Meeting Scheduling System: Business Logic Specification

System Overview

The system is a meeting scheduling platform where users can function as both **Hosts** and **Clients**. Users manage time slots and schedule meetings through these dual roles.

1 User Entity

Attributes

Each user in the system has the following attributes:

- `Username` (Unique identifier)
- `First Name`
- `Last Name`
- `Email` (Unique, used for authentication)
- `Password` (Encrypted)
- `Contact Number`

Account Structure

Each user account is divided into two functional sections:

$$\text{User Account} = \{\text{Host Module}, \text{Client Module}\}$$

2 Host Module Capabilities

A user acting as a **Host** can:

Time Slot Management

1. **CREATE**: Create new free time slots
2. **UPDATE**: Modify existing non-booked time slots
   - Only slots with state = "Free" can be updated
3. **DELETE**: Remove non-booked time slots
   - Only slots with state = "Free" can be deleted

3 Client Module Capabilities

A user acting as a **Client** can:

Host Discovery

1. View a list of all hosts with at least one available time slot

$$H_{\text{available}} = \{h \in \text{Hosts} \mid \exists\, t \in \text{TimeSlots}(h) : \text{state}(t) = \text{"Free"}\}$$

2. Search for specific users to check their available time slots

Booking Operations

1. **Book Slot**: Reserve a free time slot (UPDATE operation)

2. **Unbook Slot**: Cancel a booking

   - Must be performed at least 48 hours before meeting start time
   - Let t_{meeting} be meeting start time, t_{now} be current time:

$$t_{\text{meeting}} - t_{\text{now}} \geq 48 \text{ hours}$$

Booking Constraints

A client can only book a slot if:

$$\text{state}(\text{slot}) = \text{"Free"} \quad \wedge \quad \text{slot} \notin \text{InBookingProgress}$$

4 Meeting Entity

Attributes

Each meeting consists of:

- `Client`: Reference to client user

- `Host`: Reference to host user

- `Start Time`: Meeting commencement time

- `End Time`: Meeting conclusion time

State Transitions

$$\text{Meeting States} = \{\text{"Scheduled"}, \text{"Ongoing"}, \text{"Ended"}\}$$

The state progression follows:

$$\text{Scheduled} \rightarrow \text{Ongoing} \rightarrow \text{Ended}$$

5   Time Slot Entity

Identification

Each time slot is uniquely identified by:

$$\text{SlotID} = f(\text{HostID}, \text{StartTime}, \text{EndTime})$$

States

$$\text{TimeSlot States} = \{\text{"Booked"}, \text{"Free"}\}$$

State Transition Rules

- Free → Booked: When a client successfully books the slot

- Booked → Free: When:

    1. Client cancels booking (48+ hours before meeting start time)
    2. Host manually frees a booked slot (48+ hours before meeting start time)

Important Constraints

- **Cancellation Window**: Booked → Free transition only occurs when:

$$t_{\text{meeting}} - t_{\text{action}} \geq 48 \text{ hours}$$

where:

  - t_{meeting} is the slot start time
  - t_{action} is the cancellation/freeing time

- **Dual Authority**: Both hosts and clients can free a booked slot

- **Time Restriction**: No cancellations or freeing allowed within 48 hours of the meeting start

- **Locked State**: Within 48 hours of the meeting, the slot remains permanently "Booked"