Program 4 Design

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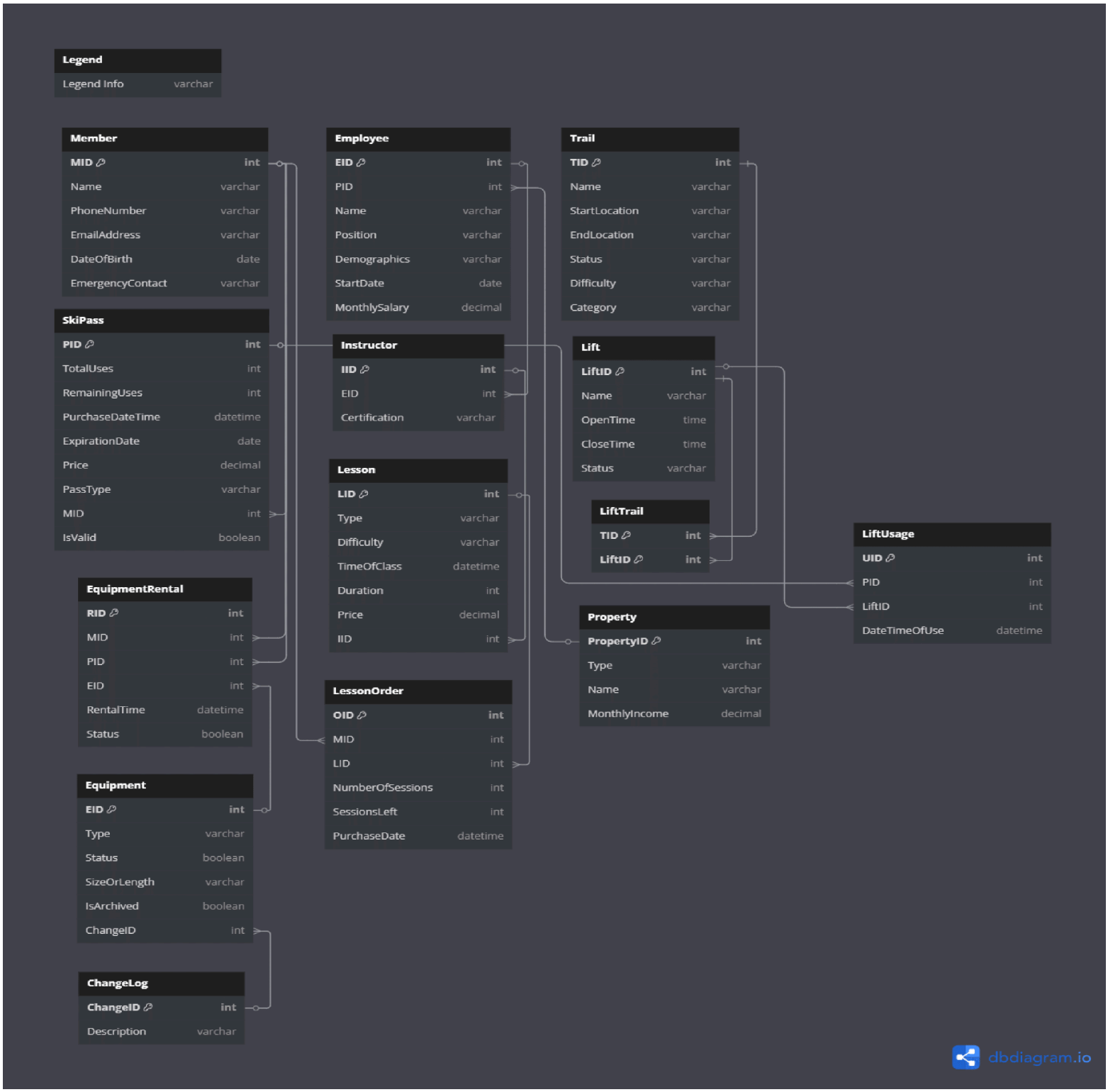
i. Conceptual database design



Not seen in E-R Diagram:

Member IDs are set to be the next available value

Equipment has a constraint to the specific sizes and lengths for boots, poles, skis and snowboards.

ii. Logical database design

Member (MID, Name, PhoneNumber, EmailAddress, DateOfBirth, EmergencyContact)

- Primary Key: MID

SkiPass (PID, TotalUses, RemainingUses, PurchaseDateTime, ExpirationDate, Price, PassType, MID, IsValid)

- Primary Key: PID
- Foreign Key: MID references Member(MID)

Equipment (EID, Type, Status, SizeOrLength, IsArchived, CID)

- Primary Key: EID
- Foreign Key: CID references ChangeLog(CID)

ChangeLog (CID, Description)

- Primary Key: CID

EquipmentRental (RID, MID, PID, EID, RentalTime, Status)

- Primary Key: RID
- Foreign Keys:
    - MID references Member(MID)
    - PID references SkiPass(PID)
    - EID references Equipment(EID)

Trail (TID, Name, StartLocation, EndLocation, Status, Difficulty, Category)

- Primary Key: TID

Lift (LiftID, Name, OpenTime, CloseTime, Status)

- Primary Key: LiftID

LiftTrail (TID, LiftID)

- Primary Key: (TID, LiftID)

- Foreign Keys:
    - TID references Trail(TID)
    - LiftID references Lift(LiftID)

LiftUsage (UID, PID, LiftID, DateTimeOfUse)

- Primary Key: UID
- Foreign Keys:
    - PID references SkiPass(PID)
    - LiftID references Lift(LiftID)

Lesson (LID, Type, Difficulty, TimeOfClass, Duration, Price, IID)

- Primary Key: LID
- Foreign Key: IID references Instructor(IID)

LessonOrder (OID, MID, LID, NumberOfSessions, SessionsLeft, PurchaseDate)

- Primary Key: OID
- Foreign Keys:
    - MID references Member(MID)
    - LID references Lesson(LID)

Instructor (IID, EID, Certification)

- Primary Key: IID
- Foreign Key: EID references Employee(EID)

Employee (EID, PID, Name, Position, Demographics, StartDate, MonthlySalary)

- Primary Key: EID
- Foreign Key: PID references Property(PropertyID)

Property (PropertyID, Type, Name, MonthlyIncome)

- Primary Key: PropertyID

iii. Normalization analysis

Member Table
MID -> Name
MID -> PhoneNumber
MID -> EmailAddress
MID -> DateOfBirth
MID -> EmergencyContact

The Member table adheres to BCNF because every nontrivial FD is determined by MID, where MID is the superkey

SkiPass Table
PID -> TotalUses
PID -> RemainingUses
PID -> PurchaseDateTime
PID -> ExpirationDate
PID -> Price
PID -> PassType
PID -> isValid
PID -> MID

The SkiPass table adheres to BCNF because every nontrivial FD is determined by PID, where PID is the superkey

EquipmentRental Table
RID -> PID
RID -> EID
RID -> RentalTime
RID -> Status

EquipmentRental adheres to BCNF because every nontrivial FD is determined by RID, where RID is the superkey

Equipment Table
EID -> Type
EID -> Status
EID -> SizeOrLength
EID -> IsArchived
EID -> CID

Equipment adheres to BCNF because every nontrivial FD is determined by EID, where EID is the superkey

ChangeLog Table
CID -> Description

ChangeLog adheres to BCNF because every nontrivial FD is determined by CID, where CID is the superkey

Trail Table
TID -> Name

TID -> StartLocation
TID -> EndLocation
TID -> Status
TID -> Difficulty
TID -> Category

Trail adheres to BCNF because every nontrivial FD is determined by TID, where TID is the superkey

LiftTrail Table
(TID, LiftID) -> No Functional Dependencies

LiftTrail is in BCNF because the composite candidate key doesn't functionally determine any attributes

Lift Table
LifdID -> Name
LiftID -> OpenTime
LiftID -> CloseTime
LiftID -> Status

Lift adheres to BCNF because every nontrivial FD is determined by LiftID, where LiftID is the superkey

LiftUsage Table
UID -> PID
UID -> LiftID
UID -> DateTimeOfUse

LiftUsage adheres to BCNF because every nontrivial FD is determined by UID, where UID is the superkey

Lesson Table
LID -> Type
LID -> Difficulty
LID -> TimeOfClass
LID -> Duration
LID -> Price
LID -> IID

Lesson adheres to BCNF because every nontrivial FD is determined by LID, where LID is the superkey

LessonOrder Table

OID -> MID
OID -> LID
OID -> NumberOfSessions
OID -> SessionsLeft
OID -> PurchaseDate

LessonOrder adheres to BCNF because every nontrivial FD is determined by OID, where OID is the superkey

Instructor Table
IID -> EID
IID -> Certification

Instructor adheres to BCNF because every nontrivial FD is determined by IID, where IID is the superkey

Employee Table
EID -> PID
EID -> Name
EID -> Position
EID -> Demographics
EID -> StartDate
EID -> MonthlySalary

Employee adheres to BCNF because every nontrivial FD is determined by EID, where EID is the superkey

Property Table
PropertyID -> Type
PropertyID -> Name
PropertyID -> MonthlyIncome

Property adheres to BCNF because every nontrivial FD is determined by PropertyID, where PropertyID is the superkey

iv. Query description

Our query is “For a given LID (Lesson ID) display the Instructors Certification Level” The question it is answering is a concern a member might have in wanting the instructor for a lesson they are going to buy to be of a certain certification level. The utility of having this query in the system is so that a member can quickly see information about the Instructor according to a Lesson rather than just the Lesson’s difficulty level.