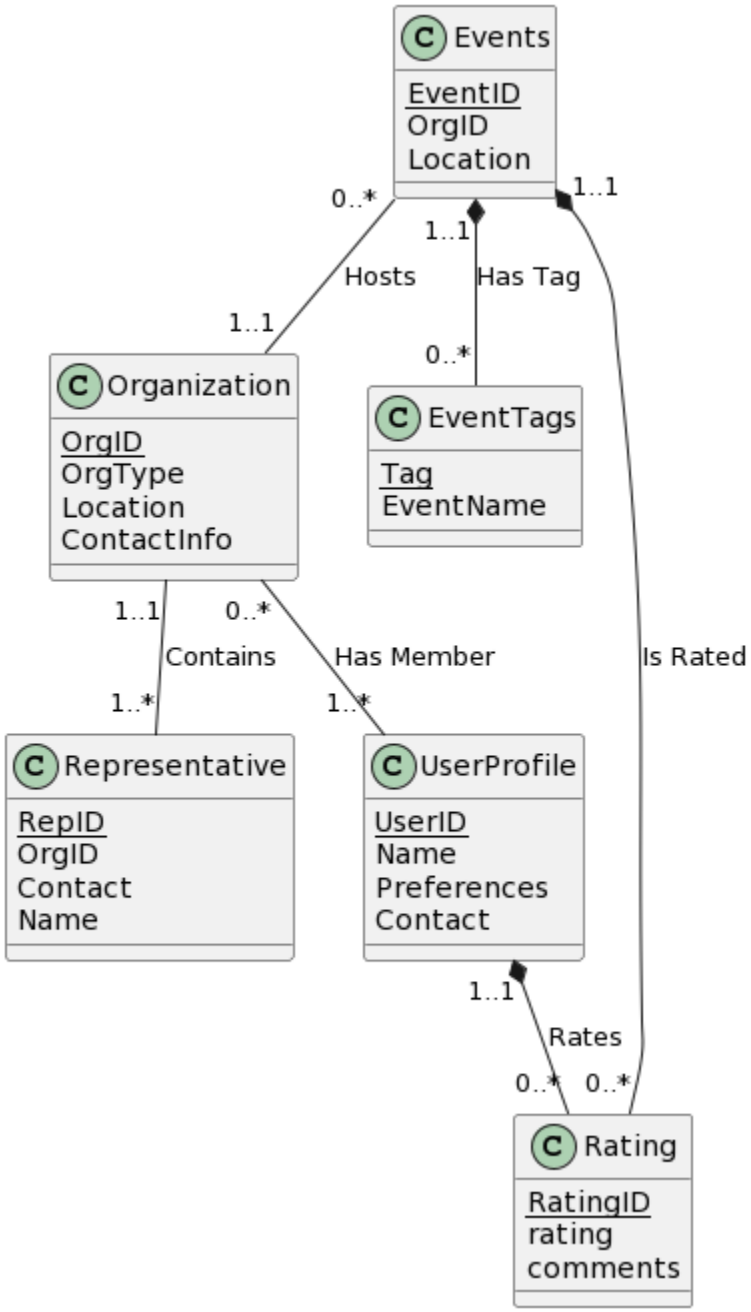
Database Conceptual Design

UML Diagram:



Entities (assumptions):

1. **Organization:**
    a. OrgID (INT)
        i. Primary Key
        ii. Unique Identifier of Organization
    b. OrgName (VARCHAR)
        i. RSO/Fraternity/Social Body name
    c. OrgType (VARCHAR)
        i. Organization category, like social, business, engineering,etc.
        ii. There will be predetermined categories to select from.
    d. Location (VARCHAR)
        i. Location (address)
        ii. Can be NULL (no in-person location/office)
    e. ContactInfo (VARCHAR)
        i. Email address or social media link
        ii. Can be NULL

2. **Representative:**
    a. RepID (INT)
        i. Primary Key
        ii. Unique identifier of the representative of a particular Organization
        iii. Assumption is that every organization will have one representative, and this representative exists outside of the 'UserProfile' space. The goal is to separate 'business' side from 'consumer' side.
    b. OrgID (INT)
        i. Foreign key to Organization. Used to identify which organization being represented.
    c. UserID (INT)
        i. Foreign key to UserProfile. Used to identify which particular user is representing the organization/
        ii. Can be NULL (if particular representative doesn't have UserProfile)
    d. First Name (VARCHAR)
    e. Last Name (VARCHAR)
    f. Contact (VARCHAR): can be NULL

3. **UserProfile:**
    a. UserID (INT)
        i. Primary Key: uniquely identify user profile
    b. First Name (VARCHAR)
    c. Last Name (VARCHAR)
    d. Preferences (VARCHAR): Event and Org Preference: can be used for recommendations.
        i. Choose from predefined categories
        ii. Can be NULL
4. **Event:**
    a. EventID (INT)
        i. Primary Key: uniquely identifies event
    b. OrgID (INT)
        i. Foreign Key to Organization. Assume each event can only belong to single organization. Single organization can have multiple distinct events
    c. Location (VARCHAR)
    d. Date (DATETIME)
5. **EventTags:** Weak Entity (dependent on EventID (foreign key from Event) and Tag for primary key)
    a. EventNum (INT)
        i. Identifies the event
        ii. Is a Foreign key to EventID
        iii. Is part of the composite primary key
    b. Tag (VARCHAR)
        i. Select from predefined options
        ii. Exists as a csv (tag1, tag2…etc) for a given EventID
        iii. Is part of the composite primary key
    c. EventName (VARCHAR)
        i. Name of an event

6. **Rating**: Weak Entity (Dependent on EventID and UserID as a composite primary key)
    a. RatingID (INT)
        i. Unique number for a record in the Rating table
        ii. Is a foreign key to EventID
        iii. Is part of the composite primary key
    b. EventIdentity (INT)
        i. Identifies the Event
        ii. Is a foreign key to EventID
        iii. Is part of the composite primary key
    c. UID (INT)
        i. Gives the User who made a rating for an event
        ii. Is a foreign key to UserID
        iii. Is part of the composite primary key
    d. Comments(VARCHAR)
        i. Gives the comments made by a user for a given event as a CSV (comment1,comment2, etc.)

Relationships (cardinality):

We start at the UserProfile Table. Here, with primary key UserID, we can have each student in multiple organizations, and multiple students in the same organization (though a student can be in no organization and an organization must have at least one member), so a many-to-many relationship from UserProfie to Organization, from UserID to OrgID.

At the Organization table, we must have at least one representative from Representative for an organization, and each representative must have one organization they represent to be a representative (we are assuming multiple would be an issue of juggling). So this relationship is one-to-many, from RepID and OrgID in Representative to OrgID in Organization. We see a similar relationship between Organization and Events: each organization can hold multiple events, and it would make sense that each event is held by one organization, so this is a one-to-many relationship between OrgID in Organization to EventId and OrgID in Events.

For the Events Table, there are other relations to keep in mind. Events, with its EventID and OrgID will have a one-to-many relation with EventId from EventIDs, since this is a mapping with the topics of the relation, and different topics can be pertained to. Then we look at the relationship between Events and Ratings: Each event can have multiple ratings for it so that relation is one-to-many.

We also note that UserProfile to Ratings has a one-to-many relationship, since each user can make multiple ratings.

Functional Dependencies and Justifications:

1. OrgId -> OrgType, Location, ContactInfo
    a. Strong entity: uniquely identifies an organization so all the attributes in the Organizations table rely on the OrgId

2. UserId -> Name, Preferences, Contact
    a. Strong entity: uniquely identifies a user so all the attributes in the Organizations table rely on the OrgId

3. RepId -> OrgId, Contact, Name
    a. We only need the RepId since that will tell us information about the organization, and information about the representative. There's only one representative for one organization

4. EventId -> OrgId, Location
    a. For a given event, which is unique, we can know what organization that event was associated with, and where the event was located.
5. RatingID, EventIdentifier, UID -> rating, comments
    a. A single user can leave a rating on one event, and provide multiple comments too. However, we store the comments as a csv, so one record represents a single user's 'rating activity.' Therefore, everytime they have some new 'rating activity', a new record appears in the table.With the user Id, we can identify which user has had 'rating activities.' With the EventId, we can figure out which events the user has had 'rating activities' on

6. EventNum,Tag ->EventName
    a. This uniquely identifies the name for an event that is going on, and is partially dependent on the Events table (because of EventID).

- Memberships is a trivial Functional dependency. It highlights the relationship between. Organizations and UserProfile. An organization may have members, but a user does not have to be part of an organization. We could define this relationship as a combination of the OrgId and UserId which uniquely identifies a member of an organization, but has no other attributes apart from that. We prove it is a relationship, and hence a trivial functional dependency, by the fact that membership is a subset of the cross product of UserProfile and Organizations.

Normalization:

We choose to normalize using 3NF due to its simplicity (as BCNF is just a stricter form of 3NF) as well as attempting to avoid further decomposition.

Relations:

1. Organization (OrgId, OrgType, Location, ContactInfo)
    i. FD: OrgId->OrgType, Location, ContactInfo
    - The relation is in 3NF because OrgId is a super key (it is a candidate key)
2. UserProfile (UserID, Name, Preferences, Contact)
    i. FD: UserID->Name, Preferences, Contact
    - The relation is in 3NF because UserID is a super key (it is a candidate key)
3. Events (EventID, OrgID, Location)
    i. FD: EventID-> OrgID, Location
    - The relation is in 3NF because EventID is a super key (it is a candidate key)
4. EventTags (EventNum, Tag, EventName)
    i. FD: EventNum, Tag->EventName
    - The relation is in 3NF because EventID and Tag is a super key (it is a candidate key)

5. Rating (RatingID, EventIdentifier, UID, rating comments)
    i. FD: RatingID, EventIdentifier, UID -> rating, comments
    - Break RHS into singletons:
        i. RatingID,EventIdentifier, UID -> rating
        ii. RatingID, EventIdentifier, UID -> comments
    - LHS simplification: no change
    - Get rid of unnecessary FDs: no change
    - Compute candidate key: (RatingID, EventIdentifier UID)
    - We conclude that the relation is in 3NF because (RatingID, EventIdentifier, UID) is a super key (it is a candidate key)

6. Representative (RepID, OrgID, Contact, Name)
    i. FD: RepID -> OrgID, Contact, Name
    - The relation is in 3NF because RepID is a super key (it is a candidate key)

Our normalized UML diagram is already in 3NF form.
We know it is in 3NF form because every relation has a primary key and all other attributes are dependent on the primary key. Additionally there are obviously no transitional dependencies.

Translated Relational Schema:

```
CREATE TABLE Organization (
   OrgID INT PRIMARY KEY AUTO_INCREMENT,
   OrgName VARCHAR(255),
   OrgType VARCHAR(55),
   Location VARCHAR(255),
   ContactInfo VARCHAR(100)
);


CREATE TABLE UserProfile (
   UserID INT PRIMARY KEY AUTO_INCREMENT,
   Name VARCHAR(100),
   Preferences VARCHAR(255),
   Contact VARCHAR(100)
);


CREATE TABLE Events (
   EventID INT PRIMARY KEY AUTO_INCREMENT,
   OrgID INT,
   Location VARCHAR(100),
   FOREIGN KEY (OrgID) REFERENCES Organization(OrgID)
);
```

```
CREATE TABLE EventTags (
    EventNum INT,
    Tag VARCHAR(25),
    EventName VARCHAR(30),
    PRIMARY KEY (EventNum, Tag),
    FOREIGN KEY (EventNum) REFERENCES Events(EventID)
);


CREATE TABLE Representative (
    RepID INT PRIMARY KEY AUTO_INCREMENT,
    OrgID INT,
    Name VARCHAR(100),
    Contact VARCHAR(100),
    FOREIGN KEY (OrgID) REFERENCES Organization(OrgID)
);

CREATE TABLE Rating (
    RatingID INT AUTO_INCREMENT,
    EventIdentifier INT,
    UID INT,
    Rating INT,
    Comments VARCHAR(8192),
    PRIMARY KEY (RatingID EventIdentifier, UID),
    FOREIGN KEY (RatingID) REFERENCES Events(EventID),
    FOREIGN KEY (UID) REFERENCES UserProfile(UserID)
);
```