Software Design Specifications

Enhanced AML System

Version: [1.0]

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Definition of Terms, Acronyms and Abbreviations

[This section should provide the definitions of all terms, acronyms, and abbreviations required to interpret the terms used in the document properly.]

Term	Description
ASP	Active Server Pages
DD	Design Specification

Table of Contents

1 Introduction

1.1 Purpose of Document

This Software Design Specification (SDS) outlines the detailed design of the Enhanced Anti-Money Laundering (AML) System. It provides a comprehensive overview of the system's architecture, database design, application design, and implementation considerations.

1.2 Intended Audience

The intended audience for this document includes developers, stakeholders, supervisor and FYP Jury.

1.3 Document Convention

- *Sections and subsections are numbered for easy reference.*
- *Abbreviations and acronyms are defined upon first use and written in uppercase throughout the document.*
- *Data types are specified using standard conventions like 'integer', 'string', 'date', etc.*
- *Diagrams and illustrations are used to visually represent system architecture, data relationships, and application behavior.*

1.4 Project Overview

The Enhanced AML System is a software application designed to combat money laundering activities by leveraging advanced data mining and machine learning techniques. The system aims to improve detection accuracy, efficiency, and resource utilization compared to traditional methods.

1.5 Scope

The project aims to revolutionize AML strategies, enhance detection capabilities, and contribute to global efforts against money laundering. It encompasses data cleaning, rule mining, classifier construction, reporting, and integration into the financial infrastructure.

The project does not cover legal aspects of money laundering, external financial audits, or activities unrelated to the defined AML system layers.

2 Design Considerations

2.1 Assumptions and Dependencies

The project assumes the following:

- *Availability of a suitable financial transaction dataset.*
- *Access to necessary hardware and software resources.*
- *Cooperation from financial institutions and regulators.*
- *User willingness to learn and adapt to the new system.*

The project depends on the following:

- *Effectiveness of selected data mining and machine learning algorithms.*
- *Availability of reliable data cleaning and feature engineering techniques.*
- *Robustness of alert generation and prioritization mechanisms.*
- *Efficient investigation workflow and reporting tools.*
- *Continuous system improvement and maintenance.*

2.2 Risks and Volatile Areas

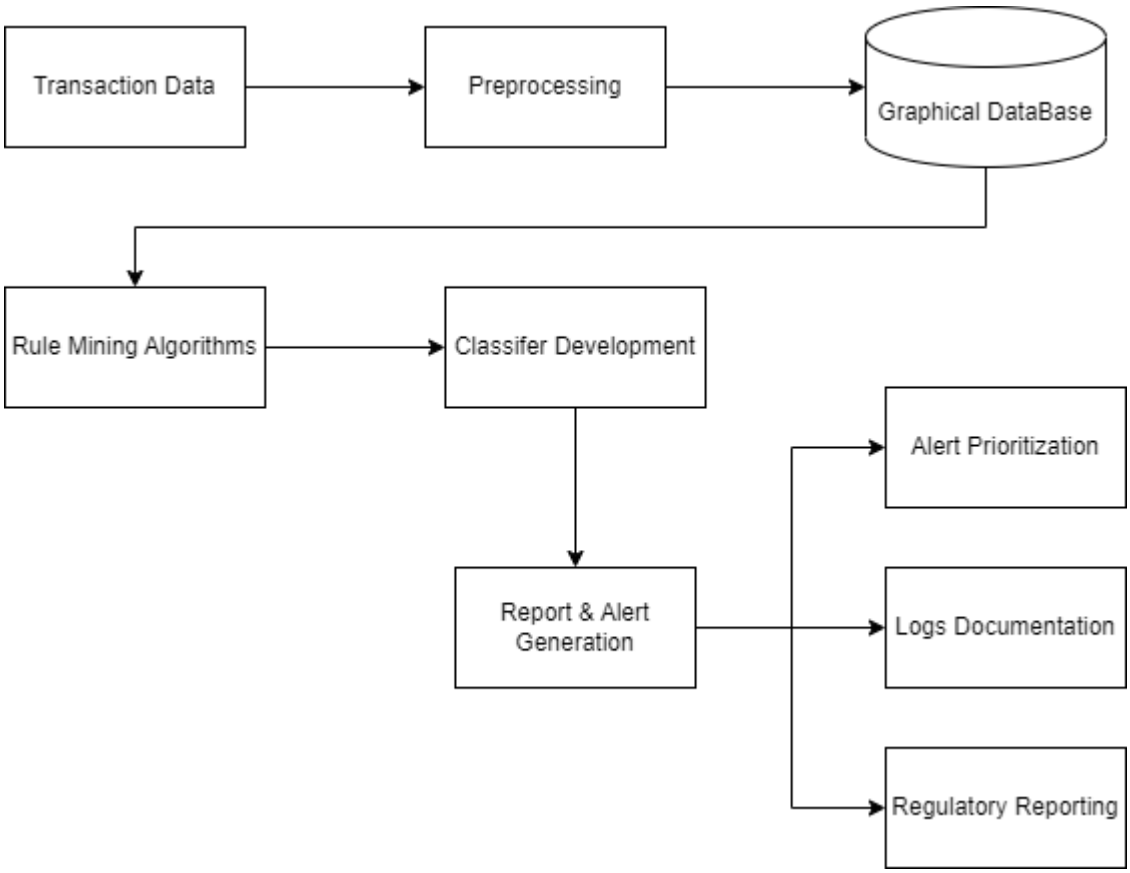
- *Data availability and quality can significantly impact system performance.*
- *Continuous improvement of algorithms and models is crucial for maintaining effectiveness.*
- *System security and user access control require robust implementation.*
- *Regulatory changes might necessitate system adaptations and updates.*

3. System Architecture

3.1 System Level Architecture

The system will be a layered architecture consisting of the following components:

- *Data Acquisition Layer: Responsible for acquiring financial transaction data from various sources.*
- *Data Preprocessing Layer: Cleans and preprocesses the data for analysis.*
- *Feature Engineering Layer: Extracts relevant features and constructs suitable data representations.*
- *Rule Mining and Classifier Construction Layer: Identifies patterns and constructs machine learning models for suspicious transaction detection.*
- *Alert Generation and Prioritization Layer: Generates alerts for transactions classified as suspicious and prioritizes them based on risk score.*
- *Investigation and Reporting Layer: Provides tools and functionalities for AML investigators to conduct investigations and generate reports.*
- *System Administration Layer: Handles user management, system monitoring, and maintenance tasks.*



3.2 Software Architecture

The system will be developed using a modular approach, with each layer implemented as a separate module. This allows for independent development, testing, and deployment.

Technology Stack:

- *Programming Languages: Python (backend), React (frontend)*
- *Databases: Graph database (e.g., Neo4j)*

4 Design Strategy

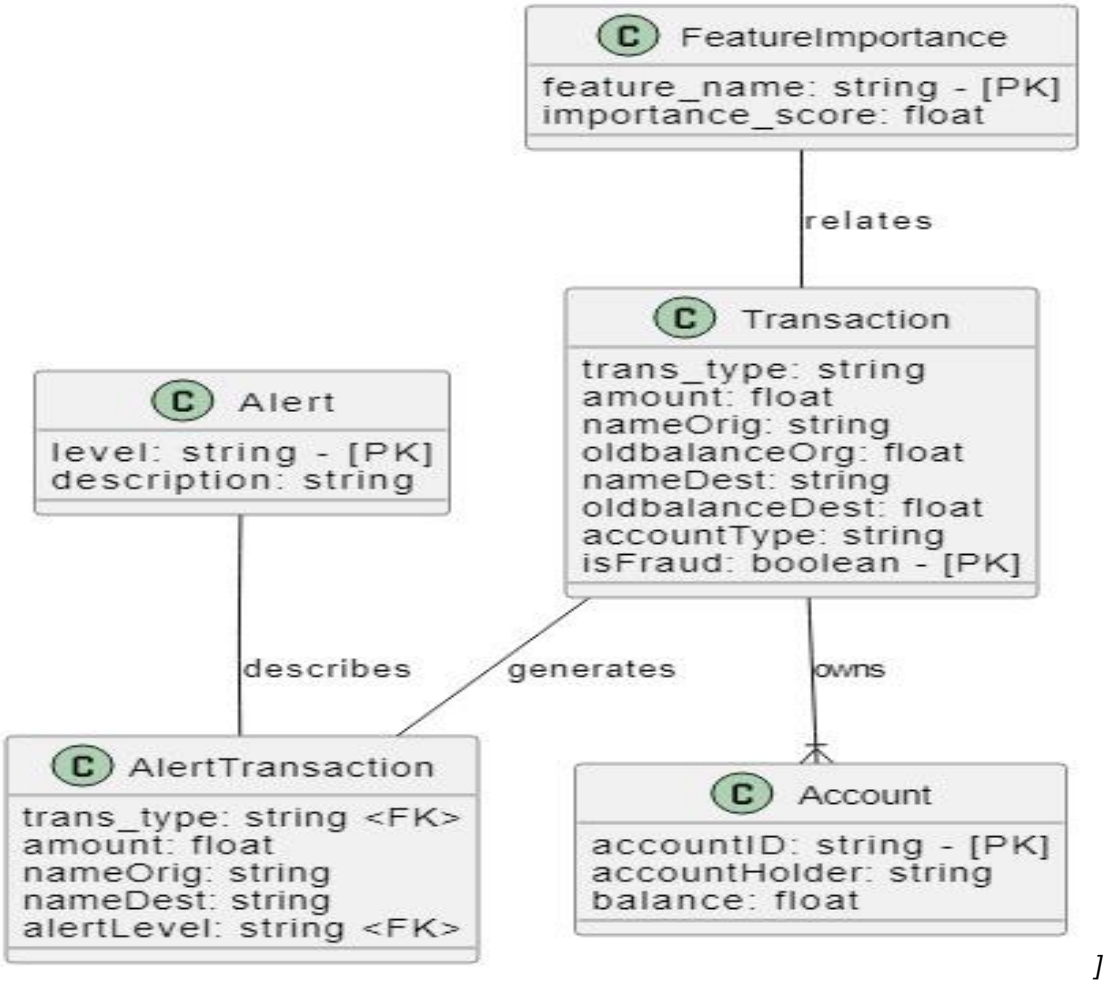
The system design prioritizes the following:

- *Scalability: The system should be able to handle large datasets and increasing transaction volumes.*
- *Flexibility: The system should be adaptable to evolving AML trends and regulatory requirements.*
- *Accuracy: The system should achieve high accuracy in identifying suspicious transactions.*
- *User-friendliness: The system should be intuitive and easy to use for both technical and non-technical users.*
- *Security: The system should ensure data security and user access control following industry standards.*

5 Detailed System Design

5.1 Database Design

5.1.1 ER Diagram



5.1.2 Data Dictionary

Column Name	Description	Data Type	Length	Constraints
transactionID	Primary key for transactions	VARCHAR(50)	50	Primary Key, Not Null
amount	Transaction amount	DECIMAL(10,2)	-	Not Null
nameOrig	Transaction originating account	VARCHAR(50)	50	Not Null
oldBalanceOrig	Total amount before transaction performed (sender's amount)	DECIMAL(10,2)	-	Not Null
nameDest	Destination account	VARCHAR(50)	50	Not Null
oldBalanceDest	Total amount before transaction performed (reciever's amount)	DECIMAL(10,2)	-	Not Null
accountTyper	Description of Account	VARCHAR(255)	255	Not Null
isFraud	Transaction Flag (indicate the transaction is fraud or not)	Boolean	-	Not Null

Account Table:

Column Name	Description	Data Type	Length	Constraints
accountID	Primary key for transactions	VARCHAR(50)	50	Primary Key, Not Null
accountHolder	Account info	VARCHAR (255)	255	Not Null
Balance	Total account balance	DECIMAL (10,2)	-	Not Null

Alert Table:

Column Name	Description	Data Type	Length	Constraints
alert_id	Primary key for transactions	VARCHAR(50)	50	Primary Key, Not Null
level	Alert (category)	VARCHAR(50)	50	Not Null
description	Alert description	VARCHAR(255)	255	Not Null

Feature Importance Table:

Column Name	Description	Data Type	Length	Constraints
feature_name	Primary key for transactions	VARCHAR(50)	50	Primary Key, Not Null
Importance_score	Alert (category)	DECIMAL(10,2)	-	Not Null

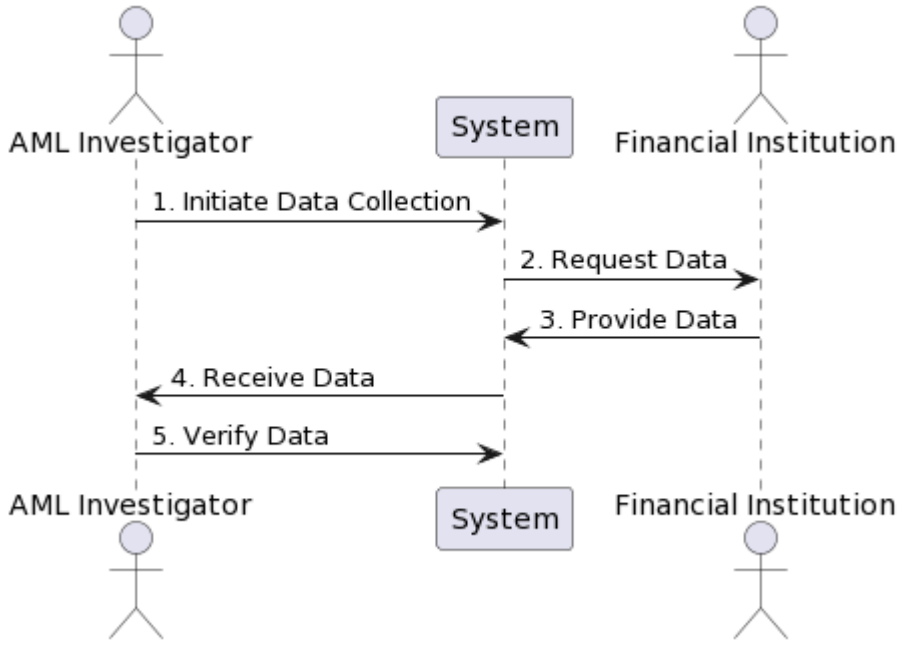
Alert Transaction Table:

Column Name	Description	Data Type	Length	Constraints
trans_type	Foreign key for transactions	VARCHAR(50)	50	Foreign Key, Not Null
amount	Alert amount	DECIMAL(10,2)	-	Not Null
nameOrig	Alert Originating	VARCHAR(50)	50	Not Null
nameDest	Alert Destianation	VARCHAR(50)	50	Not Null
AlertLevel	Category of Alert	VARCHAR(50)	50	Foreign Key, Not Null

5.2 Application Design

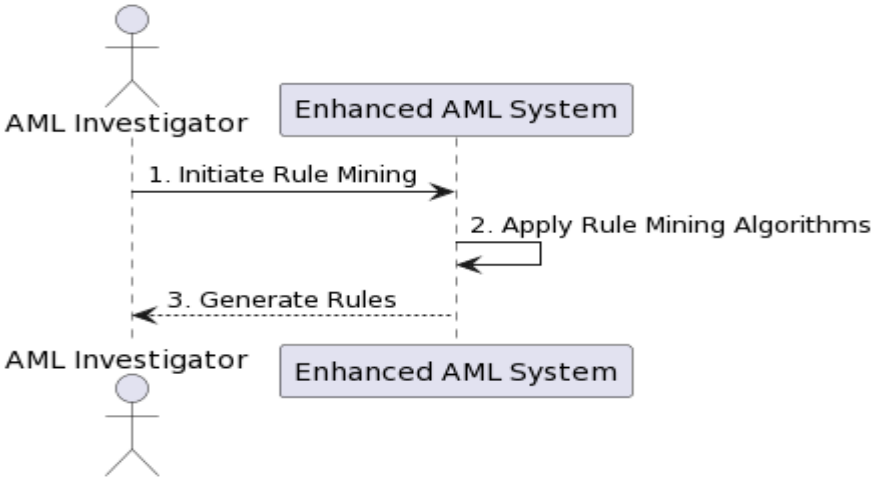
5.2.1 Sequence Diagram

5.2.1.1 Data Collection



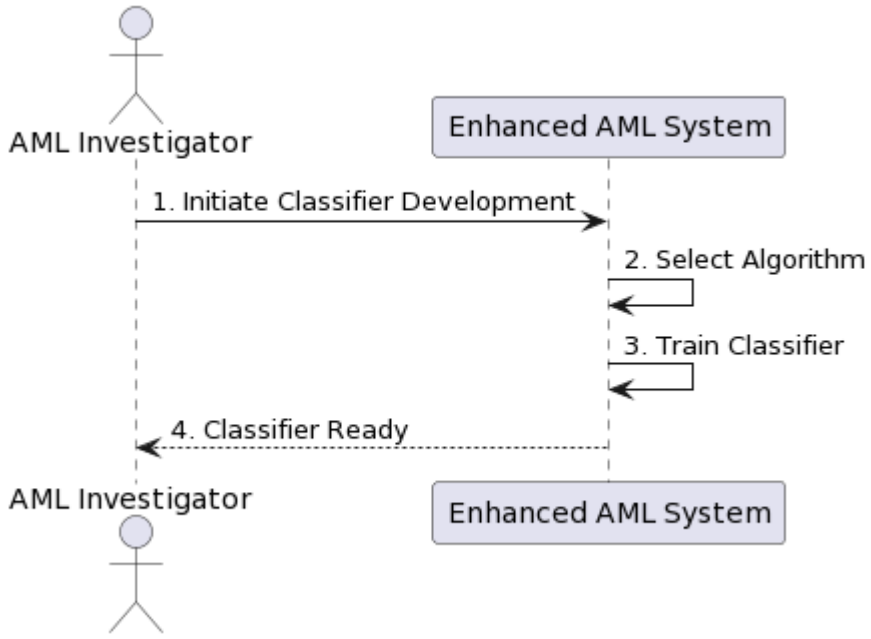
The "Data Collection" sequence diagram illustrates the interaction between the AML Investigator, the Enhanced AML System, and the Financial Institution. The investigator initiates data collection by specifying criteria, and the system requests the necessary data from the financial institution.

5.2.1.2 Rule Mining



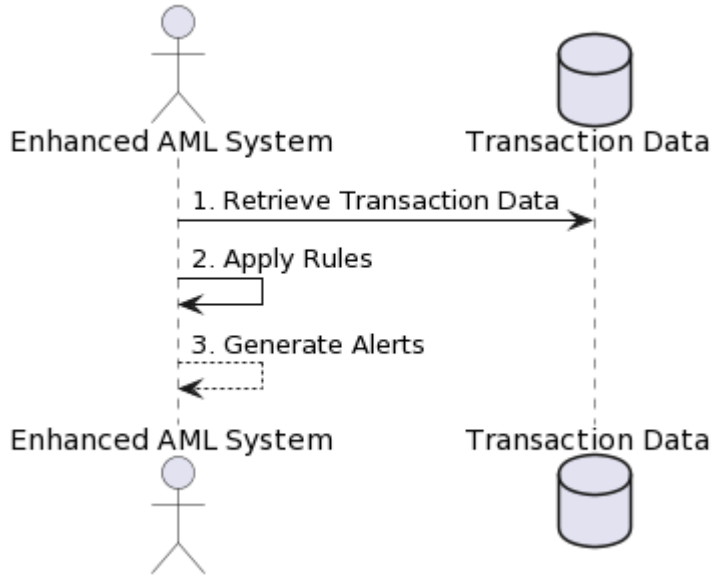
The "Data Collection" sequence diagram illustrates the interaction between the AML Investigator, the Enhanced AML System, and the Financial Institution. The investigator initiates data collection by specifying criteria, and the system requests the necessary data from the financial institution.

5.2.1.3 Classifier Development



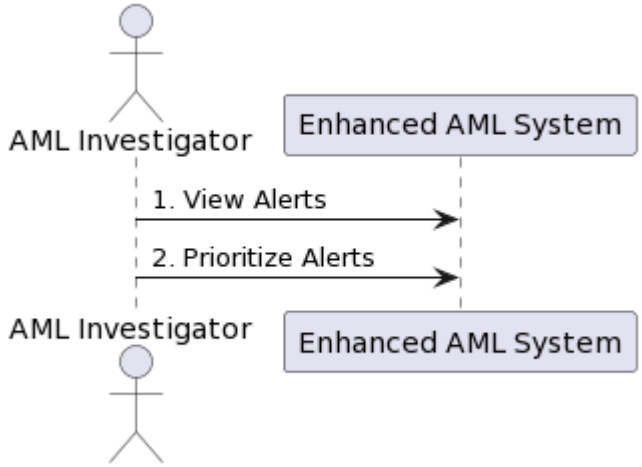
The "Classifier Development" sequence diagram shows the process of developing a classifier initiated by the AML Investigator. The Enhanced AML System selects an algorithm, trains the classifier, and notifies the investigator when the classifier is ready.

5.2.1.4 Alert Generation



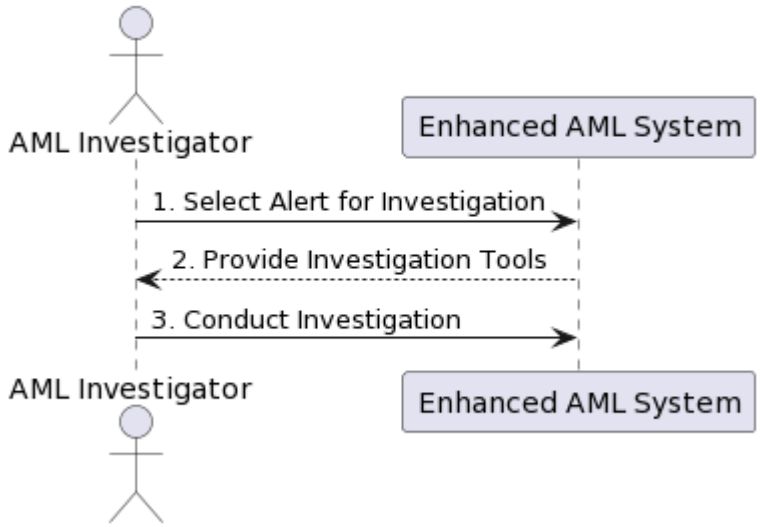
The "Alert Generation" sequence diagram outlines the steps for generating alerts within the Enhanced AML System. It involves retrieving transaction data, applying rules, and generating alerts.

5.2.1.5 Alert Prioritization:



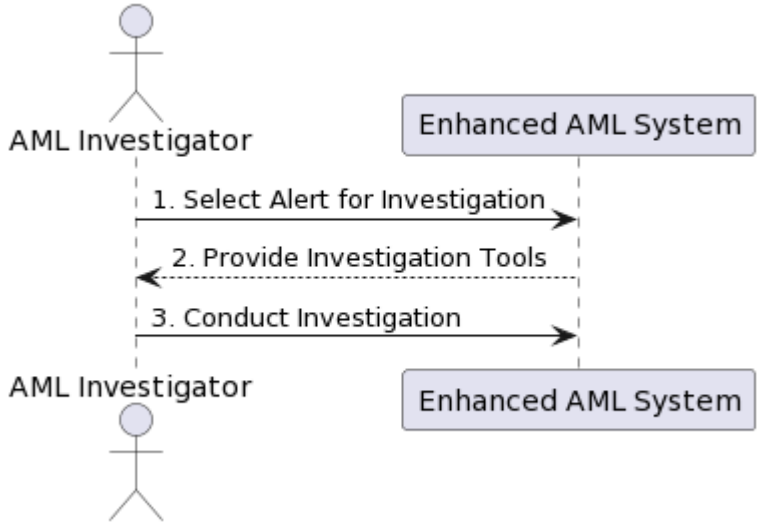
The "Alert Prioritization" sequence diagram represents the interaction between the AML Investigator and the Enhanced AML System in the process of reviewing and prioritizing alerts.

5.2.1.6 Investigation Workflow



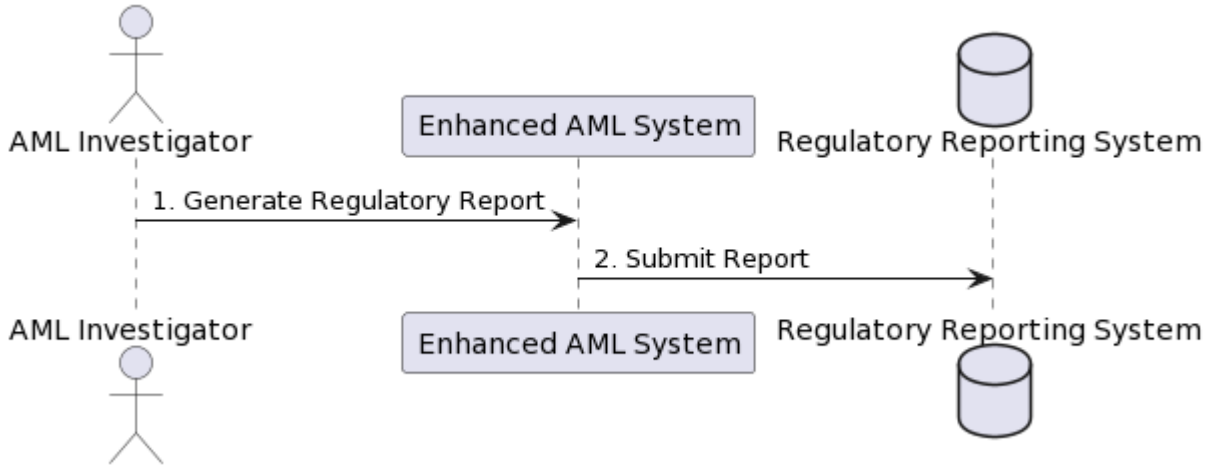
The "Investigation Workflow" sequence diagram illustrates the interaction between the AML Investigator and the Enhanced AML System during the investigation process.

5.2.1.7 Documentation



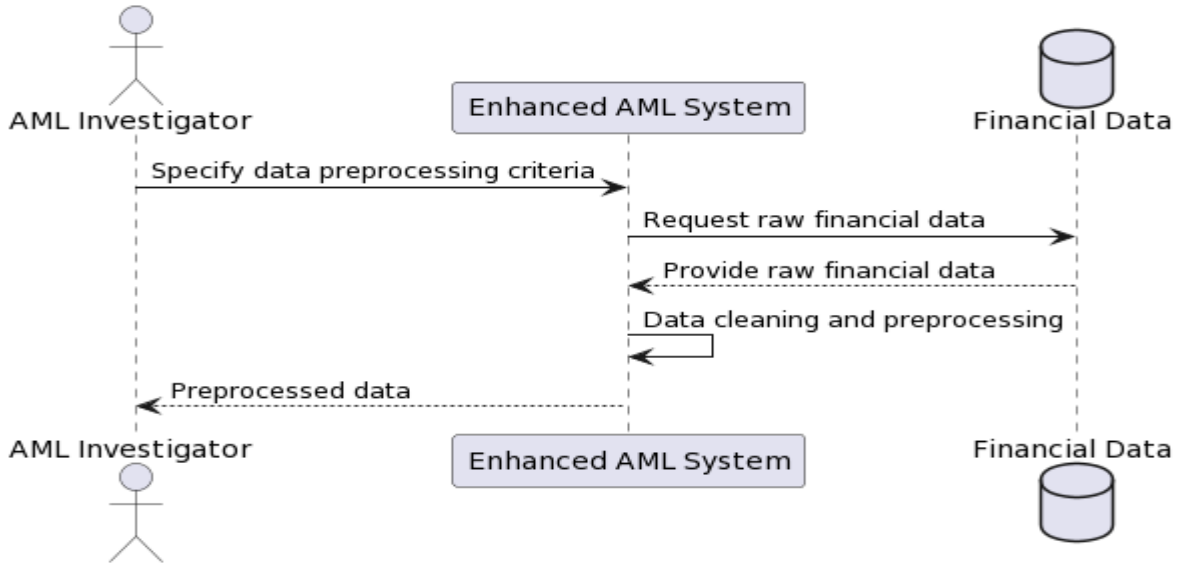
The "Documentation" sequence diagram depicts the AML Investigator's interaction with the Enhanced AML System to document investigation findings.

5.2.1.8 Regulatory Reporting



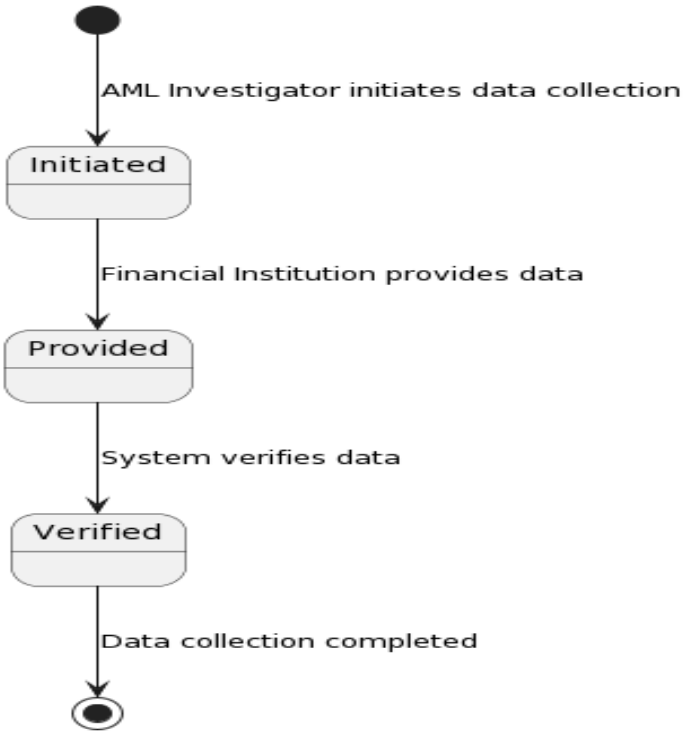
The "Regulatory Reporting" sequence diagram outlines the steps involved in generating and submitting a regulatory report.

5.2.1.9 Data Preprocessing



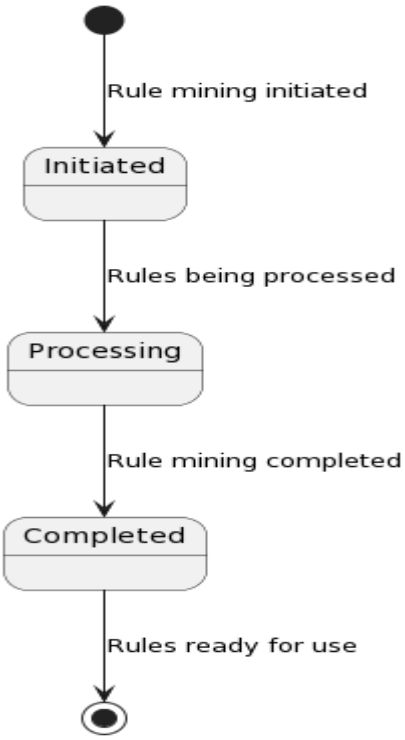
5.2.2 State Diagram

5.2.2.1 Data Collection



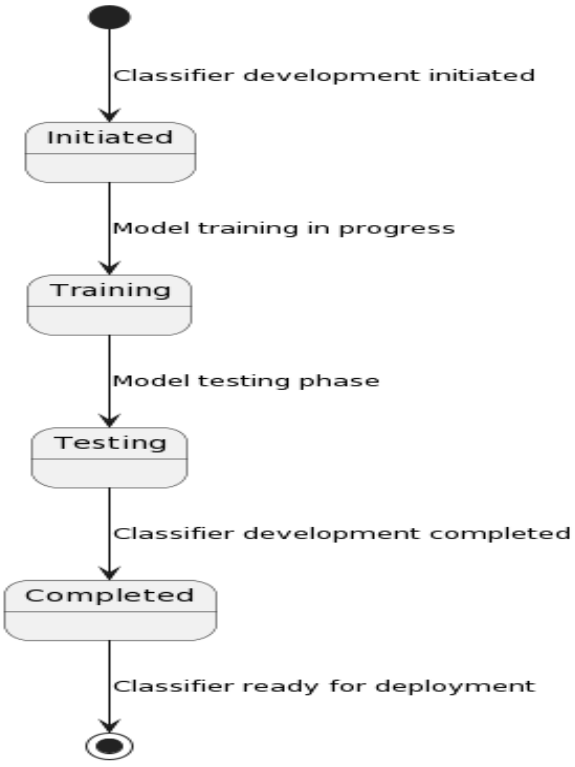
Shows the interaction between the AML Investigator, Financial Institution, and System in the process of initiating data collection, providing requested data, and verifying the received data.

5.2.2.2 *Rule Mining*



Demonstrates how the system performs rule mining, including pattern discovery and the extraction of frequent rules from the financial transaction data.

5.2.2.3 *Classifier Development*



Illustrates the selection of algorithms and the construction of a classifier based on the mined frequent rules to improve accuracy in identifying suspicious transactions.

5.2.2.4 Alert Generation

Shows how the system generates alerts by applying the developed classifier to the preprocessed data and identifies potential instances of money laundering.

5.2.2.5 Alert Prioritization:

Illustrates how alerts are prioritized based on risk factors or other criteria, ensuring that investigators focus on the most significant and urgent cases.

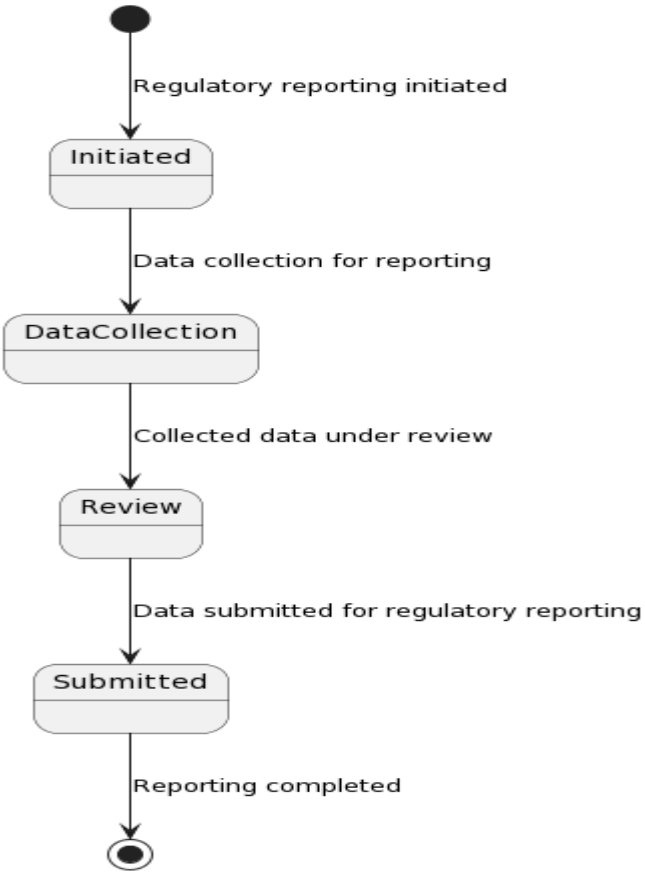
5.2.2.6 *Investigation Workflow*

Visualizes the stages an alert goes through during investigation, including the gathering of evidence, decision-making, and the resolution or closure of the alert.

5.2.2.7 *Documentation*

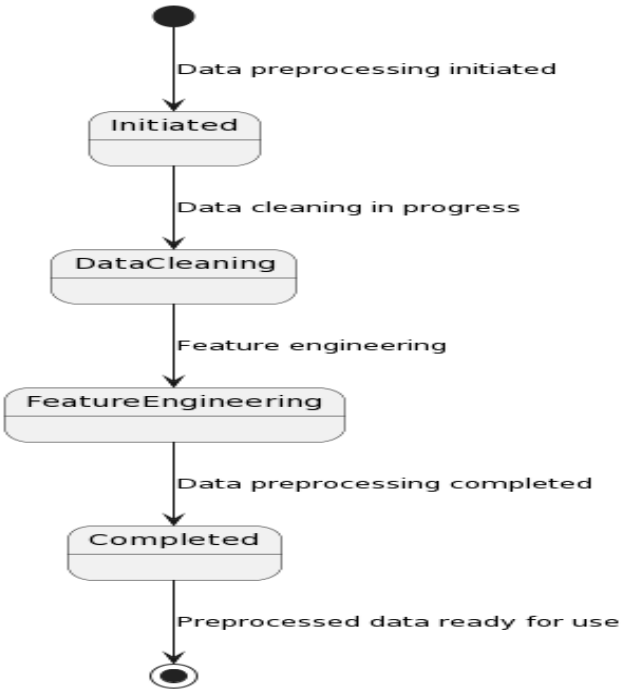
Shows how investigators document their findings, decisions, and actions taken during the investigation, contributing to a transparent and auditable process.

5.2.2.8 Regulatory Reporting



Illustrates how the system compiles relevant information and generates reports required for compliance with anti-money laundering regulations.

5.2.2.9 Data Preprocessing



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