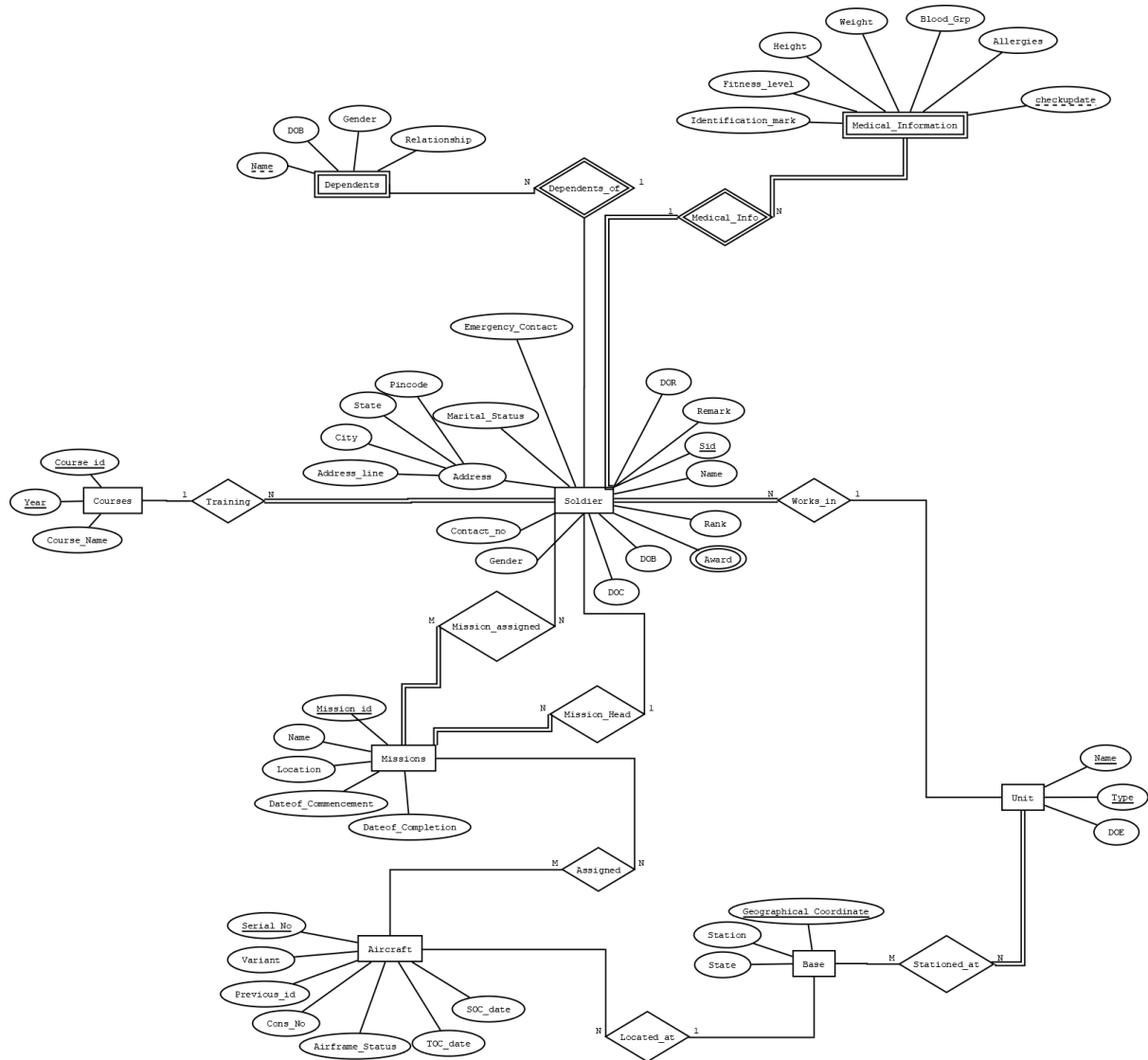
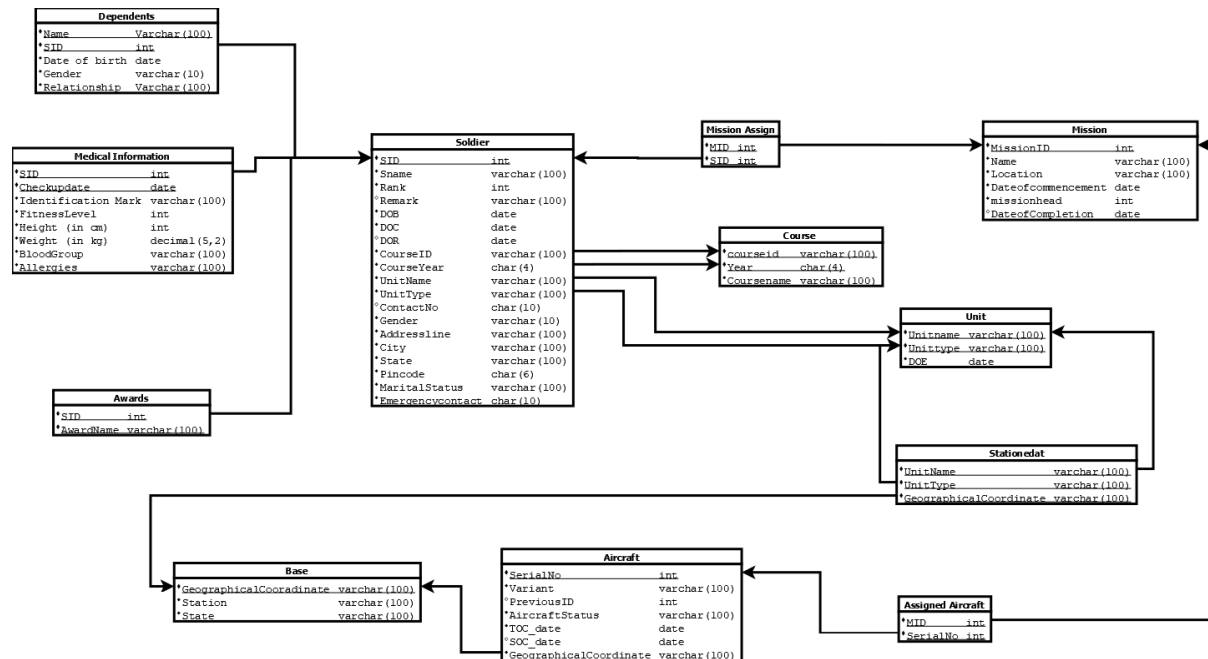


Functional Dependencies and Normal Forms

ER Diagram:



Relational Schema:



Functional Dependencies:

SID -> Name

SID -> Rank

SID -> Remark

SID -> DOB

SID -> DOC

SID -> DOR

SID -> Course ID

SID -> Year

SID -> Unit Name

SID -> Unit Type

SID -> Contact No

SID -> Gender

SID -> Address Line

SID -> City

SID -> State

SID -> Pin-code

Pin-code -> City

Pin-code -> State

SID -> Marital Status

SID -> Emergency Contact

{SID, Name} -> DOB

{SID, Name} -> Gender

{SID, Name} -> Relationship

{SID, Checkup date} -> Identification Mark

{SID, Checkup date} -> Fitness Level

{SID, Checkup date} -> Height

{SID, Checkup date} -> Weight

{SID, Checkup date} -> Blood Group

{SID, Checkup date} -> Allergies

Serial No -> Variant

Serial No -> Previous ID

Serial No -> Aircraft Status

Serial No -> TOC date

Serial No -> SOC date

Serial No -> Geographical Coordinate

MID -> Name

MID -> Location

MID -> Date of Commencement

MID -> Head SID

MID -> Date of Completion

{Unit Name, Unit Type} -> DOE

Geographical Coordinates -> Station

Geographical Coordinates -> State

{Course ID, Year} -> Course Name

SID -> DOE

SID -> CourseName

Serial No. -> Station

Serial N0. -> State

Minimal FD Set:

SID -> Name

SID -> Rank

SID -> Remark

SID -> DOB

SID -> DOC

SID -> DOR

SID -> Course ID

SID -> Year

SID -> Unit Name

SID -> Unit Type

SID -> Contact No

SID -> Gender

SID -> Address Line

SID -> Pin-code

Pin-code -> City

Pin-code -> State

SID -> Marital Status

SID -> Emergency Contact

{SID, Name} -> DOB

{SID, Name} -> Gender

{SID, Name} -> Relationship

{SID, Checkup date} -> Identification Mark

{SID, Checkup date} -> Fitness Level

{SID, Checkup date} -> Height

{SID, Checkup date} -> Weight

{SID, Checkup date} -> Blood Group

{SID, Checkup date} -> Allergies

Serial No -> Variant

Serial No -> Previous ID

Serial No -> Aircraft Status

Serial No -> TOC date

Serial No -> SOC date

Serial No -> Geographical Coordinate

MID -> Name

MID -> Location

MID -> Date of Commencement

MID -> Head SID

MID -> Date of Completion

{Unit Name, Unit Type} -> DOE

Geographical Coordinates -> Station

Geographical Coordinates -> State

{Course ID, Year} -> Course Name

Normal Forms:

<p style="text-align: center;">Soldier</p> <p>(SID, Name, Rank, Remark, DOB, DOC, DOR, Course ID, Year, Unit Name, Unit Type, Contact No, Gender, Address line, City, State, Pin-code, Marital Status, Emergency Contact)</p> <p>SID -> Name SID -> Rank SID -> Remark SID -> DOB SID -> DOC SID -> DOR SID -> Course ID SID -> Year SID -> Unit Name SID -> Unit Type SID -> Contact No SID -> Gender</p>	<p>SID functionally determines all other attributes of the relation Soldier, and it is minimal, hence SID is Key.</p> <p><u>This relation is not in BCNF because Pincode determines city and state. This relation is in 2NF. We can make the relation BCNF by creating a separate table R1{Pin-code, City, State}, and putting Pin-code as Primary key in R1 and Foreign Key in Soldier relation.</u></p>
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<p>SID -> Address Line SID -> City SID -> State SID -> Pin-code Pin-code -> City Pin-code -> State SID -> Marital Status SID -> Emergency Contact</p>	
<p>Dependents (SID, Name, DOB, Gender, Relationship)</p> <p>{SID, Name} -> DOB {SID, Name} -> Gender {SID, Name} -> Relationship</p>	<p>{SID, Name} functionally determines all other attributes of the relation Dependents and it is minimal, hence {SID, Name} is Key.</p> <p>Here for every FD, {SID, Name} -> X, where X is attribute of Relation Dependents, {SID, Name} is the super key and every attribute is getting inferred by {SID, Name}. Also, there are no redundancies. Therefore, we can say that Dependents relation is in BCNF.</p>
<p>Medical Information (SID, Checkup date, Identification Mark, Fitness level, Height, Weight, Blood Group, Allergies)</p> <p>{SID, Checkup date} -> Identification Mark {SID, Checkup date} -> Fitness Level {SID, Checkup date} -> Height {SID, Checkup date} -> Weight {SID, Checkup date} -> Blood Group {SID, Checkup date} -> Allergies</p>	<p>{SID, Checkup date} functionally determines all other attributes of the relation Medical Information and it is minimal, hence {SID, Checkup date} is Key.</p> <p>Here for every FD, {SID, Checkup date} -> X, where X is attribute of Relation Medical Information {SID, Checkup date} is the super key and every attribute is getting inferred by {SID, Checkup date}. Also, there are no redundancies. Therefore, we can say that Medical Information relation is in BCNF.</p>
<p>Aircraft (Serial No, Variant, Previous ID, Aircraft Status, TOC date, SOC date, Geographical Coordinate)</p> <p>Serial No -> Variant Serial No -> Previous ID Serial No -> Aircraft Status Serial No -> TOC date Serial No -> SOC date Serial No -> Geographical Coordinate</p>	<p>Serial No functionally determines all other attributes of the relation Aircraft and it is minimal, hence Serial No is Key.</p> <p>Here for every FD, Serial No -> X, where X is attribute of Relation Aircraft, Serial No is the super key and every attribute is getting inferred by Serial No. Also, there are no redundancies. Therefore, we can say that Aircraft relation is in BCNF.</p>
<p>Awards (SID, Award Name)</p>	<p>{SID, Award Name} together form a composite Key.</p> <p>Here, we do not have any functional dependencies. Therefore, we can say that Awards relation is in BCNF.</p>

<p style="text-align: center;">Missions</p> <p style="text-align: center;">(MID, Name, Location, Date of Commencement, Head SID, Date of Completion)</p> <p>MID -> Name MID -> Location MID -> Date of Commencement MID -> Head SID MID -> Date of Completion</p>	<p>MID functionally determines all other attributes of the relation Missions, and it is minimal, hence MID is Key.</p> <p>Here for every FD, MID -> X, where X is attribute of Relation Missions, MID is the super key and every attribute is getting inferred by MID. Also, there are no redundancies. Therefore, we can say that Missions relation is in BCNF.</p>
<p style="text-align: center;">Unit</p> <p style="text-align: center;">(Unit Name, Unit Type, DOE)</p> <p>{Unit Name, Unit Type} -> DOE</p>	<p>{Unit Name, Unit Type} functionally determines all other attributes of the relation Unit and it is minimal, hence {Unit Name, Unit Type} is Key.</p> <p>Here for every FD, {Unit Name, Unit Type} -> X, where X is attribute of Relation Unit {Unit Name, Unit Type} is the super key and every attribute is getting inferred by {Unit Name, Unit Type}. Also, there are no redundancies. Therefore, we can say that Unit relation is in BCNF.</p>
<p style="text-align: center;">Base</p> <p style="text-align: center;">(Geographical Coordinates, Station, State)</p> <p>Geographical Coordinates -> Station Geographical Coordinates -> State</p>	<p>Geographical Coordinates functionally determines all other attributes of the relation Base, and it is minimal, hence Geographical Coordinates is Key.</p> <p>Here for every FD, Geographical Coordinates -> X, where X is attribute of Relation Base, Geographical Coordinates is the super key, and every attribute is getting inferred by Geographical Coordinates. Also, there are no redundancies. Therefore, we can say that Base relation is in BCNF.</p>
<p style="text-align: center;">Course</p> <p style="text-align: center;">(Course ID, Year, Course Name)</p> <p>{Course ID, Year} -> Course Name</p>	<p>{Course ID, Year} functionally determines all other attributes of the relation Course and it is minimal, hence {Course ID, Year} is Key.</p> <p>Here for every FD, {Course ID, Year} -> X, where X is attribute of Relation Course {Course ID, Year} is the super key and every attribute is getting inferred by {Course ID, Year}. Also, there are no redundancies. Therefore, we can say that Course relation is in BCNF.</p>
<p style="text-align: center;">Missions Assigned</p> <p style="text-align: center;">(SID, MID)</p>	<p>{SID, MID} together form a composite Key.</p> <p>Here, we do not have any functional dependencies. Therefore, we can say that Missions Assigned relation is in BCNF.</p>

<p>Assigned Aircrafts (SID, Serial No)</p>	<p>{SID, Serial No} together form a composite Key. Here, we do not have any functional dependencies. Therefore, we can say that Assigned Aircrafts relation is in BCNF.</p>
<p>Stationed At (Unit Name, Unit Type, Geographical Coordinate)</p>	<p>{Unit Name, Unit Type, Geographical Coordinate} together form a composite Key. Here, we do not have any functional dependencies. Therefore, we can say that Stationed At relation is in BCNF.</p>