Homework 4
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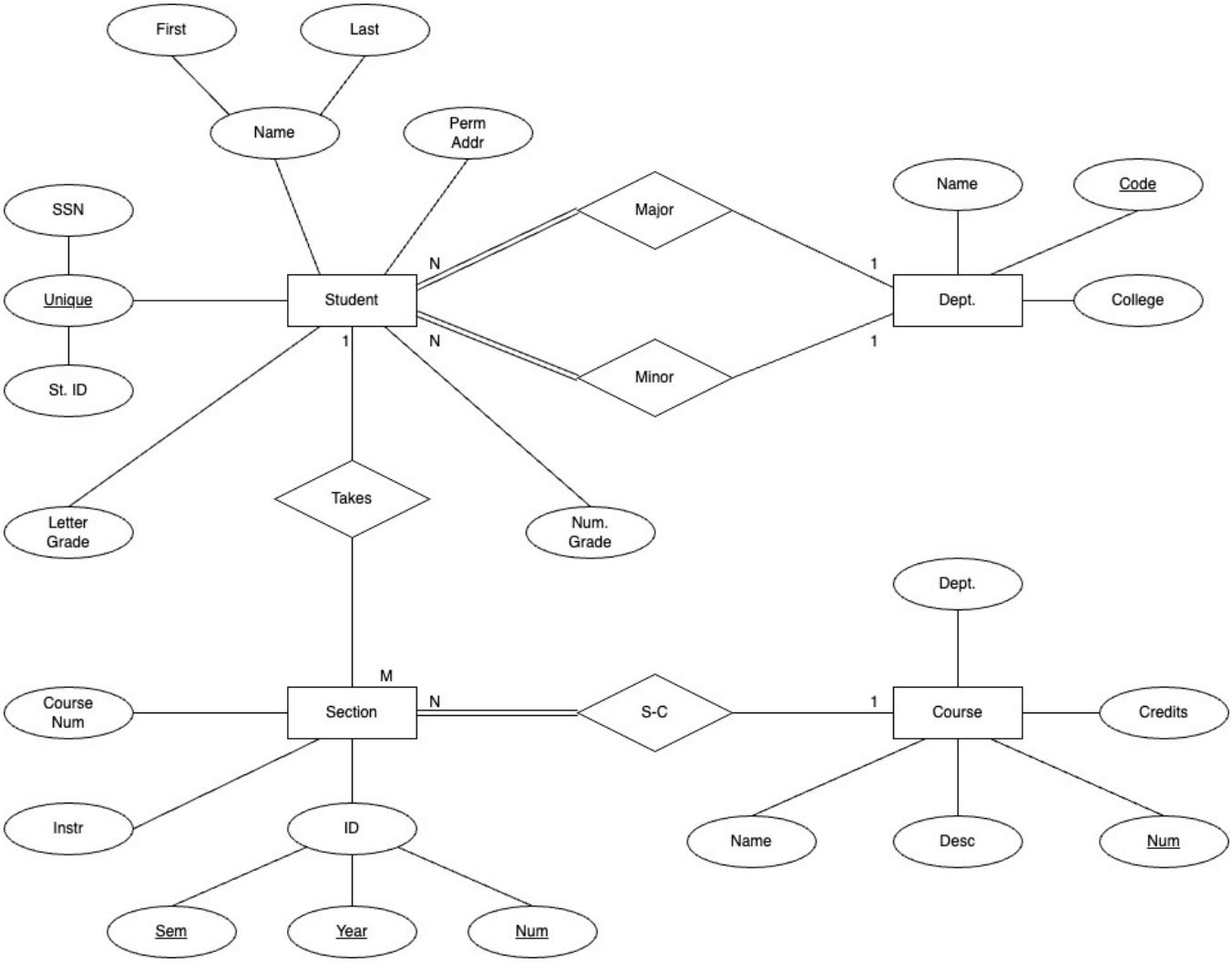
Feb 21, 2025

CS 5200: Database Management System
Homework 4

Problem 1 (5 points). You are given a narrative and an ER Diagram below. Find at least ten (10) mistakes in the diagram. Submit the diagram with your corrections, as well as an English description of each mistake. You must assume that all domain information to be reflected in the diagram is mentioned in the description.

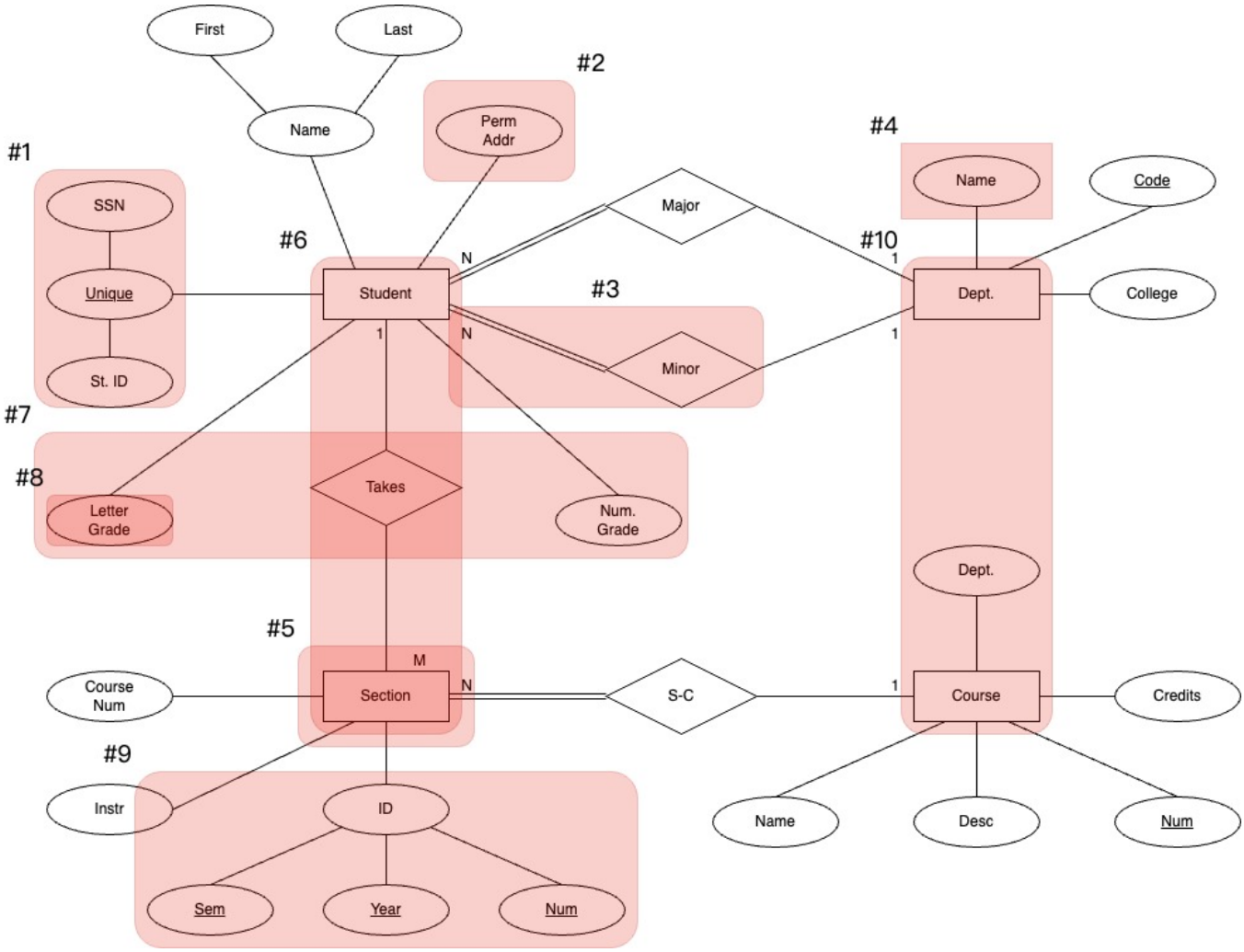
You get equal credit for each corrected mistake; even if correcting a mistake requires several changes to the diagram. For each correction, you will receive half of the points for your textual description of the mistake, as well as justification with respect to the narrative and ERD, and half if you fully correct the issue in your diagram. Please number each textual description, and label the associated change(s) in the diagram, such that your submission is clear and understandable. You will get extra credit if you find mistake(s) your instructor has not anticipated.

- The university keeps track of each student's name, student ID, social security number, permanent address, major department, and minor department (if any). Some applications need to refer to the city, state, and ZIP code of the student's permanent address, as well as the student's last name. Both SSN and student ID have unique values for each student.
- Each department is described by a unique name, a unique department code, and a college name
- Each course has a course name, description, unique course number, credits, and offering department
- Each section has an instructor, semester, year, course, and section number. The section number distinguishes sections of the same course that are taught during the same semester/year.
- When a student takes a section of a course, they receive a letter grade and a numeric grade. Given a numeric grade from the instructor, the letter grade is assigned based upon the university's standard grade-conversion table.


First
Last
Name
Perm Addr
SSN
Unique
St. ID
Student
Major
Minor
N
N
1
1
Name
Code
Dept.
College
1
1
Takes
Letter Grade
Num. Grade
M
N
Course Num
Section
S-C
1
Dept.
Course
Credits
Instr
ID
Sem
Year
Num
Name
Desc
Num

Solution:

Founded Mistakes:



Mistake 1:

- Error is the SSN and St. ID were not underlined, and "Unique" was redundantly labeled.
- Reason is the Candidate Keys are represented by underlining.
- Correction is removed "Unique" label and underlined SSN and St. ID.

Mistake 2:

- Error is the Perm Addr was missing City, State, and ZIP as sub-attributes.
- Reason is the requirement specifies that City, State, and ZIP can be referenced separately.
- Correction is added City, State, and ZIP as sub-attributes and connected them with solid lines.

Mistake 3:

- Error is the Minor was shown with double lines, indicating Total Participation.
- Reason is the Minor is optional (Partial Participation).
- Correction is Changed double line N for Minor to a single line N.

Mistake 4:

- Error is the Name was not underlined
- Reason is that each department is described by a unique name
- Correction is underlined Name.

Mistake 5:

- Error is the Section was not represented as a Weak Entity, even though Section's existence depends on Course.
- Reason is the Section is dependent on Course, and its uniqueness is determined by the composite key consisting of Course Num, Sem, Year, and Num.
- Correction is represented Section as a Weak Entity with double rectangles and connected Section to Course using double lines to indicate Identifying Relationship.

Mistake 6:

- Error is the student and section is not 1:N, should be N:M.
- Reason is the student can take multiple sections, also a section could be took by multiple students.
- Correction is change the 1 to N and N to M.

Mistake 7:

- Error is the Num Grade and Letter Grade were not connected to Takes.
- Reason is the Num Grade and Letter Grade are attributes of Takes as they represent grades received in enrolled courses.
- Correction is connected Student to Takes as N, and Section to Takes as M, effectively representing the N:M relationship through the Takes relationship.

Mistake 8:

- Error is the Letter Grade was shown as a solid ellipse, but it is a derived attribute.
- Reason is the Letter Grade is calculated from Numeric Grade and is not directly stored.
- Correction is changed Letter Grade to a dashed ellipse to show it is a Derived Attribute.

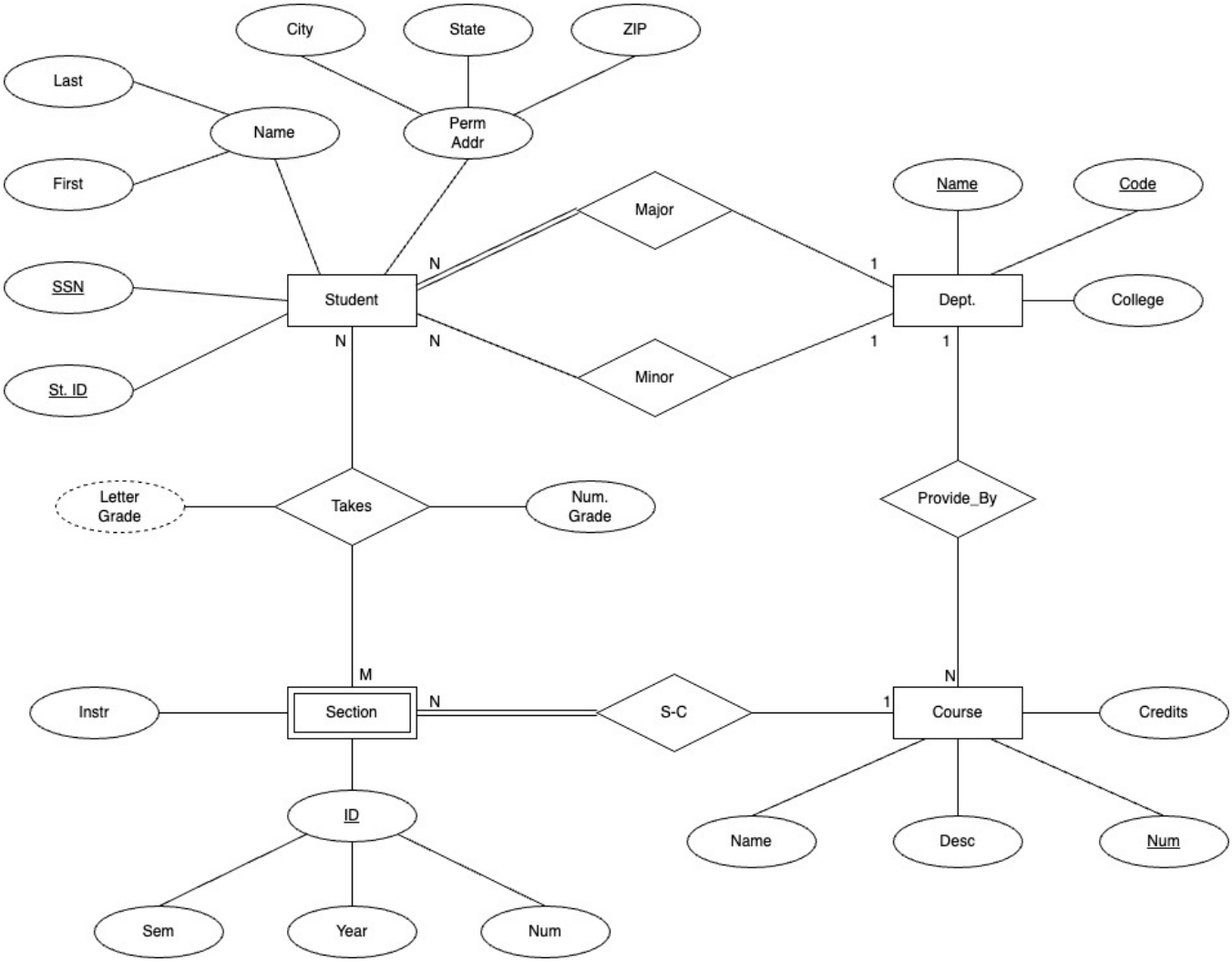
Mistake 9:

- Error is used an ID attribute without underlining, and Sem, Year, Num were incorrectly underlined.
- Reason is the unique identifier for Section is Composite Key consisting of Sem, Year, Num, but they form a combined key named ID.
- Correction is underlined ID as Composite Key and removed the underline from Sem, Year, Num because they are part of the composite key.

Mistake 10:

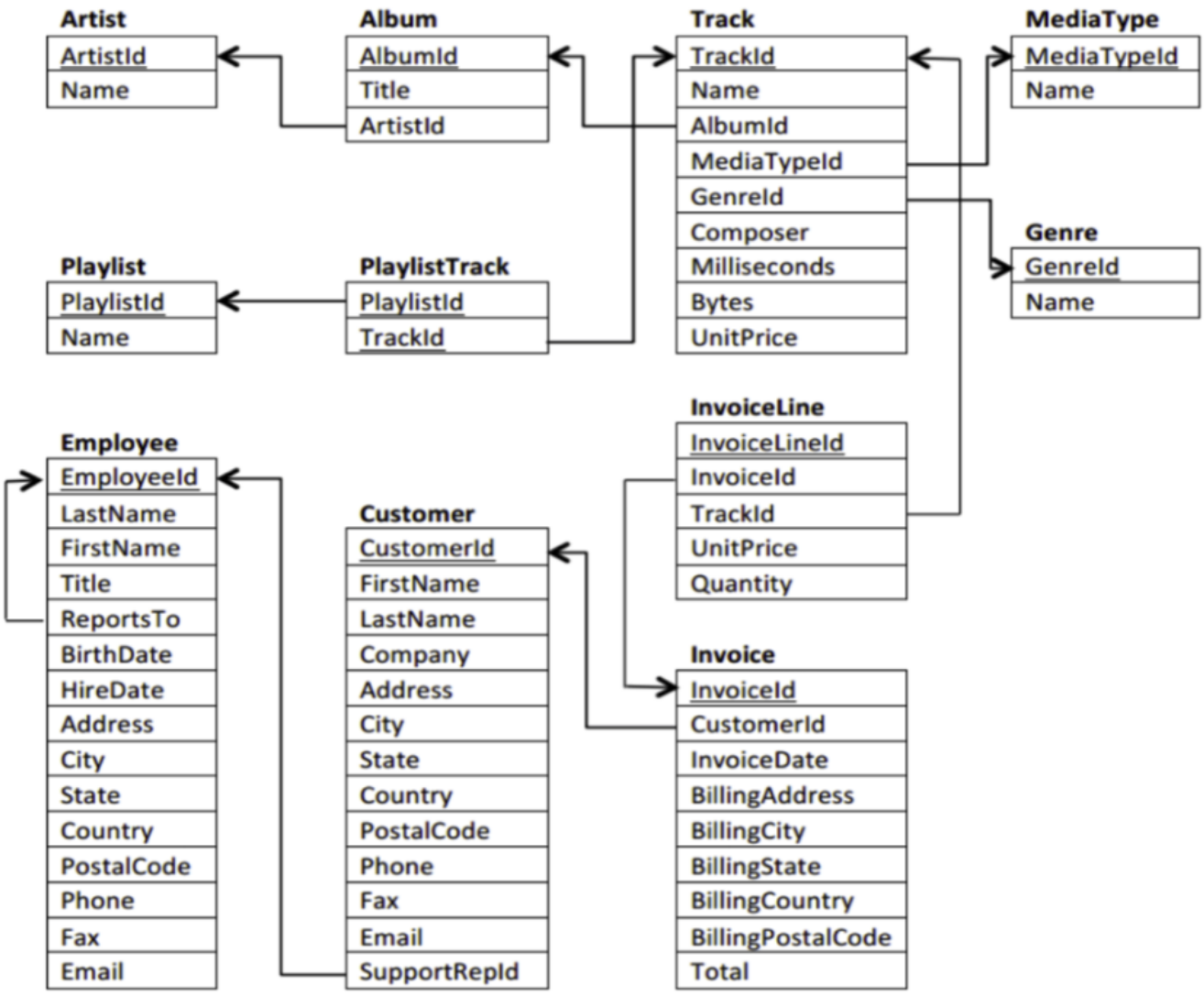
- Error is the Course contained Dept as an attribute, which incorrectly represented the relationship between Course and Dept.
- Reason is the Course is provided by Dept (offering department), which is a relationship, not a direct attribute.
- Correction is removed Dept as an attribute from Course. Added a ProvidedBy relationship (diamond) between Course and Dept, representing Course is provided by a Dept. The cardinality is N on Course and 1 on Dept, showing multiple Courses can belong to one Dept.

Correction:

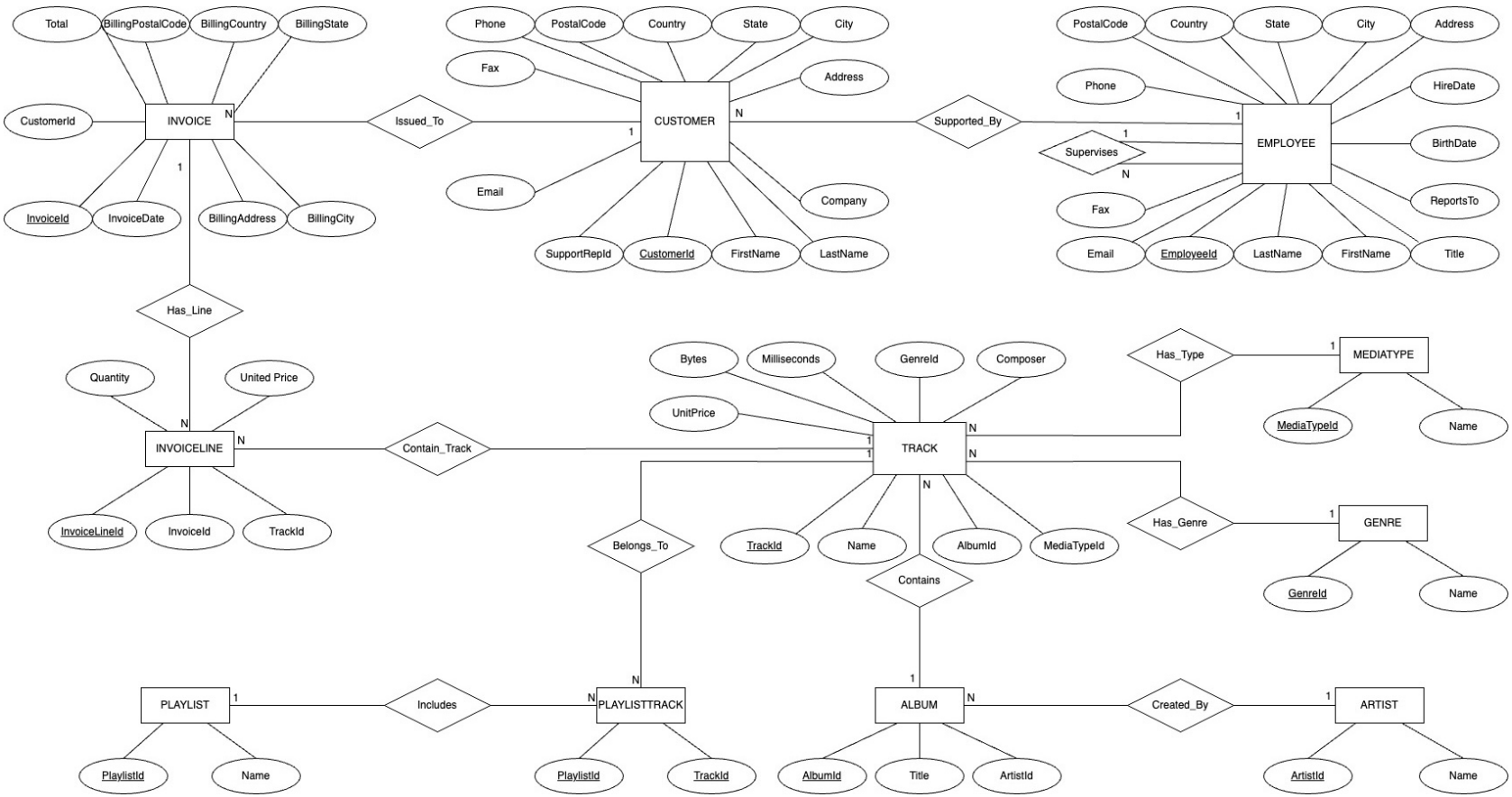


Problem 2 Remember the Chinook database?? It's baaaackkk!! :)

Based upon the relational schema (included below), reverse-map to produce an ER diagram for this digital media store.



Solution:


Total
BillingPostalCode
BillingCountry
BillingState
CustomerId
INVOICE
N
1
InvoiceId
InvoiceDate
BillingAddress
BillingCity
Issued_To
Phone
PostalCode
Country
State
City
Fax
Address
1
CUSTOMER
N
Email
Company
SupportRepId
CustomerId
FirstName
LastName
Supported_By
PostalCode
Country
State
City
Address
Phone
HireDate
1
1
Supervises
EMPLOYEE
BirthDate
N
ReportsTo
Fax
Email
EmployeeId
LastName
FirstName
Title
Has_Line
Quantity
United Price
N
INVOICELINE
N
InvoiceLineId
InvoiceId
TrackId
Contain_Track
Bytes
Milliseconds
GenreId
Composer
UnitPrice
1
1
TRACK
N
N
N
Has_Type
1
MEDIATYPE
MediaTypeId
Name
Has_Genre
1
GENRE
GenreId
Name
Belongs_To
TrackId
Name
AlbumId
MediaTypeId
Contains
N
1
PLAYLIST
1
Includes
N
PLAYLISTTRACK
PlaylistId
Name
PlaylistId
TrackId
1
ALBUM
N
Created_By
1
ARTIST
AlbumId
Title
ArtistId
ArtistId
Name

Problem 3 Produce a 3NF relational schema for the following narrative. Note any requirements that are not specified and make appropriate assumptions to complete the specification. (If you are not sure if an assumption is reasonable – ask!) Be sure to indicate foreign and primary keys where appropriate. If it helps, you may draw an ERD first, and then map to relations, but this is not required (nor would the ERD be considered/graded). Do NOT introduce artificial internal identifiers that are not mentioned in the narrative.

- All profiles have a unique id (e.g., 42), a unique URL, a name, and a picture. Each profile is either an organization or a human.
- An organization profile has a mission and a vision.
- A human profile can have any number of projects, each with a name distinct to that profile (e.g., "SQLiteDiff") and associated description (e.g., "Utility to facilitate fast feedback for learning SQL on a known SQLite database."). It can also have any number of employment positions: each such position has an order, which is unique within the profile (e.g., the first position vs second vs . . .); title; description; duration (start date, optional end date); and associated organization (assuming that the organization has a profile).

Solution:

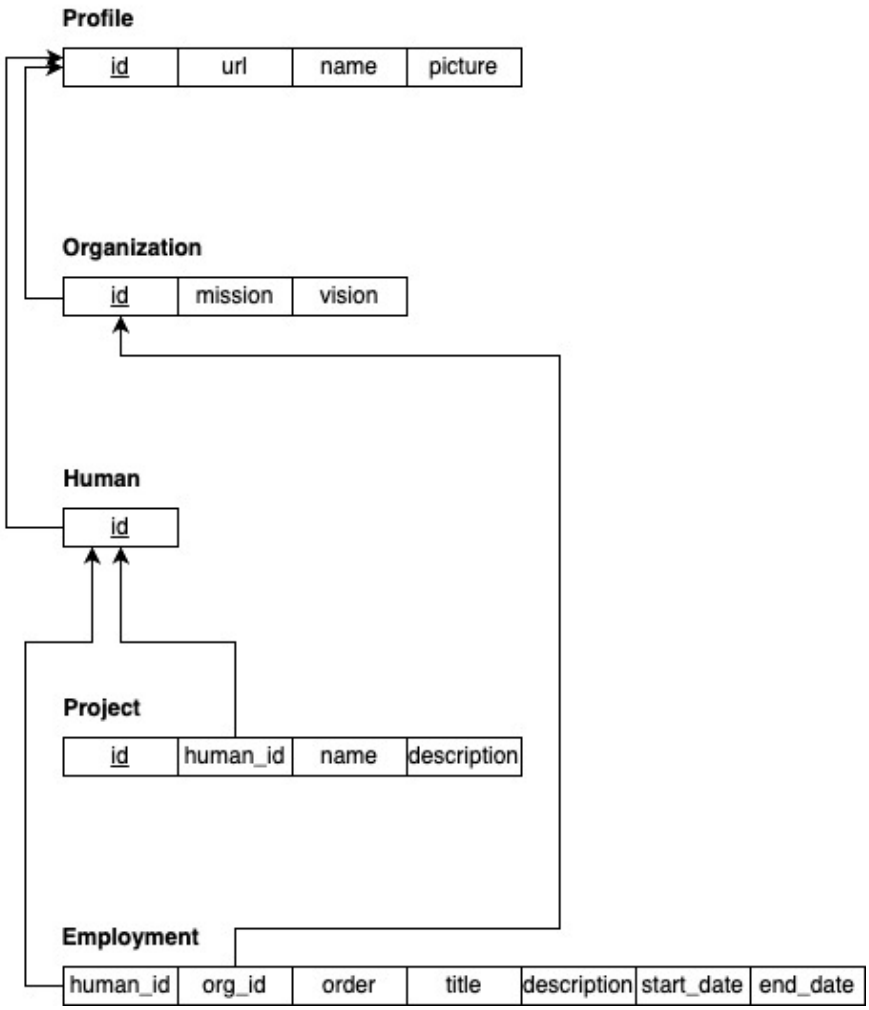


Table: Profile

Column Name	Data Type	Constraints
id	INT	PRIMARY KEY
url	VARCHAR(255)	UNIQUE, NOT NULL
name	VARCHAR(100)	NOT NULL
picture	VARCHAR(255)	
type	ENUM	NOT NULL ('Human', 'Organization')

Table: Organization

Column Name	Data Type	Constraints
id	INT	PRIMARY KEY, FOREIGN KEY (Profile.id)
mission	TEXT	
vision	TEXT	

Table: Human

Column Name	Data Type	Constraints
id	INT	PRIMARY KEY, FOREIGN KEY (Profile.id)

Table: Project

Column Name	Data Type	Constraints
id	INT	PRIMARY KEY
human_id	INT	FOREIGN KEY (Human.id)
name	VARCHAR(100)	NOT NULL, UNIQUE (human_id, name)
description	TEXT	

Table: Employment

Column Name	Data Type	Constraints
human_id	INT	FOREIGN KEY (Human.id)
org_id	INT	FOREIGN KEY (Organization.id)
order	INT	UNIQUE (human_id, order)
title	VARCHAR(100)	
description	TEXT	
start_date	DATE	
end_date	DATE	NULLABLE
PRIMARY KEY (human_id, org_id, order)		