Immigration and Visa Management System

Database Design Document

DAMG 6210 - P2. Database Design, Conceptual ERD

Version: 1.0

Date created: 03 Feb 2025

Group 10 Members:

Sonal Sunil Takalikar - (002319575)
Sakshi Mohan Tapkir (002331980)
Rupam Patra (002050766)
Bharath Kumar Tamilselvam (002050099)

Table of Contents

1. Mission Objective & Business Problem Statement

The goal of the Immigration and Visa Management System is to establish an integrated, secure, and effective platform for handling visa applications, immigration records, and related operations. This system is designed to address multiple challenges, including:

- **Decentralized Data Storage:** Applicant, visa, payment, and appointment information is often spread across separate systems, causing inefficiencies and errors.

- **Manual Processing Delays:** Heavy dependence on manual procedures results in slower application handling and increased workload.

- **Security Concerns:** Inadequate protection of sensitive data, including passport numbers and payment details, increases the risk of breaches.

- **Limited Applicant Communication:** Applicants frequently experience uncertainty due to the absence of real-time status updates.

By implementing this system, immigration procedures can be streamlined, ensuring a secure, efficient, and transparent process for both applicants and officials.

2. Key Entities and Relationships

2.1 Essential Entities

1. **Applicants** *(Stores personal details of individuals applying for visas, ensuring unique identification and tracking)*

   - applicant_id (PK)

   - first_name

   - last_name

   - email (Unique)

   - passport_number (Unique)

   - nationality

   - dob

2. **Applications** *(Each applicant may submit multiple visa applications, making this entity essential for tracking different cases separately)*

   - application_id (PK)

   - applicant_id (FK)

   - visa_type

   - application_status (Submitted, Approved, Rejected, Pending)

- o submission_date

3. **Visas** *(Links issued visas to approved applications, preventing inconsistencies in data storage)*

    - o visa_id (PK)

    - o application_id (FK)

    - o valid_from

    - o valid_to

    - o status (Active, Expired, Revoked)

4. **Payments** *(Tracks payments for applications, ensuring fee compliance and transaction monitoring)*

    - o payment_id (PK)

    - o application_id (FK)

    - o amount

    - o payment_date

    - o payment_status (Pending, Completed, Failed)

5. **Immigration Offices** *(Represents official immigration centers where applications are processed, ensuring structured operations)*

    - o office_id (PK)

    - o office_name

    - o location

    - o contact_number

6. **Appointments** *(Ensures applicants interact with immigration officials at scheduled times, reducing processing delays)*

    - o appointment_id (PK)

    - o applicant_id (FK)

    - o office_id (FK)

    - o appointment_date

    - o appointment_status (Scheduled, Completed, Canceled)

7. **Officers** *(Maintains records of immigration officers responsible for reviewing applications, ensuring accountability)*

    - o officer_id (PK)

- first_name

- last_name

- designation

- office_id (FK)

8. **Documents** *(Tracks required applicant documents for verification and compliance)*

   - document_id (PK)

   - application_id (FK)

   - document_type (Passport, Proof of Funds, etc.)

   - upload_date

   - verification_status (Pending, Verified, Rejected)

9. **Notifications** *(Manages automated alerts and updates to applicants regarding application progress)*

   - notification_id (PK)

   - applicant_id (FK)

   - notification_date

   - message

   - status (Read, Unread)

10. **Case Notes** *(Enables officers to record relevant observations and decisions related to applications)*

- note_id (PK)

- application_id (FK)

- officer_id (FK)

- note_date

- note_content

11. **Appeal Cases** *(Handles applicant appeals for rejected visa applications, ensuring structured review processes)*

- appeal_id (PK)

- application_id (FK)

- appeal_date

- appeal_status (Submitted, Accepted, Rejected)

12. **Travel History** *(Records past travel details of applicants, aiding in verification and decision-making)*

- history_id (PK)

- applicant_id (FK)

- country

- travel_date

- return_date

2.2 Entity Relationships & Justifications

- **One-to-Many:** Each applicant may have multiple applications, but each application belongs to a single applicant.

- **One-to-One:** A visa corresponds to a single application to maintain structured data integrity.

- **Many-to-One:** Multiple payments are associated with a single application to track fee collection accurately.

- **One-to-Many:** An officer manages multiple applications, ensuring workload distribution.

- **Many-to-One:** Appointments are linked to immigration offices, optimizing scheduling and processing.

3. Key Database Design Decisions

1. **Normalization:**

   - The system applies **3rd Normal Form (3NF)** to minimize redundancy and improve efficiency.

2. **Security Enhancements:**

   - **Encryption** secures sensitive information, including passport numbers and payment details.

   - **Role-based access control (RBAC)** ensures limited data visibility based on user roles.

3. **Scalability Considerations:**

   - Supports **horizontal scaling** to accommodate increasing application volumes.

   - Implements indexed primary keys for **optimized query performance**.

4. **Audit Trails & Compliance:**

   - Logs actions performed by officers for accountability.

   - Ensures adherence to **GDPR and other regulatory requirements**.

5. **Automation & Workflow Optimization:**

   o Implements automated triggers for notifications, appointment scheduling, and visa expiry alerts.

6. **Real-Time Status Updates:**

   o Keeps applicants informed with instant updates via email and SMS.

4. ER Diagram