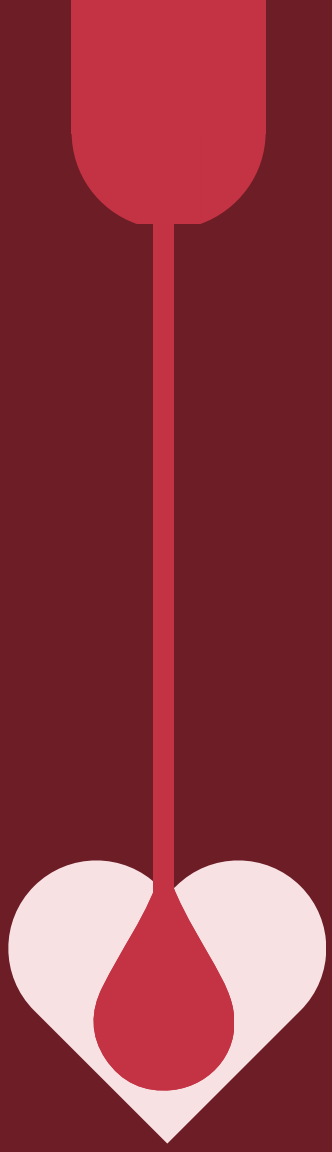

BLOOD DONATION APPLICATION
DATABASE

# DONATE BLOOD & SAVE LIVES

EVERY TWO SECONDS,
SOMEBODY NEEDS BLOOD

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CIS360 PROJECT

# Database application project
# Blood donation system

The Application Database we have chosen for the CIS360 project is called "BLOOD DONATION APPLICATION DATABASE". As the name would suggest it concerns the blood donation process from a donors' perspective (mainly), while also including the request of the mentioned donated blood.

Here are some realistic queries that our database should be able to answer:

## Realistic queries:

1. Give me the names of all the donors that have RO Subtype?
2. Give me all donors that live close to center B?
3. Give me the working hours of blood bank C?
4. Give me the time of the appointment with reference number ####?
5. Give me hospital name that requested blood with reference number #### ?
6. Give me the closest blood bank to me (doner ID)?
7. Give me the donors that takes this ABCD medication?
8. If patient Z takes medication ABCD, and donor Y takes medication EFGH, are they compatible?
9. Is blood type AB+ available in volume ##?
10. For donor B (70+), when was the last time they gave a full donation?

**The blood donation process:**

A donor will first need to register with an ID and a password for several reasons, them being a) for repeated donors, b) to keep the information in the database in case of blood shortages for specific requests so the wanted donor can be contacted.

After registration, several attributes must be entered, most importantly the MEDICAL_INFO part, to check the eligibility of the donors and calculate the age based on the current sysdate.

Every time a donor books an appointment or donates a unit of blood, an automatically generated reference number will be created for each (used as primary/foreign keys throughout the database).

Blood requests must be given priorities ranging between 1 - 5, where 1 is the highest priority.

When booking an appointment at a blood bank, first the attribute BANK_AVAILABILITY must be assessed to check if there are any spots available.

**Notes to consider:**

- Every donation of blood equal to one (1) unit.
- Blood expires after six weeks of donating (unless provided with the technology for freezing blood, we will assume the involved blood banks don't have this option since it is very rare).
- Depending on the requested volume, several units may be given.
- Before any donation takes place, a blood test must be conducted and the test results must be manually revised by staff, so we have added the attribute BLOOD_TESTS to store the tests, assuming they are in document form and therefore of type CLOB.
- People with type 1 or 2 diabetes take insulin which prevents them from donating, same with donors suffering from contagious illnesses such as AIDS, HIV and so on.
- Donors that take certain heart related medications like Warfarin, are not allowed to donate.
- There can be a clash between the medications the donor takes and the medications of the patient of the blood request, so it must be checked.
- People who weigh above 50KG can donate, anything less is rejected.
- The accepted age for donation is 16 - 74 years for legal reasons.
- If donor is 70+ years of age, they can donate only if they have made at least one full donation in the last two years.

## Unanswerable queries:

1. Normally, people from African/Black/Hispanic decent are more likely to have RO Subtype. Give me donors from African/Black/Hispanic decent to prioritize their appointments.

2. For every donor we need a blood test and some donors donate a lot, we can keep track of the blood test for every donation appointment and compare results to catch any anomalies that might prevent them from future donations.

## Functional Dependencies and Normal Forms:

1. 1NF: In the ER diagram, we have several composite attributes for better readability of the diagram but that violates the first normal form. So, in the schema the composite attributes have been broken down into separate simple attributes (no multivalued attributes exist in the database).

2. 2NF: We have no candidate keys in the schemas, but:

   a) Blood request attributes have been split into two tables to minimize repetitions and null values.

   b) Since a single donor may donate several times, they will need a blood test and a new eligibility check with every donation. To reduce the redundancy in the table DONOR, we have created a new table for eligibility.

3. 3NF: No known transitive dependencies.

4. BCNF: No known non-trivial functional dependencies.

**Result:** Schema is in 3NF and BCNF (meaning it is automatically in both 1NF and 2NF)

## DONOR

- DONOR_ID —type—Varchar2(10)
- PASSWORD—type—Varchar2(10)
- D_NAME {F_NAME —type—char (10),L_LAST —type—char (10)}
- D_CONTACT {EMAIL —type—Varchar2(20), PHONE_NUMBER —type—Number (15), D_ADDRESS —type—– Varchar2(10)}
- CITY —type— char (15)
- MEDICAL_INFO {GENDER —type— char (1), BIRTHDAY —type— date, WEIGHT —type— Number (4,2), CHRONIC_ILLNESS_MEDICATIONS —type—Varchr2(80)}
- AGREE_TO_CONTACT —type—Boolean

## BLOOD_BANK

- LOCATION_ID —type— Varchar2(10)
- WORKING_HOURS —type— Interval
- BANK_AVAILABITY —type— Boolean
- BANK_FAX —type— Varchar2(10)
- B_EMAIL —type— Varchar2(20)
- B_NUMBER —type— Varchar2(15)

## APPOINTMENT

- APPOINTMENT_RN —type—Sequence
- DONER_ID —type—Varchar2(10)

- BLOOD_BANK_LOCATION_ID —type—Varchar2(10)
- DATE_TAKEN —type—Date
- A_STATUS —type— Char (10)
- IS_BOOKED —type— Boolean
- NEW_DATE —type— Date default Null

## BLOOD_REQUEST

- REQUEST_RN—type— Sequence
- BLOOD_TYPE —type— Char (1)
- REQUEST_DATE —type—Date
- HOSPITAL_NAME —type—Varchar2(20)
- REQUESTED_VOLUME —type—Number (3)
- IS_GIVEN —type—Boolean
- PRIORETY —type— Number (1)

## DONATED_BLOOD

- BLOOD_RN —type— Sequence
- BLOOD_TYPE —type— Char (1)
- MEDICATIONS —type— Varchar2(30)
- IS_RO_SUBTYPE —type— Boolean
- BLOOD_STRENGTH —type— Number (3,1)
- IS_AVAILABLE —type— Boolean

- IS_EXPIRED —type— Boolean
- BLOOD_TEST —type— Clob
- DATE_TAKEN —type— Date

**Done By :**
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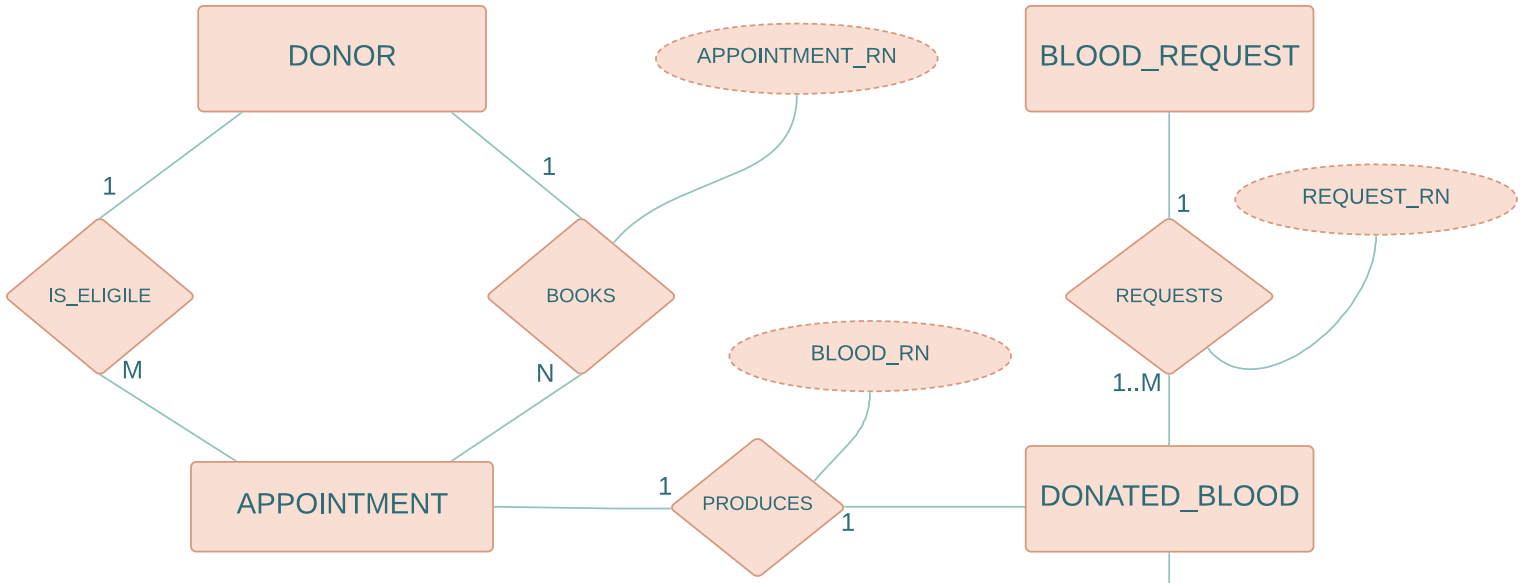
# BLOOD DONATION APPLICATION DATABASE

November 16, 2021

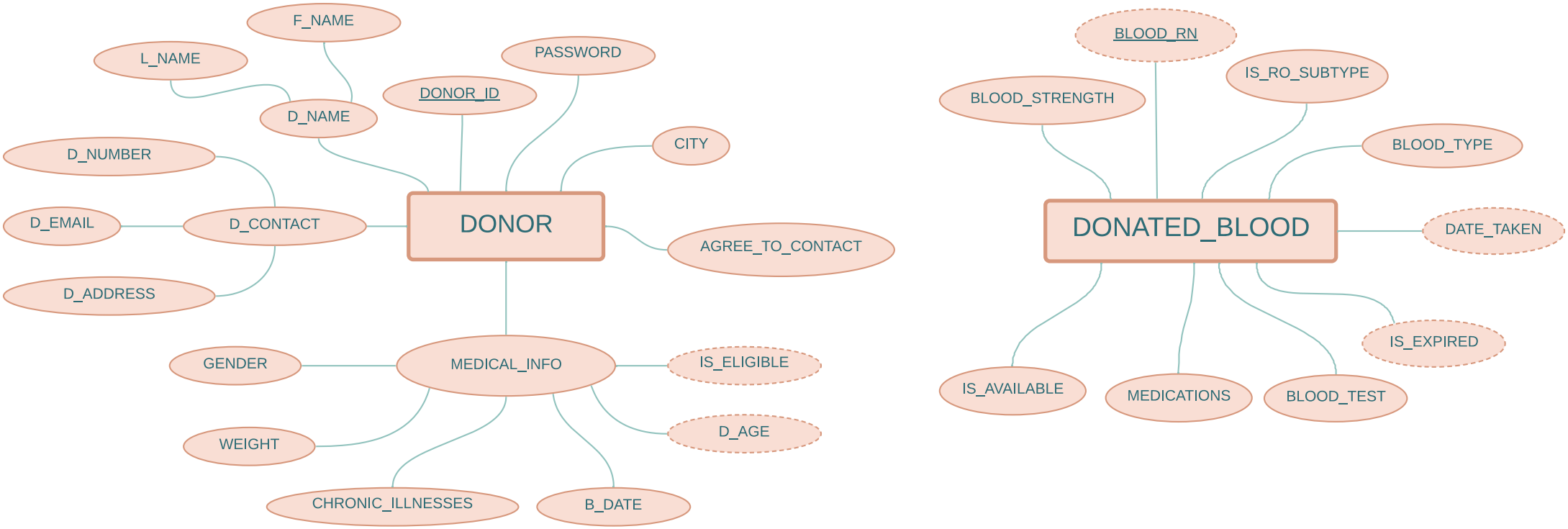



We have 5 relationships in this database, which are :

1. A **DONOR** can *Book* an **APPOINTMENT**, the same **DONOR** may *book* several **APPOINTMENTS**, buf each **APPOINTMENT** belongs to one **DONOR** only.
2. A **DONOR** may or may not *be eligible* for an **APPOINTMENT**, one **DONOR** can have eligibility for several **APPOINTMENTS**, but not the other way around.
3. A unit of **DONATED_BLOOD** is the *produces* of every **APPOINTMENT**.
4. A **BLOOD_REQUEST** will *ask* for one or more units of **DONATED_BLOOD**, but each unit of **DONATED_BLOOD** can only satisfy one **BLOOD_REQUEST**.
5. every unit of **DONATED_BLOOD** *is stored* in a **BLOOD_BANK**, and a **BLOOD_BANK** will have several units of **DONATED_BLOOD** in its storage.

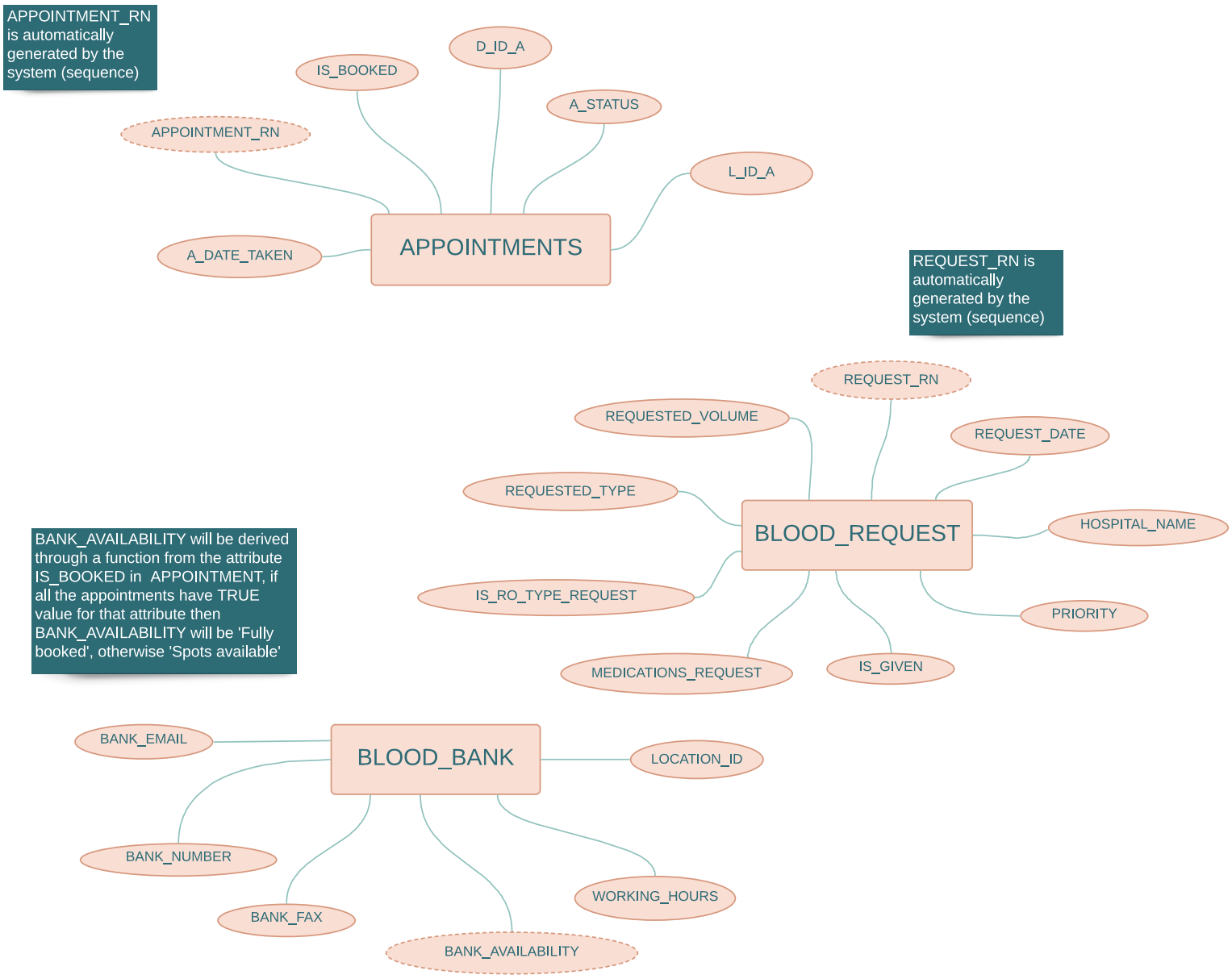
# DONOR & DONATED_BLOOD

November 16, 2021



# APPOINTMENTS & BLOOD_REQUEST & BLOOD_BANK

November 16, 2021



# BLOOD DONATION DATABASE SCHEMA

November 16, 2021

## DONOR

| DONOR_ID | PASSWORD | CITY | F_NAME | L_NAME | D_EMAIL | D_NUMBER | D_ADDRESS | AGREE_TO_CONTACT |
|---|---|---|---|---|---|---|---|---|

## DONOR_ELIGIBILITY

| D_ID_ELI | A_RN_ELI | BIRTH_DATE | AGE | GENDER | CHRONIC_ILLNESSES | IS_ELIGIBLE | WEIGHT |
|---|---|---|---|---|---|---|---|

## DONATED_BLOOD

| D_ID_BLOOD | BLOOD_RN | BLOOD_TEST | DATE_TAKEN | IS_EXPIRED | BLOODTYPE | IS_RO_SUBTYPE | BLOOD_STRENGTH | MEDICATIONS | IS_AVAILABLE | A_RN_BLOOD | B_ID_BLOOD |
|---|---|---|---|---|---|---|---|---|---|---|---|

## BLOOD_BANK

| LOCATION_ID | WORKING_HOURS | BANK_AVAILABILITY | BANK_PHONE_NUMBER | BANK_EMAIL | BANK_FAX |
|---|---|---|---|---|---|

## APPOINTMENT

| L_ID_A | D_ID_A | APPOINTMENT_RN_ | IS_BOOKED | APPOINTMENT_STATUS | A_DATE_TAKEN |
|---|---|---|---|---|---|

## BLOOD_REQUEST

| REQUEST_RN | HOSPITAL_NAME | PRIORITY | REQUESTED_VOLUME | REQUEST_DATE | IS_GIVEN | REQUESTED_TYPE | IS_RO_REQUEST | MEDICATIONS_REQUEST |
|---|---|---|---|---|---|---|---|---|

## ANSWERED_REQUESTS

| R_RN | B_RN |
|---|---|