ASSIGNMENT

COURSE TITLE

CSE 417 - SOFTWARE ENGINEERING & DESIGN PATTERN

ASSIGNMENT ON

SOFTWARE REQUIREMENTS SPECIFICATION(SRS)

SUBMITTED TO

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SOFTWARE REQUIREMENTS SPECIFICATION

FOR

DataPulse

Data-Driven Business Solution Software

Version 1.0 Approved

PREPARED BY

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Revision History

Version	Date	Author	Description of Changes	Approval
1.0	04/04/2025	Borna Rani Bhowmik, Md. Yasin Ahmed Mahi	Initial release of the SRS document.	Samia Rahman Rima (Lecturer)

1. Introduction

1.1 Purpose

DataPulse is a software tool designed to help businesses understand and utilize their data more effectively. It allows companies to **collect**, **organize**, and **analyze** business information in one centralized platform. Through this tool, businesses can track performance, identify patterns, and predict future trends - enabling smarter, data-driven decision making.

In today's rapidly evolving industries, businesses face a variety of complex, data-centric challenges. **DataPulse** aims to address the following critical problems:

- **Sales Forecasting Challenges**: Businesses often struggle to predict future demand. **DataPulse** uses historical trends and patterns to provide accurate sales forecasts.
- **Customer Churn Prediction**: By analyzing user behavior and feedback, the system can identify at-risk customers, enabling proactive retention strategies.
- **Operational Inefficiencies**: Performance and workflow data can be monitored to uncover bottlenecks and reduce costs.
- **Marketing ROI Measurement**: Campaign performance data helps marketers understand which strategies are most effective.
- **Fraud Detection**: Unusual behavior in transaction data can be flagged using anomaly detection algorithms.
- **Product Development Insights**: Customer feedback and trend analysis can inform product innovation and planning.

The goal of this document is to provide a comprehensive Software Requirements Specification (SRS) for building **DataPulse**. It outlines:

✔ What the software should do (**functional requirements**)

✔ How well it should perform (**non-functional requirements**)

✔ How the system components interact (**system architecture & interactions**)

✔ Who will use it and what they can do (**user roles & permissions**)

✔ What other systems or tools it needs to integrate with (**external dependencies**)

This SRS serves as a guide for developers, designers, testers, and business stakeholders to ensure that DataPulse is developed to meet both technical and business needs.

1.2 Document Conventions

➢ **Entire document should be justified.**

➢ **Convention for main title**

Font face: Times New Roman

Font style: Bold

Font size: 16

➢ **Convention for subtitle**

Font face: Times New Roman

Font style: Bold

Font size: 14

➢ **Convention for normal texts**

Font face: Times New Roman

Font size: 12

1.3 Intended Audience and Usage

This document is designed for various stakeholders who will use, develop, or invest in **DataPulse**. It serves as a comprehensive guide to understanding the system's capabilities, ensuring effective collaboration among different roles.

The primary audiences include:

✔ **Business Owners & Managers -** Gain insights into how **DataPulse** can enhance decision-making, improve efficiency, and drive business growth through data-driven strategies.

✔ **Software Developers -** Utilize the technical specifications to develop and maintain the system, ensuring seamless integration and optimal performance.

✔ **Quality Assurance (QA) Teams -** Validate the system's functionality by referencing detailed requirements, ensuring reliability and accuracy in data processing.

✔ **Investors & Stakeholders -** Assess the feasibility, profitability, and scalability of **DataPulse** as a business intelligence solution.

To maximize the benefits of **DataPulse**, users should have a fundamental understanding of **data management, analytics, and business intelligence concepts**. The document is structured to provide a high-level overview for business users while offering in-depth technical details for developers.

Additionally, **DataPulse** enables businesses to:

- ✔ Securely store and manage business data.
- ✔ Perform data analysis to derive actionable insights.
- ✔ Visualize key metrics via interactive dashboards and reports.
- ✔ Forecast future trends using AI and machine learning.
- ✔ Integrate with third-party systems (ERP, CRM, etc.) to ensure a seamless data ecosystem.

To navigate this document effectively, readers should start with the overview sections and proceed to the relevant details based on their role and responsibilities. Supplementary materials such as glossaries, appendices, and reference documentation are included to support comprehension and application of the system.

1.4 Product Scope

DataPulse is a **cloud-based software solution**, with a future mobile extension, offering:

i. **Real-time business data management** – DataPulse helps businesses collect, store, and manage their data instantly. This means users can see updates as they happen, without any delay.

ii. **Customizable dashboards for reporting and visualization** – Users can create their own dashboards to display important business information in an easy-to-understand way, using charts, graphs, and reports. They can choose what data to see and how it looks.

iii. **AI-driven business trend forecasting** – The software uses Artificial Intelligence to study past business data and predict future trends. This helps companies make better decisions based on expected changes.

iv. **Seamless integration with external business applications** – DataPulse can easily connect with other business tools and software, allowing users to share data between different platforms without extra work.

1.5 Assumptions and Constraints

i. Businesses will have **existing structured data sources** (databases, Excel, APIs).

ii. The system will be **cloud-hosted** and require internet access for most features.

iii. Compliance with **data protection laws (GDPR, CCPA)** is required.

1.6 References

[1] The structure and formatting of this document were inspired by SRS templates from **IEEE Recommended Practice for Software Requirement Specifications, IBM Knowledge Center, Atlassian, Perforce, and TechTarget**.

[2] Ian Sommerville, *Software Engineering* (9th Edition), Pearson Education, 2010.

[3] Perforce Software, "How to Write a Software Requirements Specification (SRS) Document," available at:

https://www.perforce.com/blog/alm/how-write-software-requirements-specification-srs-document.

2. Overall Description

2.1 Product Perspective

DataPulse is an independent business intelligence software that helps companies make sense of their data. While it works on its own, it can also connect with other business tools like accounting software, inventory systems, and customer management platforms.

The software is built using a **modular approach**, meaning businesses can add or customize features based on their needs. This makes **DataPulse** flexible and adaptable as companies grow or require new functions.

2.2 Product Features

✦ Data Entry & Management

Businesses can safely input, store, and retrieve their data without worrying about loss or unauthorized access.

✦ Data Analysis & Insights

The software uses AI to examine data, find patterns, and predict future trends to help businesses make informed decisions.

✦ Visualization & Reporting

Users can view data through interactive charts, reports, and dashboards to track key business performance indicators (KPIs).

✦ Integration Capabilities

DataPulse can connect with external business tools like **Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) software, and cloud storage services** for seamless data flow.

2.3 User Classes and Characteristics

Different types of users will interact with **DataPulse**, each with their own needs:

- **Business Owners** - Need an overview of their company's financial health and daily operations to make strategic decisions.
- **Managers & Executives** - Use the platform to analyze performance trends, improve efficiency, and plan future strategies.
- **Data Analysts** - Require detailed reports, charts, and predictive insights to understand trends and support decision-making.
- **Employees** - Have role-based access, meaning they can only manage and interact with the data relevant to their job.

2.4 Operating Environment

DataPulse is designed to run on different devices and platforms to ensure easy access:

- **Web Browsers** - Works on **Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari** without needing to install extra software.
- **Operating Systems** - Compatible with **Windows, macOS, and Linux** for both office and personal use.
- **Mobile Devices** - While initially web-based, a mobile app will be developed in the future for **iOS and Android**.

2.5 Design & Implementation Constraints

- **Security Compliance -** The software must follow global data protection laws like **GDPR (General Data Protection Regulation) and CCPA (California Consumer Privacy Act)** to ensure user privacy and data security.
- **Performance Efficiency -** The system should handle **large amounts of business data** quickly and efficiently, without delays or crashes.
- **Scalability -** As businesses grow and data increases, DataPulse should **expand its capacity** without slowing down or requiring a complete system overhaul.

2.6 User Documentation

User documentation will include **user manuals, admin guides, FAQs**, and **on-screen tutorials** to support effective use of the DataPulse platform. All documentation will be provided in **digital formats**, accessible via web and **mobile-friendly interfaces** for convenience.

The following resources will be available:

- **User Guide -** Simple, step-by-step instructions for navigating and using **DataPulse**.
- **Admin Guide -** Detailed documentation for system administrators on platform setup, configuration, and management.
- **FAQs & Troubleshooting -** A curated list of frequently asked questions and common issues, along with clear solutions.
- **Interactive On-Screen Tutorials -** Built-in walkthroughs and tooltips within the platform to guide users in real time.

These materials aim to minimize the learning curve and reduce the need for technical support.

3. System Features

3.1 Business Data Management

3.1.1 Description and Priority

This feature enables businesses to securely input, organize, store, and retrieve structured data.

Priority: High

3.1.2 Stimulus/Response Sequences

- **Stimulus**: User uploads a CSV file containing sales records.
- **Response**: System validates the file format, imports data into the database, and confirms successful upload.
- **Stimulus**: User searches for a customer record using keywords.
- **Response**: System displays filtered results within 2 seconds.

3.1.3 Functional Requirements

- **REQ-1**: The system shall allow users to import data from CSV, Excel, and external APIs.
- **REQ-2**: The system shall support advanced search with filters (date range, category, keyword).
- **REQ-3**: Automated daily backups shall be performed to prevent data loss.
- **REQ-4**: Users shall be able to categorize data using custom tags.

3.2 Data Analysis & AI Insights

3.2.1 Description and Priority

Leverages AI/ML algorithms to detect trends, generate forecasts, and highlight anomalies.

Priority: High

3.2.2 Stimulus/Response Sequences

- **Stimulus**: User selects a dataset and requests a sales forecast.
- **Response**: System processes historical data and displays a 12-month forecast graph.
- **Stimulus**: Anomaly detected in transaction data.
- **Response**: System triggers an email alert to the admin.

3.2.3 Functional Requirements

- **REQ-5**: The system shall apply AI models to predict sales trends with ≥90% accuracy.
- **REQ-6**: Automated insights (e.g., customer churn risk) shall be generated weekly.
- **REQ-7**: Users shall receive real-time notifications for critical anomalies.

3.3 Visualization & Reporting

3.3.1 Description and Priority

Provides customizable dashboards and real-time data visualization. *Priority: Medium*

3.3.2 Stimulus/Response Sequences

- **Stimulus**: User creates a dashboard widget for revenue tracking.
- **Response**: System updates the widget with live data every 5 seconds.
- **Stimulus**: User exports a report to PDF.
- **Response**: System generates a formatted PDF file for download.

3.3.3 Functional Requirements

- **REQ-8**: Dashboards shall support drag-and-drop customization of widgets.
- **REQ-9**: Reports shall be exportable in PDF, Excel, and CSV formats.
- **REQ-10**: Real-time data updates shall reflect in visualizations within 5 seconds.

3.4 Integration with External Systems

3.4.1 Description and Priority

Enables seamless data exchange with ERP, CRM, and third-party tools. *Priority: High*

3.4.2 Stimulus/Response Sequences

- **Stimulus**: User configures an API connection to Salesforce.
- **Response**: System validates credentials and syncs customer data hourly.

3.4.3 Functional Requirements

- **REQ-11**: RESTful APIs shall support read/write operations with OAuth2 authentication.
- **REQ-12**: The system shall auto-sync data with external systems every 30 minutes.

3.5 Security & Compliance

3.5.1 Description and Priority

Ensures data protection and regulatory compliance. *Priority: High*

3.5.2 Stimulus/Response Sequences

- **Stimulus**: User attempts to access sensitive financial data without permissions.
- **Response**: System blocks access and logs the unauthorized attempt.

3.5.3 Functional Requirements

- **REQ-13**: Role-Based Access Control (RBAC) shall restrict data access by user role.
- **REQ-14**: All data transmissions shall use TLS 1.2+ encryption.
- **REQ-15**: Audit logs shall retain user activity records for 7 years.

4. External Interface Requirements

4.1 User Interfaces

- **Web Interface**: Responsive design compatible with Chrome, Firefox, Edge, and Safari.
- **Mobile Interface**: Future iOS/Android app with feature parity to the web version.
- **Dashboard Layout**: Drag-and-drop widgets, configurable themes, and accessibility modes (e.g., high contrast).

4.2 Hardware Interfaces

- **Cloud Hosting**: Requires x86-64 servers (AWS/Azure/Google Cloud) with ≥8GB RAM.
- **Local Storage**: Optional on-premise deployment supported via Docker containers.

4.3 Software Interfaces

- **ERP/CRM Systems**: Pre-configured connectors for SAP, Oracle, Salesforce, and Zoho.
- **APIs**: RESTful endpoints for third-party integration (documentation available at /api/v1/docs).

- **Database**: MySQL/PostgreSQL for structured data; MongoDB for unstructured logs.

4.4 Communications Interfaces

- **Protocols**: HTTPS for API calls; SFTP for secure file transfers.
- **Data Formats**: JSON (API payloads), CSV/Excel (import/export), and PDF (reports).
- **Rate Limiting**: API requests capped at 100 calls/minute per user to ensure stability.

5. Other Non-Functional Requirements

5.1 Performance Requirements

The system should be **fast and responsive**. When a user searches for information or performs an action, the system should **respond within 2 seconds**. If data is updated in real-time (for example, new sales records), the system should **refresh and show the latest data within 5 seconds** so users always see the most up-to-date information.

5.2 Security Requirements

To keep business data **safe from hackers or unauthorized access**, the system will use **end-to-end encryption**. This means that even if someone tries to steal the data, they won't be able to read it. The system will also go through **regular security checks (audits)** to make sure there are no weaknesses or security risks.

5.3 Usability & Accessibility

The system should be **easy to use**, even for people who are not very tech-savvy. The design should be **simple and clear**, so users can find what they need without confusion. It should also follow **accessibility standards**, meaning it will support users with disabilities, such as those who are visually impaired.

5.4 Scalability & Reliability

The system should be able to handle **thousands of users at the same time** without slowing down or crashing. It should also have **automated backups**, meaning if something goes wrong (like a system failure), data will not be lost, and users can restore it easily.

6. Other Requirements

6.1 Data Requirements

DataPulse must effectively manage structured business data while ensuring security and accessibility for users.

Types of Data Supported:

- **Sales Records:**
  - Stores transaction details, including product/service sold, amount, date, and customer information.
  - Enables tracking of business revenue and identification of trends over time.
- **Expenses Data:**
  - Records business expenditures such as salaries, office supplies, and operational costs.
  - Facilitates financial planning and budget management.
- **Customer Details:**
  - Maintains customer names, contact details, purchase history, and preferences.
  - Enhances customer relationship management and personalized service delivery.
- **Business Performance Data:**
  - Monitors key metrics such as revenue, profit, losses, and employee productivity.
  - Provides insights to support strategic decision-making.

Data Storage & Security:

- **Secure Storage:** Data should be stored in a structured format using relational databases (MySQL, PostgreSQL) or cloud-based solutions.
- **Access Controls:** Role-Based Access Control (RBAC) ensures restricted access to sensitive data.
- **Data Encryption:** Business data must be encrypted to prevent unauthorized access.
- **Backup & Recovery:** Automated backups are required to prevent data loss in case of system failures.

6.2 System Architecture

DataPulse follows a modular and cloud-based system architecture to ensure high performance, scalability, and ease of maintenance.

Key Architectural Components:

- **Modular Microservices Design:**
  - The system is divided into independent services, each responsible for specific functions (e.g., data processing, reporting, AI insights).
  - Enables seamless updates and scalability.
  - Ensures system reliability by allowing other services to function if one service fails.
- **Cloud-Based Deployment:**
  - Hosted on cloud platforms such as AWS, Google Cloud, or Azure for global accessibility.
  - Allows users to access data via web browsers or mobile applications.
  - Ensures high availability with minimal downtime.
- **Database Management System (DBMS):**
  - Uses relational databases (MySQL, PostgreSQL) for structured business data.
  - NoSQL databases (MongoDB) may be utilized for storing large or unstructured datasets.
- **Security Layer:**
  - **Authentication & Authorization:** Utilizes Multi-Factor Authentication (MFA) for secure logins.
  - **Data Encryption:** Ensures sensitive business data remains protected.
  - **API Security:** Prevents unauthorized access to third-party integrations.
- **Integration Layer:**
  - REST APIs facilitate integration with external business applications such as ERP and CRM systems.
  - Supports third-party analytics tools for advanced data insights.

6.3 Testing Requirements

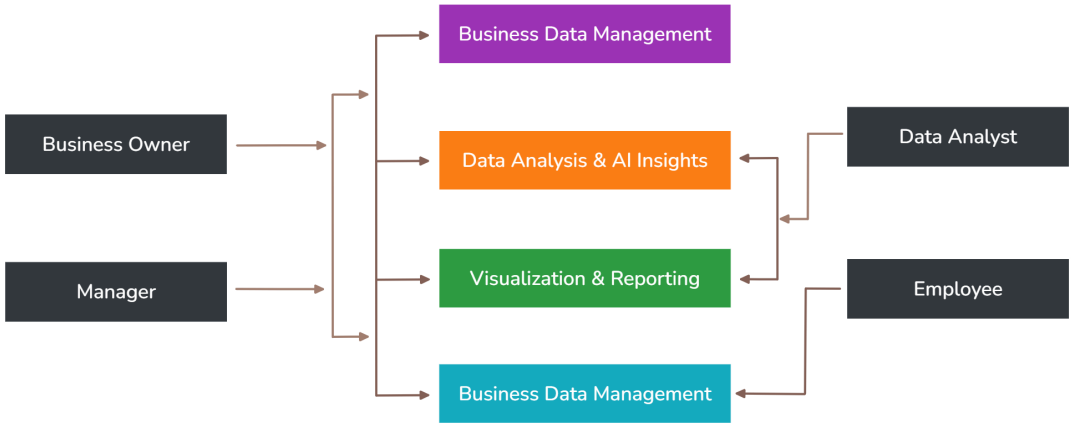
Comprehensive testing is required to ensure DataPulse functions effectively, efficiently, and securely. The following types of testing will be conducted:

1. **Unit Testing (Component-Level Testing):**
   - Ensures individual modules function as expected.
   - Verifies that small components such as login, report generation, and data entry operate correctly.
   - *Example:* Testing the data entry module to confirm that sales records are correctly stored.
2. **Performance Testing (Speed & Load Handling):**
   - Measures system responsiveness and ability to handle high data volumes and user traffic.
   - Evaluates system behavior under stress conditions.
   - *Example:* Ensuring the dashboard loads within 2 seconds when accessed by 1,000 users simultaneously.
3. **Security Testing (Data Protection & Access Control):**
   - Identifies vulnerabilities in system security and ensures compliance with GDPR and CCPA regulations.
   - Validates user access control mechanisms, data encryption, and threat prevention measures.
   - *Example:* Conducting penetration testing to simulate hacker attacks and prevent unauthorized data access.

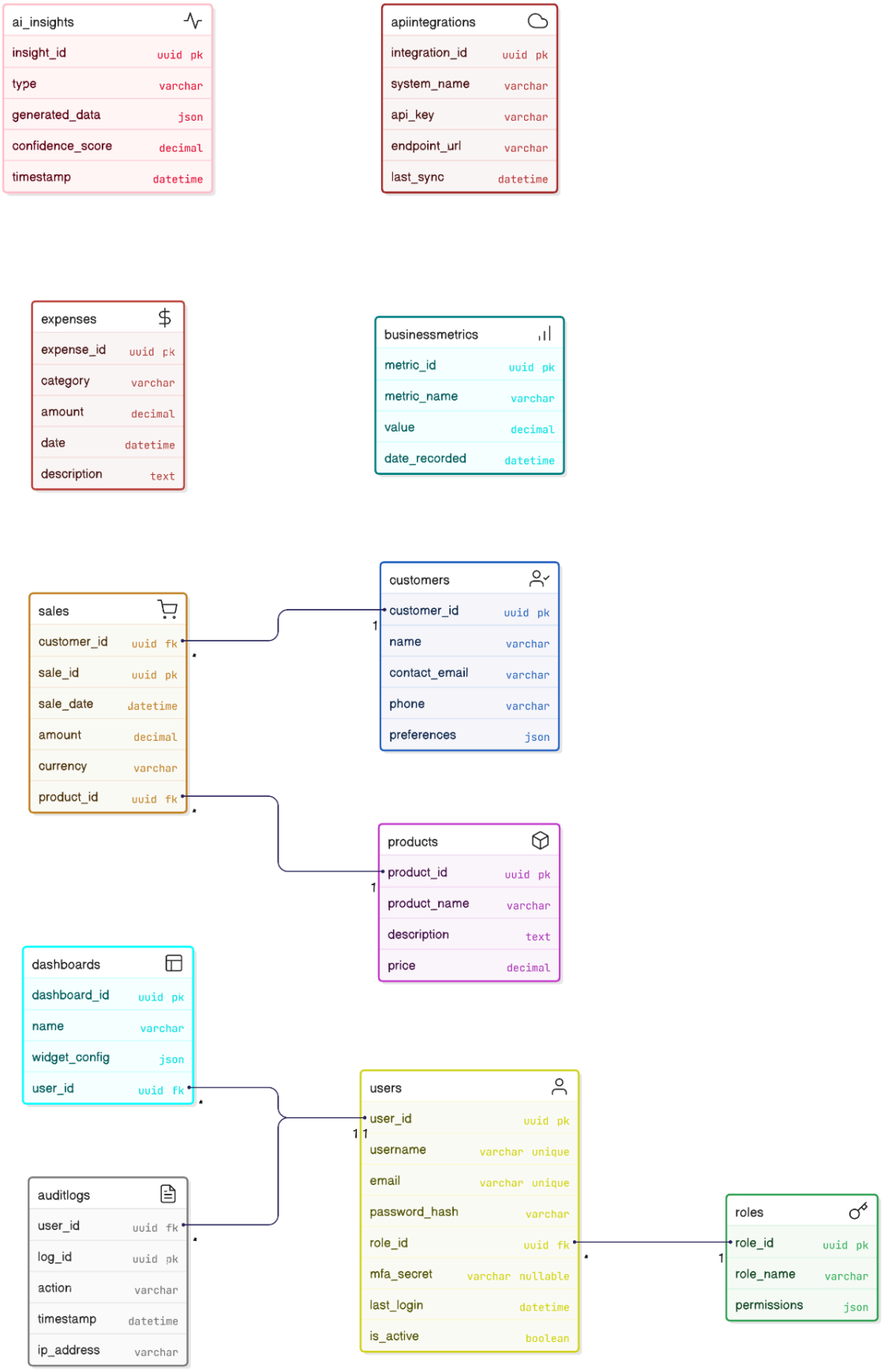
These testing protocols will help maintain system stability, security, and user satisfaction.

Appendices

A. Use Cases Diagram



B. Database Schema Diagram



C. Glossary of Terms and Acronyms:

Term/Acronym	Definition
AI (Artificial Intelligence)	The simulation of human intelligence in machines, used in DataPulse for trend prediction, anomaly detection, and automated insights.
API (Application Programming Interface)	A set of protocols enabling software components to communicate. DataPulse uses RESTful APIs for third-party integrations.
CCPA (California Consumer Privacy Act)	A U.S. law enhancing privacy rights for California residents. DataPulse complies with CCPA for data handling and user consent.
CRM (Customer Relationship Management)	Software for managing customer interactions, sales pipelines, and marketing efforts. DataPulse integrates with CRM systems like Salesforce.
CSV (Comma-Separated Values)	A file format for storing tabular data (e.g., sales records) used for data imports/exports in DataPulse.
ETL (Extract, Transform, Load)	A process for data integration. DataPulse uses ETL pipelines to prepare data for analysis.
GDPR (General Data Protection Regulation)	EU regulation governing data privacy. DataPulse ensures GDPR compliance through encryption and access controls.
JSON (JavaScript Object Notation)	A lightweight data format used for API payloads and configuration files in DataPulse.
KPI (Key Performance Indicator)	A measurable metric (e.g., revenue growth) tracked in DataPulse dashboards to assess business performance.
MFA (Multi-Factor Authentication)	A security method requiring multiple verification steps (e.g., password + SMS code) for user logins.
NoSQL	A database type (e.g., MongoDB) used in DataPulse for unstructured data storage (logs, user activity).
OAuth2	An authentication protocol used by DataPulse APIs to securely grant third-party access.