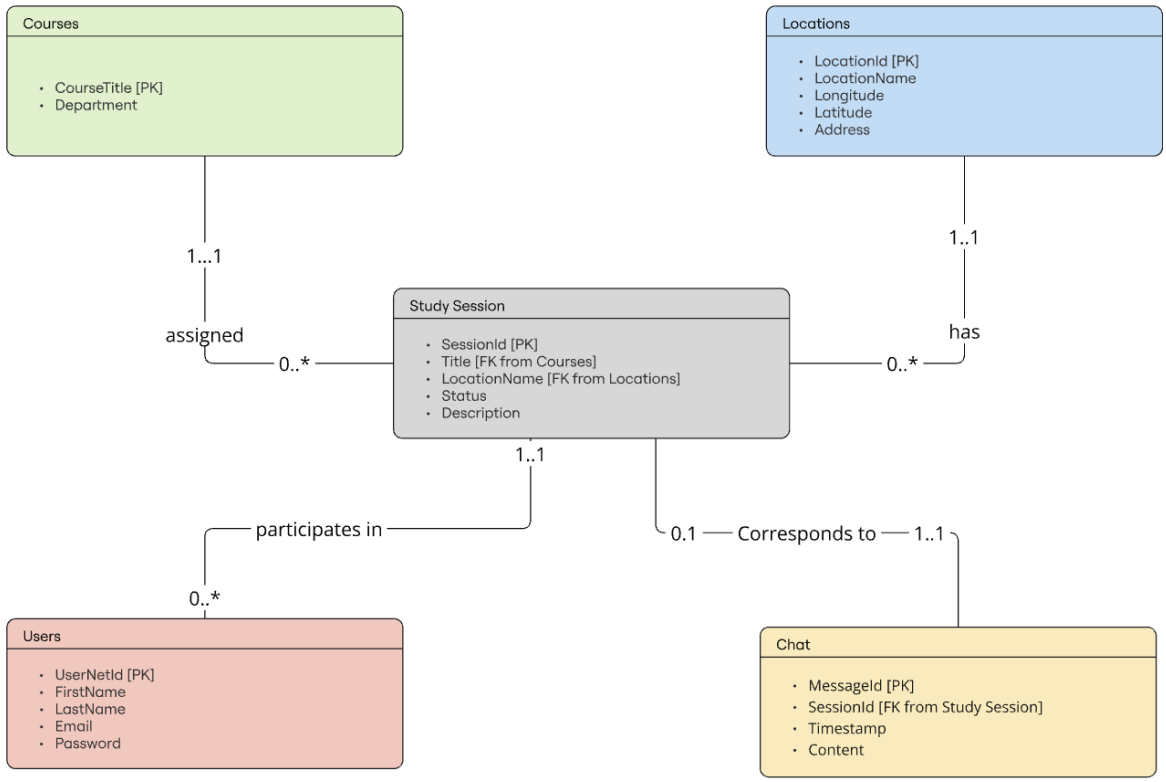
Stage 2

UML

UML Miro Link: Click Here



UML Explanation:

Entities Description

1. Users
    - Represents all students using the StudyLync platform.
    - Attributes include UserNetId (Primary Key), FirstName, LastName, Email, and Password.
    - Assumption: Each user has a unique NetId, and user authentication is required which will be done using Firebase.
2. Courses
    - Represents university courses that students are studying for.

    - Attributes include CourseTitle (Primary Key) and Department.
    - Assumption: Each course has a unique title, and students can be associated with multiple courses.
3. Study Session
    - Represents a scheduled or ongoing study session.
    - Attributes include SessionId (Primary Key), Title (Foreign Key from Courses), LocationName (Foreign Key from Locations), Status, and Description.
    - Assumption: A session **must** be linked to one course and one location, ensuring relevant grouping.
4. Locations
    - Represents study locations available for students.
    - Attributes include LocationId (Primary Key), LocationName, Longitude, Latitude, and Address.
    - Assumption: Locations are predefined using pin using radius around location or created dynamically by users when dropping a pin.
5. Chat
    - Represents a communication channel within a study session.
    - Attributes include MessageId (Primary Key), SessionId (Foreign Key from Study Session), Timestamp of messages, and Content of the messages.
    - Assumption: Chats are only accessible within a session, ensuring relevance and organization.

Relationships/Cardinality

1. Users - Study Sessions (Many-to-Many)
    - Relationship
        i. A user can only participate in one study session (1..1)
        ii. Each session can have multiple users. (0..*)
    - Explanation: A user can only participate in one study session at a time because our website is built so that users can look for peers to work with when focusing on a specific course. That way, we can display clusters of students studying for the one unique course. However, each session can have multiple users, as we want students to be joined by peers when studying for that course.
2. Courses - Study Sessions (One-to-Many)
    - Relationship
        i. A study session is always associated with a course (1..1)
        ii. but a course can have multiple sessions. (0..*)
    - Explanation: A study session is associated with one course, as we want each session to only focus on once class
3. Locations - Study Sessions (One-to-Many)
    - Relationship
        i. Each study session occurs at a single location (1..1)
        ii. But a location can host multiple study sessions. (0..*)

    - Explanation: A session must have a location, but a location may be used for multiple sessions over time.
4. Study Sessions - Chat (One-to-One)
    - Relationship
        i. Each study session may have a dedicated chat, (1..1)
        ii. The chat however is not required. (0..1)
    - Explanation: Ensures that only active study sessions have an associated chat thread.

Why Model These as Entities Instead of Attributes?

- Users and Courses are separate entities because they represent distinct actors in the system.
- Study Sessions is an independent entity to allow for flexible scheduling and user participation tracking.
- Locations is a separate entity to allow geolocation functionality and mapping integration.
- Chat is an entity instead of an attribute of Study Sessions to support structured messaging and potential chat history retrieval.

Relational Schema:

Courses(CourseTitle:VARCHAR(100) [PK], Department:VARCHAR(50))

Locations(LocationId:INT [PK], LocationName:VARCHAR(100), Longitude:DECIMAL(9,6), Latitude:DECIMAL(9,6), Address:VARCHAR(200))

StudySessions(SessionId:INT [PK], CourseTitle:VARCHAR(100) [FK to Courses.CourseTitle], LocationId:INT [FK to Locations.LocationId], Status:VARCHAR(20), Description:TEXT)

Users(UserNetId:VARCHAR(20) [PK], FirstName:VARCHAR(50), LastName:VARCHAR(50), Email:VARCHAR(100), Password:VARCHAR(100), SessionId:INT [FK to StudySessions.SessionId, NULL allowed])

Chat(MessageId:INT [PK], SessionId:INT [FK to StudySessions.SessionId, UNIQUE], Timestamp:DATETIME, Content:TEXT)

UserSessions(UserNetId:VARCHAR(20) [FK to Users.UserNetId], SessionId:INT [FK to StudySessions.SessionId], [PK(UserNetId, SessionId)])

Normalization Process

To make sure the StudyLync database is normalized, we have to make sure that it hits the Third Normal Form (3NF), which means that the primary keys of our tables determine the values of the non-key attributes.

- Courses Table
    - The primary key (CourseTitle) determines the non-key attribute values (Department). Based on the CourseTitle, the department will be decided.
- Users Table
    - The non-key attributes (FirstName, LastName, Email, Password) are dependent on the primary key (UserNetId)
    - The primary key (UserNetId) determines the non-key attributes (FirstName, LastName, Email, Password). Based on the UserNetId, the other attributes will be defined accordingly.
- Locations Table
    - The primary key (LocationId) determines the non-key attributes (LocationName, Longitude, Latitude, Address). Based on the LocationId, the other attributes will be defined accordingly.
- Chat Table
    - The primary key (MessageId) determines the non-key attributes (Timestamp, Content). Based on the MessageId, the other attributes will be defined accordingly. We do not need to worry about SessionId since it is a foreign key that references the Study Session Table (attribute from another table)
- Study Session Table
    - The primary key (SessionId) determines the non-key attributes (Status, Description). Based on the SessionId, the other attributes will be defined accordingly. We do not need to worry about CourseTitle and LocationName since they are foreign keys that reference Courses Table and the Locations Table respectively.