Software Prototype Use-cases:

Scenario	Description	Tested Input	Expected Outcome
Vehicle Registration	Register a new vehicle with license plate and owner details	license_plate, vehicle_type, etc.	Returns vehicle ID and stores registration successfully
Tag Assignment	Assign RFID tag to an already registered vehicle	tag_id, vehicle_id	Tag linked to vehicle; returns confirmation
Tag Blacklisting	Add a tag to blacklist list due to fraud or loss	tag_id, reason, severity	System logs blacklisted tag and returns status
Plate Notification Check	Check if notifications are correctly logged when a valid plate is passed	Valid license_plate	Returns notification logs (non-null)
Tag Notification Check	Same as above but for RFID tags	Valid tag_id	Returns notification logs (non-null)
Security Incident Logging	Log all critical unresolved alerts into Security Incident DB	System-generated	Incident ID stored; alerts tied to unresolved notifications
Toll Deduction (Success)	Deduct toll when valid vehicle and sufficient balance exists	license_plate, plaza_id	Returns TOLL_PAID, deducts from wallet
Invalid Plaza	Handle invalid toll plaza scenario	Wrong plaza_id	Returns error: Invalid Plaza
RFID–Plate Mismatch	Simulate mismatch between registered tag and plate	Wrong license_plate with valid tag_id	Returns UNMATCHED_PLATE and logs alert
Missing Tag	Simulate entry without RFID tag	Only license_plate	Returns TAG_MISSING notification
Insufficient Funds	Simulate toll with low balance in wallet	Low balance account	Returns INSUFFICIENT_FUNDS, logs pending toll
Unregistered Vehicle (Plate Only)	Try passing a vehicle that isn't in the system	Unknown license_plate	Returns UNMATCHED_PLATE
Unknown RFID Tag	Try passing an unregistered tag	Unknown tag_id	Returns UNKNOWN_TAG
Missing License Plate for Tag	Simulate case where tag has no associated plate	Tag with missing plate	Returns LICENSE_MISSING

Table 1: Use Cases List

Use-Case –1

Vehicle Registration:

Payload Input:
Part A: Non-Registered Vehicle

```
{
  "owner_id": "OWN032",
  "tag_id": "TAG011",
  "license_plate": "EU-7881-GG",
  "vehicle_type": "Hatchback",
  "model": "Volkswagen",
  "color": "Green"
}
```
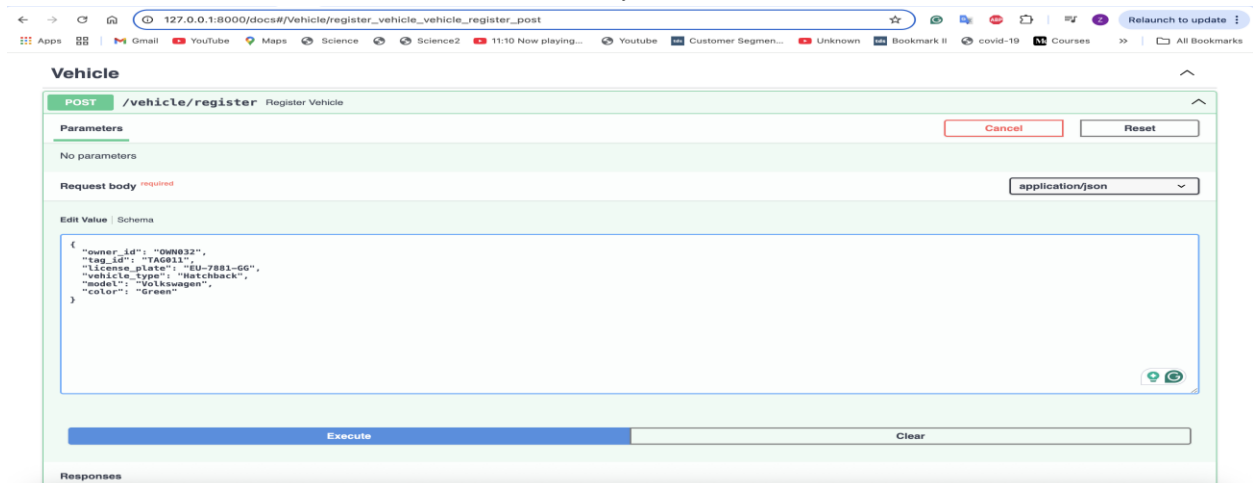

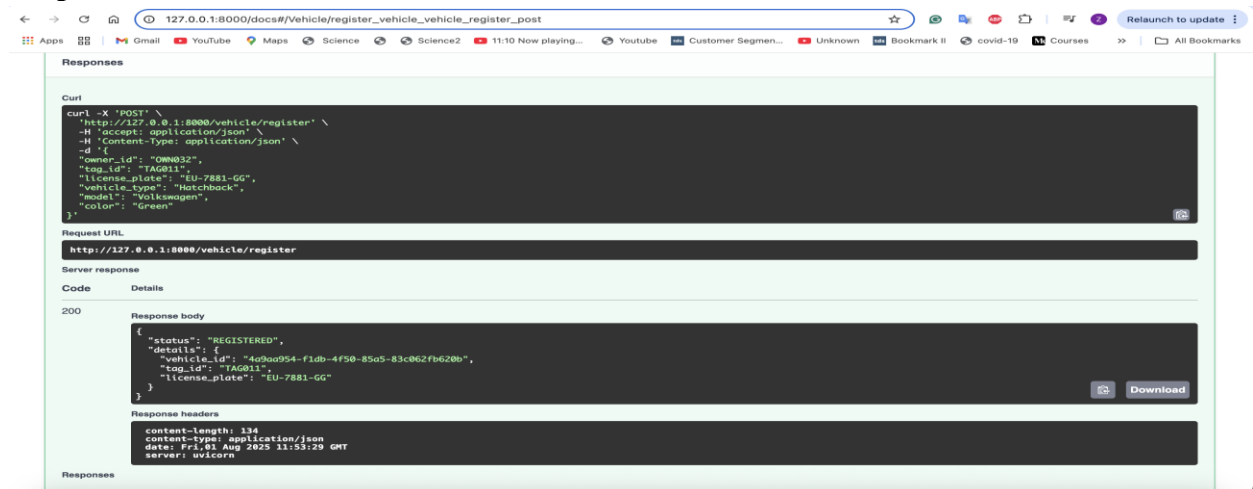Figure 1: Payload Input for Vehicle Registration

Response

Figure 2: Response for Non-Registered Vehicle
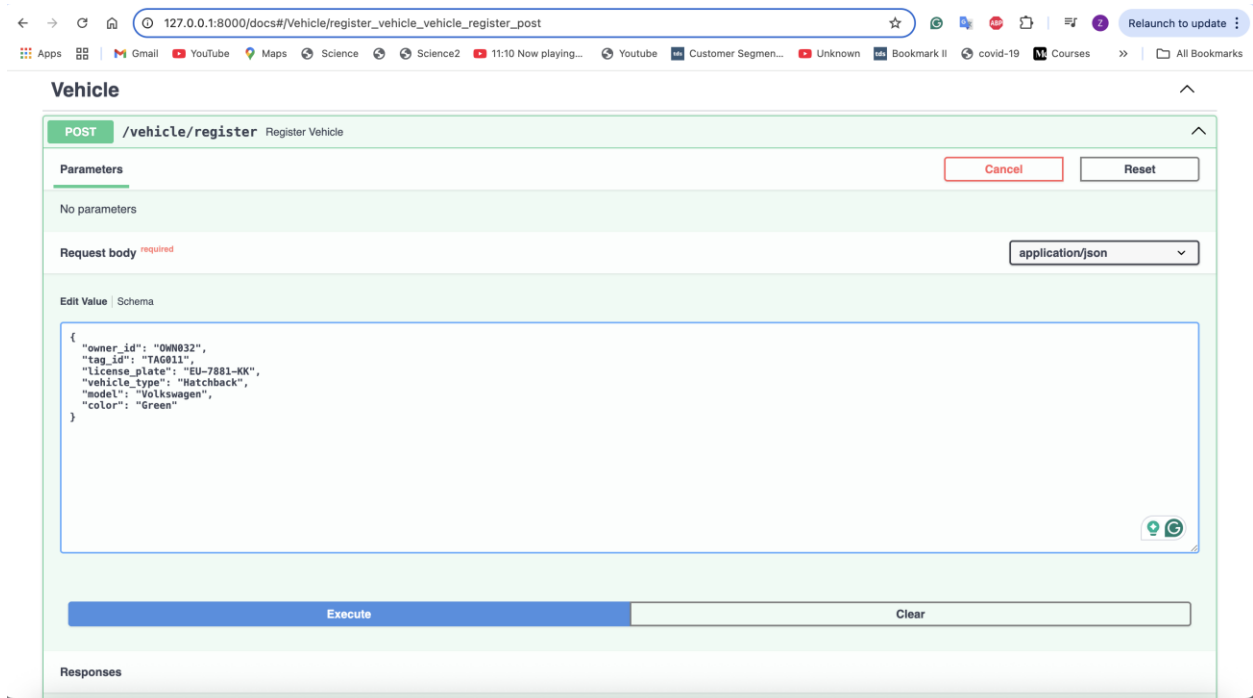
Part-B: Registered Vehicle Tag
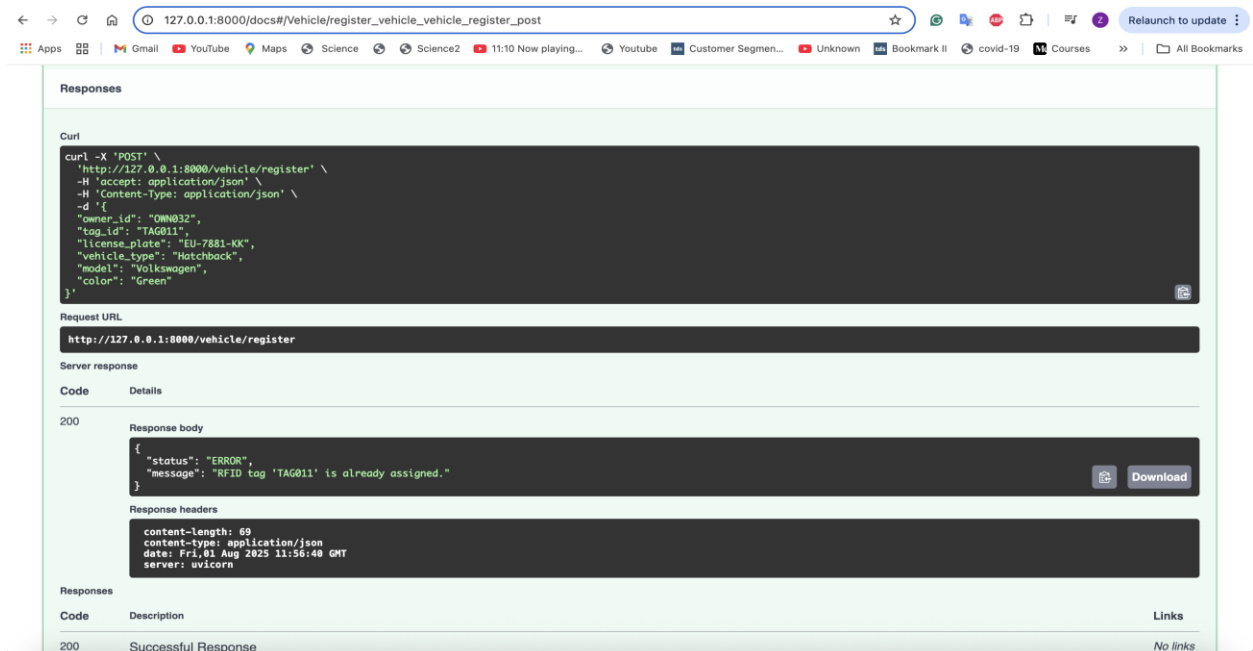

Figure 3: Passing an Existing Tag to Payload

Response:

Figure 4: Response For Existing Tag

Part-C: Registered License Plate
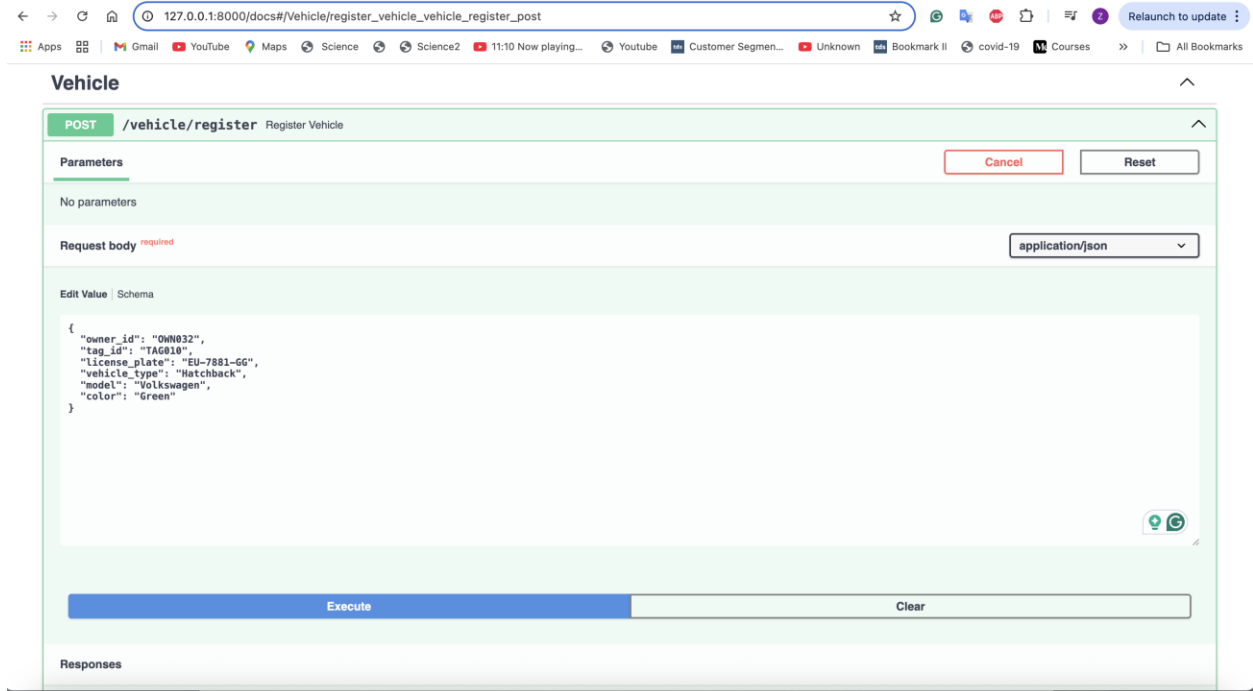
Figure 5: Existing License Plate

Response:
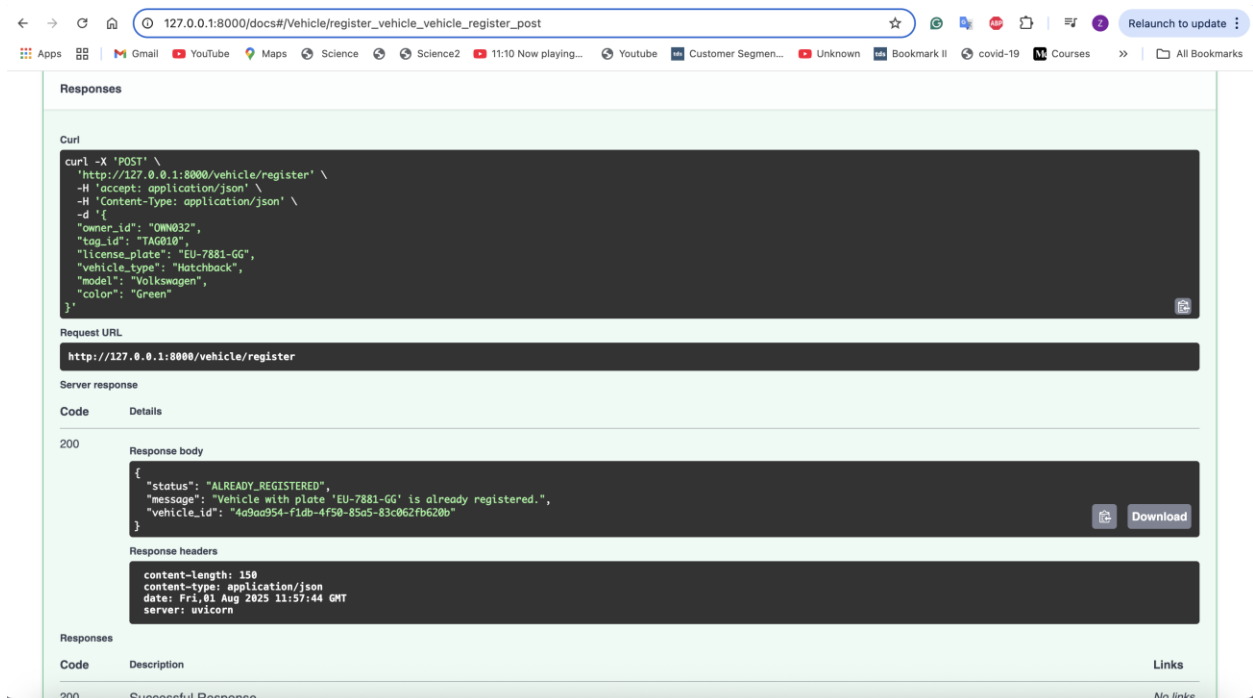
Figure 6: Response Returned for Existing License Plate

Use-Case 2: Assignment of Tag:
Part A: Assigning New Tag for Registered Vehicle
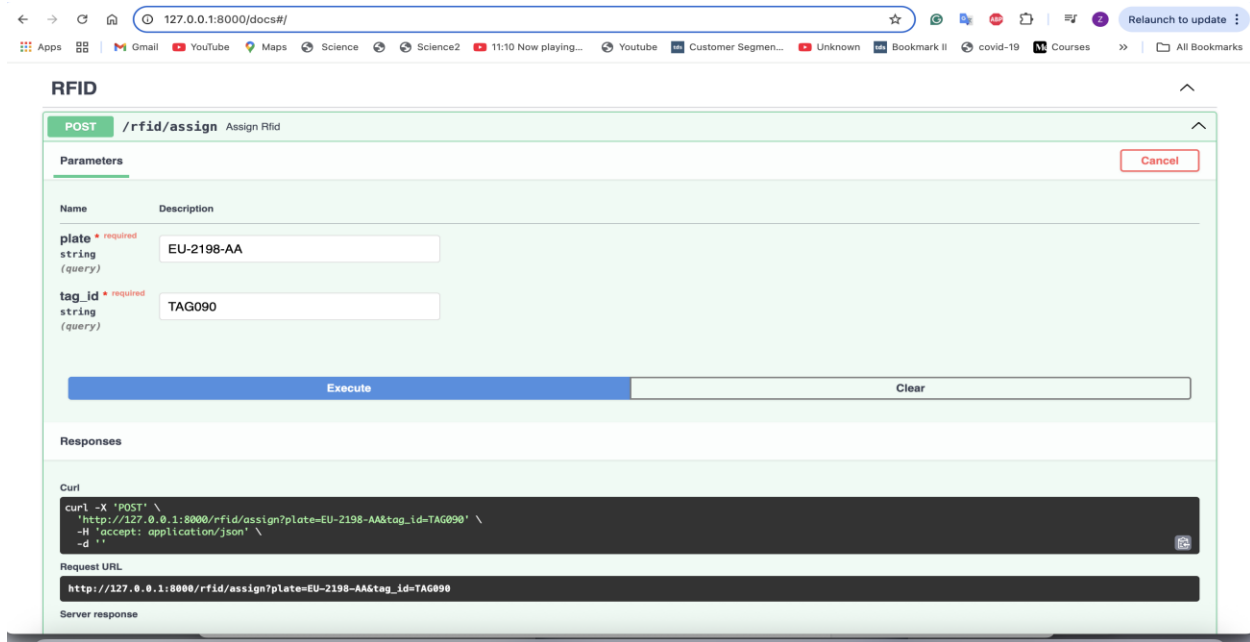
Figure 7: Tag Assignment for Licensed Vehicles Normal Condition

Response
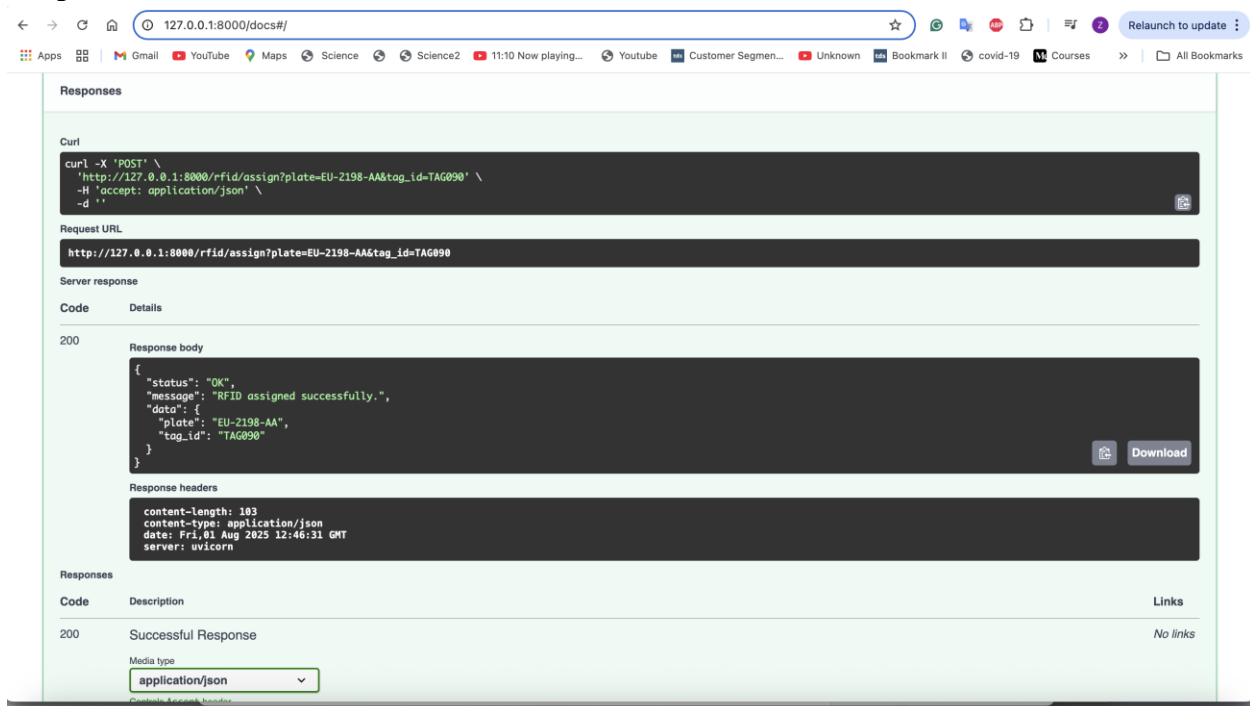
Figure 8: Response for a successful registration for Tag

Part B:
Assigning Existence Tag to Vehicle:
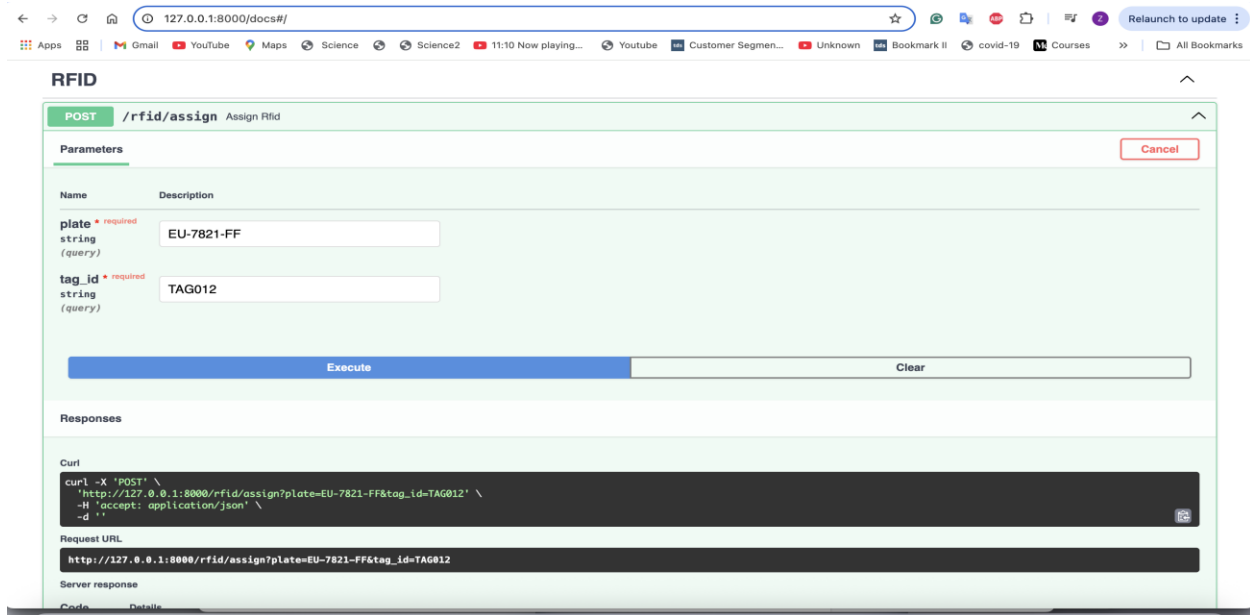
Figure 9: Assignment of Existence Tag to New Vehicle

Response:
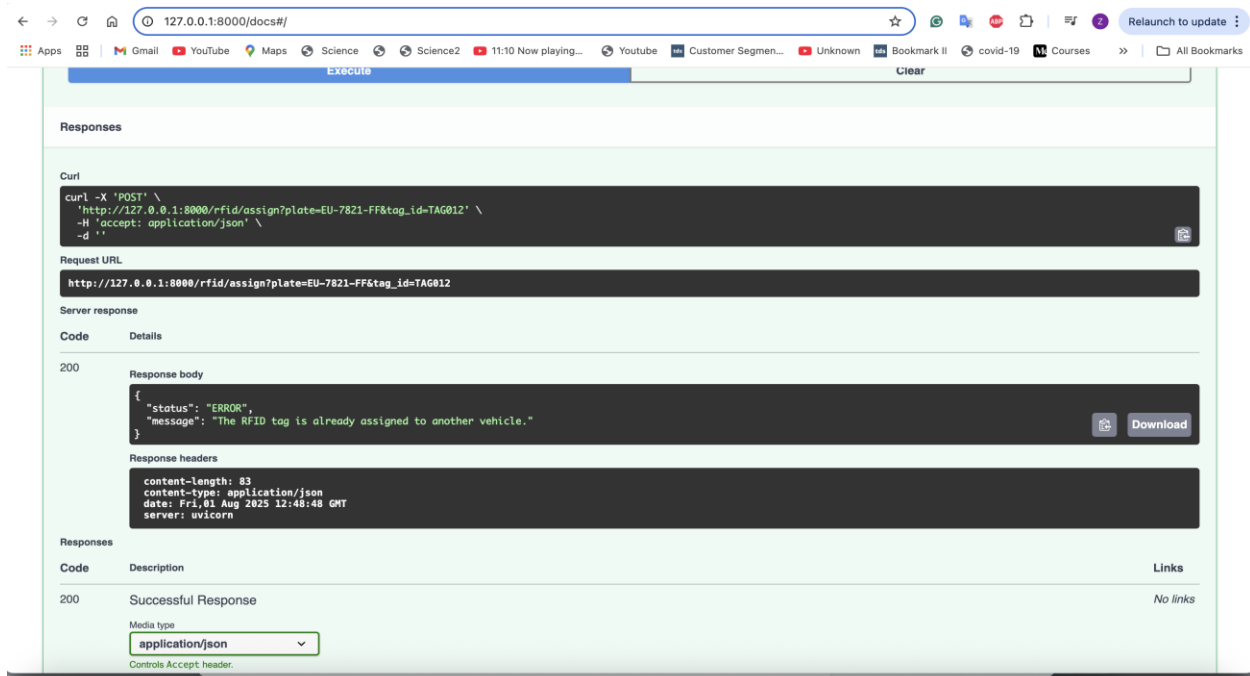
Figure 10: Response for Existing Tag

Use-Case: 3: Blacklisting RFID Tag

Part A: Normal Condition
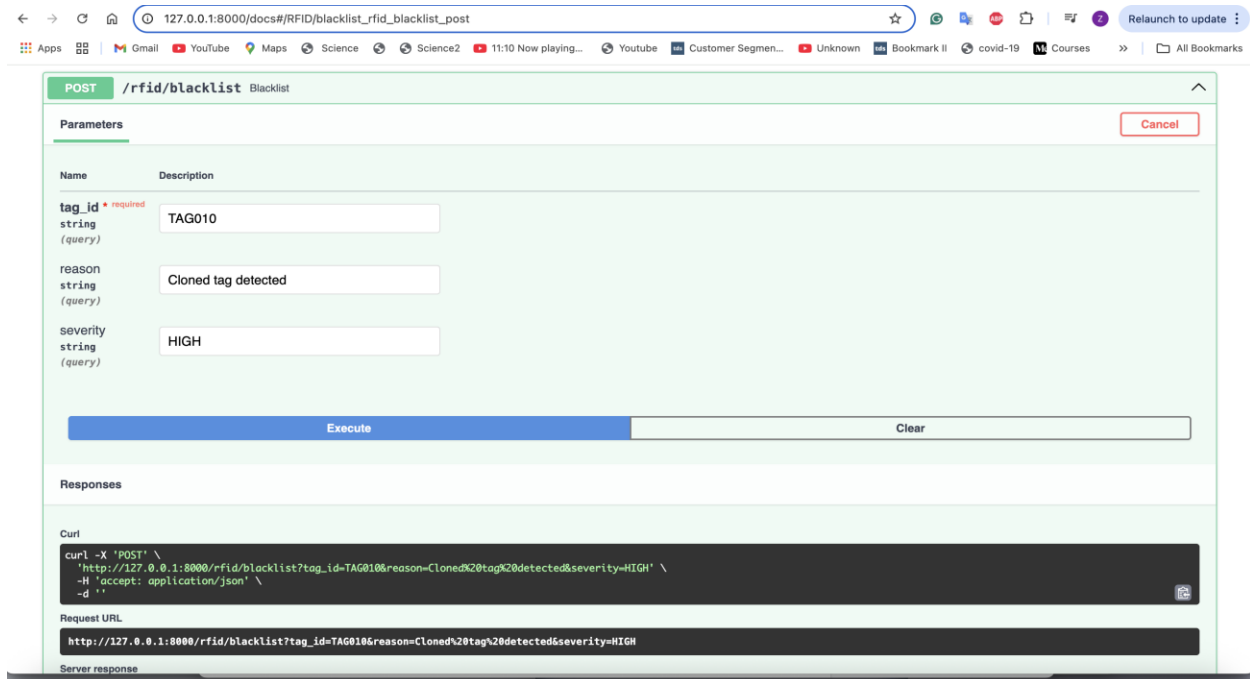
Figure 11: Blacklisting RFID Tag

Response:
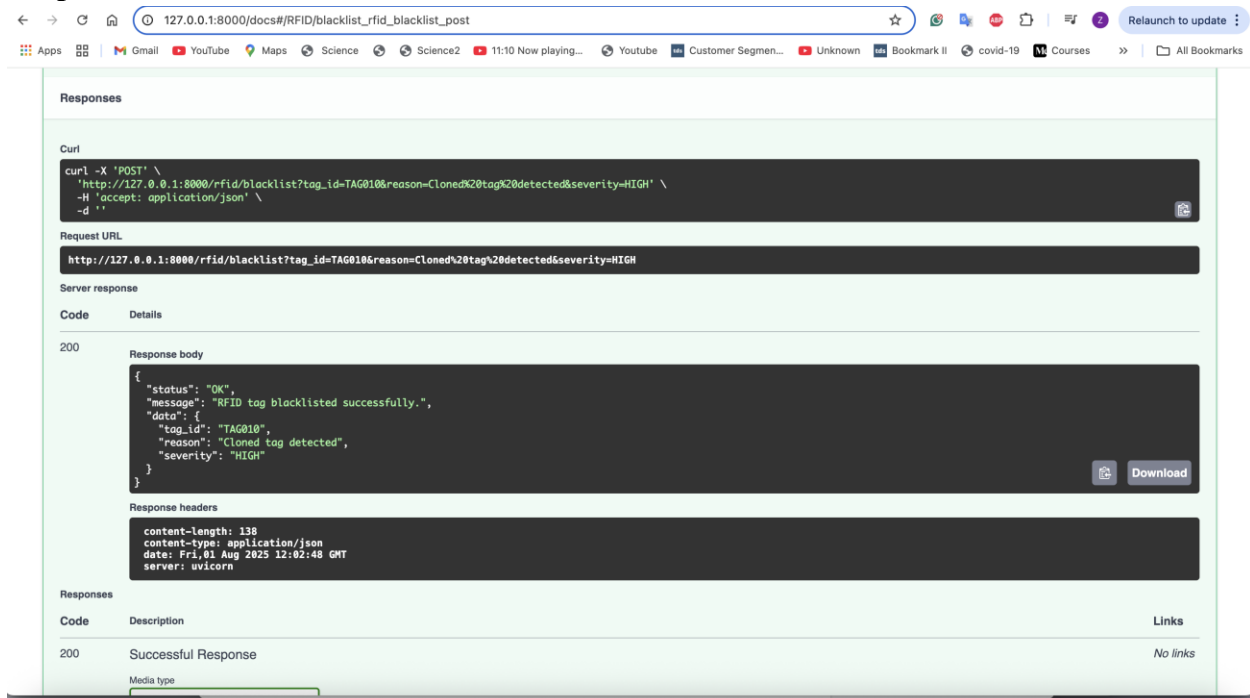
Figure 12: Response for blacklisting of Tag

Use-Case 4: Notification Checklist
Part A: Only with License Plate:
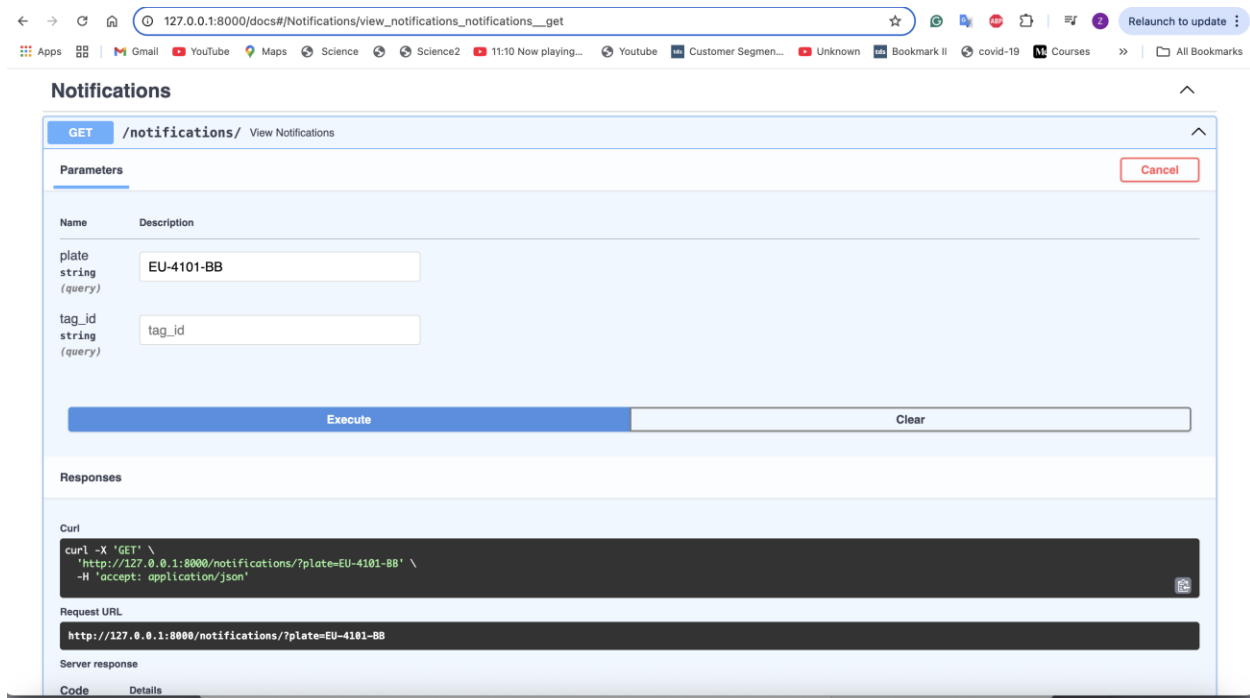
Figure 13: Checking Notifications against the License Plate

Response:
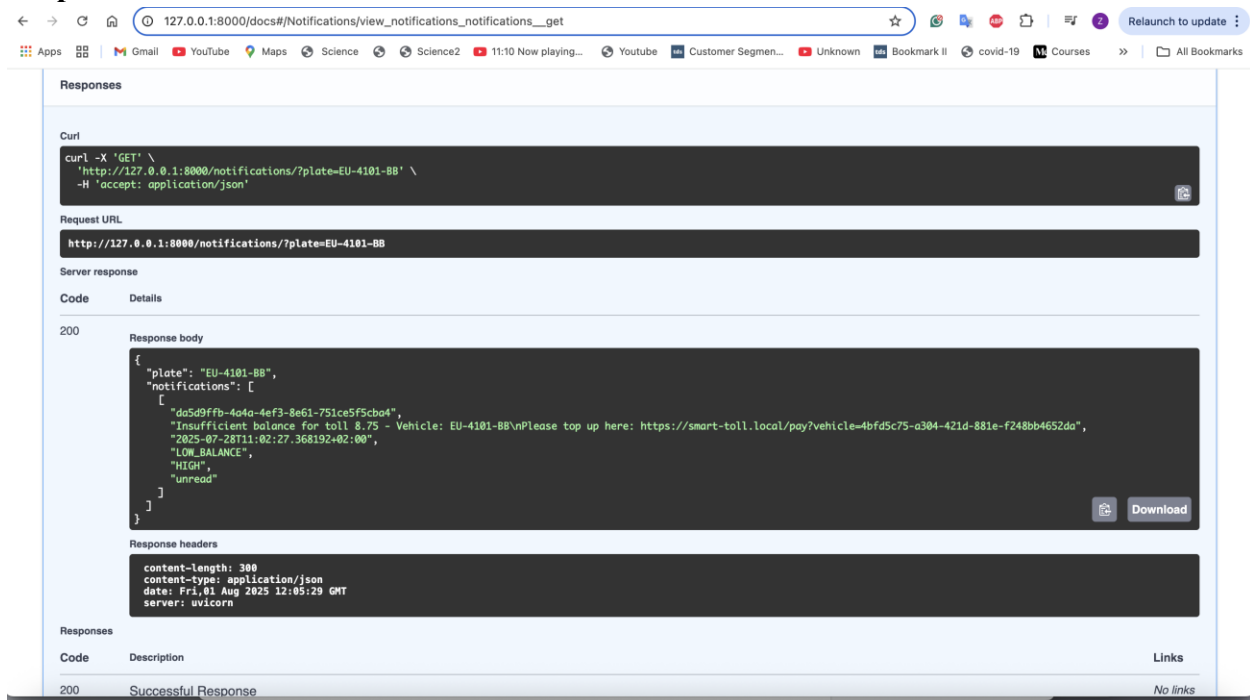
Figure 14: Response returned for notification check

Part B: With Tag only Non-Active Tag
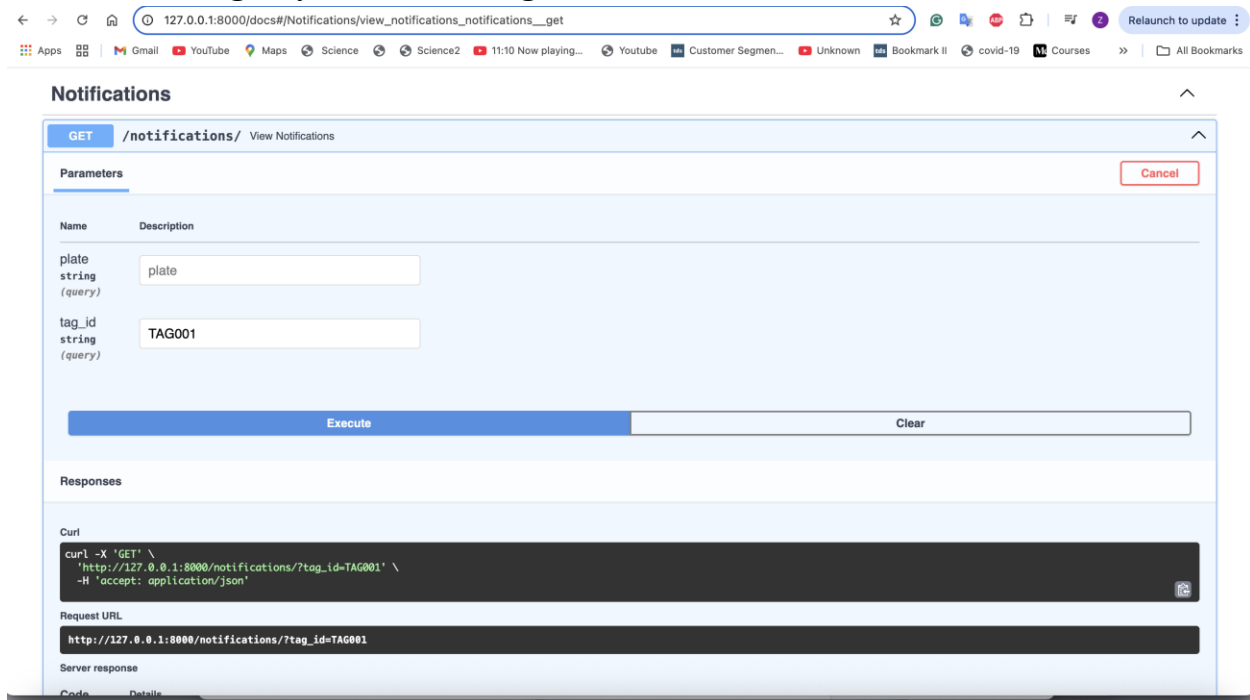
Figure 15: Notification check with Tag

Response:
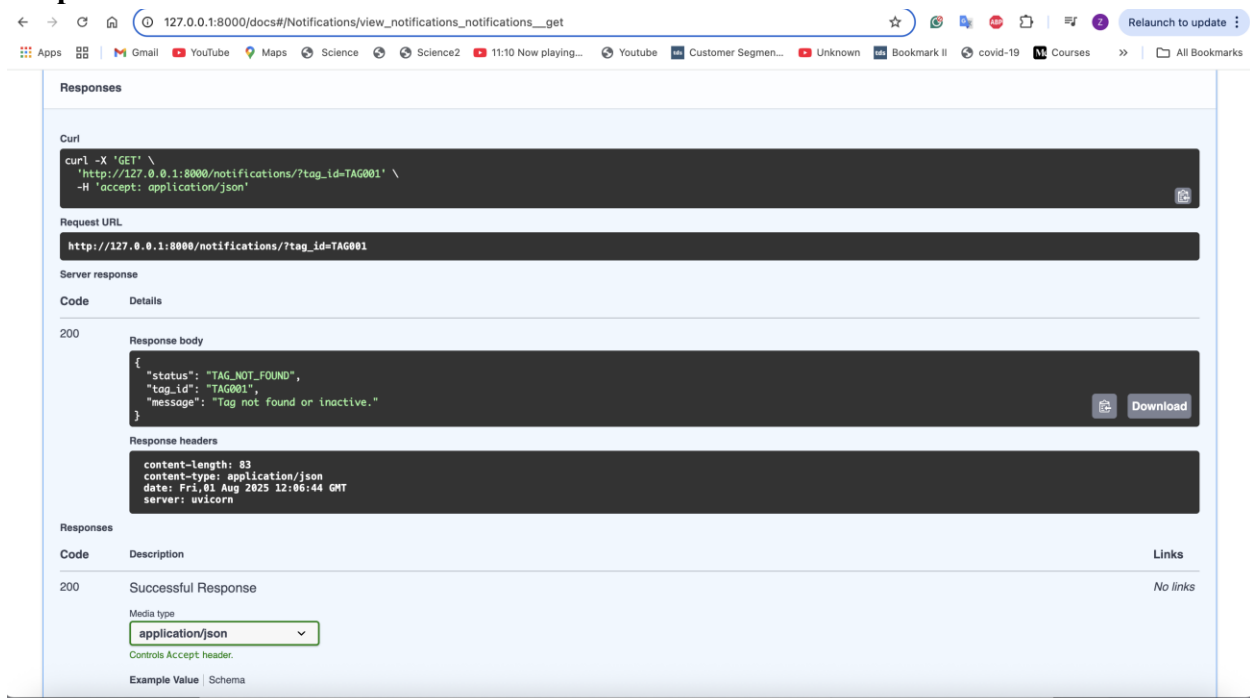
Figure 16: Response for non-registered Tag

Part C: Notifications for blacklisting Tag with Tag
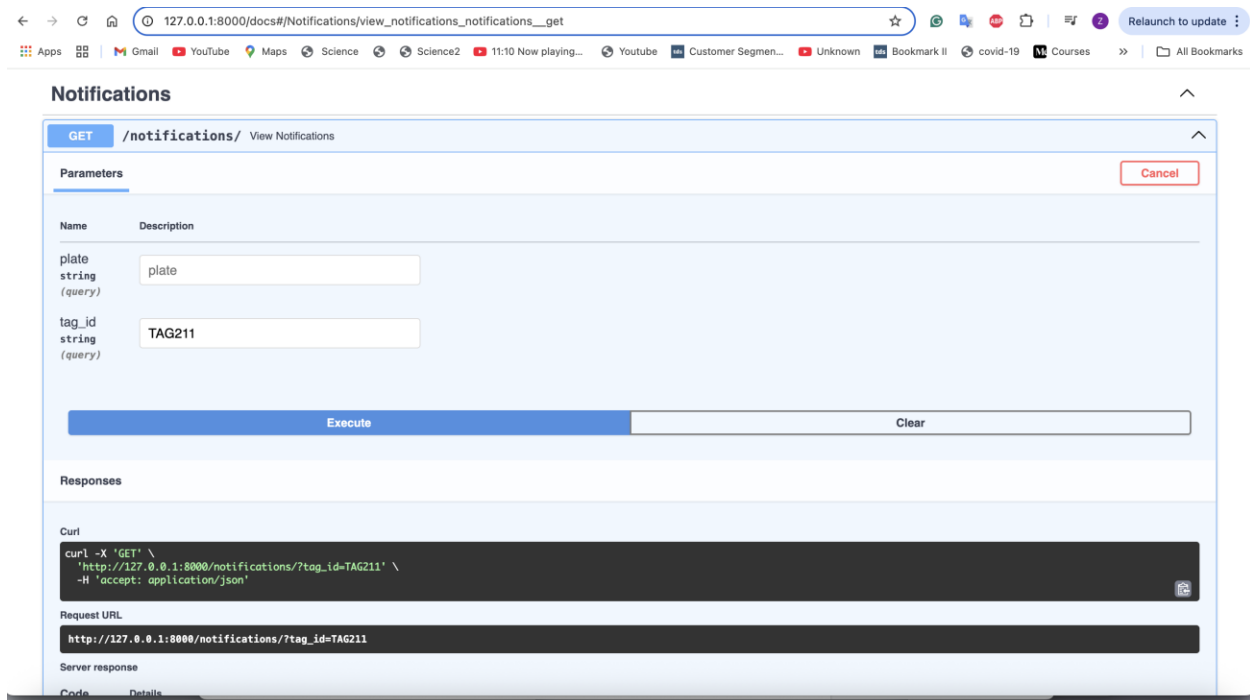
Figure 17: Blacklisted Vehicle

Response:
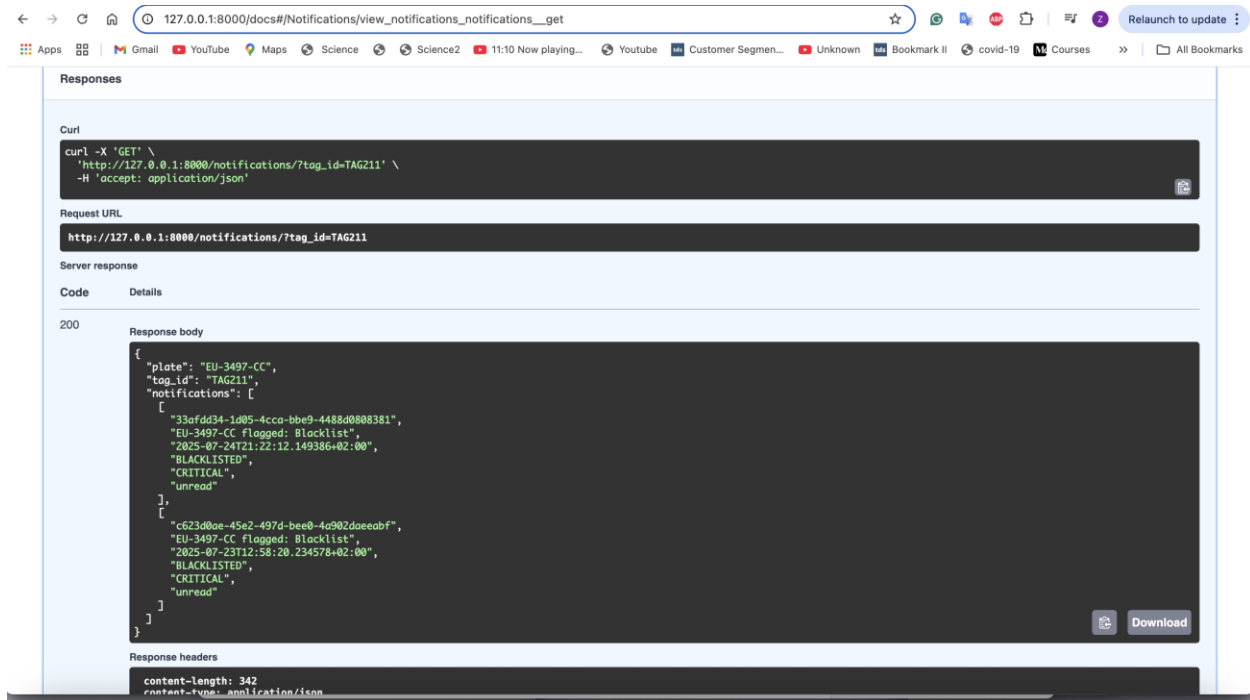
Figure 18: List of Notifications against blacklisted Tag

Part D: Low Account Balance:
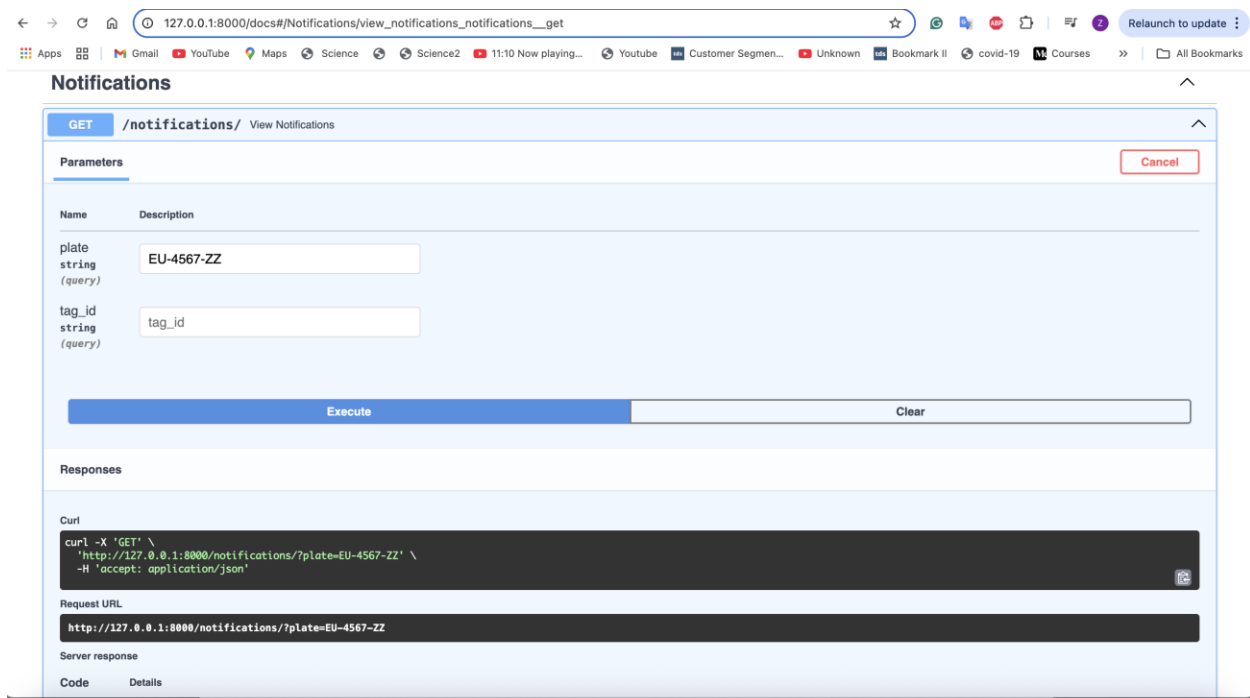
Figure 19: Notifications for Low Balance

Response: Payment Link is added to the notification
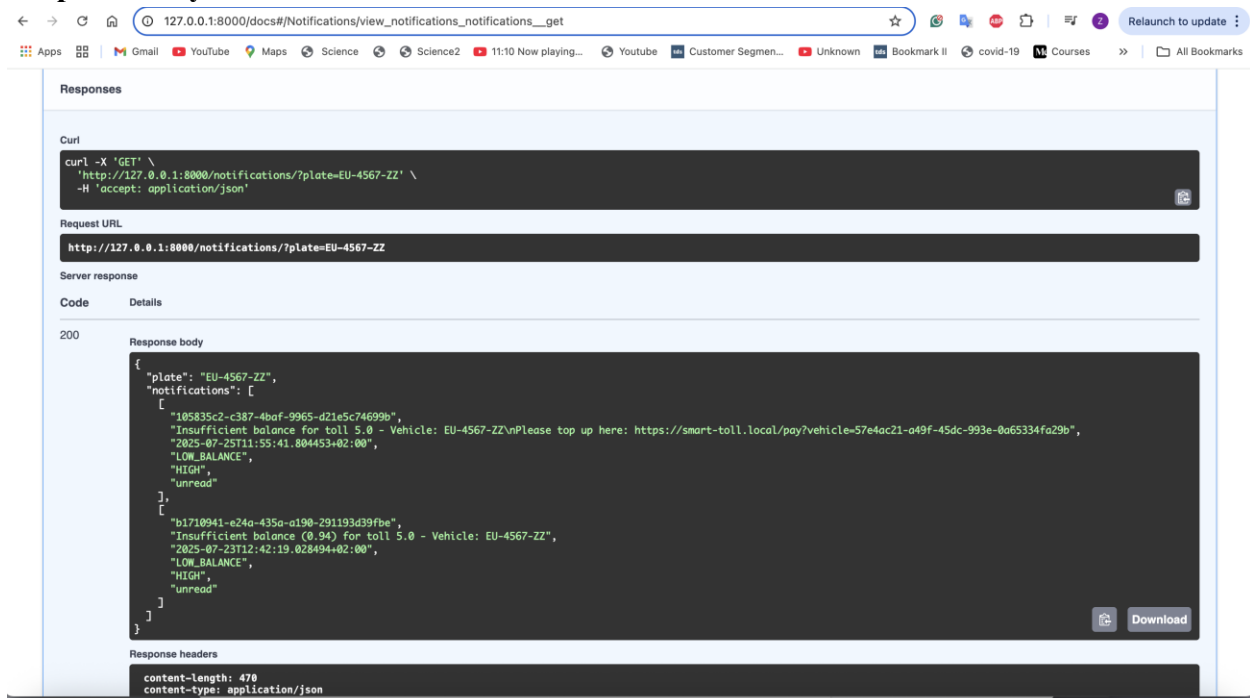
Figure 20: List of Notifications returned against low balance through vehicle (unresolved yet)

Part E: Non-Registered License Plate:
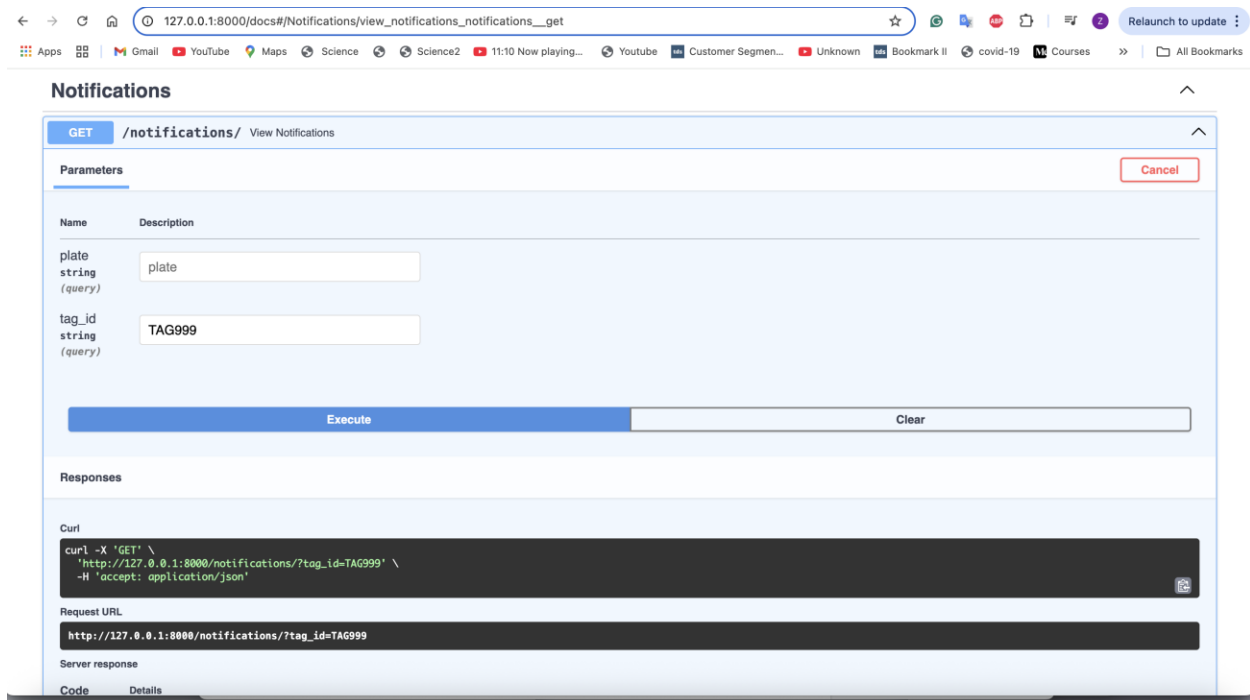
Figure 21: Non-Registered Vehicle Passed through Toll
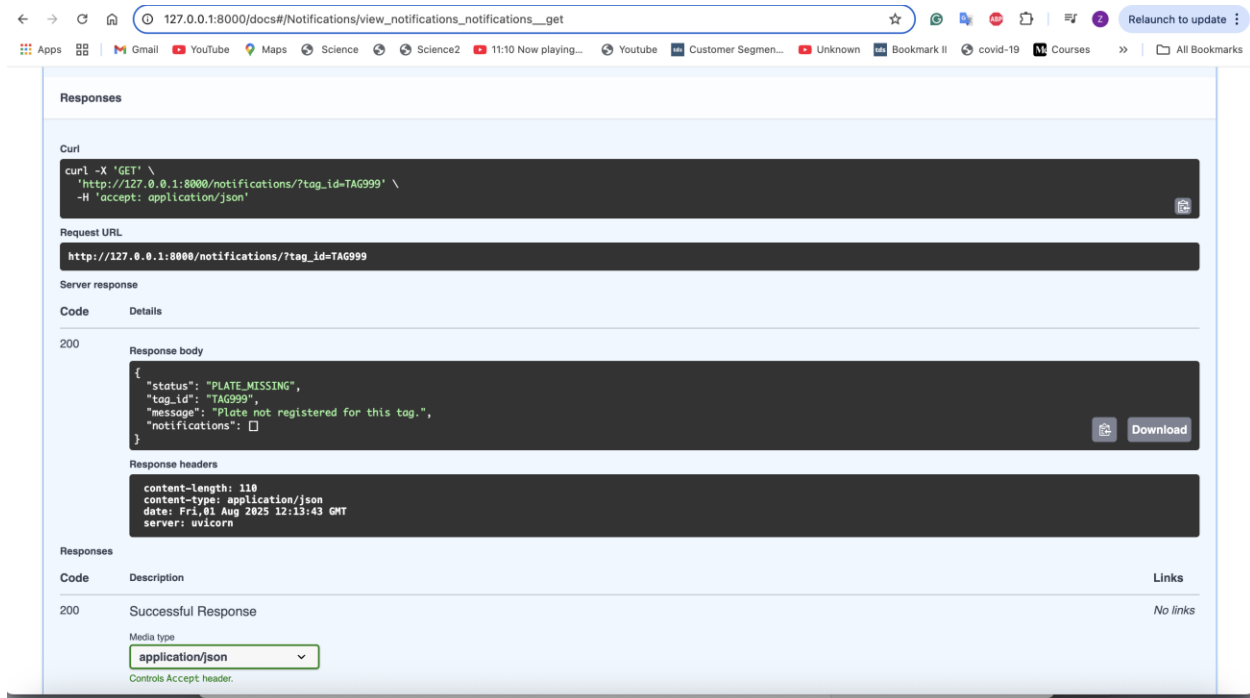
Response:

Figure 22: Notification stored for non-registered tag

Use-Case 5: Security Incidents:
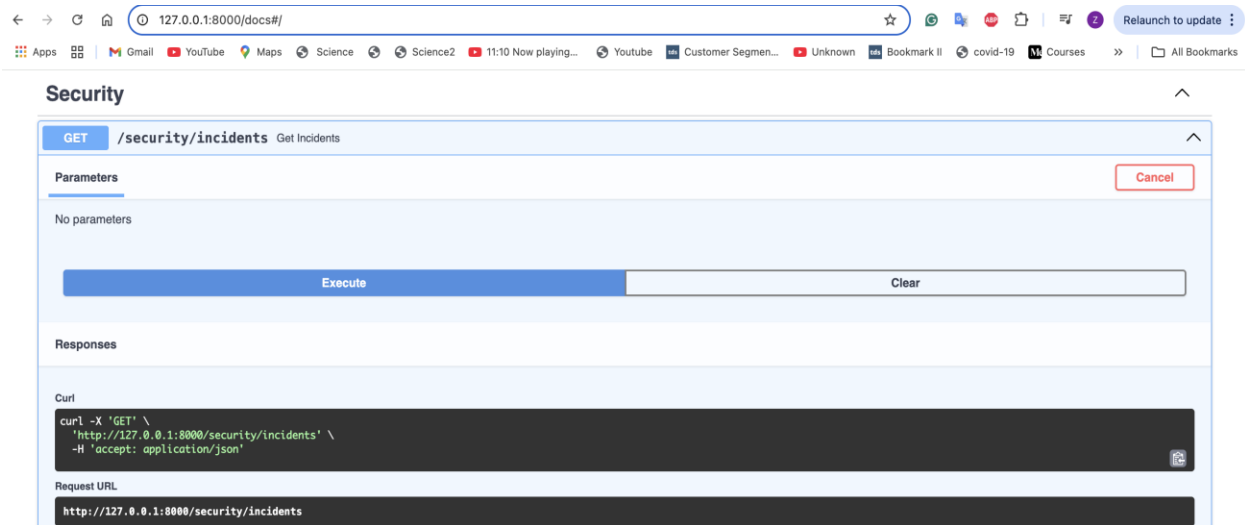
Figure 23: Security Incidents checklist (Unresolved)

Response: (Enlists All Unresolved Incidents)
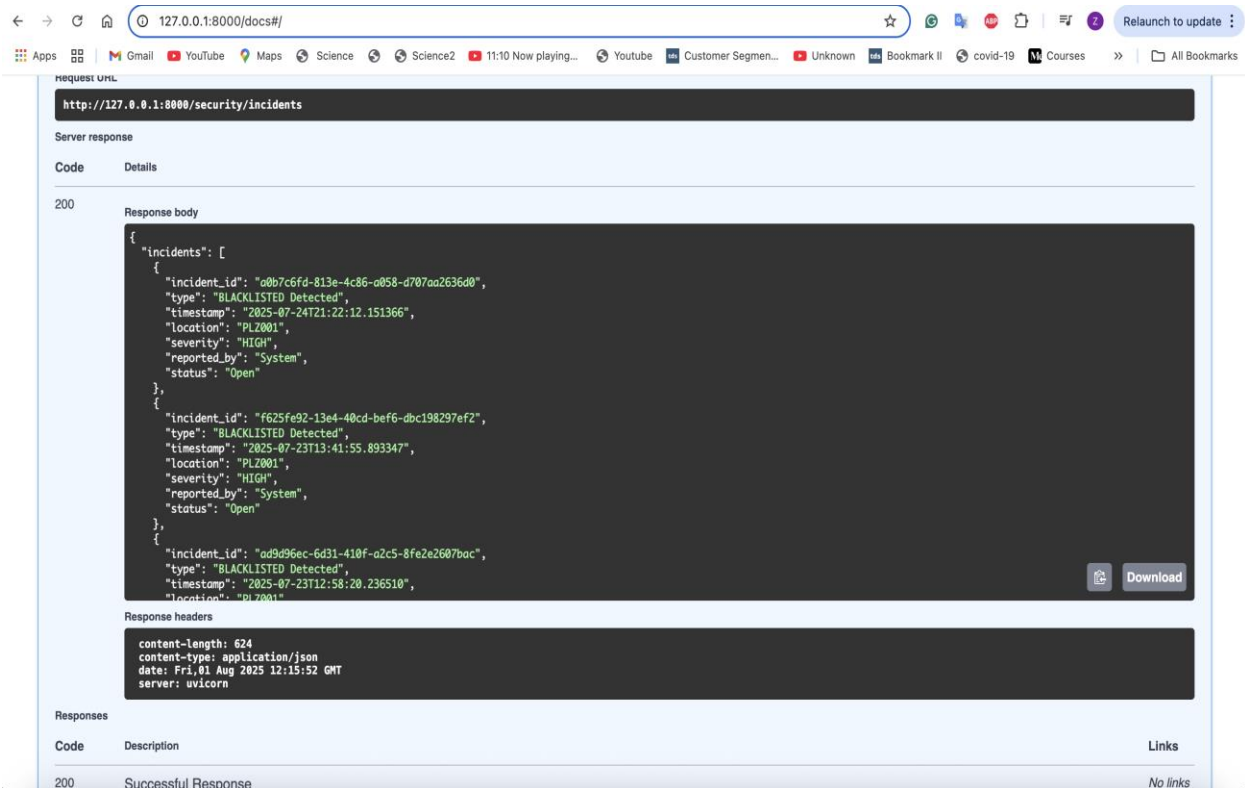
Figure 24: All Enlisted Vehicles Passed through Toll with Security Incidents

Use Case 6:
Part A: Vehicle Passing Normal Conditions

Figure 25: Normal Vehicle Passing through Toll

Response:

Figure 26: Toll Collected for Passing Vehicle (Normal Condition)

Part B: Insufficient Balance:
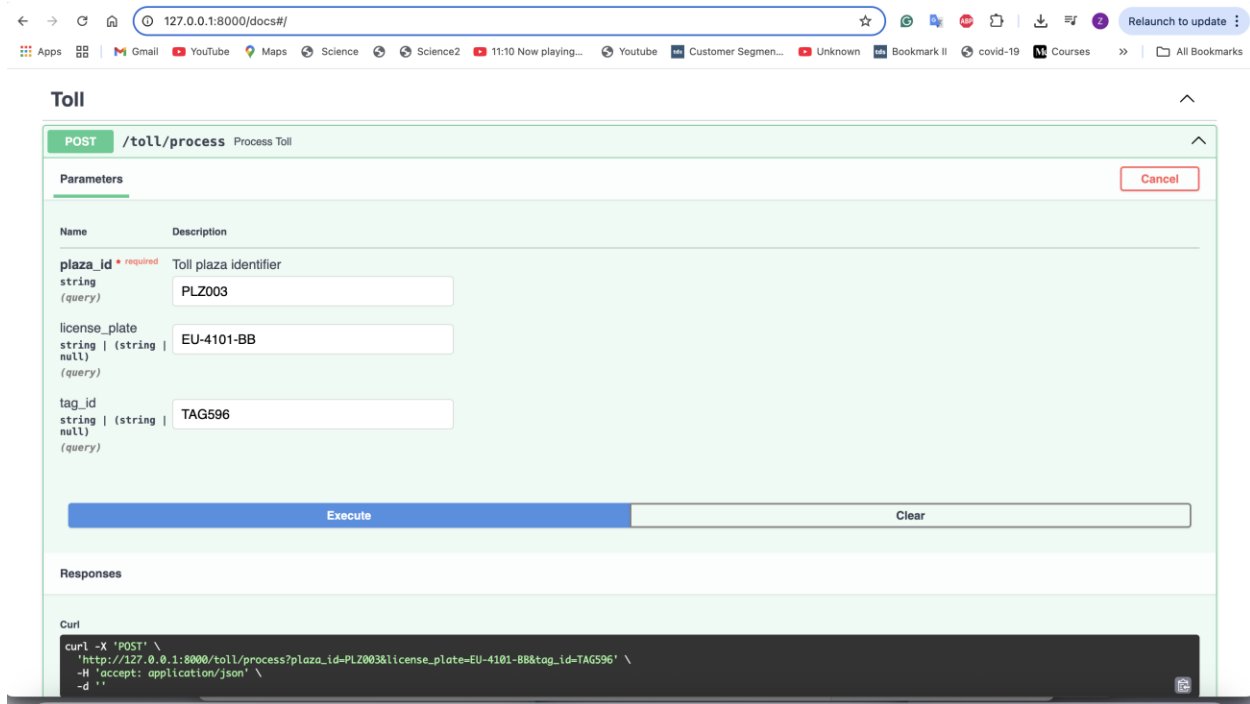
Figure 27: Vehicle Passing with insufficient account balance

Response
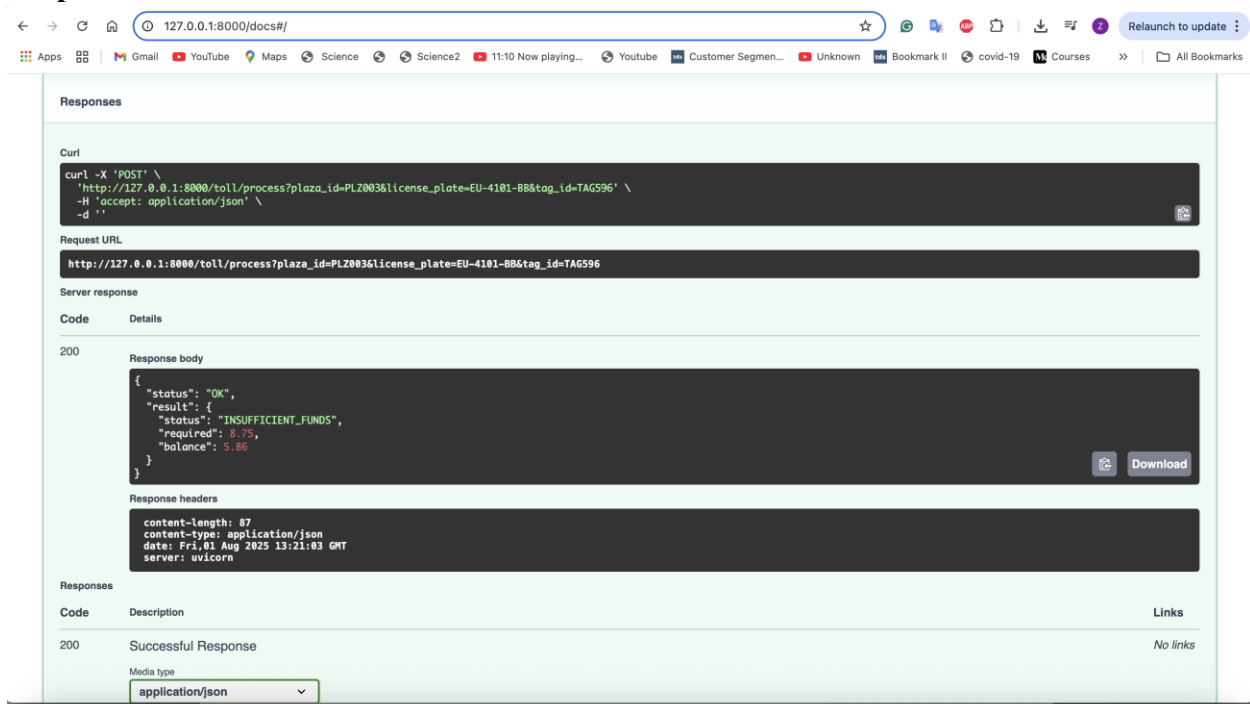
Figure 28: Response and stored notification for Insufficient balance

Part C: Tag Missing

Figure 29: Vehicle Passed through Toll with non-registered Tag

Response:

Figure 30: Response Returned along with stored notification

Part D: License Plate Missing

Figure 31: Non-Registered/Missing Vehicle Passed through Toll

Response:

Figure 32: Response for Missing License Plate

Notifications Generated While Passing Vehicles through these conditions:

Figure 33: Stored Notifications for Passing Vehicles