Revised ERD

1. Consistent Primary and Foreign Key Naming:

- Update: Foreign keys across all entities have been standardized. For example, the foreign key device_ID was renamed to device_ID_FK in related tables like Schedule, EnergyUsage, and Security to match the primary key device_ID_PK in the Device entity.
- Reason: Consistency in primary and foreign key naming ensures clarity when establishing relationships between entities.

2. Clear Relationship Cardinality:

- Update: Cardinality has been specified between entities. For instance:
    - A **one-to-many** relationship was defined between User and Device, indicating that a user can manage multiple devices.
    - A **similar one-to-many** relationship was established between Device and Notification, meaning that one device can trigger multiple notifications.
- Reason: Specifying cardinality reduces ambiguity and ensures clear, accurate relationships between entities.

3. Introduction of Access Log Entity:

- Update: A new AccessLog entity has been introduced to track security logs independently from the Security entity. This new entity records information such as access_log_ID, timestamp, user_ID_FK, and device_ID_FK.
- Reason: Separating access logs from the Security entity prevents data redundancy and allows for efficient tracking of access events.

4. Security Enhancements:

- Update: Additional fields, such as last_Accessed_Time and login_Attempts, were added to the Security entity.
- Reason: These fields enhance security tracking by recording user login attempts and the last time a user accessed the system, enabling better security monitoring.

5. Subscription Features:

- Update:The new Table of subscription feature is added.
- Reason:The reason is because subscription features contain multi-values so to normalize this we created a new table.

6. Admin Foreign Key Clarification:

- Update: The foreign key admin_ID_FK was standardized in the Fault Notification and Maintenance entities to ensure a clear link back to the SystemAdmin entity.
- Reason: This helps clarify which system administrator is responsible for handling specific faults or maintenance issues.

7. User Role Differentiation:

- Update: A role field was added to both the User and SystemAdmin entities to differentiate between user types and their access levels.
- Reason: This allows for precise control of permissions and access levels within the system.

8. Device-Room Relationship:

- Update: A room_ID_FK was added to the Device entity, establishing a link between devices and their corresponding rooms.
- Reason: This ensures each device is correctly associated with its respective room, making device management more organized.

9. Fault Notification Improvements:

- Update: The Fault Notification entity was added with additional attributes like fault_detail, fault_type, and fault_Report_Time.
- Reason: These changes enable more detailed tracking of system faults, improving fault management and reporting.

10. Disjoint Generalization for User and Admin:

- Update: A disjoint generalization relationship was created between Person, User, and SystemAdmin. The Person entity acts as the parent, with common attributes like person_ID_PK, name, and email inherited by both User and SystemAdmin.
- Reason: This structure ensures that a person can either be a User or a SystemAdmin, but not both, preventing confusion over roles and access rights.

11. Notification Entity Improvements:

- Update: The Notification entity was enhanced with the trigger_Condition attribute, allowing notifications to be triggered automatically based on device events.
- Reason: This adds a layer of automation to the system, improving responsiveness to device-related incidents.