Dumbledore's Army's Project

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Link to ER Diagram (Added for convenience):
https://app.creately.com/diagram/nLTg8GHjgt9/view

We have chosen our mini-world to be a hospital with multiple branches in different places. Each of these branches have their own staff (doctors, nurses, etc.), equipment (X-ray machines, MRI machines, etc.) and resources (ambulances, medicines, etc.).

The purpose of a database for this miniworld is to allow a user to have an overview of what is happening and what has happened in the hospital. For example: a user can use the database to check how many in-patients a branch of the hospital is currently treating, or they can use it to check the stock of a certain medicine in the pharmacy of a branch of the hospital, or they can check (with the right authorization) the previous treatment records of any patient across branches of the hospital.

The expected users of our database are hospital staff members such as clerks (Ex: to check for vacant rooms for patient treatment, or to insert/update user information for new patients of the hospital), hospital management (Ex: to check stock of certain medicines, or to view revenue from patients for a certain branch, or to view employee data), etc.

Data requirements :-

- All the below must be given for all BRANCHes of the hospital.
- A HOSPITAL is organized into BRANCHES. Each BRANCH has a BRANCH NAME, a BRANCH ID, a BRANCH ADDRESS, and a PHONE NUMBER and a BRANCH MANAGER. Each BRANCH has DEPARTMENTS of DOCTORS. Each DEPARTMENT has a department name and the number of DOCTORS working under it, and is part of a certain BRANCH.
- We also keep a record of the EMPLOYEES of the HOSPITAL, the BRANCH they work in. DOCTORS, NURSES, CLEANING STAFF, TECHNICIANS, MANAGERS, PHARMACISTS have unique STAFF ID, IDENTIFICATION

INFORMATION(AADHAR NO., NAME, DoB, GENDER, PHONE NO.), SALARY, START DATE AND TERMINATION DATE. DOCTOR's unique MEDICAL LICENCES and the one DEPARTMENT they work for is stored too. We also keep a record of which PATIENTS(IN-PATIENT or OUT-PATIENT) the DOCTOR treats and his REPORT for said PATIENT. MANAGERS manage NURSES, CLEANING STAFF and PHARMACISTS respectively. We record the hierarchy of TECHNICIANS and the EQUIPMENT they operate, if any.

- We keep track of PATIENT INFORMATION, such as NAME, AADHAR NO., PHONE NO., DoB, GENDER , PATIENT TYPE(in-patient or out-patient), HEIGHT, and WEIGHT. We keep track of PAST TREATMENT of each PATIENT (previous treatment conducted on PATIENT in the hospital), where we store the DIAGNOSIS (diagnosed disease along with past diseases of the PATIENT), DATE OF DIAGNOSIS and TREATMENT details. We keep track of OUT_PATIENT and IN_PATIENT details, like the operating DOCTOR, the DOCTOR's REPORT, the ROOM (in case of PATIENT being an IN-PATIENT). For IN-PATIENTS we store EMERGENCY CONTACT, Date of admission, Date of Discharge (if applicable). For OUT-PATIENTs we store Date of Consultancy. We also store all complaints made by patients for all branches.
- We derive ROOM OCCUPANCY details and store the records of ROOM OCCUPANCY for each specific ROOM in each BRANCH alongside ROOM NO.
- The database also stores information regarding the EQUIPMENT, such as the EQUIPMENT MODEL, EQUIPMENT COMPANY, and EQUIPMENT ID.
- We store the details of the EQUIPMENT in every BRANCH, such as (EQUIPMENT ID, EQUIPMENT MODEL, EQUIPMENT COMPANY), along with who the OPERATORS of the EQUIPMENT are.
- The database will also keep track of STOCK and availability of different kinds of MEDICINE present in a specific BRANCH at all times.
- We also store information regarding the AMBULANCES such as availability of AMBULANCES in different BRANCHes alongside the REGISTRATION and AMBULANCE MODEL of all AMBULANCES in all BRANCHes.
- The database will also store records of all previous DIAGNOSES (DOCTOR'S REPORT) made by different DOCTORS for different PATIENTS.

ENTITIES AND THEIR ATTRIBUTES :-

- BRANCH :
    - BRANCH ADDRESS (primary key)
    - BRANCH NAME
    - BRANCH ID (primary key)

    - BRANCH PHONE NUMBER
- DEPARTMENT (weak entity) :
    - DEPARTMENT NAME (partial key)
    - NO. OF DOCTORS (derived attribute)

- PATIENTS:
    - AADHAR NO. (primary key)
    - NAME
    - PHONE NO.
    - DoB
    - GENDER
    - PATIENT TYPE
    - HEIGHT
    - WEIGHT
    - SUB-CLASSES:
        - OUT-PATIENT:
            - DATE OF CONSULTANCY
        - IN-PATIENT:
            - EMERGENCY CONTACT
            - DATE OF ADMISSION
            - DATE OF DISCHARGE

- DOCTORS REPORT:
    - DIAGNOSIS (multi-valued)
    - PRESCRIPTION (multi-valued)
    - COST OF TREATMENT
    - REPORT ID (primary key)
    - DATE OF REPORT
- TEST (weak entity)
    - TEST CONDUCTED (partial key)
    - TEST DATE AND TIME (partial key)
    - TEST RESULT (partial key)
- PAST DISEASE (weak entity) :
    - DIAGNOSIS (partial key)
    - DATE OF DIAGNOSIS (partial key)
    - TREATMENT (partial key)
- EMPLOYEES:
    - STAFF ID (primary key)
    - JOB_TYPE

    - START DATE
    - TERMINATION DATE
    - SALARY
    - EMPLOYEE IDENTIFICATION(composite attribute):
        - NAME
        - AADHAR NO
        - GENDER
        - DoB
        - PHONE NO.
    - SUB-CLASSES:
        - DOCTORS (Have 2 primary keys: STAFF ID and MEDICAL LICENSE ID):
            - MEDICAL LICENSE ID (primary key)
        - NURSES
        - CLEANING STAFF
        - TECHNICIANS
        - MANAGERS
        - PHARMACISTS
- COMPLAINTS:
    - COMPLAINT NO (primary key)
    - COMPLAINT TEXT
- EQUIPMENT:
    - EQUIPMENT KEY(composite key):
        - EQUIPMENT COMPANY
        - EQUIPMENT MODEL
        - EQUIPMENT ID
- ROOM (Weak Entity):
    - ROOM NO. (partial key)
    - OCCUPANCY (derived attribute)
- AMBULANCE:
    - REGISTRATION(composite key):
        - REGN STATE
        - REGN NUMBER
    - AMBULANCE MODEL
- MEDICINE (Weak Entity):
    - MEDICINE NAME (partial key)
    - STOCK

CONSTRAINTS ON ENTITIES:

- Each DOCTOR'S REPORT can only be given to exactly one PATIENT.
- An EMPLOYEE can only work for one BRANCH.
- An IN-PATIENT has to be or have been allocated one ROOM
- When a PATIENT is currently hospitalized, the PATIENT_TYPE of that patient is set to IN_PATIENT (Records of treatment done on IN-PATIENTs are stored in the database) if the PATIENT is hospitalised. If an incoming PATIENT is not hospitalized, their PATIENT TYPE is set to OUT-PATIENT.
- A DOCTOR can only work in one DEPARTMENT at a time.
- A PHARMACIST, cleaning staff or nurse must have exactly one manager.
- A senior technician can overlook any number of junior technicians, and a junior technician can be overlooked by at most one senior technician.
- Any branch can have any amount of any medicine, but medicine isn't shared across branches.
- AMBULANCES and EQUIPMENT can only belong to one BRANCH at a time.
- Any BRANCH can only have one BRANCH HEAD, who is a MANAGER.
- Any DEPT can only belong to one BRANCH.

RELATIONSHIPS :-

- IN-PATIENT DIAGNOSIS:
    - Quaternary relationship
    - It's a relationship between:
        - DOCTOR(0,N)
        - IN-PATIENT (1,N)
        - DOCTOR'S REPORT(1,1)
        - ROOM(0,N)
    - This relationship tells us the IN_PATIENT's DOCTOR, the REPORT by his DOCTOR and the ROOM where he was admitted.
- OUT-PATIENT DIAGNOSIS :
    - Ternary relationship
    - It's a relationship between :
        - DOCTOR(0,N)
        - OUT-PATIENT(1,N)
        - DOCTOR"S REPORT(1,1)
    - This relationship conveys the details of the entire treatment received by the PATIENT, i.e. The DOCTOR'S REPORT (Includes diagnosis and treatment) and the DOCTOR who gave the diagnosis and treatment.
- WORKS UNDER:
    - Binary relationship

    - This relationship signifies which doctor is working in which department
    - It's a relationship between:
        - DOCTOR(1,1)
        - DEPARTMENT(1,N)
    - This relationship tells us which DEPARTMENT a DOCTOR works under, and is used to find out a list of doctors that work for a given department
- SUPERVISES:
    - Binary relationship
    - It is a relationship that maps a Pharmacist to
    - It's a relationship between:
        - MANAGERS(0,N)
        - PHARMACISTS(1,1)
    - This relationship tells us which MANAGER manages which PHARMACISTS.
- OVERLOOKS:
    - Binary relationship
    - Relationship type with the same participating entity type in distinct roles
    - It's a relationship between:
        - TECHNICIANS (role - senior technician)(0,N)
        - TECHNICIANS (role - junior technician)(1,1)
    - This relationship tells us which (senior) technician a certain (junior) technician is under, and gives us a list of (junior) technicians a (senior) technician overlooks.
- MANAGES:
    - Binary relationship
    - It's a relationship between:
        - MANAGERS(0,N)
        - NURSES(1,1)
    - This relationship tells us which MANAGER manages which NURSES.
- OVERSEES:
    - Binary relationship
    - It's a relationship between:
        - MANAGER(0,N)
        - CLEANING STAFF(1,1)
    - This relationship tells us which MANAGER a member of the CLEANING STAFF is under, and gives us a list of CLEANING STAFF under a certain MANAGER.
- OPERATES:
    - Binary relationship

    - It's a relationship between:
        - TECHNICIANS (0,N)
        - EQUIPMENT (1,N)
    - This relationship tells us which TECHNICIANS operate which EQUIPMENT.
- WORKS FOR:
    - Binary relationship
    - It's a relationship between:
        - BRANCH(1,N)
        - EMPLOYEE(1,1)
    - This tells us which EMPLOYEE works for which BRANCH,and gives us a list of employees that work for a certain branch
- MAINTAINS:
    - Binary relationship
    - It's a relationship between:
        - BRANCH(0,N)
        - EQUIPMENT(1,1)
    - This relationship tells us which BRANCH owns which EQUIPMENT.
- HAVE:
    - Binary relationship
    - Identifying relationship of PAST TREATMENT
    - It is in between :
        - PAST TREATMENT(1,1)
        - PATIENTS(0,N)
    - This relationship tells us all the past TREATMENTS a PATIENTS has had in our hospital.
- HAS:
    - Binary relationship
    - It is the identifying relationship of ROOM
    - It is between:
        - BRANCH(0,N)
        - ROOM(1,1)
    - This relationship tells us which BRANCH a ROOM belongs to.
- COMPLAINED:
    - Ternary relationship
    - It's a relationship between :
        - COMPLAINTS (1,1)
        - PATIENTS (0,N)
        - BRANCH (0,N)

    - This relationship tells us which PATIENT lodged which COMPLAINT and where (which BRANCH) they lodged the COMPLAINT at. This gives us a list of complaints of a certain PATIENT and gives us a list of all COMPLAINTs lodged in a certain BRANCH.
- CONDUCTED:
    - Binary relationship
    - It is the identifying relationship of TEST
    - It's a relationship between:
        - TEST (1,1)
        - DOCTOR'S REPORT (0,N)
    - This relationship tells us which TESTS were conducted for the DOCTOR'S REPORT.
- OWNS:
    - Binary relationship
    - It's a relationship between:
        - BRANCH (0,N)
        - AMBULANCE (1,1)
- STOCKS:
    - Binary relationship
    - It is the identifying relationship of MEDICINE
    - It's a relationship between:
        - BRANCH (0,N)
        - MEDICINE (1,1)
    - This tells us the current amount of each type of medicine in each branch.
- BELONGS TO:
    - Binary relationship
    - It is the identifying relationship of DEPT
    - It's a relationship between:
        - DEPT (1,1)
        - BRANCH (1,N)
    - This relationship tells us the branch a certain department belongs to. It is the identifying relationship of a branch instance.
- BRANCH HEAD:
    - Binary relationship
    - It's a relationship between:
        - MANAGER (0,1)
        - BRANCH (1,1)
    - This relationship tells us which MANAGER is the head of which BRANCH. This gives us a list of all BRANCH HEADS for a certain hospital.

Functional Requirements :-

- Retrieval
    - Selection
        - Select all DOCTORS from a certain DEPT (over all branches)
        - Select all technicians at a certain BRANCH
        - Select all EQUIPMENT in a certain BRANCH
    - Projection
        - Give all PATIENTS who have a height above 6 feet
        - Give all PATIENTS who have a weight about 100 kgs
        - All DOCTORS WITH SALARY above 40 Lpa
    - Aggregate
        - MAX cost of treatment for any PATIENT
        - AVG cost treatment for any PATIENT in a certain DEPARTMENT
        - MIN salary paid to CLEANING STAFF
    - Search
        - Search for medicines by name, and check availability
        - Search for machines by equipment model or equipment ID
        - Search for complaints
    - Analysis
        - Number of patients whose bmi is above their recommended bmi
        - Analyse number of filed complaints in different branches to judge patient satisfaction
        - Analyse salaries of doctors over different departments to find out the highest paying departments in different branches of the hospital
        - Analysing patient costs across departments of a branch to find out the costliest treatment across departments

- Modification:
    - Insert:
        - Insert new patient to PATIENT
        - Insert new MEDICINE
        - Insert new AMBULANCE
    - Update:
        - Update MEDICINE STOCK
        - Update ROOM OCCUPANCY
        - Update SALARY of EMPLOYEE
        - Update DATE OF TERMINATION of EMPLOYEES

        - Update DATE OF DISCHARGE of IN_PATIENTS
    - Delete:
        - Delete out of commission AMBULANCES
        - Delete out of commission EQUIPMENT
        - Delete PATIENT data
- Miscellaneous:
    - To check STOCK of certain MEDICINEs
    - Insert/Update user information for new PATIENTs of the hospital
    - to check for vacant ROOMs for patient treatment
    - To check (with the right authorization) the previous treatment records of any PATIENT across BRANCHes of the hospital
    - To check how many IN-PATIENTs a BRANCH of the hospital is currently treating
    - To view EMPLOYEE data
    - To view income from PATIENTs for a certain BRANCH/DEPARTMENT

MEETING PROJECT REQUIREMENTS:

- We have 12 entities as specified above
- AMBULANCE has 2 key attributes and EQUIPMENT has 3 key attributes
- The entities TEST, PAST DISEASE, ROOM, DEPARTMENT, MEDICINE, are weak entities.
- We have 18 relationship types.
- IN-PATIENT DIAGNOSIS is a quaternary relationship
- EMPLOYEE has 6 subclasses, and PATIENT has 2 subclasses
- Attributes :-
    - Multivalued ones:-
        - PRESCRIPTION (of DOCTORS REPORT)
        - DIAGNOSIS (of DOCTORS REPORT)
    - Composite one :-
        - REGISTRATION (of AMBULANCE)
        - EMPLOYEE IDENTIFICATION (of EMPLOYEES)
        - EQUIPMENT KEY (of EQUIPMENT)
    - Derived ones :-
        - OCCUPANCY (of ROOM)
        - NO OF DOCTORS (in DEPT)
- Relationship type with the same participating entity type in distinct roles
    - OVERLOOKS (relationship between TECHNICIANS)
- Cardinality constraints have been specified for all relationships.