University of British Columbia, Vancouver
Department of Computer Science

CPSC 304 Project Cover Page

Milestone #: 2

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Group Number: 35

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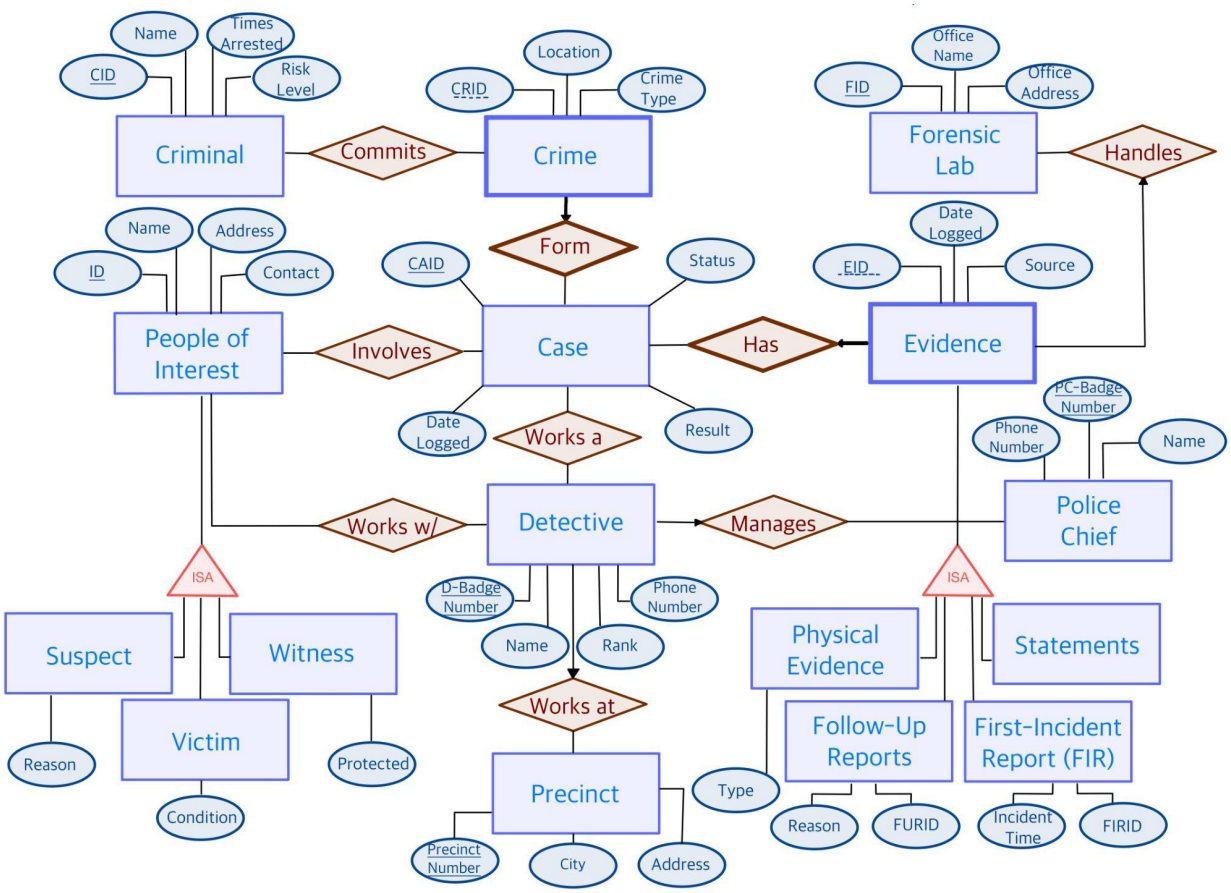
By typing our names and student numbers in the above table, we certify that the work in the attached assignment was performed solely by those whose names and student IDs are included above. (In the case of Project Milestone 0, the main purpose of this page is for you to let us know your e-mail address, and then let us assign you to a TA for your project supervisor.)

In addition, we indicate that we are fully aware of the rules and consequences of plagiarism, as set forth by the Department of Computer Science and the University of British Columbia

2. ER Diagram



Notes on changes:

- Crime Type changed from entity to attribute of crime
- Added Forensic Lab and Police Chief entities
- Changed Crime to weak entity
- Removed FURID and FIRID as primary keys
- Added City attribute into Precinct entity
- Split CriminalRecord into TimesArrested and RiskLevel
- Changed names of attribute to make it more distinct/understandable

3. Schema

Legend
Primary key
Foreign key
Candidate key

Entities

Detective(D-BadgeNumber: integer, **PC-BadgeNumber**: integer, **PrecinctNumber**: integer, Name: string, Rank: string, *PhoneNumber*: string)

Police Chief(PC-BadgeNumber: integer, Name: string, *PhoneNumber*: string)

Precinct(PrecinctNumber: integer, *Address*: string, City: string)

Case(CAID: integer, Status: string, Result: string, DateLogged: date)

Criminal(CID: integer, Name: string, TimesArrested: integer, RiskLevel: string)

Forensic Lab(FID: integer, OfficeName: string, *OfficeAddress*: string)

People of Interest(ID: integer, Name: string, Address: string, Contact: string)

Suspect(**ID**: integer, Reason: string)

Witness(**ID**: integer, Protected: char)

Victim(**ID**: integer, Condition: string)

Physical Evidence(**CAID**: integer**,** EID: integer, **FID**: integer, Date: date, Source: string, Type: string)

Statements(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string)

Follow-Up Reports(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string, Reason: string, *FURID*: integer)

First-Incident Report(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string,

IncidentTime: time, *FIRID*: integer)

Relations

Works_A(**D-BadgeNumber**: integer, **CAID**: integer)

Crime_Forms(**CAID**: integer, CRID: integer, Location: string, CrimeType: string)

Works_with(**ID**: integer, **D-BadgeNumber**: integer)

Involves(**ID**: integer, **CAID**: integer)

Has_Evidence(**CAID**: integer, EID: integer, Date: date, Source: string)

Commits(**CID**: integer, **CRID**: integer**,** **CAID**: integer)

4. Functional Dependencies

Precinct:
PrecinctNumber → Address, City (PK)
Address, City → PrecinctNumber (CK)

Detective:
BadgeNumber → Name, Rank, PhoneNumber (PK)
PhoneNumber → BadgeNumber, Name, Rank (CK)

People of Interest:
ID → Name, Address, Contact (PK)

Suspect:
ID → Reason (PK)

Witness:
ID → Protected (PK)

Victim:
ID → Condition (PK)

Criminal:
CID → Name, TimesArrested, RiskLevel (PK)
TimesArrested -> RiskLevel

Crime:
CAID, CRID → Location, CrimeType (PK)

Forensic Lab:
FID → OfficeName, OfficesAddress (PK)
OfficeAddress -> FID, OfficeName (CK)

Physical Evidence:
CAID, EID → FID, Date, Source, Type (PK)

Follow-Up Reports:

CAID, EID → FID, Date, Source, Reason, FURID (PK)
FURID → CAID, EID, FID, Date, Source, Reason (CK)

First Incident Report:
CAID, EID → FID, Date, Source, IncidentTime, FIRID (PK)
FIRID → CAID, EID, FID, Date, Source, IncidentTime (CK)

Police Chief:
BadgeNumber → Name, PhoneNumber (PK)
Name → PhoneNumber, BadgeNumber (CK)

Case:
CAID → Date Logged, Status, Result (PK)
Result → Status

5. Tables after Normalization

* Normalization work shown below

Entities

Detective(D-BadgeNumber: integer, **PC-BadgeNumber**: integer, **PrecinctNumber**: integer, Name: string, Rank: string, *PhoneNumber*: string)

Police Chief(PC-BadgeNumber: integer, Name: string, *PhoneNumber*: string)

Precinct(PrecinctNumber: integer, *Address*: string)

Case(CAID: integer, **Result**: string, DateLogged: date)
CaseStatus(Result: string, Status: string)*

Criminal(CAID: integer, Name: string, **TimesArrested**: integer)
CriminalRiskLevel(TimesArrested: integer, RiskLevel: string)*

Forensic Lab(FID: integer, Name: string, *OfficeAddress*: string)

People of Interest(ID: integer, Name: string, Address: string, Contact: string)

Suspect(**ID**: integer, Reason: string)

Witness(**ID**: integer, Protected: char)

Victim(**ID**: integer, Condition: string)

Physical Evidence(**CAID**: integer**,** EID: integer, **FID**: integer, Date: date, Source: string, Type: string)

Statements(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string)

Follow-Up Reports(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string, Reason: string, *FURID*: integer)

First-Incident Report(**CAID**: integer, EID: integer, **FID**: integer, Date: date, Source: string, IncidentTime: time, *FIRID*: integer)

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Relations

Manages(**Det-BadgeNumber**: integer, **CAID**: integer)

Crime_Forms(**CAID**: integer, CRID: integer, Location: string, CrimeType: string)

Works_with(**ID**: integer, **Det-BadgeNumber**: integer)

Involves(**ID**: integer, **CAID**: integer)

Has_Evidence(**CAID**: integer, EID: integer, Date: date, Source: string)

Commits(**CID**: integer, **CRID**: integer, **CAID**: integer)

Precinct:
PrecinctNumber → Address, City

Precinct (PrecinctNumber, Address, City)
BCNF:
PrecintNumber$^+$: {PrecintNumber, Address, City} # Superkey

Detective: (BCNF: D-BadgeNumber is a superkey)
D-BadgeNumber → Name, Rank, PhoneNumber
Name → D-BadgeNumber

Detective(D-BadgeNumber, Name, Rank, PhoneNumber)
BCNF:
D-BadgeNumber$^+$: {D-BadgeNumber, Name, Rank, PhoneNumber} # Superkey
Name$^+$: {D-BadgeNumber, Name, Rank, PhoneNumber} # Superkey

PoliceChief:
PC-BadgeNumber → Name, PhoneNumber

PoliceChief(PC-BadgeNumber, Name, PhoneNumber)
BCNF:
PC-BadgeNumber$^+$: {PC-BadgeNumber, Name, PhoneNumber} # Superkey
Name$^+$: {PC-BadgeNumber, Name, PhoneNumber} # Superkey

PeopleOfInterest: (BCNF: ID, Name is a superkey)
ID, Name → Address, Contact
Suspect: (BCNF: ID, Name is a superkey)
ID, Name → Address, Contact, Reason
Victim: (BCNF: ID, Name is a superkey)
ID, Name → Address, Contact, Condition
Witness: (BCNF: ID, Name is a superkey)
ID, Name → Address, Contact, Protected

PeopleOfInterest(ID, Name, Address, Contact)
BCNF:
ID,Name$^+$: {ID, Name, Address, Contact} # Superkey

Suspect(ID, Name, Address, Contact, Reason)
BCNF:
ID,Name$^+$: {ID, Name, Address, Contact, Reason} # Superkey

Victim(ID, Name, Address, Contact, Condition)
BCNF:
ID,Name$^+$: {ID, Name, Address, Contact, Condition} # Superkey

Witness(ID, Name, Address, Contact, Protected)
BCNF:
ID,Name$^+$: {ID, Name, Address, Contact, Protected} # Superkey

Forensic Lab:
FID → OfficeName, OfficesAddress (PK)
OfficeAddress -> FID, OfficeName (CK)

ForensicLab(FID, OfficeName, OfficeAddress)
BCNF:
FID$^+$: {FID, OfficeName, OfficeAddress}
OfficeAddress$^+$: {FID, OfficeName, OfficeAddress}

Criminal:
CID → Name, TimesArrested, RiskLevel (PK)
TimesArrested -> RiskLevel

Criminal (CID , Name , TimesArrested , RiskLevel)
BCNF:
CID$^+$: { CID, Name, TimesArrested , RiskLevel}
TimesArrested$^+$: { TimesArrested , RiskLevel } # not in BCNF

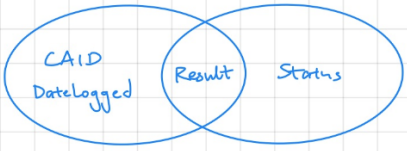
R_1 (CID, Name, TimesArrested)
R_2 (TimesArrested, RiskLevel)

Crime: (BCNF: CID, CRID is a superkey)
CID, CRID → Location, CrimeType

Crime (**CID** , CRID , Location , CrimeType)
BCNF: # Superkey
CID, CRID$^+$: { CID, CRID, Location, CrimeType }

Case:
CID → Date Logged, Status, Result (PK)
Result → Status

Case (CAID , DateLogged , Status, Result)
BCNF:
CAID : { CAID, DateLogged, Status, Result}
Result$^+$: { Result , Status } # not in BCNF, Result not superkey



R_1 (Result, Status)
R_2 (CAID, DateLogged, Result)

Evidence:
CAID, EID → DateLogged, Source
PhysicalEvidence:
CAID, EID → DateLogged, Source, Type
Follow-Up Reports:
CAID, EID → FURID, DateLogged, Source, Reason
FURID → CAID, EID, DateLogged, Source, Reason
First-Incident Report:
CAID, EID → FIRID, DateLogged, Source, IncidentDate
FIRID → CAID, EID, DateLogged, Reason

Evidence (**CAID** , EID , DateLogged , Source)
BCNF:
CAID, EID$^+$: { CAID, EID, DateLogged, Source } # Superkey

PhysicalEvidence(**CAID** , EID , DateLogged , Source)
BCNF:
CAID, EID$^+$: { CAID, EID, DateLogged, Type } # Superkey

FURID (**CAID** , EID , FURID , DateLogged , Source)
BCNF:
CAID, EID$^+$: { CAID, EID, FURID, DateLogged, Source } # Superkey

FIRID (**CAID** , EID , FURID , DateLogged , Source)
BCNF:
CAID, EID$^+$: { CAID, EID, FIRID, DateLogged, Source } # Superkey

6. SQL Statements

```
CREATE TABLE PoliceChief (
  BadgeNumber INTEGER PRIMARY KEY,
  Name CHAR(30),
  PhoneNumber CHAR(12) UNIQUE);

CREATE TABLE Precinct (
  PrecinctNumber INTEGER PRIMARY KEY,
  Address CHAR(30) UNIQUE);

CREATE TABLE Detective (
  DBadgeNumber INTEGER PRIMARY KEY,
  PCBadgeNumber INTEGER,
  PrecinctNumber INTEGER,
  Name CHAR(30),
  Rank CHAR(20),
  PhoneNumber CHAR(12) UNIQUE,
  FOREIGN KEY (PCBadgeNumber) REFERENCES PoliceChief(BadgeNumber),
  FOREIGN KEY (PrecinctNumber) REFERENCES Precinct(PrecinctNumber));

CREATE TABLE CaseStatus (
  Result CHAR(20) PRIMARY KEY,
  CaseStatus CHAR(20));

CREATE TABLE Cases (
  CAID INTEGER PRIMARY KEY,
  DateLogged DATE,
  Result CHAR(40),
  FOREIGN KEY (Result) REFERENCES CaseStatus(Result));

CREATE TABLE CriminalRiskLevel (
  TimesArrested INTEGER PRIMARY KEY,
  RiskLevel CHAR(8));

CREATE TABLE Criminal (
  CID INTEGER PRIMARY KEY,
```

```
  Name CHAR(30),
  TimesArrested INTEGER,
  FOREIGN KEY (TimesArrested) REFERENCES CriminalRiskLevel(TimesArrested));

CREATE TABLE ForensicLab (
  FID INTEGER PRIMARY KEY,
  OfficeName CHAR(20),
  OfficeAddress CHAR(30) UNIQUE);

CREATE TABLE PeopleOfInterest (
  ID INTEGER PRIMARY KEY,
  Name CHAR(30),
  Address CHAR(30),
  Contact CHAR(40));

CREATE TABLE Suspect (
  ID INTEGER PRIMARY KEY,
  Reason CHAR(30),
  FOREIGN KEY (ID) REFERENCES PeopleOfInterest(ID));

CREATE TABLE Witness (
  ID INTEGER PRIMARY KEY,
  Protected CHAR(1),
  FOREIGN KEY (ID) REFERENCES PeopleOfInterest(ID));

CREATE TABLE Victim (
  ID INTEGER PRIMARY KEY,
  CurrCondition CHAR(20),
  FOREIGN KEY (ID) REFERENCES PeopleOfInterest(ID));

CREATE TABLE PhysicalEvidence (
  CAID INTEGER,
  EID INTEGER,
  FID INTEGER,
  DateCollected DATE,
  EvdSource CHAR(20),
```

```
  Type CHAR(20),
  PRIMARY KEY (CAID, EID),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID),
  FOREIGN KEY (FID) REFERENCES ForensicLab(FID));

CREATE TABLE Statements (
  CAID INTEGER,
  EID INTEGER,
  FID INTEGER,
  DateCollected DATE,
  EvdSource CHAR(20),
  PRIMARY KEY (CAID, EID),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID),
  FOREIGN KEY (FID) REFERENCES ForensicLab(FID));

CREATE TABLE FollowUpReports (
  CAID INTEGER,
  EID INTEGER,
  FID INTEGER,
  DateCollected DATE,
  EvdSource CHAR(20),
  Reason CHAR(30),
  FURID INTEGER UNIQUE,
  PRIMARY KEY (CAID, EID),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID),
  FOREIGN KEY (FID) REFERENCES ForensicLab(FID));

CREATE TABLE FirstIncidentReport (
  CAID INTEGER,
  EID INTEGER,
  FID INTEGER,
  DateCollected DATE,
  EvdSource CHAR(20),
  IncidentTime TIME,
  FIRID INTEGER UNIQUE,
  PRIMARY KEY (CAID, EID),
```

```
  FOREIGN KEY (CAID) REFERENCES Cases(CAID),
  FOREIGN KEY (FID) REFERENCES ForensicLab(FID));

CREATE TABLE DetectiveCaseManagement (
  DBadgeNumber INTEGER,
  CAID INTEGER,
  PRIMARY KEY (DBadgeNumber, CAID),
  FOREIGN KEY (DBadgeNumber) REFERENCES Detective(DBadgeNumber),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID));

CREATE TABLE CrimeInCase (
  CAID INTEGER,
  CRID INTEGER,
  Location CHAR(20),
  CrimeType CHAR(20),
  PRIMARY KEY (CAID, CRID),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID) ON DELETE CASCADE);

CREATE TABLE WorkWithPOI (
  DBadgeNumber INTEGER,
  ID INTEGER,
  PRIMARY KEY(DBadgeNumber, ID),
  FOREIGN KEY (DBadgeNumber) REFERENCES Detective(DBadgeNumber),
  FOREIGN KEY (ID) REFERENCES PeopleOfInterest(ID));

CREATE TABLE CaseInvolvesPOI (
  CAID INTEGER,
  ID INTEGER,
  PRIMARY KEY(CAID, ID),
  FOREIGN KEY (CAID) REFERENCES Cases(CAID),
  FOREIGN KEY (ID) REFERENCES PeopleOfInterest(ID));

CREATE TABLE CommitCrime (
  CRID INTEGER,
  CID INTEGER,
  CAID INTEGER,
```

```
PRIMARY KEY (CRID, CID, CAID),
FOREIGN KEY (CID) REFERENCES Criminal(CID),
FOREIGN KEY (CAID, CRID) REFERENCES CrimeInCase(CAID, CRID));
```

7. INSERT Statements

```
INSERT
INTO PoliceChief(BadgeNumber, Name, PhoneNumber)
VALUES (100, "Tyreke Beasley", "604-888-8888"),
        (200, "Tyrone Moose", "604-456-4566"),
        (300, "Tyler the Creator", "604-101-1010"),
        (400, "Tyra Banks", "604-289-9820"),
        (500, "Tyler Relyt", "604-604-6040")

INSERT
INTO Precinct(PrecinctNumber, Address)
VALUES (95, "5603 Charming Ave"),
        (96, "8888 University Blvd"),
        (97, "5555 West Mall St"),
        (98, "9023 Pender St"),
        (99, "1000 Jake St")

INSERT
INTO Detective(DBadgeNumber, PCBadgeNumber, PrecinctNumber, Name, Rank,
PhoneNumber)
VALUES (1, 100, 95, "Batman", "Vigilante", "888-888-8888"),
        (2, 100, 95, "Jim Gordon", "Lieutenant", "487-581-2945"),
        (3, 200, 96, "Sherlock Holmes", "Chief", "555-555-5555"),
        (4, 300, 97, "Inspector Gadget", "Inspector", "234-432-1234"),
        (5, 500, 98, "Spongebob Squarepants", "Sergeant", "406-604-5555");

INSERT
INTO CaseStatus(Result, CaseStatus)
VALUES ("Guilty", "Non-active"),
        ("Unsolved", "Active"),
        ("Suspect not located", "Active"),
        ("Perp Dead", "Non-active"),
        ("Abandoned", "Non-active");

INSERT
INTO Cases(CAID, DateLogged, Result)
```

```
VALUES (1800001, "2022-06-06", "Guilty"),
        (1800002, "2022-11-10", "Unsolved"),
        (1800003, "2022-05-18", "Perp Dead"),
        (1800004, "2022-07-11", "Perp Dead"),
       (1800005, "2022-01-05", "Unsolved");

INSERT
INTO CriminalRiskLevel(TimesArrested, RiskLevel)
VALUES (70, "High"),
        (1, "Low"),
        (54, "Mid"),
        (0, "Low"),
        (9999, "EXTREME");

INSERT
INTO Criminal(CID, Name, TimesArrested)
VALUES (1, "Jawa", 9999),
        (2, "Walter White", 1),
        (3, "Riddler", 54),
        (4, "Jack the Ripper", 0),
        (5, "Chuck E. Cheese", 70);

INSERT
INTO ForensicLab(FID, OfficeName, OfficeAddress)
VALUES (15, "Flesh Sweeper", "555 Death St"),
        (16, "We Love Evidence!", "723 Yummy Dr"),
        (17, "4ensics 4lyfe", "809 Patrice St"),
        (18, "Peter", "111 Peter St"),
        (19, "Lois", "222 Lois Rd");

INSERT
INTO PeopleOfInterest (ID, Name, Address, Contact)
VALUES(1, "Peter Griffin", "31 Spooner St", "petergriffinfunny@yahoo.com"),
        (2, "Eric Cartman", "1542 Colorado Spring Rd",
        "respectmahauthoritah@southpark.com"),
        (3, "Tyler Blevins", "9400 San Francisco St", "ninja@twitch.tv"),
```

```
        (4, "John Cena", "5545 BingQilin Ave", "cantseeme@wwe.com"),
        (5, "Pooh Shiesty", "420 Drill Rd", "reallyshiesty@rapper.com"),
        (6, "Lebron James", "0623 Goat Dr", "goat@nba.com"),
        (7, "Odell Beckham Jr.", "1313 One Hand St", "obj@nfl.com"),
        (8, "Dave Chappelle", "2134 Comedy St", "davechappelle@comedy.com"),
        (9, "Will Smith", "2451 Bel Air Dr", "wildwest@acting.com"),
        (10, "Chris Rock", "4444 Oscar St", "slapped@acting.com"),
        (11, "Mr. Bean", "0592 Great St", "mrbean@acting.com"),
        (12, "Undertaker", "100-5055 Forsyth Commerce Rd", "undertaker@wwe.com"),
        (13, "Patrick Star", "2 Rock St", "starpatrick@bbmail.com"),
        (14, "Homer Simpson", "742 Evergreen Terrace", "homesimp@smail.com"),
        (15, "Bender Rodríguez", "#1 Apt The Future", "bitemyshinymetal@ssfuture.com");

INSERT
INTO Suspect(ID, Reason)
VALUES (1, "Too Funny!"),
        (13, "Under his rock all the time"),
        (4, "Can’t see this man"),
        (5, "Acting suspicious"),
        (9, "Slapped Chris Rock");

INSERT
INTO Witness (ID, Protected)
VALUES (7, "Y"),
        (15, "N"),
        (8, "Y"),
        (2, "Y"),
        (11, "N");

INSERT
INTO Victim (ID, CurrCondition)
VALUES (10, "Bruise on cheek"),
        (14, "Two brain cells"),
        (6, "Sprained ankle"),
        (3, "Losing popularity"),
        (12, "Dead");
```

```
INSERT
INTO PhysicalEvidence(CAID, EID, FID, DateCollected, EvdSource, Type)
VALUES (1800001, 511, 15, "2022-06-06", "Crime Scene", "Weapon"),
        (1800002, 512, 16, "1985-03-28", "Crime Scene", "Finger Prints"),
        (1800003, 513, 17, "2000-12-25", "WWE Cage", "Foldable Chair"),
        (1800004, 514, 18,  "2008-05-30", "Crime Scene", "Drug"),
        (1800005, 515, 19, "2021-10-10", "National TV", "Chris Rock's hand");

INSERT
INTO Statements(CAID, EID, FID, DateCollected, EvdSource)
VALUES(1800001, 516, null, "2022-06-06", "Victim"),
        (1800002, 512, null, "1985-03-28", "Witness"),
        (1800003, 513, null, "2000-12-25", "Suspect A"),
        (1800004, 514, null, "2008-05-30", "Victim's Friend"),
        (1800005, 515, null, "2021-10-10", "Witness");

INSERT
 INTO FollowUpReports (CAID, EID, FID, DateCollected, EvdSource, Reason, FURID)
 VALUE (1800001, 516, 15, "2022-06-16", null, "Reinterrogate" 606),
        (1800002, 512, 16, "1985-04-10", null, "New POI found", 607),
        (1800003, 513, 17, "2000-12-31",null, "New POI found", 608),
        (1800004, 514, 18,  "2008-06-25", null, "New information found", 609),
        (1800005, 515, 19, "2021-11-10", null, "Reinterrogate", 610);

INSERT
 INTO FirstIncidentReport (CAID, EID, FID, DateCollected, EvdSource, Reason, FURID)
 VALUE (1800001, 516, 15, "2022-06-06", null, "Reinterrogate" 606),
        (1800002, 512, 16, "1985-03-28", null, "New POI found", 607),
        (1800003, 513, 17, "2000-12-25", null, "New POI found", 608),
        (1800004, 514, 18,  "2008-05-30", null, "New information found", 609),
        (1800005, 515, 19, "2021-10-10", null, "Reinterrogate", 610);

INSERT
INTO DetectiveCaseManagement(DBadgeNumber, CAID)
VALUES (1, 1800001),
```

```
        (2, 1800002),
        (3, 1800003),
        (4, 1800004),
        (5, 1800005);

INSERT
INTO CrimeInCase(CAID, CRID, Location, CrimeType)
VALUES (1800001, 1010, "Downtown", "Murder"),
        (1800002, 1015, "Mount Pleasant", "B&E"),
        (1800003, 1010, "Yaletown", "Murder"),
        (1800004, 1016, "Waterfront", "Drug Dealing"),
        (1800005, 1012, "Downtown", "Assault");


INSERT
 INTO WorkWithPOI(DBadgeNumber, ID)
 VALUES (1, 1),
        (3, 9),
        (3, 10),
        (4, 14),
        (5, 6);

INSERT
 INTO CaseInvolvesPOI(CAID, ID)
 VALUES (1800001, 5),
        (1800002, 7),
        (1800003, 6),
        (1800005, 9),
        (1800005, 10);


INSERT
 INTO CommitCrime(CRID, CID, CAID)
 VALUES (1010, 1, 1800001),
         (1016, 2, 1800004),
         (1015, 3, 1800002),
```

(1010, 4, 1800003),
(1012, 5, 1800005);