Database Management System

Course Project

Project No: 1b

MockMail Database

GithubLink: https://github.com/JindalMohit/ClassroomMail

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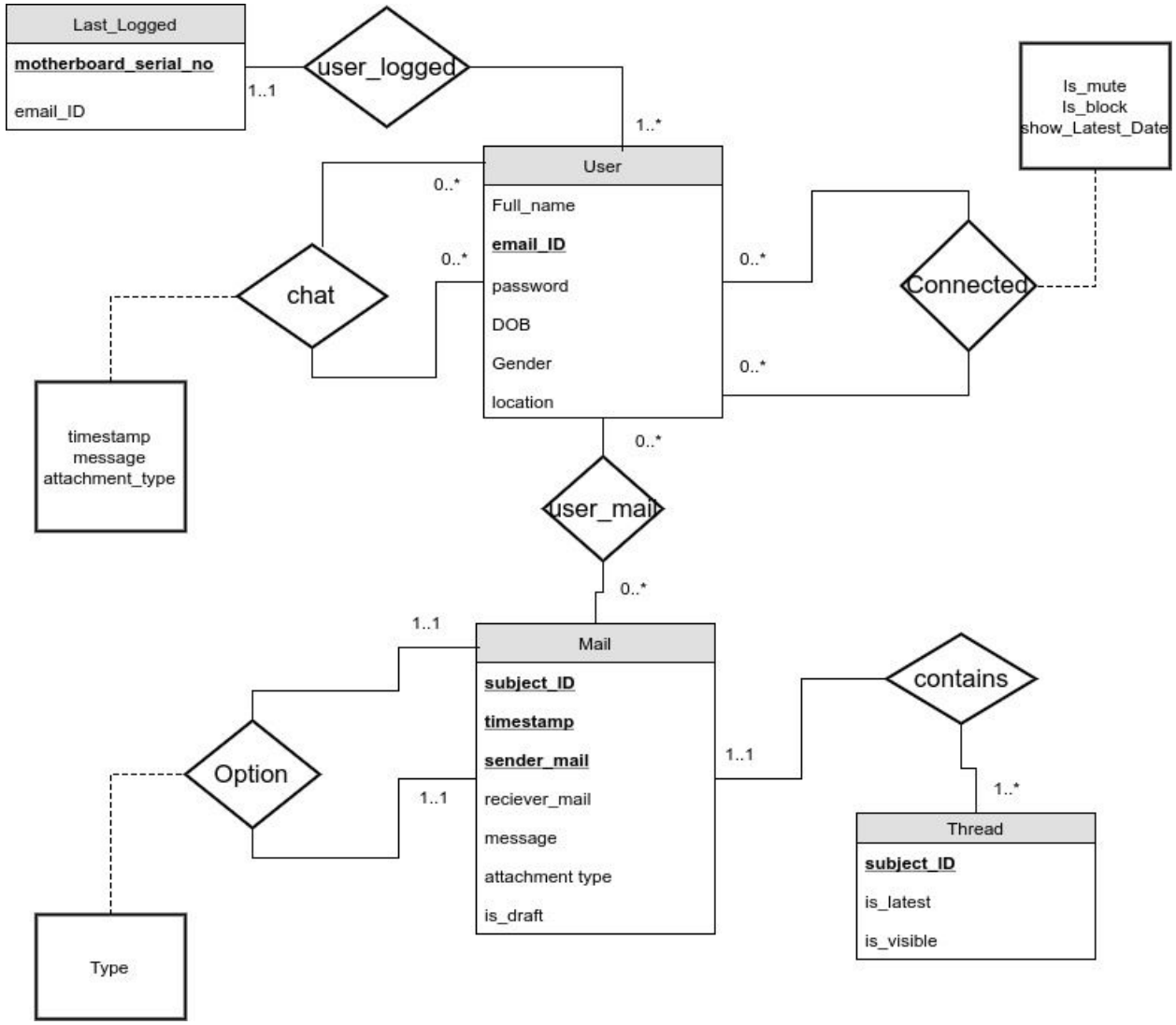
Before we begin with the project, here are the list of ASSUMPTIONS made while implementing the project.

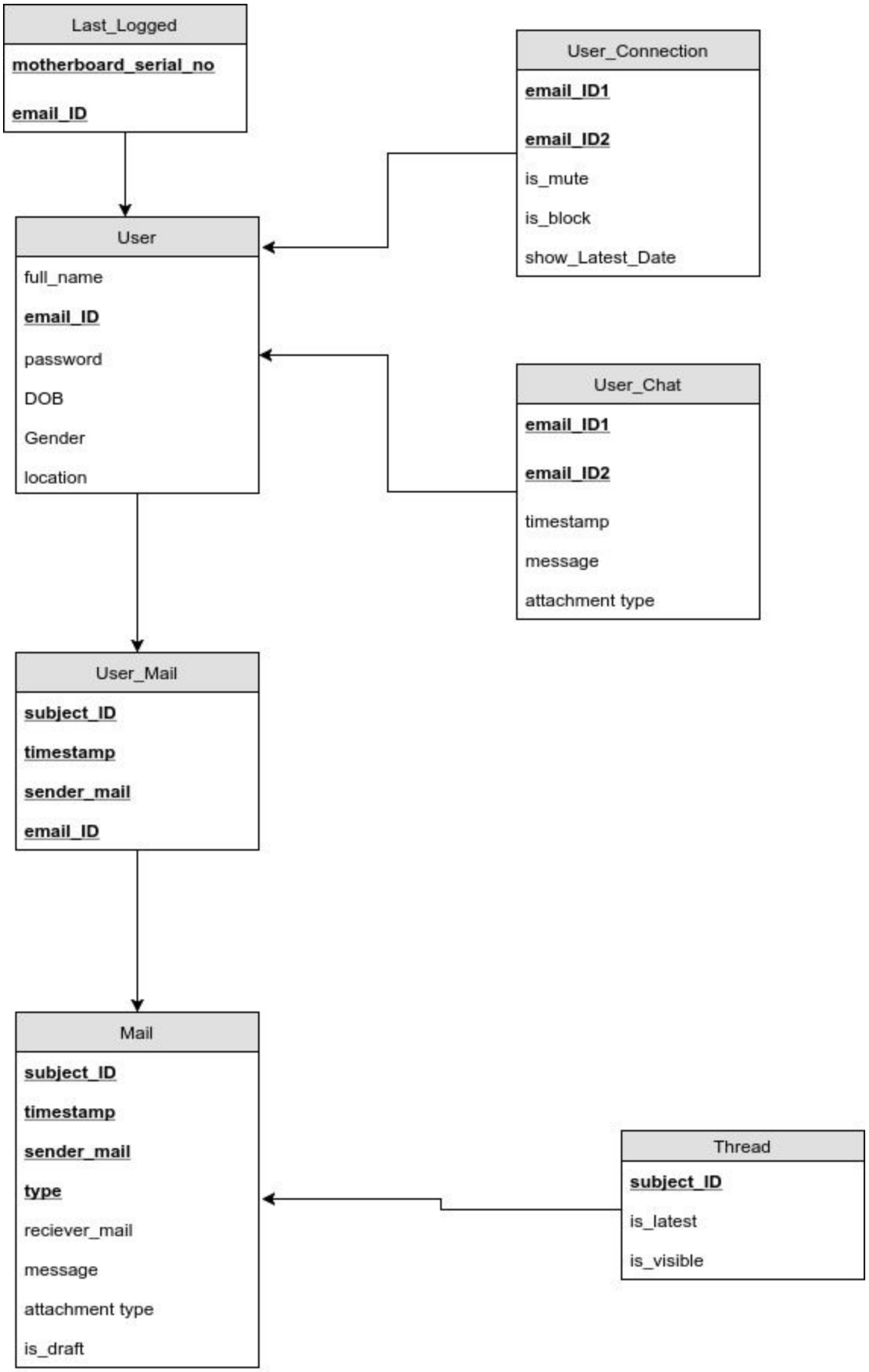
ASSUMPTIONS:

1. **A person CANNOT send multiple messages/mails at same point of time.**
2. **Motherboard serial numbers are unique**
3. **Reply mails and Forward mails are considered to be in same thread as their parent.**
4. **Each time a user views a mail, a new tuple is added with new timestamp (even if user had read that mail earlier).**

Entity Relationship Diagram (ER Diagram)



Schema Diagram



Functional Dependencies & Candidate Keys

Functional Dependencies:

1. **User** (email_ID, full_name, password, DOB, Gender, location)
    - email_ID -> full_name, password, DOB, Gender, location
2. **Last_Logged** (email_ID, motherboard_serial_no)
    - No FD
3. **User_Connection** (email_ID1, email_ID2, is_mute, is_block, show_latest_date)
    - {email_ID1, email_ID2} -> is_mute, is_block, show_latest_date
4. **User_Chat** (email_ID1, email_ID2, timestamp, message, attachment_type)
    - {email_ID1, email_ID2} -> timestamp, message, attachment_type
5. **User_mail** (subject_ID, timestamp, sender_mail, email_ID)
    - No FD
6. **Mail** (subject_ID, timestamp, sender_mail, type, receiver_mail, message, attachment_type, is_draft)
    - {subject_ID, timestamp, sender_mail, type} -> receiver_mail, message, attachment_type, is_draft
7. **Thread** (subject_ID, is_latest, is_visible)
    - subject_ID -> is_latest, is_visible

Candidate Keys

1. **User:** {email_ID}
2. **Last_Logged:** {email_ID, motherboard_serial_no}
3. **User_Connection:** {email_ID1, email_ID2}
4. **User_Chat:** {email_ID1, email_ID2}
5. **User_mail:** {subject_ID, timestamp, sender_mail, email_ID}
6. **Mail:** {subject_ID, timestamp, sender_mail, type}
7. **Thread:** {subject_ID}

Minimal Cover

Since there is no FD in any relation, in which LHS is not a candidate key, the above written dependencies are also the minimal cover for the schema.

1NF, 2NF, 3NF, BCNF 4NF, 5NF?

Observation: In all our tables, we have FDs of type X -> A, X ∈ Candidate Key.

1. **1NF:**
    a. Since all our columns are atomic, the tables are in 1NF.

2. **2NF:**

    a. Since X ∈ Candidate Key, no non-prime attribute can be dependent on a subset of candidate key.

3. **3NF:**

    a. Since X ∈ Candidate Key, there cannot be a functional dependency from non-prime attribute to non-prime attribute

4. **BCNF:**

    a. Since X ∈ Candidate Key ∈ Super Key, this means all our tables are in **BCNF.**

Since there are no multi-valued dependencies or Join Dependencies, the schema is in **5NF**
