**Project Documentation: Automated Financial Transaction Monitoring and Fraud Detection System**

**Author:** VELLANKI SANTHOSH

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**1.0 Executive Summary**

This document outlines the architecture, implementation, and configuration of the "Automated Financial Watchdog," a real-time system designed to monitor bank transactions, perform intelligent fraud analysis, and provide actionable alerts.

The primary objective of this project is to create a fully automated, end-to-end workflow that enhances personal financial security and centralizes transaction data for analysis. The system leverages the n8n workflow automation platform to orchestrate a series of actions triggered by incoming bank transaction alerts. Key technologies include the Google Gemini/Mistral AI API for natural language processing and risk assessment, the Google Sheets API for data logging, and the Gmail API for event triggering and user notification.

The resulting system successfully captures transaction data from its origin on a mobile device, processes it through a cloud-based AI, logs it persistently, and makes intelligent, real-time decisions, demonstrating a robust application of modern automation and AI principles.

**2.0 System Architecture & Workflow Logic**

The system operates on a linear, event-driven architecture. The workflow is initiated by an external event (a bank transaction SMS) and proceeds through a series of data processing, analysis, and action steps.

**Logical Data Flow:**

1. **Event Origination (Mobile Client)**: A transaction SMS is received on the user's mobile device.
2. **Event Forwarding**: A dedicated application (SMS Forwarder) on the mobile device detects the SMS from a pre-configured sender (the bank) and forwards its content to a dedicated Gmail inbox.
3. **Workflow Trigger (n8n)**: An n8n workflow, configured to monitor the dedicated Gmail inbox, triggers upon the arrival of the new email.
4. **AI Analysis & Data Extraction**: The body of the email (containing the raw SMS text) is sent via API call to a Large Language Model (e.g., Google Gemini Pro). The AI is tasked with two functions:
   * **Extraction**: Parsing the unstructured text to extract structured data points: Amount, Merchant, Transaction ID.
   * **Analysis**: Calculating a Fraud Score (0-100) and providing a Reason for the score.
   * The AI is instructed to return this information in a structured JSON format for reliable downstream processing.
5. **Persistent Data Logging**: The structured JSON output from the AI is used to append a new row in a designated Google Sheet. This serves as the system's permanent transaction ledger.
6. **Conditional Logic**: The workflow evaluates the Fraud Score received from the AI.
7. **Action & Notification**:
   * If the score is below a defined threshold (e.g., 80), the workflow concludes.
   * If the score exceeds the threshold, the workflow proceeds to an alerting step, sending a formatted, high-priority email to the user's primary address, containing all relevant details of the potentially fraudulent transaction.

**3.0 Technology Stack**

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| --- | --- | --- |
| **Component** | **Technology/Service** | **Purpose** |
| **Workflow Orchestration** | n8n (Cloud or Self-Hosted) | The core platform for building, managing, and executing the workflow. |
| **Event Trigger** | Gmail API | To detect new emails in the dedicated inbox and initiate the workflow. |
| **AI Processing** | Google Gemini Pro API / Mistral AI API | For natural language processing, data extraction, and risk analysis. |
| **Data Logging** | Google Sheets API | To provide a persistent, structured log of all processed transactions. |
| **Alerting** | Gmail API | To send conditional, high-risk alerts to the end-user. |
| **Mobile Client** | SMS Forwarder (Android App) | To bridge the mobile device with the cloud workflow by forwarding SMS. |

**4.0 Prerequisite Setup and Configuration**

**4.1 Google Cloud Platform (GCP) Configuration**

1. **Project Creation**: A new project must be created in the Google Cloud Console.
2. **API Enablement**: The following APIs must be enabled for the project:
   * Gmail API
   * Google Sheets API
3. **OAuth 2.0 Credentials**:
   * Navigate to "APIs & Services" -> "Credentials".
   * Click "Create Credentials" -> "OAuth client ID".
   * Select "Web application" as the application type.
   * Under "Authorized redirect URIs", add the specific URI provided by the n8n credentials pane. For self-hosted n8n, this URI depends on the WEBHOOK\_URL environment variable.
   * The resulting **Client ID** and **Client Secret** must be securely stored for use in n8n.

**4.2 AI Service Provider Configuration**

An API key must be generated from the chosen AI provider (e.g., Google AI Studio for Gemini, Hugging Face for Mistral).

**4.3 Google Sheets Setup**

A new Google Sheet must be created with the following exact column headers in the first row:  
Timestamp, Amount, Merchant, TransactionID, FraudScore, Reason

**5.0 n8n Workflow Implementation Details**

This section details the configuration of each node within the n8n workflow.

**5.1 Node 1: Gmail Trigger ("New Transaction Email")**

* **Purpose**: To start the workflow.
* **Configuration**:
  + **Credentials**: Utilizes the GCP OAuth 2.0 Client ID and Secret to authenticate with the dedicated transaction Gmail account.
  + **Options**: A filter is applied to only trigger on emails from a specific sender address (e.g., alerts@yourbank.com) to ensure workflow integrity.

**5.2 Node 2: HTTP Request ("AI Brain - Gemini/Mistral")**

* **Purpose**: To perform data extraction and fraud analysis.
* **Configuration**:
  + **URL**: The API endpoint for the chosen LLM (e.g., https://generativelanguage.googleapis.com/v1beta/models/gemini-pro:generateContent).
  + **Authentication**: Header-based authentication using the AI provider's API key.
  + **Body (JSON Payload)**: The node sends a POST request with a precisely engineered prompt. The {{ $json.body }} variable from the trigger node is embedded within the prompt.

**Prompt Snippet (JSON format for Gemini):**

json

{

"contents": [{

"parts": [{

"text": "You are an expert Financial Fraud Detection AI. Your sole purpose is to receive raw email text from a bank transaction, extract key information, analyze it for fraud risk, and return the data ONLY in a single, valid JSON object. Do not add any text before or after the JSON. --- TRANSACTION TEXT --- {{ $json.body }} --- END OF TEXT --- Use the following keys exactly: \"amount\", \"merchant\", \"transaction\_id\", \"fraud\_score\", \"reason\"."

}]

}]

}

Use code [with caution](https://support.google.com/legal/answer/13505487" \t "_blank).Json

**5.3 Node 3: Google Sheets ("Log Transaction")**

* **Purpose**: To create a permanent record of the transaction.
* **Configuration**:
  + **Operation**: Append Row.
  + **Sheet ID**: The unique ID of the target Google Sheet, extracted from its URL.
  + **Column Mapping**: Each field in the node is mapped to the corresponding output from the AI node's JSON response.
    - Example: The Amount column is mapped to the expression {{ $('AI Brain').item.json.amount }}.

**5.4 Node 4: IF ("Check Fraud Score")**

* **Purpose**: To function as a decision gate for the alerting mechanism.
* **Configuration**:
  + **Value 1**: {{ $('AI Brain').item.json.fraud\_score }}
  + **Operation**: Number - Larger Than
  + **Value 2**: 80 (This value is the configurable risk threshold).

**5.5 Node 5: Gmail ("Send High-Risk Alert")**

* **Purpose**: To notify the user of a potentially fraudulent transaction.
* **Configuration**:
  + This node is connected to the **TRUE** output of the IF node.
  + **To Address**: The user's primary email address.
  + **Subject/Body**: Dynamically constructed using data from the AI node to provide a detailed and actionable alert.

**6.0 Deployment and Activation**

Once all nodes are configured and tested individually, the workflow is activated by toggling the "Active" switch on the n8n canvas and saving the workflow. The system then runs autonomously in the background.

**7.0 Potential Enhancements and Future Work**

* **Database Integration**: For higher volume and more robust querying, the Google Sheets node could be replaced with a PostgreSQL or MySQL node to log transactions to a proper database.
* **Multi-Channel Alerting**: The alerting system could be expanded to include other channels like Slack, Telegram, or push notifications by adding parallel nodes after the IF condition.
* **Dashboarding**: The data logged in Google Sheets or a database can be connected to a business intelligence tool like Google Looker Studio or Grafana to create interactive financial dashboards.
* **Advanced Fraud Metrics**: The AI prompt could be enhanced to consider time-of-day or transaction frequency as additional factors in its fraud scoring logic.

**8.0 Conclusion**

The Automated Financial Watchdog project successfully demonstrates the capability of modern low-code platforms like n8n to create sophisticated, AI-driven systems. By integrating multiple APIs and services, this workflow provides tangible value in the form of enhanced security, data centralization, and intelligent automation. It serves as a strong foundation for more complex personal and enterprise automation solutions.