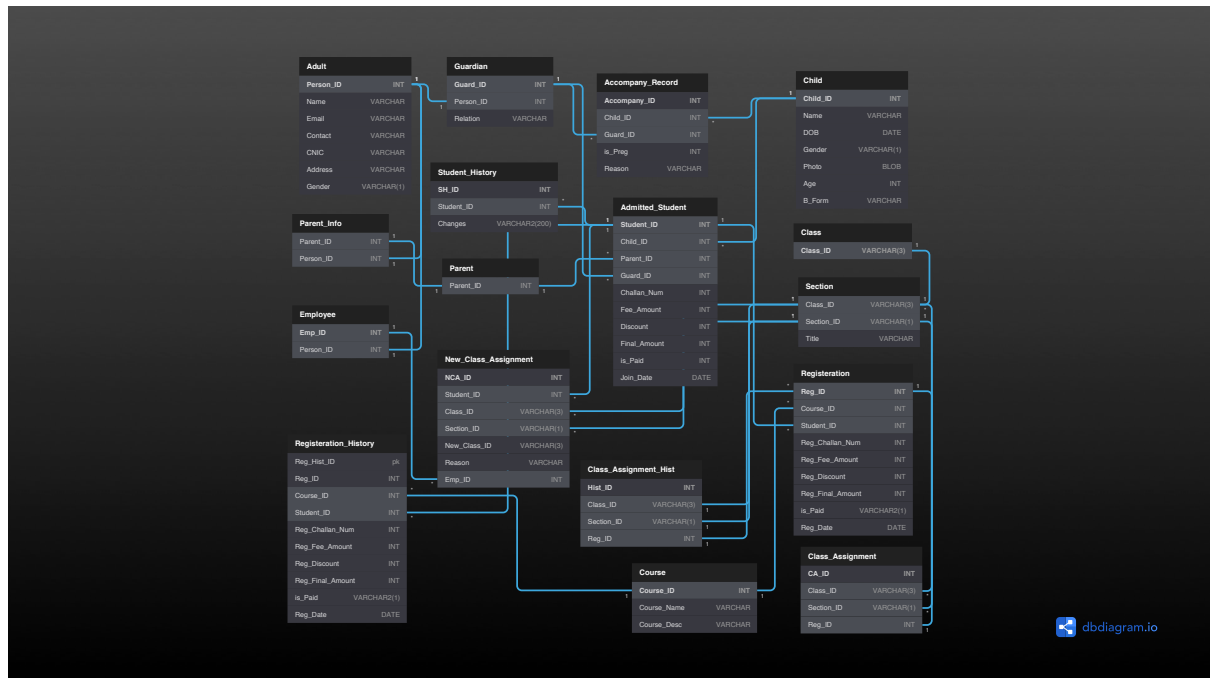# FIRST NORMAL FORM AND FUNCTIONAL DEPENDANCIES

NOTE:
1) SINCE ALL THE ATTRIBUTES ARE NOT MULTIPLE VALUED, AND ALL ALPHA (PRIMARY KEYS) CAN UNIQUELY IDENTIFY EACH ROW, THIS LOGICAL DESIGN PROVES IT IS IN 1st NORMAL FORM.
2) NOW WE NEED TO FIND PARTIAL DEPENDANCIES AND REMOVE THEM TO GET 2ND NORMAL FORM.

PARTIAL DEPENDENCY INSIDE TABLE:

1. ACCOMPANY_RECORD (GUARD_ID → IS_PREG)
2. ADMITTED_STUDENT (STUDENT_ID → All other NON PRIME attributes)
3. SECTION (SECTION_ID → Title)
4. NEW_CLASS_ASSIGN (STUDENT_ID → New_Class_ID, New_Section_ID, Reason)
5. REGISTERATION (STUDENT_ID → All other NON PRIME attributes)

NOTE: WE CAN SEE FROM THE SCHEMA ABOVE THAT ALL THESE TABLES HAVE > 1 ATTRIBUTES IN SUPERKEY. BUT, **NON PRIME ATTRIBUTES** DEPEND ON **PART** OF THOSE **SUPERKEYS**. THEREFORE, I HAVE ONLY MENTIONED THAT PART OF SUPERKEY ABOVE

SECOND NORMAL FORM AND FUNCTIONAL DEPENDANCIES
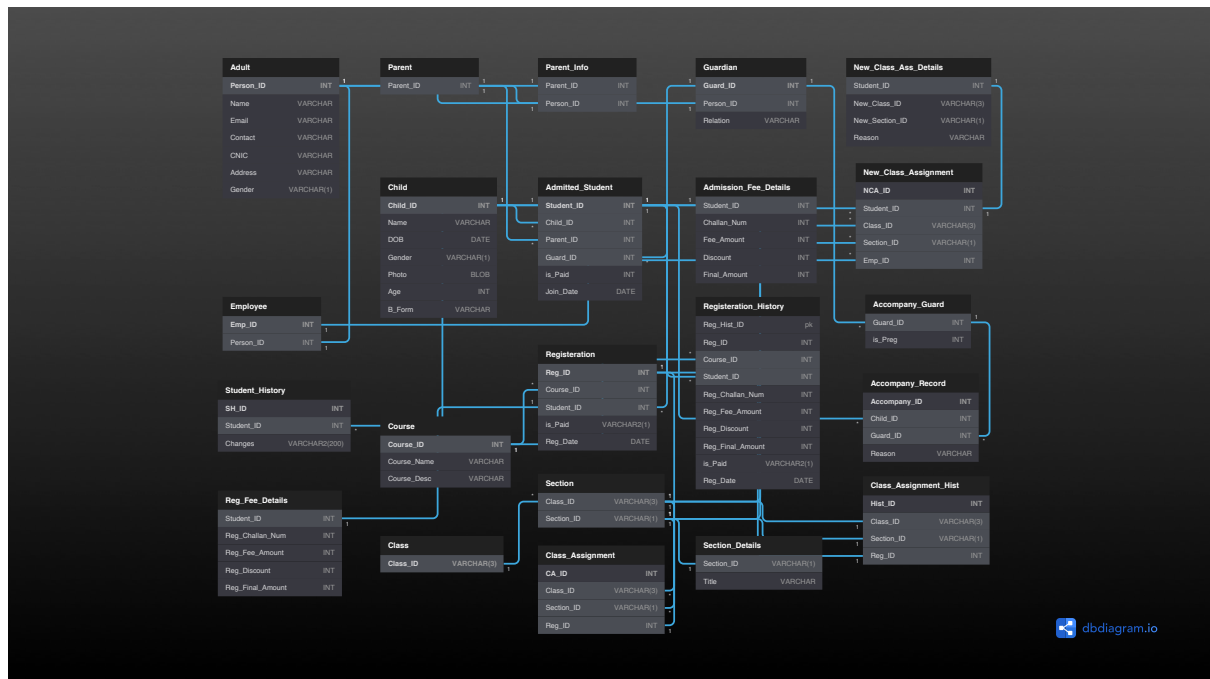
NOTE:

1) ALL PARTIAL DEPENDENCIES HAVE BEEN REMOVED AND WE GET 2ND NF.
2) NOW WE NEED TO FIND TRANISITIVE DEPENDANCIES AND REMOVE THEM TO GET 3RD NORMAL FORM.

TRANSITIVE DEPENDENCY INSIDE TABLE:

1. ADULT (CNIC → Name, Address, Gender)
2. CHILD (BFORM → All attributes of a Child can be ID'd by BFORM)
3. ADMITTED_STUDENT (CHALLAN_NUM → Fee_Amount, Discount, Final_Amount)
4. REGISTERATION (REG_CHALLAN_NUM → Fee_Amount, Discount, Final_Amount)

NOTE: WE CAN SEE FROM THE SCHEMA ABOVE THAT ALL THESE ATTRIBUTES BEFORE AND AFTER THE SYMBOL '→' ARE _NON PRIME_. THEREFORE, WE CAN USE THE INFORMATION DISSEMINATED ABOVE TO REMOVE THESE TRANSITIVE DEPENDENCIES TO ACHIEVE 3RD NORMAL FORM.

THIRD NORMAL FORM AND FUNCTIONAL DEPENDANCIES
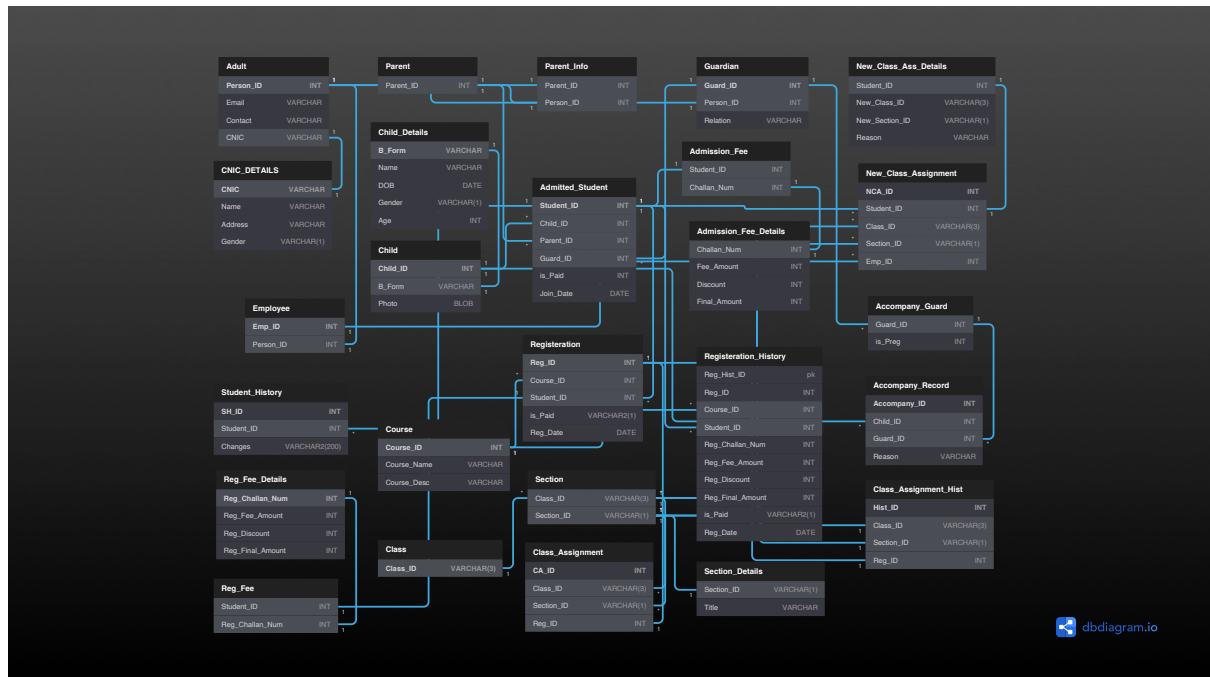
NOTE:

3) ALL TRANSITIVE DEPENDENCIES HAVE BEEN REMOVED AND WE GET 3RD NF.
4) NOW WE NEED TO FIND NON-PRIME → PRIME DEPENDANCIES AND REMOVE THEM TO GET BOYCE CODD NORMAL FORM (BCNF).

***NOTE:

1. FOR A *POSSIBILITY* OF 3NF NOT TO BE IN BCNF, IT MUST HAVE COMPOSITE PRIMARY KEY/ SUPER KEY IN ANY TABLE.
2. THERE SHOULD BE A CLEAR DEPENDENCY BETWEEN NON PRIME AND PART OF THAT SUPER KEY.
3. LOOKING AT THE ABOVE 3NF FORM, WE HAVE 4 SUCH TABLES THAT HAVE COMPOSITE SUPERKEY:
   a. ADMITTED_STUDENT (CHILD_ID, PARENT_ID, GUARD_ID, IS_PAID, JOIN_DATE)
   b. REGISTERATION (STUDENT_ID, COURSE_ID, IS_PAID, REF_DATE)
   c. CLASS_ASSIGNMENT (CLASS_ID, SECTION_ID, REG_ID)
   d. NEW_CLASS_ASSIGN (STUDENT_ID, CLASS_ID, SECTION_ID, EMP_ID)

4. ATTRIBUTES HIGHLIGHTED IN BLUE ARE PRIME.
5. SINCE c. and d. HAVE NO NON PRIME ATTRIBUTE, THEY ARE ALREADY IN BCNF.
6. WHEREAS a. HAS TWO NON PRIME ATTRIBUTES. HOWEVER, NONE OF THE PRIME ATTRIBUTES DEPEND ON THESE TWO THEREFORE BCNF CONFIRMED. LIKEWISE FOR b.

NOTE: FINALLY, WE CAN CONCLUDE THAT OUR DATABASE DESIGN HAS BEEN NORMALISED TO BCNF LEVEL.