Entities and Attributes

- **User Info**
    - UserID (INT) **Primary Key**
    - UserName (VARCHAR)
    - Password (VARCHAR)
- **Time**
    - TimeID (INT) **Primary Key**
    - DateOccur (DATE)
    - TimeOccur (TIME)
- **Crime Detail**
    - CrimeID (INT) **Primary Key**
    - TimeID (INT) **Foreign Key**
    - LocationID(INT) **Foreign Key**
    - CrimeType (VARCHAR)
    - VictimSex (CHAR)
    - VictimAge (INT)
    - VictimDescent (CHAR)
- **Location**
    - LocationID (INT) **Primary Key**
    - AreaName (VARCHAR)
    - Location (VARCHAR)
    - Latitude (DECIMAL)
    - Longitude (DECIMAL)
- **Comment**
    - CommentID (INT) **Primary Key**
    - UserID (INT) **Foreign Key**
    - CrimeID (INT) **Foreign Key**
    - Comment (VARCHAR)

Relational Schema

UserInfo(UserID:INT [PK], UserName:VARCHAR, Password:VARCHAR)

Time(TimeID:INT [PK], DateOccur:DATE, TimeOccur:TIME)

CrimeDetail(CrimeID:INT [PK], TimeID:INT [FK to Time.TimeID], LocationID:INT [FK to

Location.LocationID], CrimeType:VARCHAR, VictimSex:CHAR, VictimAge:INT, VictimDescent:CHAR)

Location(LocationID:INT [PK], AreaName:VARCHAR, Location:VARCHAR, Latitude:DECIMAL, Longitude:DECIMAL)

Comment(CommentID:INT [PK], UserID:INT [FK to UserInfo.UserID], CrimeID:INT [FK to CrimeDetail.CrimeID], Comment:VARCHAR)

Assumption by Attribute

User Info:

UserName is unique.

Each UserID is associated with exactly one UserName and one Password.

Time:

Each CrimeID is associated with one or zero DateOccur and TimeOccur, which allows for unknown dates and times.

Crime Detail:

Each crime is associated with specific details about the type of crime and victim information. However, there's no scenario where a crime has multiple types, victim sexes, ages, or descents in this model.

Each CrimeID is associated with one location and one or zero time.

Location:

Each LocationID is unique, and each CrimeID is associated with one location details set (AreaName, Location, Latitude, Longitude).

Comment:

Each CommentID is unique.

Each CommentID is associated with one UserID and one CrimeID and one Comment.

Relational Assumption and Cardinality

User and Comment:

Relationship: Each UserID is associated with one or many CommentIDs.
A user can make multiple comments, but each comment is made by one and only one user.

Cardinality: One to Many (1:N) from User Info to Comment.

Comment and Crime Detail:

Relationship: Each CommentID is associated with exactly one CrimeID.
Each comment should be associated with a specific crime. Multiple comments can refer to the same crime.
Cardinality: One to Many (1:N) from Crime Detail to Comment.

Crime Detail and Time:

Relationship: Each CrimeID is associated with exactly one TimeID.
Each crime happens at a specific time, but multiple crimes can occur at the same time.
Cardinality: Many to One (N:1) from Crime Detail to Time.

Crime Detail and Location:

Relationship: Each CrimeID is associated with exactly one LocationID.
Each crime happens at a specific location, but multiple crimes can occur at the same location.
Cardinality: Many to One (N:1) from Crime Detail to Location.

3NF Verification

User Info:

UserID→UserName,Password

Time:

TimeID→DateOccur,TimeOccur

Crime Detail:

CrimeID→TimeID,LocationID,CrimeType,VictimSex,VictimAge,VictimDescent

Location:

LocationID→AreaName,Location,Latitude,Longitude

Comment:

CommentID→UserID,CrimeID,Comment

In each table we have, all other attributes depend on the primary key so that there are no transitive or partial dependencies. Thus our database is in 3NF. Furthermore, the primary key is a super key which means our database is in BCNF. BCNF is chosen over 3NF because BCNF is stricter and ensures that every non-trivial functional dependency has a superkey as its determinant, thereby further reducing redundancy.

ER/UML Diagram