Database diagrams & Cardinality

Database design

NIFR 2024

Capturing data model requirements

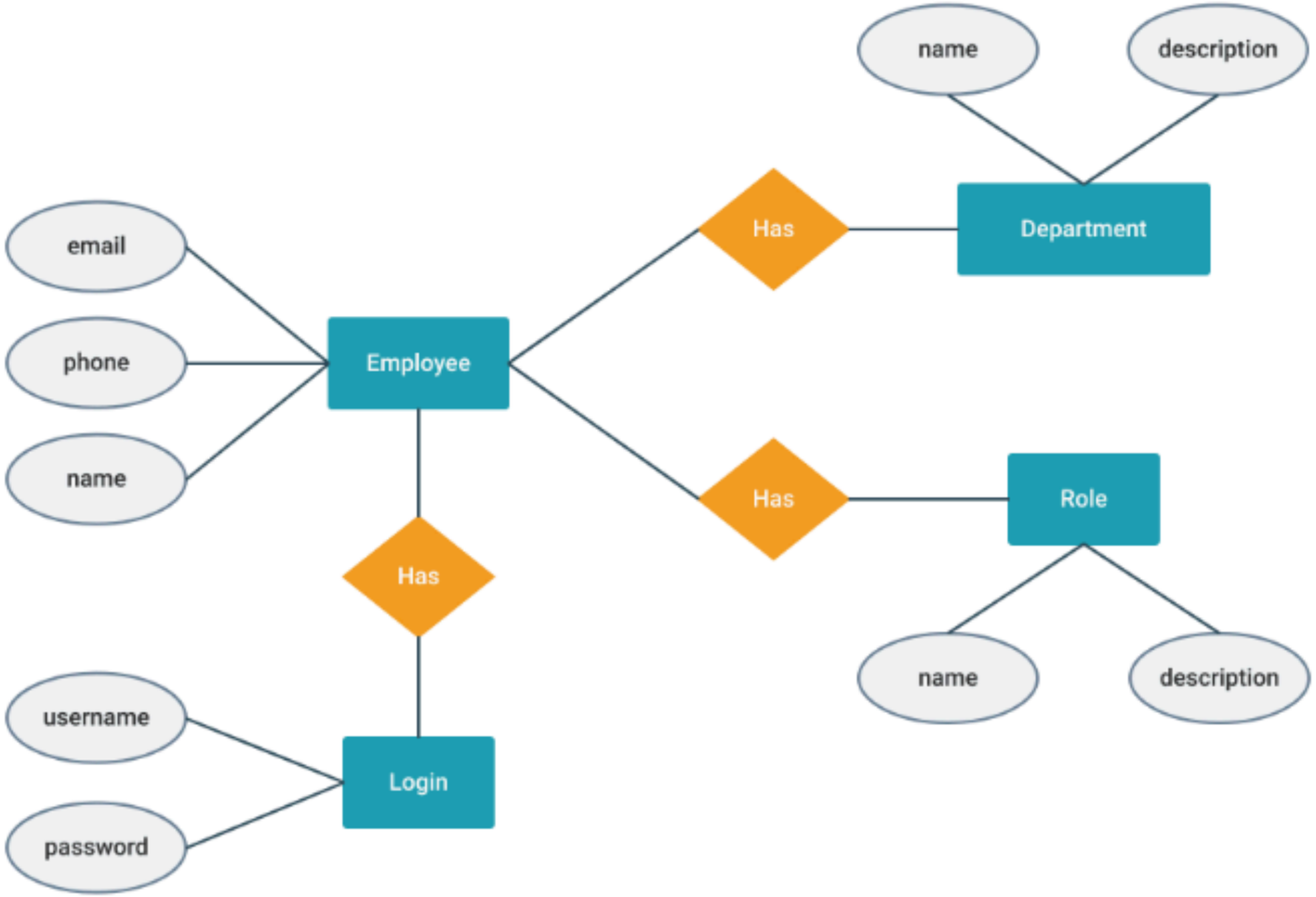
How the client described it

How the designer designed it

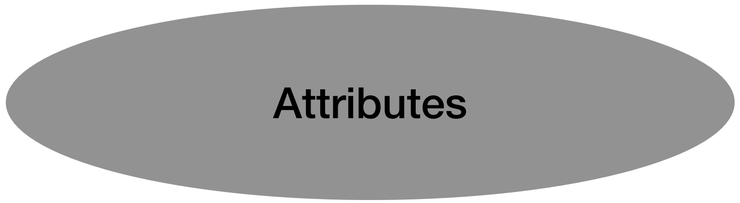
How the engineer developed it

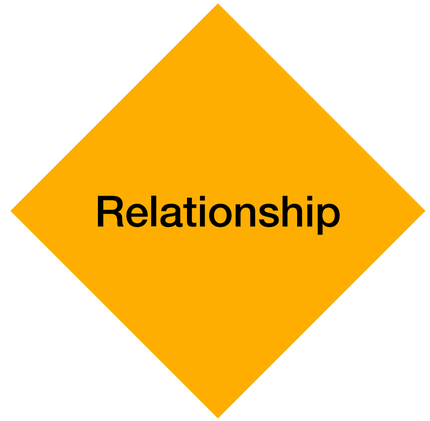
What the customer really wanted

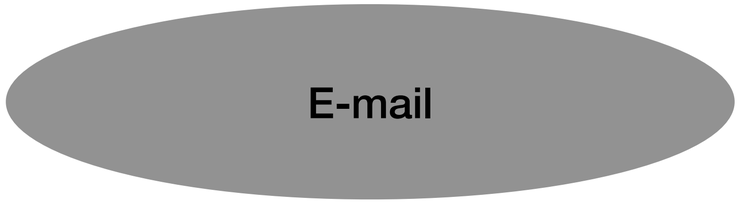
Entity Relationship Diagram (ERD)

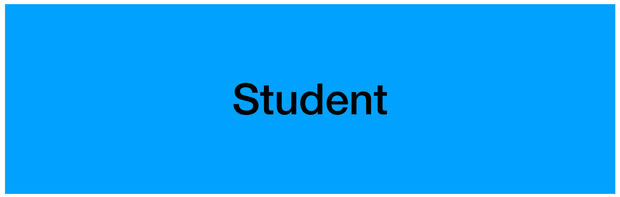


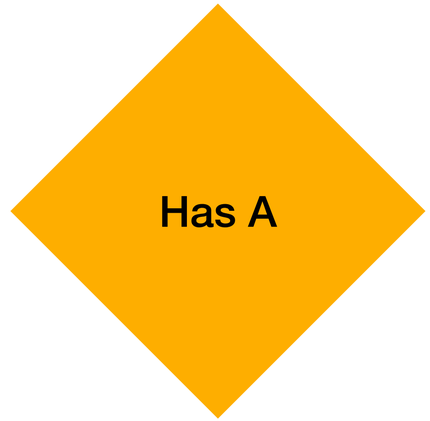
ERD Chen notation

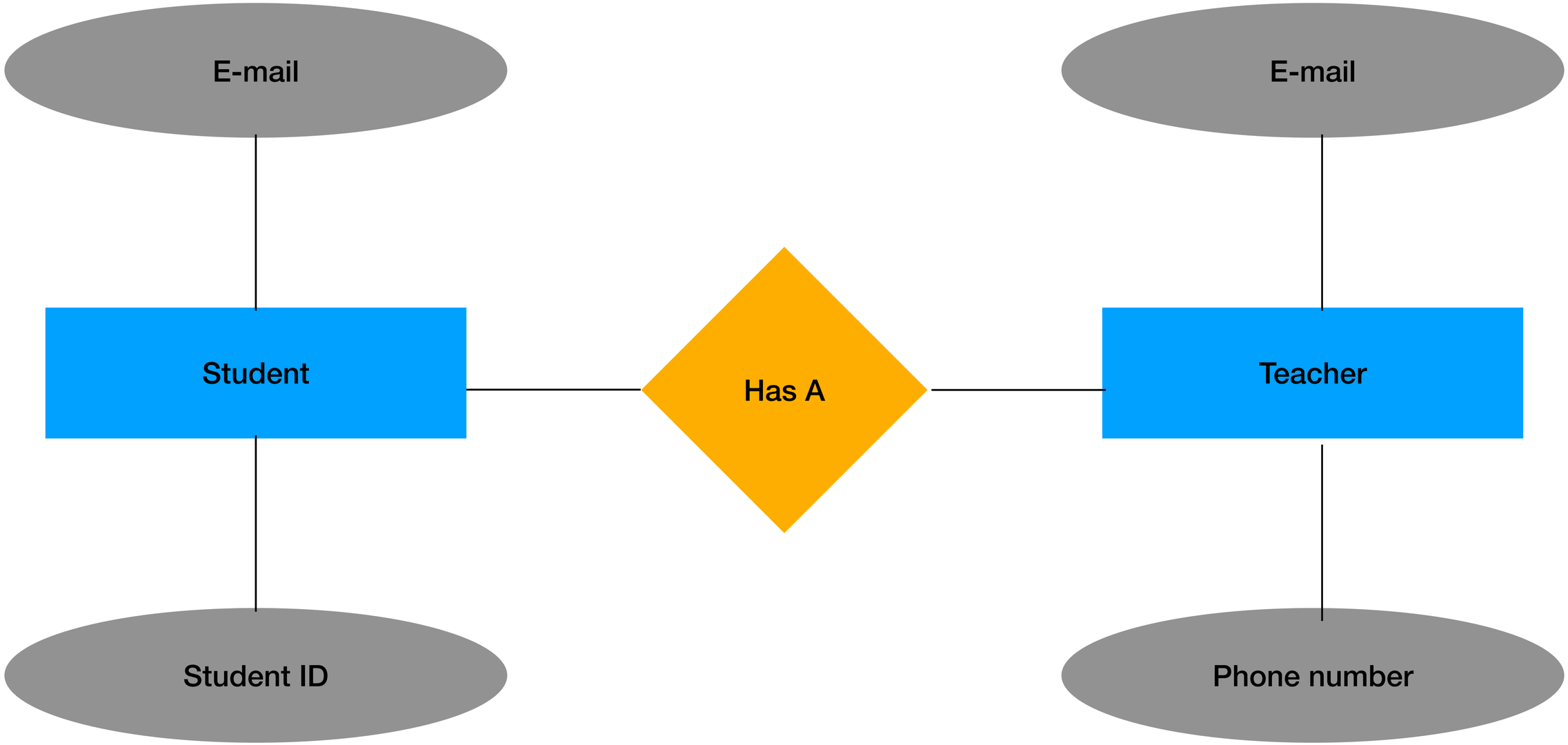











E-mail
E-mail
Student
Has A
Teacher
Student ID
Phone number

- **one-to-one (1:1)**

  The employee can manage only one department, and each department can be managed by one employee only:

- **one-to-many (1:N)**

  The customer may place many orders, but each order can be placed by one customer only:

https://vertabelo.com/blog/chen-erd-notation/

- **many-to-one (N:1)**

  Many employees may belong to one department, but one particular employee can belong to one department only:

- **many-to-many (M:N)**

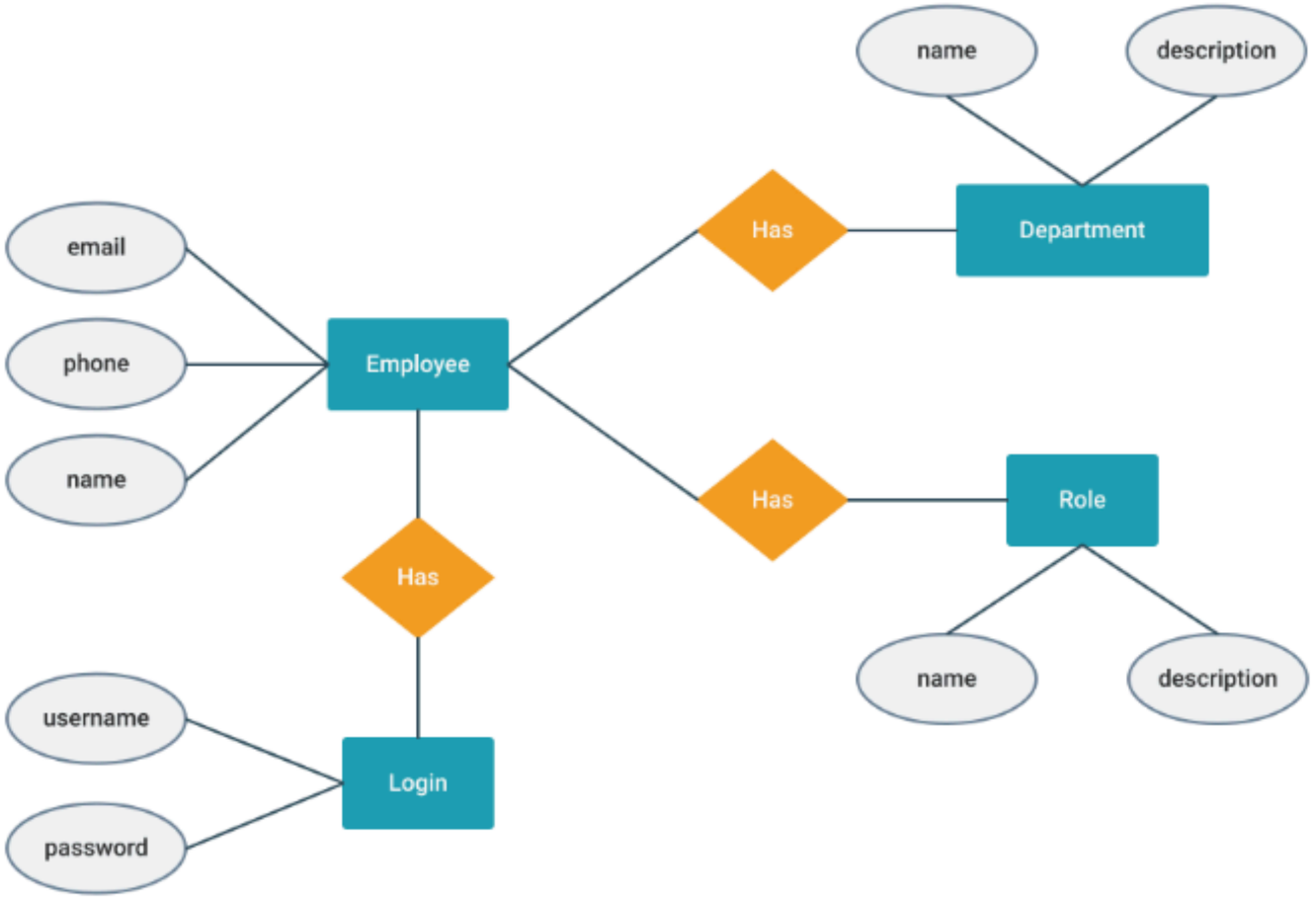
  One student may belong to more than one student organizations, and one organization can admit more than one student:

https://vertabelo.com/blog/chen-erd-notation/

Entity Relationship Diagram (ERD)

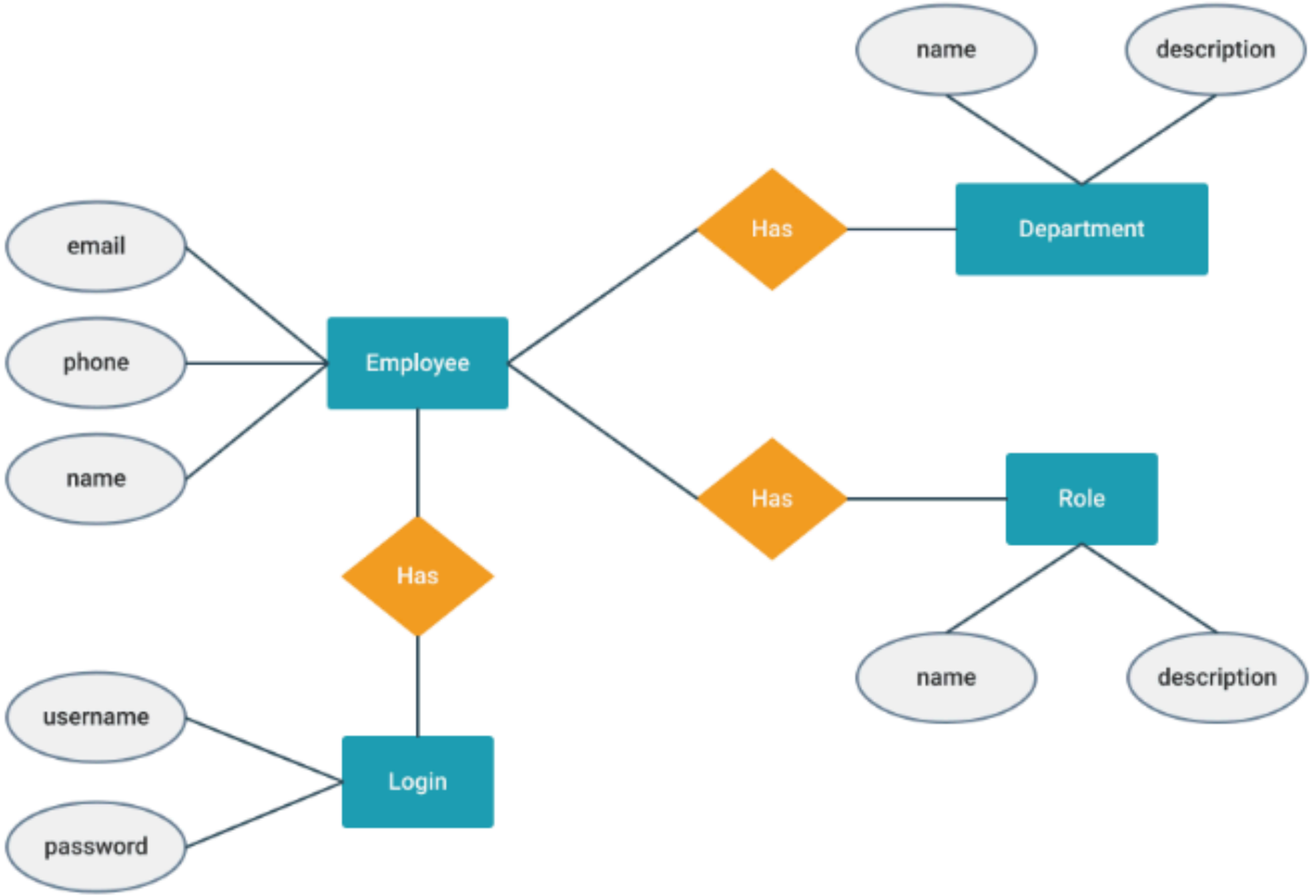
Why?

- Kommunikation
- Design
- Attributter
- Forhold



Logisk Design

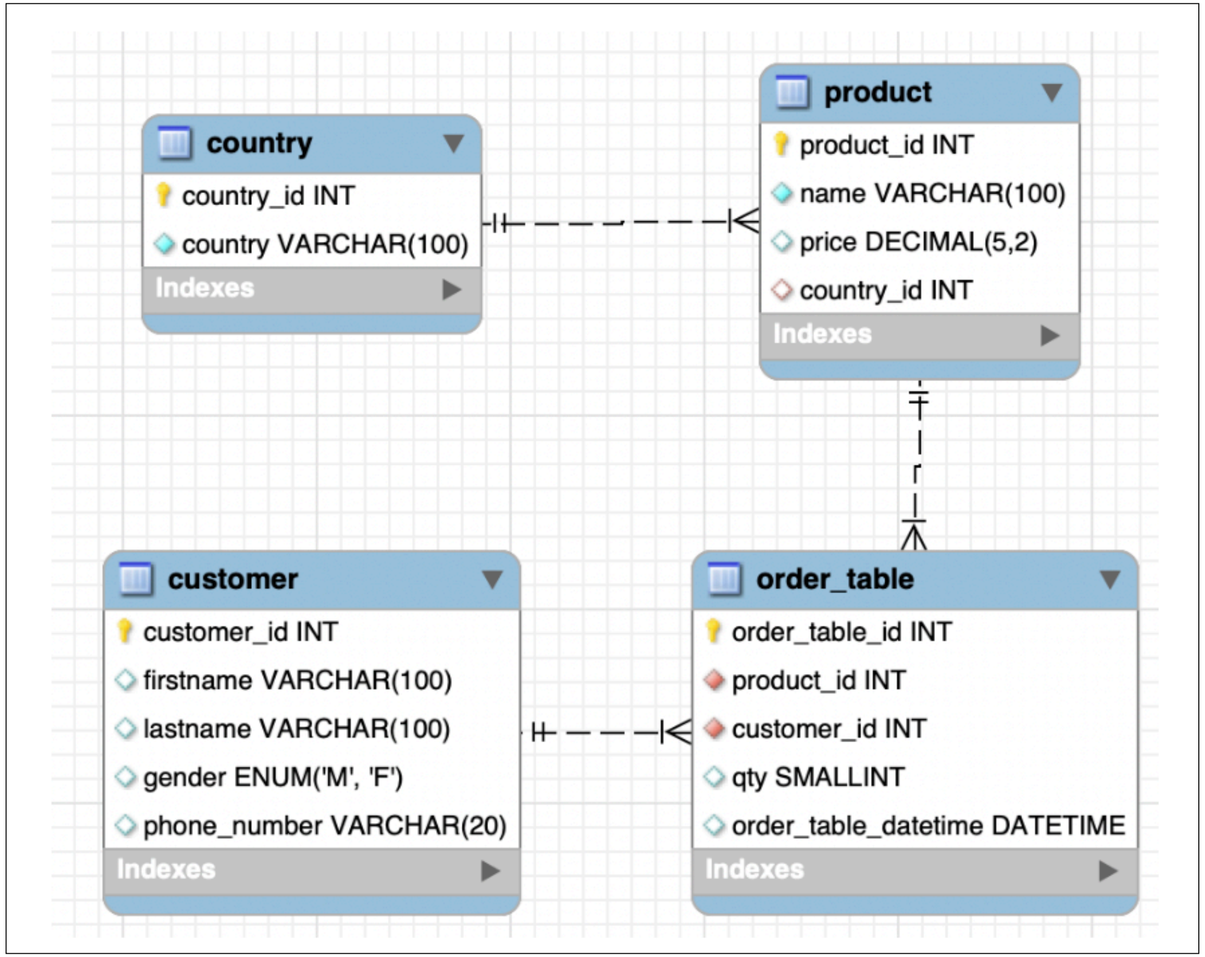
- Ingen datatyper
- Ingen fremmednøgler
- Ingen primærnøgler



Exercise 1 & 2

Fysisk Implementation

- Kan forward/reverse engineeres

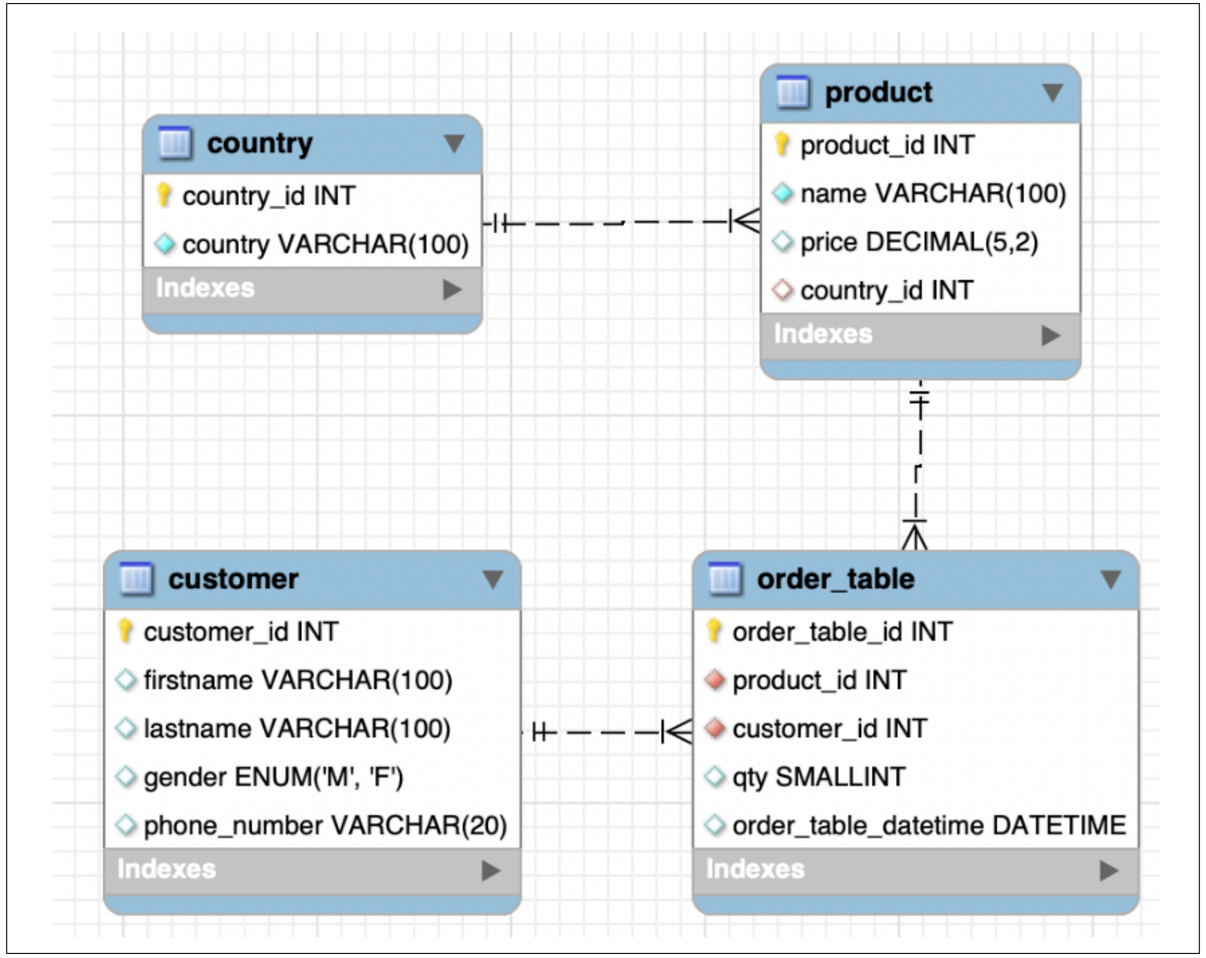


```sql
CREATE TABLE DEPT (
    DEPTNO INTEGER,
    DNAME VARCHAR(30),
    LOC VARCHAR(30),
    PRIMARY KEY (DEPTNO)
);
```

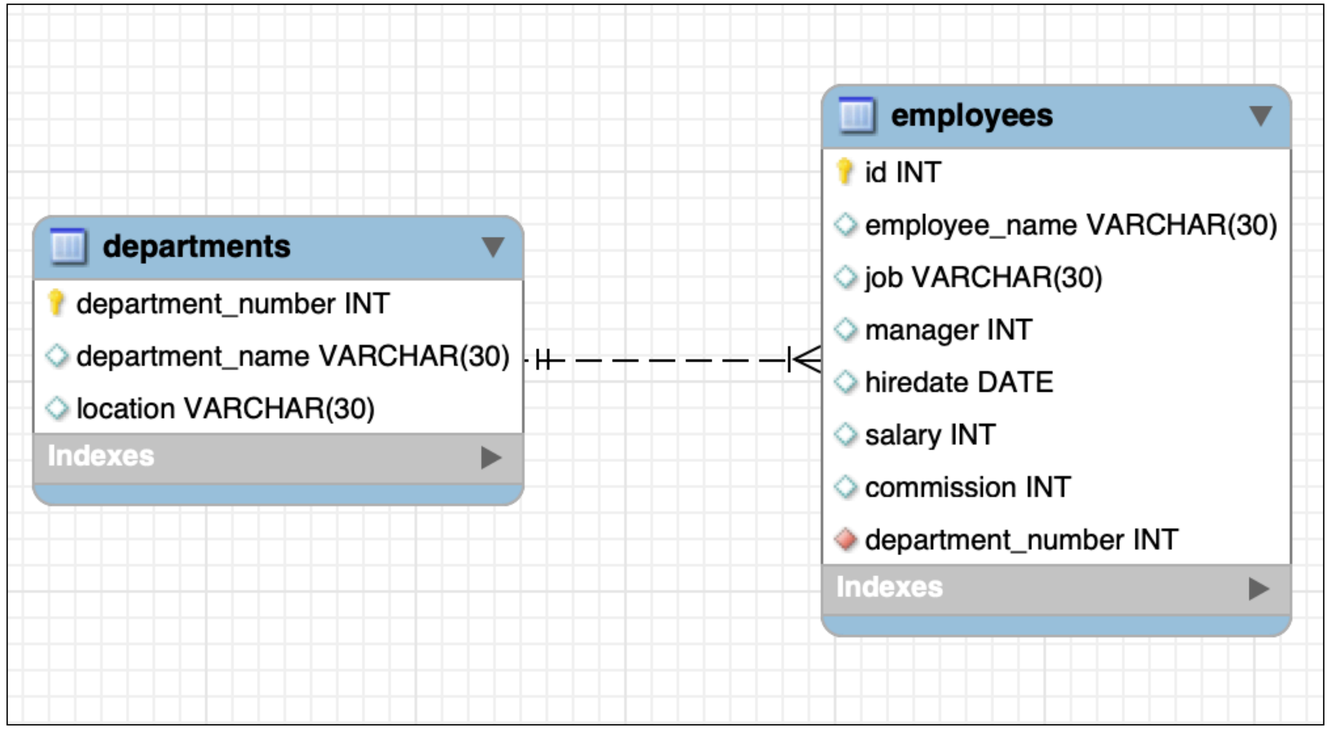
Data Query Language

Query > Response (Data)

Why?

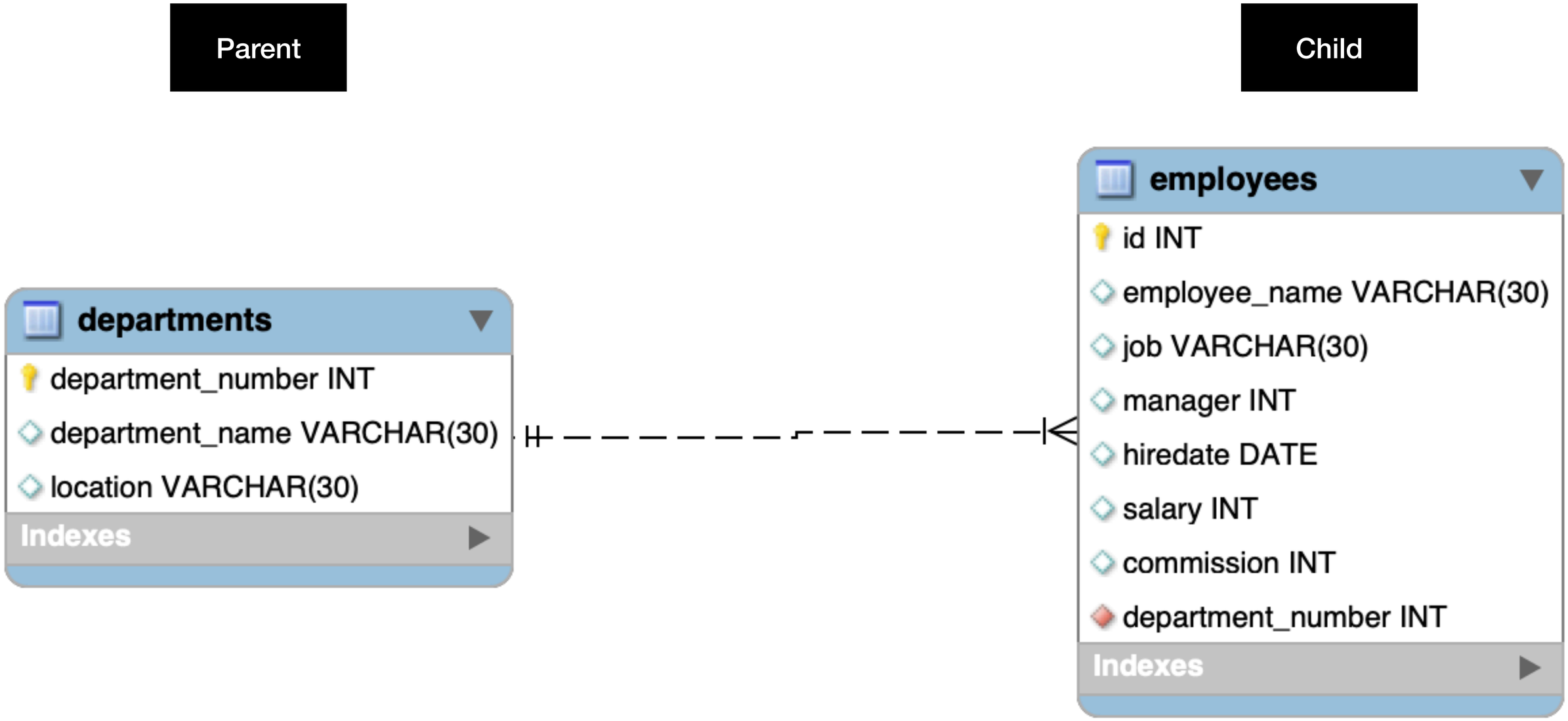

country
country_id INT
country VARCHAR(100)
Indexes
product
product_id INT
name VARCHAR(100)
price DECIMAL(5,2)
country_id INT
Indexes
customer
customer_id INT
firstname VARCHAR(100)
lastname VARCHAR(100)
gender ENUM('M', 'F')
phone_number VARCHAR(20)
Indexes
order_table
order_table_id INT
product_id INT
customer_id INT
qty SMALLINT
order_table_datetime DATETIME
Indexes

A Foreign Key: A reference to another tables primary key

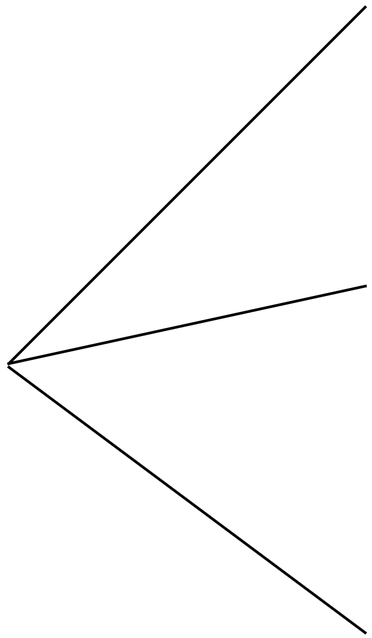


department_number	department_name	location
10	ACCOUNT…	NEW YORK
20	RESEARCH	DALLAS
30	SALES	CHICAGO
40	OPERATIO…	BOSTON

employee_name	job	department_number
SMITH	CLERK	20
ALLEN	SALESMAN	30
WARD	SALESMAN	30
JONES	MANAGER	20

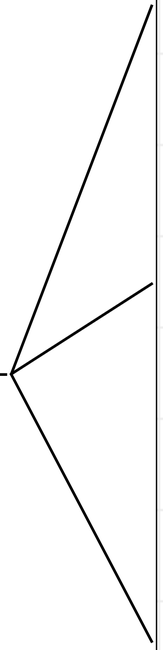

Parent
Child
departments
department_number INT
department_name VARCHAR(30)
location VARCHAR(30)
Indexes
employees
id INT
employee_name VARCHAR(30)
job VARCHAR(30)
manager INT
hiredate DATE
salary INT
commission INT
department_number INT
Indexes

department_name	location	department_number
ACCOUNTING	NEW YORK	10
RESEARCH	DALLAS	20
SALES	CHICAGO	30
OPERATIONS	BOSTON	40



department_number	employee_name	salary
20	SMITH	800
30	ALLEN	1600
30	WARD	1250
20	JONES	2975
30	MARTIN	1250
30	BLAKE	2850
10	CLARK	2450
20	SCOTT	3000
10	KING	5000
30	TURNER	1500

department_name	location	department_number
ACCOUNTING	NEW YORK	10
RESEARCH	DALLAS	20
SALES	CHICAGO	30
OPERATIONS	BOSTON	40

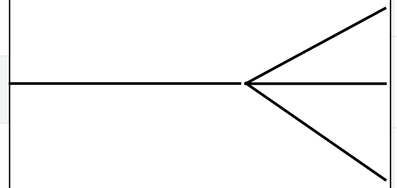


department_number	employee_name	salary
20	SMITH	800
30	ALLEN	1600
30	WARD	1250
20	JONES	2975
30	MARTIN	1250
30	BLAKE	2850
10	CLARK	2450
20	SCOTT	3000
10	KING	5000
30	TURNER	1500

Many employees

One department

department_name	location	department_number
ACCOUNTING	NEW YORK	10
RESEARCH	DALLAS	20
SALES	CHICAGO	30
OPERATIONS	BOSTON	40

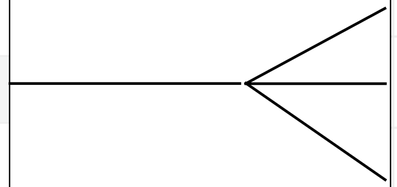


department_number	employee_name	salary
20	SMITH	800
30	ALLEN	1600
30	WARD	1250
20	JONES	2975
30	MARTIN	1250
30	BLAKE	2850
10	CLARK	2450
20	SCOTT	3000
10	KING	5000
30	TURNER	1500

Many employees

Many departments?

department_name	location	department_number
ACCOUNTING	NEW YORK	10
RESEARCH	DALLAS	20
SALES	CHICAGO	30
OPERATIONS	BOSTON	40



department_number	employee_name	salary
20	SMITH	800
30	ALLEN	1600
30	WARD	1250
20	JONES	2975
30	MARTIN	1250
30	BLAKE	2850
10	CLARK	2450
20	SCOTT	3000
10	KING	5000
30	TURNER	1500

Many employees

Many departments

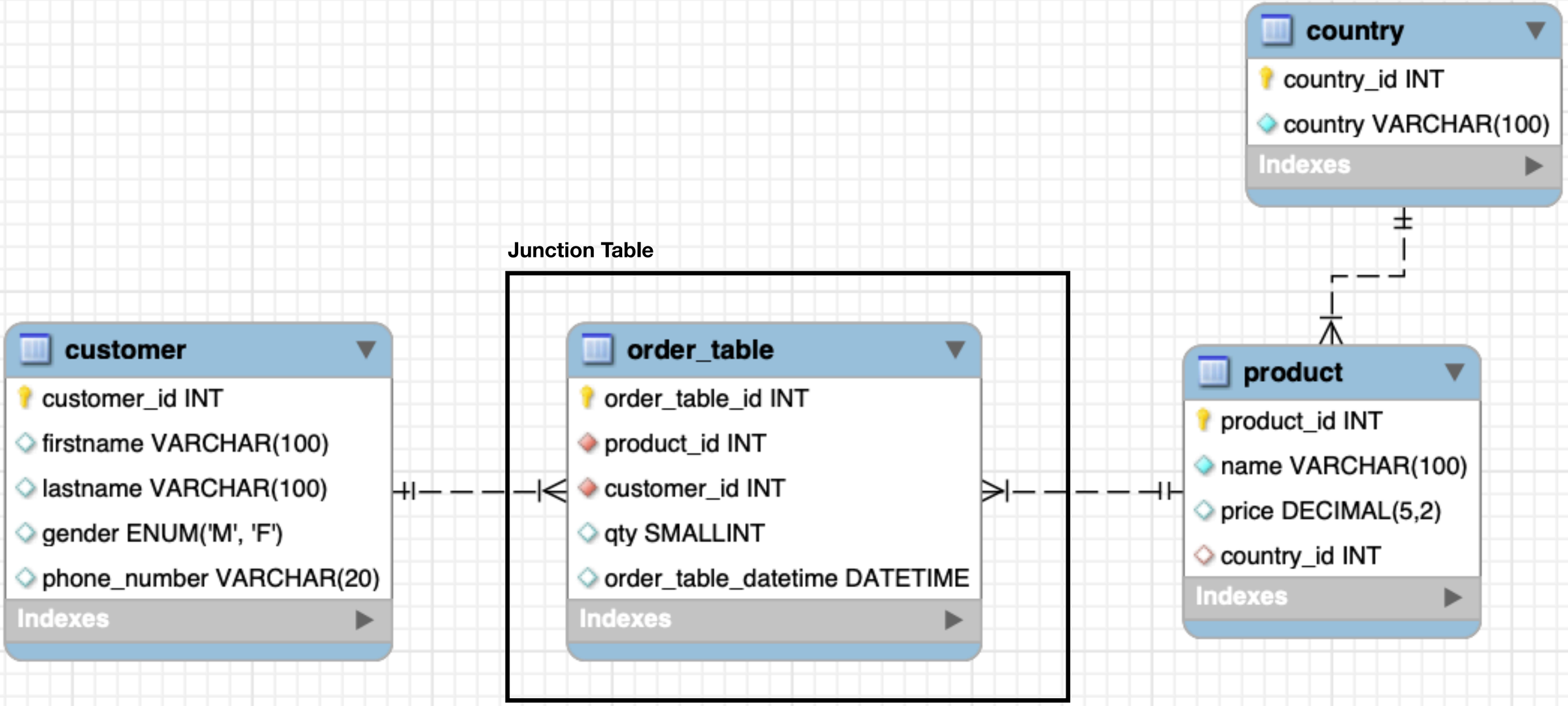
department_name	location	department_number
ACCOUNTING	NEW YORK	10
RESEARCH	DALLAS	20
SALES	CHICAGO	30
OPERATIONS	BOSTON	40

department_id	employee_id
30	7521
10	7369
20	7369
30	7369
10	7499
40	7499
30	7521

7369	SMITH
7499	ALLEN
7521	WARD
7566	JONES
7654	MARTIN

Junction table

Krydstabel


country
country_id INT
country VARCHAR(100)
Indexes
Junction Table
customer
customer_id INT
firstname VARCHAR(100)
lastname VARCHAR(100)
gender ENUM('M', 'F')
phone_number VARCHAR(20)
Indexes
order_table
order_table_id INT
product_id INT
customer_id INT
qty SMALLINT
order_table_datetime DATETIME
Indexes
product
product_id INT
name VARCHAR(100)
price DECIMAL(5,2)
country_id INT
Indexes

Exercise 3

Exercise 3: EER Diagram