Gotham Police Department (GPD) Database Design

1. Introduction to the Mini-World

The Gotham City Police Department (GCPD) is the law enforcement agency of Gotham. The GCPD plays a vital role in maintaining order, investigating crimes, and collaborating with vigilantes like Batman. This mini-world focuses on the internal operations and data management needs of the GCPD. Our database supports law enforcement's efforts by integrating criminal profiles, cases, and other entities to make it easier for the GCPD to respond to and manage criminal activities.

2. Purpose of the Database

The purpose of this database is to streamline and enhance the GCPD's operations by tracking, managing, and storing information about criminal cases, maintaining records of officers and their assignments, managing evidence and crime scene details, coordinating with other city departments and external agencies, and analyzing crime patterns to allocate resources more effectively.

3. Users of the Database

The primary users of the database include police officers, detectives, forensic specialists, personnel from the Major Crimes Unit (MCU), administrative staff, and the Police Commissioner, such as Jim Gordon, authorized external agencies like the District Attorney's office (Harvey Dent) and vigilantes like Batman.

4. Applications of the Database

The database serves multiple applications, including a case management system for officer scheduling, and assignments, and integrated evidence tracking with detailed crime information. It also provides comprehensive criminal profiles for characters like the Joker and Two-Face. The crime mapping and analysis feature helps identify hotspots, understand crime patterns, and predict future criminal activities. Additionally, it aids resource allocation and budgeting by assisting the GCPD and government in distributing police forces and equipment based on crime levels. Finally, it supports strategic decision-making for vigilantes like Batman, offering data on criminal networks, infrastructure, and potential threats.

5. Database Requirements

a. Assumptions: The database operates under several assumptions: officers have unique IDs, and cases each with its unique identifier; suspects and victims are identified using unique citizen IDs; and Wayne Enterprises plays a significant role in Gotham's development and Batman's operations, influencing various technological and economic aspects of the city.

b. Strong Entity Types

1. DEPARTMENTS: Details about the various departments within the GCPD, including department ID, name (e.g., Homicide, Narcotics, Cybercrime), head of department, number of officers, contact information, and location.

2. OFFICERS: Details about officers like their name, ID, designation, department, date hired, contact information, dependents, and status.

3. CASE: Details about the case ID, lead detective, case description, case type (homicide /robbery/assault/etc), status (open/closed/cold), date opened, date closed (if applicable), and priority.

4. CRIMINAL: Details like criminal ID, name, aliases, status, threat level, last known location, physical description, unique abilities, and known associates.

5. PRECINCT: Details like location ID, address, crime rate, location type (residential/commercial/industrial), patrol frequency, and average emergency response time.

6. CITIZEN: Citizen SSN, name, address, date of birth, occupation, contact information, status, dependents.

c. Weak Entity Types

1. CASE EVIDENCE: Evidence ID, description (about fingerprint, blood sample, weapon), type (forensic, material, etc), collecting officer (officer ID), case ID.
Evidence is a weak entity as it is entirely dependent on the case it is assigned to. Evidence cannot exist without a case.

2. WITNESS: Witness ID (if applicable), name, contact information, statement description, statement date, status (cooperative, hostile, missing), case ID.

3. VICTIM: Victim ID, case ID, name, address, status (alive, dead, missing), injuries (if applicable), connections (family, friends, colleagues).

d. Relationship Types

Degree: Binary (2)

1). INVESTIGATES Relationship:

Participating Entity Types: OFFICER, CASE.

Cardinality Ratio: Many-to-Many (M: N),

Participation Constraints: OFFICER: Partial (Some officers may not be investigating any cases), CASE: Total (Every open case must have at least one investigating officer)

(Min, Max) Constraints: OFFICER: (0, N) - An officer might investigate no cases up to many cases. CASE: (1, N) – Cases may have 1 or many investigating officers depending on status or priority.

2). INVOLVED_IN Relationship:

Participating Entity Types: CASE, CRIMINAL

Cardinality Ratio: Many-to-Many (M: N)

Participation Constraints: CASE: Total (Every case involves at least one criminal), CRIMINAL: Total (every criminal involved in at least 1 case)

(Min, Max) Constraints: CASE: (1, N) - A case must have at least one criminal involved, CRIMINAL: (1, N) - Every criminal should be involved in at least one case.

3). CONTAINS Relationship:

Participating Entity Types: CASE, EVIDENCE

Cardinality Ratio: One-to-Many (1: N)

Participation Constraints: CASE: Partial (Some cases might not have any evidence), EVIDENCE: Total

(All evidence must be linked to a case)

(Min, Max) Constraints: CASE: (0, N) - A case can have zero to many pieces of evidence, EVIDENCE: (1, 1) - Each piece of evidence belongs to one case.

e. Degree: > 2, Relationship (Ternary Relationship degree = 3):

1. CRIMINAL_INVESTIGATION

Entities: CASE, OFFICER, CRIMINAL Cardinality: Many-to-Many-to-Many (M: N: P).

Participation: Total for CASE and CRIMINAL, Partial for OFFICER.

(min, max) constraints: CASE (1, N), OFFICER (0, N), CRIMINAL (1, N).

2. CRIME_SCENE:

Entities: CASE, CRIMINAL, LOCATION.

Cardinality: Many-to-Many-to-Many (M: N:P).

Participation: CASE: Total, CRIMINAL: Total. LOCATION: Partial

(min, max) constraints: CASE: (1, N), CRIMINAL: (1, N), LOCATION: (0, N).

6. Functional Requirements

a. Modifications

1. Insert new case: Authorized personnel (detectives, officers) can open a new case and insert all relevant details (case ID, description, status, lead detective) (INSERT)

2. Update Officer Assignment: The case assignment of an officer can change when they are reassigned or their role changes. (UPDATE)

3. Update Case Status: Case status can be updated (from "open" to "closed"). (UPDATE)

4. Delete Evidence: Delete evidence if it's proven irrelevant or duplicated. (DELETE)

a. Retrievals

1. Retrieve open cases: The system allows authorized users to list all open cases to prioritize ongoing investigations. (select by case status)

2. Officer assignment report: The system reports all officers and their assigned cases. (select by officer ID, name, and case ID).

3. View evidence for a case: The system allows officers to retrieve all evidence linked to a specific case. (select by evidence ID, collected by officer, case ID, date)

7. Summary

The GCPD Database is designed to support the complex operations of the Gotham City Police Department as depicted in "The Dark Knight." By centralizing information about cases, officers, evidence, and involved parties, the database will enhance the efficiency and effectiveness of the department's crime-fighting efforts. The system considers the unique challenges faced by the GCPD, including the need to coordinate with vigilantes like Batman and handle high-profile cases involving supervillains like the Joker. This database will serve as a crucial tool in maintaining law and order in Gotham City, enabling the GCPD to better protect and serve its citizens.