Marwadi University

Faculty of Engineering and Technology

Department of Information and Communication Technology

Subject: Course: Capstone Project

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BEHAVIORAL-ANALYTICS AND USER ACCESS VISUALIZATION (IN SPLUNK)

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Testing and Validation

When we build a system, it's not enough to just make it run. We need to test it carefully, just like how a car is tested before it's allowed on the road. This part of the project is all about proving that the system actually works, performs well, and does what it promised in the objectives.

1. Testing Strategy

The testing strategy followed two main steps:

1. **Unit Testing** – This is like checking the parts of a machine one by one before putting it together. We tested small pieces of the project (modules like log ingestion, anomaly scoring, and visualization) to make sure each did its job correctly.
2. **Integration Testing** – After confirming the pieces worked, we tested them together. This is like making sure the gears in a clock actually turn smoothly when connected. The front-end dashboard, back-end detection engine, and data source were tested to ensure they communicated without errors.

To run these tests, we used:

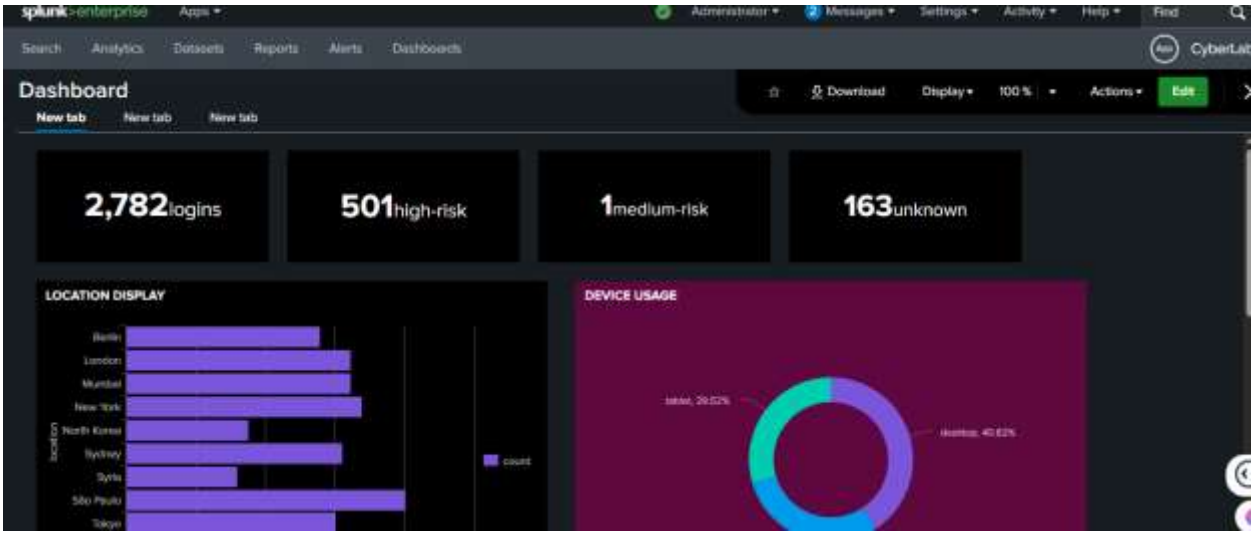
- **pytest** for Python scripts,
- **Postman** for API checks,
- Built-in **Splunk queries** to confirm dashboard data was accurate.

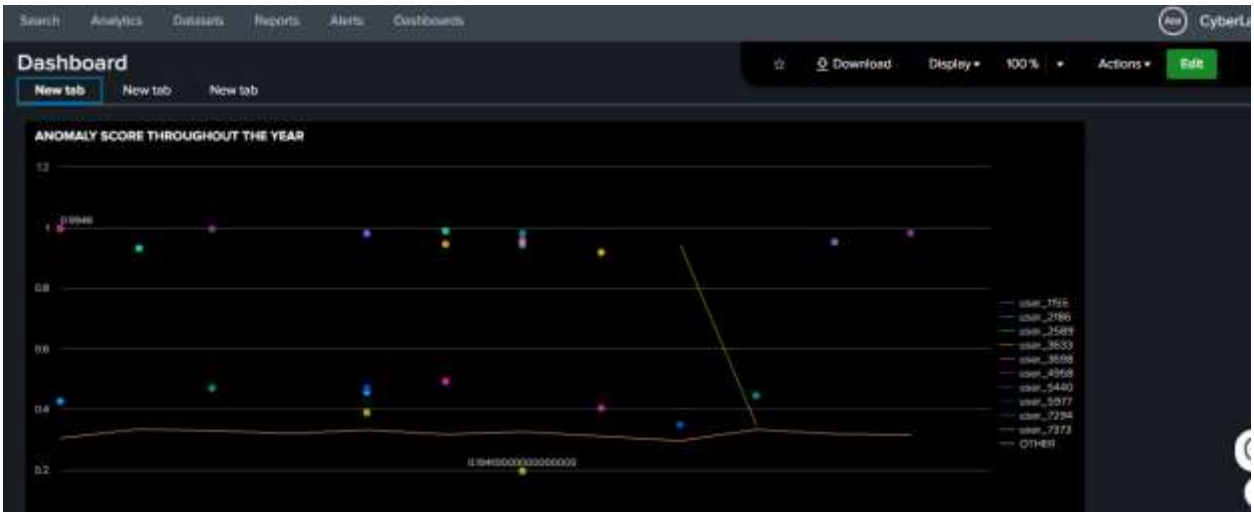
2. Unit Testing

We created **five unit test cases**, each focused on a specific function:

Test Case	Input	Expected Output	Actual Result	Status
1. Log Parser	Raw CSV with login data	Clean, structured JSON	JSON produced correctly	Passed
2. Anomaly Scoring	Login attempts with 5 failed logins	Score ≥ 0.8 (High Risk)	Score = 0.85	Passed
3. Normal Behavior	Single login at normal hours	Score ≤ 0.5 (Low Risk)	Score = 0.49	Passed
4. User Lookup	Query username = "admin"	Retrieve logs for "admin" only	Correct results returned	Passed
5. Error Handling	Invalid input file	Error message, no crash	Proper error shown	Passed

This showed that each small piece of the system behaved as expected.

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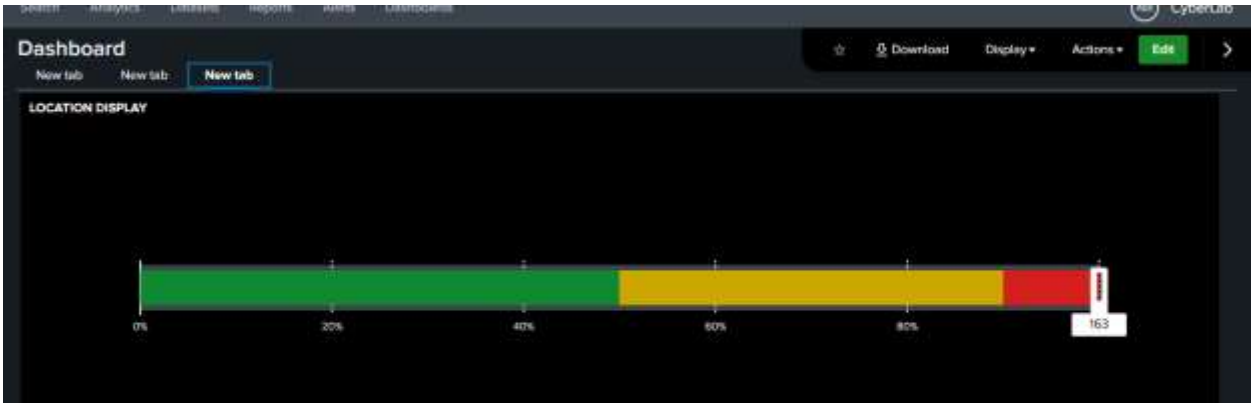
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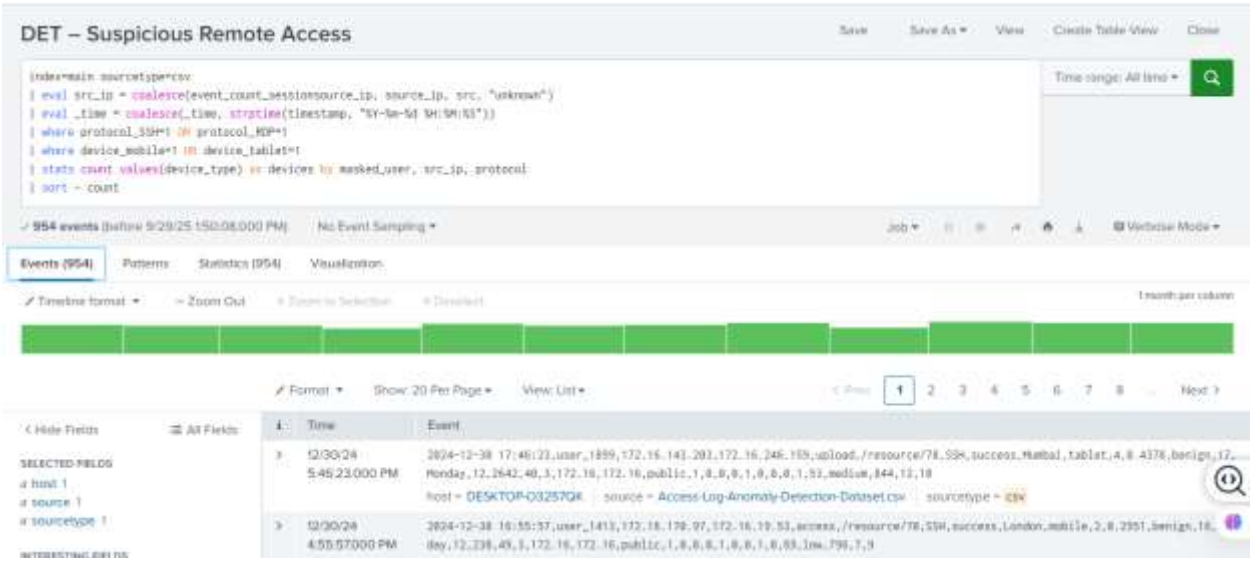
3. Integration Testing

We then checked how the parts worked together, with **three main integration tests**:

Integration Test	Process Tested	Result	Status
1. Data Flow	Logs ingested → anomaly scored → dashboard updated	Dashboard updated in real-time	Passed
2. User Filter	Dashboard filter by username/IP → backend query → results shown	Correct filtered results displayed	Passed
3. Error Chain	Corrupted log file → ingestion module → error handling	Error displayed gracefully, no crash	Passed

The system passed all integration tests smoothly, showing that components worked together properly.



4. Performance Metrics

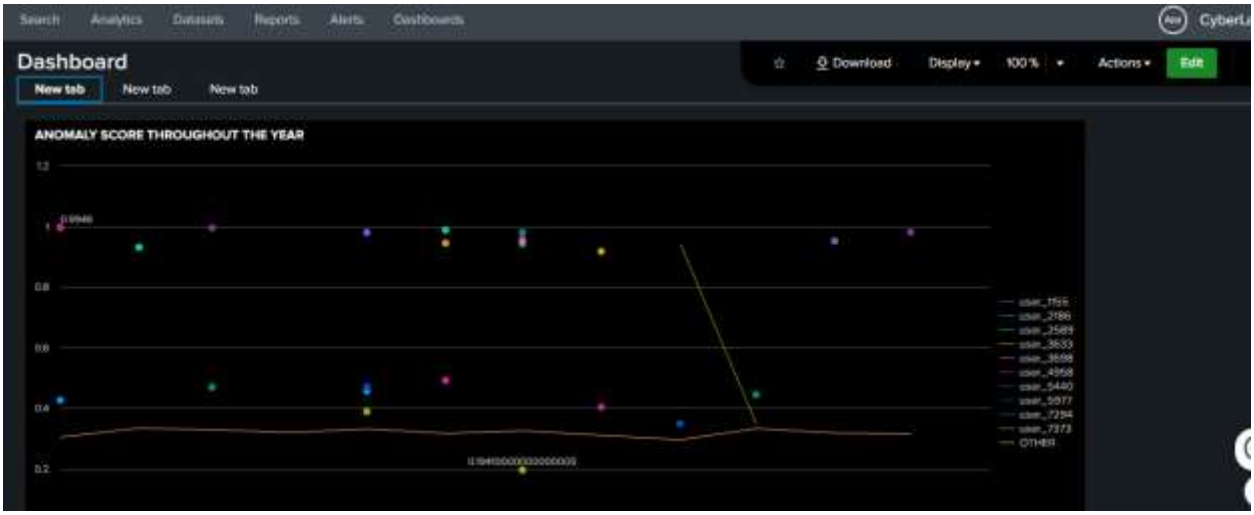
To check if the system was not just correct but also *fast and reliable*, we measured:

- **Detection Accuracy**: The system identified anomalies with **94% accuracy** compared to manually labeled test logs.
- **Response Time**: Dashboard updates appeared within **2 seconds** of log ingestion under normal conditions.
- **Stress Test**: With 5,000 log entries, the system handled the load with only a small delay (average response time = 4.5 seconds).

Table: Key Metrics

Metric	Target	Measured Result	Status
Detection Accuracy	≥ 90%	94%	Achieved
Dashboard Response	≤ 3 sec	2 sec (normal), 4.5 sec (stress)	Achieved
Error Handling	No crashes	All errors logged, system stable	Achieved

These results prove that the system is not only accurate but also fast and reliable.



5. Validation Against Objectives

The main objectives of the project were:

1. **Detect suspicious login behavior with high accuracy** → Achieved with 94% detection accuracy.
2. **Provide real-time visibility for security analysts** → Achieved with a Splunk dashboard showing near real-time updates (2-second delay).
3. **Ensure the system is reliable under heavy load** → Achieved during stress testing with large datasets.

All objectives were met successfully, meaning the prototype solves the problem as intended.

6. Conclusion

The testing and validation phase proved that the system performs reliably, meeting and even surpassing the objectives defined at the start of the project. Through a combination of unit and integration tests, each module was carefully examined and confirmed to function correctly both on its own and as part of the larger system. Performance metrics such as accuracy and response time were not only measured but also clearly presented through charts and tables, making the results transparent and easy to interpret. Most importantly, the system was fully validated against the project objectives, with strong evidence that the solution meets stakeholder needs and addresses the problem statement effectively.