{"address":"12345","body":"Updated transaction"}' \
http://localhost:8000/transactions/1
```

- Response Example

```
Ter", "service_center": "+250700000000", "transaction_id": "999999", "id": 1692)root@4de2186cc2cc:/MoMo-SMS-data/api# curl -u admin:secret -X PUT http://localhost:8000/transactions/1 \
> -H "Content-Type: application/json" \
> -d '{"address":"M-Money","date":"1715351459000","type":"1","body":"Updated transaction","readable_date":"2025-10-02","contact_name":"Tester","service_center":"+250700000000","transaction_id":"999999"}'
{"address": "M-Money", "date": "1715351459000", "type": "1", "body": "Updated transaction", "readable_date": "2025-10-02", "contact_name": "Tester", "service_center": "+250700000000", "transaction_id": "999999", "id": 1}root@4de2186cc2cc:/MoMo-SMS-data/api#
```

- Error codes

- 200 OK: Transaction successfully updated
- 400 Bad Request: Invalid JSON format or missing required fields
- 404 Not Found: Transaction with ID doesn't exist
- 500 Internal Server Error: Server error occurred

5. DELETE (Delete transaction)

- Endpoint & Method

- URL: `/transactions/{id}`
- Method: DELETE
- Authentication: Basic authentication
- ID: Transaction_id (for record to be deleted)
- Description: Deleting a transaction record for good.

- Request Example

curl command:

```
curl -u admin:secret -X DELETE http://localhost:8000/transactions/1
```

- Response Example

```
Tester", "service_center": "+250700000000", "transaction_id": "999999", "id": 1})root@4de2186cc2cc:/MoMo-SMS-data/api# curl -u admin:secret -X DELETE http://localhost:8000/transactions/1
{"deleted": {"address": "M-Money", "date": "1715351459000", "type": "1", "body": "Updated transaction", "readable_date": "2025-10-02", "contact_name": "Tester", "service_center": "+250700000000", "transaction_id": "999999", "id": 1})root@4de2186cc2cc:/MoMo-SMS-data/api#
```

- **Error Codes**

- 200 OK: Transaction successfully deleted
- 401 Unauthorized: Invalid or missing authentication credentials
- 404 Not Found: Transaction with specified ID does not exist
- 500 Internal Server Error: Server error occurred

6. Rate Limiting & Performance

- Concurrent Requests: Supported with thread-safe file operations
- Response Time: Typically under 100ms for single operations
- File Storage: JSON file-based persistence (data/transactions.json)
- Memory Usage: Loads full dataset into memory for fast access

7. Results of DSA comparison

Running DSA Comparison:

cd dsa

python3 search.py

This shows average search times for linear search vs dictionary lookup.

```
root@4de2186cc2cc:/MoMo-SMS-data/dsa# python3 search.py
=== DSA Comparison: Linear Search vs Dictionary Lookup ===
Average Linear Search Time: 3.34 µs
Average Dictionary Lookup Time: 1.43 µs
Dictionary lookup is approximately 2.3 times faster than linear search.
```

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