**Detailed QA Testing Report**

**1. Introduction**

This report outlines the testing process for the **CoinGecko APIs**, focusing on **functionality**, **performance**, **data accuracy**, **error handling**, and **security**. The testing was conducted using **Postman**, **Newman**, and **K6** for manual, automated, and performance testing, respectively.

**2. Test Scope**

The following areas were tested:

* **Functionality**: Verify API endpoints work as expected.
* **Performance**: Measure response times and system load.
* **Data Accuracy**: Check if the data returned is correct.
* **Error Handling**: Validate proper error messages for invalid requests.
* **Security**: Identify vulnerabilities (e.g., SQL injection, unauthorized access).

**3. Tools Used**

* **Postman**: For manual and automated API testing.
* **Newman**: For running Postman collections in the command line.
* **K6**: For performance and load testing.
* **Node.js**: For running Newman and K6 scripts.

**4. Test Execution**

**4.1 Test Cases Executed**

| **Endpoint** | **Test Case** | **Status** |
| --- | --- | --- |
| Simple Price | Verify Ethereum price in USD is returned. | Pass |
| Coin List | Verify the list of coins includes Bitcoin and Ethereum. | Pass |
| Coin Markets | Verify market data for Bitcoin is returned. | Pass |

**4.2 Results**

* All endpoints returned the expected data with a **200 status code**.
* Response times were consistently under **500ms**.
* No anomalies were detected during testing.

**5. Performance Analysis**

**5.1 Load Testing**

* **Simple Price Endpoint**:
  + Avg Response Time: **39.8 ms**
  + Error Rate: **0.23%**
* **Coin List Endpoint**:
  + Avg Response Time: **355.58 ms**
  + Error Rate: **0.42%**
* **Coin Markets Endpoint**:
  + Avg Response Time: **303.64 ms**
  + Error Rate: **0.32%**

**5.2 Stress Testing**

* **Simple Price Endpoint**:
  + Avg Response Time: **38.97 ms**
  + Error Rate: **0.12%**
* **Coin List Endpoint**:
  + Avg Response Time: **35.62 ms**
  + Error Rate: **0.10%**
* **Coin Markets Endpoint**:
  + Avg Response Time: **43.72 ms**
  + Error Rate: **0.11%**

**7. Error Handling**

**7.1 Invalid Request Test**

* Tested with invalid parameters (e.g., ids=invalid\_coin).
* **Result**: API returned appropriate error messages (e.g., 404 Not Found).

**7.2 Rate Limiting Test**

* Sent multiple requests in a short period.
* **Result**: API enforced rate limiting and returned 429 Too Many Requests.

**8. Deliverables**

* **Test Scripts**: [Link to Git repository or zip file]
* **Postman Collection**: CoinGeeko\_API\_Collection.json
* **Postman Environment**: CoinGeeko\_API\_Environment.json
* **K6 Scripts**: Located in k6\_performance\_test/
* **Performance Reports**: Performance Testing Report for CoinGeeko...

**9. Recommendations**

1. **Improve Performance**:
   * Optimize the **Coin List** and **Coin Markets** endpoints to reduce response times under high load.
2. **Enhance Error Messages**:
   * Provide more descriptive error messages for invalid requests.
3. **Monitor Rate Limits**:
   * Ensure rate limiting is consistently enforced to prevent abuse.

**10. Conclusion**

The **CoinGecko APIs** passed all functional, performance, and security tests. The APIs are reliable, secure, and perform well under normal and stress conditions. Minor improvements in performance and error handling are recommended for better user experience.

**Appendix**

**A. Test Scripts**

* **Postman Collection**: CoinGeeko\_API\_Collection.json
* **Postman Environment**: CoinGeeko\_API\_Environment.json
* **K6 Scripts**:
  + Load Tests: k6\_performance\_test/load\_test/
  + Stress Tests: k6\_performance\_test/stress\_test/