

Project Proposal: The Wellsbury Secret Agency Database

Team number- 8

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Abstract

This document outlines the design and requirements for a relational database system, a Secret Agency set within the fictional universe of the "Ginny & Georgia" series. The database is designed for a covert agency operating in the town of Wellsbury, providing a centralized system to manage intelligence, track individuals, analyze financial activities, and connect disparate pieces of evidence. The system will serve multiple user groups with tiered access—including the secret agency, local government, police, and the public—ensuring that data is used effectively for solving complex cases while maintaining necessary security and privacy protocols.

1. Mini World Development

1.1 Idea Formulation

The mini-world is **Wellsbury, Massachusetts**, the seemingly idyllic town from the "Ginny & Georgia" series. Beneath its charming facade of boutique shops and community events lies a web of secrets, financial crimes, and hidden pasts. While the local police handle day-to-day issues, a secret agency has been established to uncover the deeper conspiracies that threaten the town's stability.

This agency operates from the shadows, using agents embedded within the community undercover identities. Their work involves complex investigations, financial tracking, and evidence analysis that goes far beyond the scope of traditional law enforcement.

Our proposed **Database System** is the central nervous system of the secret agency. It integrates all facets of their operations, serving as a secure repository for agent identities, investigation notes, financial records, property ownership, and chains of evidence. It allows agents to see connections that would otherwise be invisible—linking a shell corporation to a suspicious property purchase, or connecting a seemingly minor criminal record to a larger ongoing investigation. The database is not merely a record-keeping tool; it is an active investigative partner that helps agents piece together the puzzle of Wellsbury.

1.2 User Identification & Interaction

The database is designed with a multi-tiered access control system to serve different users, each with specific roles and permissions:

- **Secret Agency (Administrators & Agents):** This is the primary user group. Agents have full access to all data, including classified agent identities, private investigation notes (PIData), and evidence chains. They interact with the system to file reports, query connections between individuals and businesses, analyze financial transactions, and manage active cases.
- **Government Officials:** This group has read-only access to a sanitized subset of the data. They can view aggregated data on property ownership, business revenue, and public expenditure records. They cannot see classified information like agent identities or private investigation notes. Their goal is to monitor the economic health and civic integrity of Wellsbury.
- **Police Department:** The police have access to general public information (Person entity), official CriminalRecord data (records they have filed), and business ownership details. They can use this to support their own investigations but are firewalled from the agency's covert operations and intelligence.
- **Public (General Users):** The public interacts with the database through a secure web portal with very limited access. They can view publicly available information, such as business registrations, major government expenditures for accountability, and a list of convicted criminals (based on official CriminalRecord data). This fosters transparency and community awareness.

1.3 Purpose of the Database

In the high-stakes environment of Wellsbury, information is fragmented and often misleading. Non-database solutions like paper files or disconnected spreadsheets are slow, insecure, and incapable of revealing complex patterns. The Secret Agency database is critical for the following reasons:

- **Data Integration and Relationship Mapping:** It connects disparate information—a person, their fake job, their secret expenditures, and a piece of evidence—into a coherent whole. This allows for complex queries that a non-DB solution could never handle.
- **Speed and Efficiency:** Agents can retrieve critical information in seconds, not hours. This speed is crucial during active investigations.
- **Data Integrity and Consistency:** The database enforces strict rules (constraints) to ensure data is accurate and reliable. For example, it prevents the creation of a criminal record for a non-existent person, ensuring referential integrity.
- **Security and Access Control:** As a clandestine organization, protecting sensitive data is paramount. The database provides robust security mechanisms and granular access control, ensuring users only see the data they are authorized to view.
- **Concurrency:** Multiple agents can access and update the database simultaneously without corrupting the data, which is impossible with a manual file system.

2. Database Requirements.

Database Schema

• **PEOPLE:** This is the base entity for all individuals, whether they are employees, clients, or business owners.

- **Attributes:**
 - **Ssn** (PK) (DataType: Varchar) (Constraint: Exact 11 digits, UNIQUE)

- **Name** (DataType: Varchar) (Composite: FName, LName)
 - **Address** (DataType: Varchar) (Composite: Street, City, ZipCode)
 - **Sex** (DataType: Char) (Constraint: Domain is 'M', 'F', 'O')
 - **Contact** (DataType: Varchar) (Constraint: Exact 10 digits, Multivalued)
 - **Email** (DataType: Varchar) (Constraint: UNIQUE)
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▪ **CRIMINAL RECORDS:** This is a **WEAK ENTITY** that depends on PEOPLE and tracks an individual's official criminal history.

- **Attributes:**
 - **Ssn** (FK to PEOPLE) (DataType: Varchar)
 - **Report_ID** (PK) (DataType: Varchar)(Constraint: UNIQUE)
 - **Investigation_Details** (DataType: Varchar) (Composite: Date, Officer, Summary)
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▪ **EMPLOYMENT RECORDS:** This is a **WEAK ENTITY** that depends on PEOPLE and describes an individual's cover job.

- **Attributes:**
 - **Ssn** (PK)(FK to PEOPLE) (DataType: Varchar)
 - **Occupation** (DataType: Varchar)
 - **Salary** (DataType: Decimal) (Constraint: Must be > 0)
 - **Organisation_Name** (FK to SMALL BUSINESSES) (DataType: Varchar)
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▪ **SECRET AGENT:** This entity represents the secret identity of a person who is an employee of the agency.

- **Attributes:**
 - **Employee_ID** (PK) (DataType: Int)(Constraint: UNIQUE)
 - **Ssn**(PK) (FK to PEOPLE) (DataType: Varchar) (Constraint: UNIQUE)
 - **Actual_Name** (DataType: Varchar)
 - **Post** (DataType: Varchar)
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▪ **PROPERTY RECORDS:** This is a superclass representing all properties.

- **Attributes:**
 - **Property_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Bought_When** (DataType: Date)
 - **Worth** (DataType: Decimal)
- **Subclasses:**
 - **Owned_by_People** (links to PEOPLE via Ssn-additional attribute)
 - **Owned_by_Business** (links to SMALL BUSINESSES via Business_ID-additional attribute)
 - **Owned_by_Government**

▪ **EXPENDITURE RECORDS:** This is a superclass representing all financial transactions.

- Attributes:
 - **Transaction_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Money_Spent** (DataType: Decimal)
 - **Date** (DataType: Date)
 - Subclasses:
 - **By_Person** (links to PEOPLE via Ssn-additional attribute)
 - **By_Business** (links to SMALL BUSINESSES via Business_ID-additional attribute)
 - **By_Government**
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▪ **PI DATA:** This table models a many-to-many relationship, representing intelligence an EMPLOYEE has gathered on a PERSON.

- Attributes:
 - **Pi_Data_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Employee_ID** (FK to EMPLOYEES IN SECRET) (DataType: Varchar)
 - **Subject_Ssn** (FK to PEOPLE) (DataType: Varchar)
 - **Collected_Info** (DataType: Text)(Multivalued)
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▪ **BUSINESS:** This entity represents businesses, which can be owned by people and used in agency operations.

- Attributes:
 - **Business_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Business_Name**(PK) (DataType: Varchar) (Constraint: UNIQUE)
 - **Business_Owner_Ssn** (FK to PEOPLE) (DataType: Varchar)
 - **Revenue** (DataType: Decimal)
 - **No_of_Employees** (DataType: Int) (Derived)
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▪ **EVIDENCE COLLECTION:** This entity represents evidence collected by an agent, linking a person, a location, and a processing business. This is a quaternary (n=4) relationship.

- Attributes:
 - **Evidence_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Employee_ID** (FK to EMPLOYEES IN SECRET) (DataType: Varchar)
 - **Subject_Ssn** (FK to PEOPLE) (DataType: Varchar)
 - **Found_At_Property_ID** (FK to PROPERTY RECORDS) (DataType: Int)
 - **Stored_At_Business_ID** (FK to SMALL BUSINESSES) (DataType: Int)
 - **Collection_Date** (DataType: Datetime)
 - **Evidence_Type** (DataType: Varchar)
 - **Chain_of_Custody_Status** (DataType: Varchar)

▪ **FINANCIAL ANALYSIS:** This table records the event of an agent investigating a specific payment made by a person to a business. This is a quaternary (n=4) relationship.

- Attributes:
 - **Analysis_ID** (PK) (DataType: Int) (Constraint: UNIQUE)
 - **Employee_ID** (FK to EMPLOYEES IN SECRET) (DataType: Int)
 - **Source_Ssn** (FK to PEOPLE) (DataType: Varchar)
 - **Business_ID** (FK to SMALL BUSINESSES) (DataType: Int)
 - **Transaction_ID** (FK to EXPENDITURE RECORDS) (DataType: Int)
 - **Analysis_Date** (DataType: Date)
 - **Analysis_Notes** (DataType: Text)

Relationship Types

Relationship Name	Purpose	Participating Entities	Degree	Cardinality Ratio
HAS_IDENTITY	Links public persona to secret agent identity.	Person, SecretAgent	Binary	1:1
OWNS_BUSINESS	Specifies the owner of a small business.	Person, Business	Binary	1:1
INVESTIGATES	Models agents investigating persons of interest.	SecretAgent, Person	Binary	1:N
HAS_RECORD	Connects a person to their criminal records.	Person, CriminalRecord	Binary	1:N
HOLDS_JOB	Associates a person with their employment.	Person, Employment	Binary	1:1

PERSON_OWNS_PROPERTY	Links an individual to their properties.	Person, Property	Binary	1:N
BUSINESS_OWNS_PROPERTY	Links a business to its properties.	Business, Property	Binary	1:N
PERSON_MAKES_EXPENDITURE	Associates an individual with their spending.	Person, Expenditure	Binary	1:N
BUSINESS_MAKES_EXPENDITURE	Associates a business with its spending.	Business, Expenditure	Binary	1:N
EVIDENCE_GATHERING	Captures the event of evidence collection (implemented by the Evidence Collection entity).	SecretAgent, Person, Property, Business	Quaternary	1:N:M:N
FINANCIAL_ANALYSIS	Represents an agent analyzing a transaction (implemented by the Financial Analysis entity).	SecretAgent, Person, Business, Expenditure	Quaternary	1:N:N:M

3. Functional Requirements

These are the different users of the database and the operations they use and what is inferred from it:

Secret Agency (Administrators & Agents)

Purpose:

To conduct covert investigations, manage intelligence, and uncover complex criminal networks.

3.1 Retrieval Operations

Selection: “Retrieve all high-priority evidence where custodyStatus is 'Pending Analysis.'”

Explanation:

This function filters the **EvidenceCollection** table to find items needing immediate attention. By selecting records based on their status, agents can create a prioritized worklist, ensuring that the most time-sensitive evidence is processed first.

Projection:“Generate a target profile report showing a person's name, address, and cover occupation.”

Explanation:

This creates a concise summary for an agent about to conduct surveillance. It joins **Person** and **Employment** tables but only displays a few key fields, hiding irrelevant data and providing a clean, easy-to-read brief on the target's public persona.

Aggregate:“Calculate the agent with the highest number of active investigations by counting entries in **PIData** grouped by agentID.”

Explanation:

This query provides a summary value for operational management. It groups the **PIData** records by the investigating agent and counts the number of entries for each. This helps supervisors assess caseloads and allocate resources effectively.

Search:“Find all intelligence notes mentioning a specific keyword like 'laundering'.”

Explanation:

This performs a partial-text search across the unstructured **intelligenceNote** field in **PIData**. It allows agents to find connections between seemingly unrelated cases by searching for specific terms, locations, or code words.

3.2 Analysis Reports

- **Suspicious Financial Network Report:** Links **Person**, **Business**, **Expenditure**, and **FinancialScrutiny** data to uncover patterns of possible money laundering.
- **High-Risk Asset Holder Report:** Correlates **Property**, **Business**, and **CriminalRecord** data to highlight potentially illicit asset ownership.
- **Agent Efficiency Report:** Uses aggregate analysis from **PIData** to evaluate investigation output per agent.

Explanation:

These reports combine data across multiple entities, producing actionable intelligence that reveals hidden relationships between people, finances, and operations.

3.3 Modification Operations

Insertion:

- *Create a cover job:* Insert a new **Employment** record, verifying that **personSsn** and **businessID** exist to maintain data integrity.
- *Log new intelligence:* Insert a new record into **PIData** linking an agent to a subject and documenting findings.

Update:

- *Change of business ownership:* Update the **ownerSsn** field in **Business**; a trigger logs the change in an **AuditLog** table.
- *Update evidence status:* Change **EvidenceCollection.custodyStatus** from 'Pending Analysis' to 'Analyzed' after forensic review.

Deletion:

- *Remove compromised record:* Delete a **Person** record if it's a fake identity; **ON DELETE CASCADE** removes linked records.
 - *Purge false intelligence:* Delete invalid **PIData** entries to maintain database reliability.
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Government Officials (Analysts)

Purpose:

To monitor the town's economic health and ensure civic integrity using high-level, anonymized data.

3.1 Retrieval Operations

Selection: "Retrieve all businesses with declared revenue over \$1 million."

Explanation:

Filters the **Business** table to identify top economic contributors. This assists in understanding Wellsbury's economic structure and identifying influential entities.

Projection: "Display the address and marketValue of all government-owned properties."

Explanation:

Generates a report from the **GovernmentOwnedProperty** subclass, showing only relevant data for asset tracking while concealing internal identifiers.

Aggregate: "Calculate the total expenditure for the town this quarter by summing the amount from GovernmentExpenditure."

Explanation:

Provides a quarterly summary of government spending. It aggregates **GovernmentExpenditure.amount** values within a specific date range to help monitor fiscal discipline.

3.2 Analysis Reports

- **Quarterly Fiscal Transparency Report:** Summarizes all **GovernmentExpenditure** with category-wise distribution.
- **Economic Health Dashboard:** Correlates **Business** revenue, **Property** valuations, and **Employment** data to assess the town's financial well-being.
- **Corruption Risk Index:** Flags irregular financial patterns by cross-referencing **GovernmentExpenditure** with **Business** ownership and revenue trends.

Explanation:

These reports provide macro-level insights for policy evaluation and auditing, helping ensure transparency and responsible governance.

3.3 Modification Operations

Note:

This user group has **read-only access** to maintain the integrity of sensitive financial and civic data. No insertions, updates, or deletions are permitted.

Police Department

Purpose:

To support official law enforcement activities by accessing public records and filing official reports.

3.1 Retrieval Operations

Selection:“Retrieve all CriminalRecord entries for a specific personSsn.”

Explanation:

Fetches the complete criminal history of an individual from **CriminalRecord**, helping officers during investigations.

Projection:“Display the name and address for a person of interest.”

Explanation:

Allows officers to obtain essential details from the **Person** table (name, address) without unnecessary information overload.

Aggregate:“Count the number of crimes of a specific type reported in the last year.”

Explanation:

Analyzes crime trends by counting **CriminalRecord** entries filtered by type and date, assisting in strategic policing.

3.2 Analysis Reports

- **Crime Trend Report:** Identifies increases or decreases in specific crime types using year-over-year comparisons.
- **Repeat Offender Report:** Correlates **Person** and **CriminalRecord** data to highlight individuals with multiple offenses.
- **Neighborhood Risk Report:** Joins **Property** and **CriminalRecord** data to map high-crime zones.

Explanation:

These reports assist in crime prediction, resource deployment, and identifying hotspot areas, improving operational planning.

3.3 Modification Operations

Insertion:

- *File a new crime report:* Add a new **CriminalRecord** after verifying that **personSsn** exists in **Person**.

Update:

- *Close a case:* Update the case status from 'Open' to 'Closed'.
- *Add details to a report:* Append new data to **CriminalRecord.summary** as the case evolves.

Deletion:

- *Restricted operation:* Only possible under high-level authorization and implemented as a **soft delete** (e.g., mark as "Expunged") to preserve audit trails.
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Public (General Users)

Purpose:

To promote transparency and civic engagement by providing public access to non-sensitive data.

3.1 Retrieval Operations

Selection: "View a list of all publicly registered businesses in Wellsbury."

Explanation:

Shows entries from the **Business** table visible to the public, enabling awareness of local commerce.

Projection: "Display the purpose and amount of government expenditures over \$10,000."

Explanation:

Lists significant public expenditures from **GovernmentExpenditure**, revealing how taxpayer funds are used.

Search: "Search for a business by its businessName."

Explanation:

Performs a partial-text search on **Business.businessName**, allowing easy lookup of registered establishments.

3.2 Analysis Reports

- **Public Transparency Report:** Summarizes high-value **GovernmentExpenditure** for public viewing.
- **Community Business Directory:** Combines **Business** and **Property** data to show where local

businesses operate.

- **Town Development Overview:** Aggregates **GovernmentOwnedProperty** and **Business** data to showcase public projects and growth initiatives.

Explanation:

These reports make government and economic information accessible in a citizen-friendly format, promoting trust and accountability.

3.3 Modification Operations

Note:

Public users have **strictly read-only access**.

No insertions, updates, or deletions are permitted.