The subject of the project:

Airline services: flights, passengers, personnel

Content of the project:

Creating a database for airline employees from various departments:

- sales department (reservation and sale of tickets)

- human resources department (employment)

- technical department (aircraft management)

- management department (flight schedule management)

A detailed description of the project:

The task was commissioned by the airline services. The database is to contain current information about tables of aircraft flights, passengers, and employees. The client requires the database to contain data on:

>Spreads of individual flights and routes assigned to them

>Airline tickets which vary depending on the specific class seats and the number of bought tickets

>Aircraft and crew serving the appropriate flight on a given route

The most important element that must appear in the base is the flight schedule containing information about all current flights. The database must contain information about which specific flight is active (selectable) and its booking by the user.

Limitations/Assumptions:

The database takes into account strictly 3 classes of passenger seats; economy class, business class, and invalid class- for disabled. It focuses only on 4 areas; reservation and sale of tickets, employment, aircraft management and finally flight schedule management.

Possible scenarios: (Functions)

-adding, deleting an aircraft, searching for it by its identification number, searching for all aircraft

-adding, deleting, airports, searching for it by airport name or country name, updating airport data

-adding, deleting a route, searching for it depending on the place of departure, arrival or both, updating the route

- adding a flight, searching for it by date or date and time (hour)

- adding, removing a customer, searching for him by name

- connecting a passenger with a selected flight, place and amount of baggage

- checking if there are free seats on the selected flight and reducing the number of free seats in the case of connecting a passenger with a flight

-adding, removing a function, searching for it by the name of the position, related to it, searching for all functions, ranked in relation to the position

- checking what planes are available at the airport when selecting a flight on a given day and at a given time

User's requirements:

-possibility to search for a travel route depending on the given place of arrival and departure

- the possibility of checking the flight date of the selected route depending on the given date and time, if you specify the time, flights scheduled also an hour earlier and later will be displayed, e.g. when 17:20 is entered, all flights between 16:00 and 18:00 will be displayed

- the possibility of selling a ticket for a selected flight

-possibility to choose the amount of luggage from the range of 0-3 (0 by default), the type of seat (economy class, business class, seat for the disabled-invalid class)

- the customer's data is the surname, first names and telephone number as well as the identification number (a string of digits provided by the customer - maximum 6 digits)

- the ability to search for all functions

- the ability to add functions to the selected position

- the ability to remove the selected employee

- no possibility to remove an employee who is taking part in a flight

- possibility to add an aircraft with an identification number (string of characters not longer than 7), the number of seats for each of the three types

-possibility to remove the plane if it is not used

-possibility to display all aircraft

-possibility to add an airport with a given name and country in which it is located

-possibility to search for an airport by name of the airport or country

-possibility to delete the selected airport if there are no flights there

- the ability to add a route by selecting the place of departure and arrival and entering the flight and price

- the ability to update the selected route

-possibility to delete the selected route if there are no flights related to it

- the ability to add a flight to the selected route along with adding employees, associated with the flight and their functions, and selecting the aircraft available at the airport (from which the flight is to take place)

Inquiries to the database:

-What time does the plane with id ‘RY623’ arrived to Berlin on 23 of July in 2022 on route from Berlin to London?

-How many seats in business class were occupied during flight with id ‘LOS5423’ on 12 of March in 2022 on the route from Paris to Warsaw at 7:54:00?

-Did Robinson Alfred Crusoe travelled across the North Sea by the plane during the week 22-27 of September in 2022?

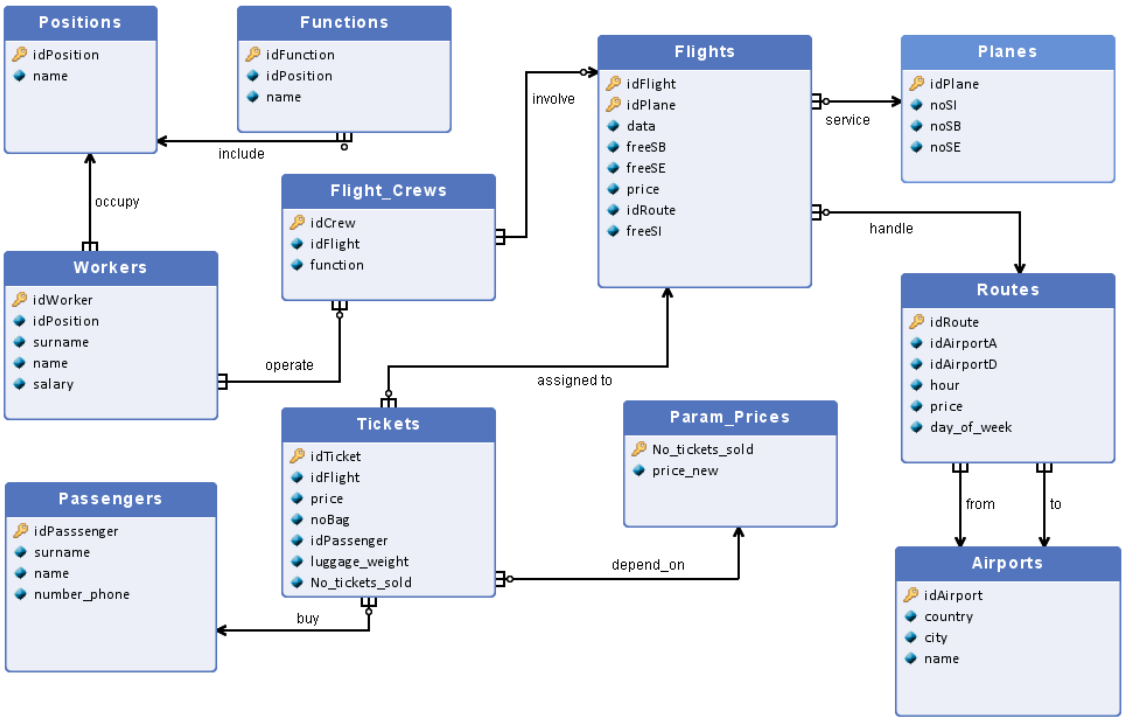
-What is the value of parameter price in case of selling 180 tickets for the specific flight?

-What position does the worker Robert Bielski hold? What salary, depending on his job does he earn?

-What is the city location of the airport with name of Charles de Gaulle, which is located in France?

-What time does the route takes place from Brussels to Bern on Mondays, which cost for ticket is estimated to around 248$?

Diagram ERD:



Set of entities:

Set of entity 1: Flights
Description

Quantity: about 400 000 For the current situation airline services at most 1 586 flights per day. They contain crucial information on what route it is on, what aircraft was used, when and at what time it takes place, and the number of free seats of each of the four types.			
Attributes			
Name	**Primary key**	**Type/Domain**	**Description**
idFlight	YES	Varchar(7)	Specific code of flight which contains 3 characters and 4 digits etc. DOS5634
idPlane	YES	Varchar (7)	Unique identifier of flight
data	NO	Contains the definite date in a specific format YYYY-MM-DD (year, month, day) etc. 2023-08-03	The particular date of the flight
freeSI	NO	Integer	Number of free seats of invalid class
freSB	NO	Integer	Number of free seats of business class
freeSE	NO	Integer	Number of free seats of economy class
price	NO	Numeric	Monetary unit of dollars ($), which describes the value of the specific ticket etc. 489
idRoute	NO	Integer	Unique identifier of route

Set of entity 2: Airports			
Description			
Quantity: about 24 Describes the airport, its name, and the country in which it is located.			
Attributes			
Name	**Primary key**	**Type/Domain**	**Description**
idAirport	YES	Char(3)	Unique identifier of airport
country	NO	Varchar(50)	Name of the country, where the specific airport is located
city	NO	Varchar(50)	Name of the city, where the specific airport is located
name	NO	Varchar(30)	Name of the airport

Set of entity 3: Tickets
Description

Quantity: about 100 000 000 Lists the passengers on the flight, the price of the seat, the amount of baggage, the cost of the ticket, and the quantity of tickets.			
Attributes			
Name	**Primary key**	**Type/Domain**	**Description**
idTicket	**YES**	**Integer**	Unique identifier of ticket
idFlight	NO	Varchar(7)	Specific code of flight which contains 3 characters and 4 digits etc. DOS5634
idPassenger	NO	Integer	Unique identifier of passenger
No_tickets_sold	NO	Integer	Number of sold tickets per flight
price	NO	Numeric	Presents the cost of the ticket for the flight
noBags	NO	Integer	Number of baggage
LuggageWeight	NO	Integer	The weight of main luggage

Set of entity 4: Routes			
Description			
Quantity: about 20 000 Describes between which airports the route takes place, its time, price, and day of the week.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idRoute	YES	Integer	Unique identifier of route
idAirportA	NO	Char(3)	Describes the unique identifier of the arrival airport; final destination of the flight.
idAirportD	NO	Char(3)	Describes the unique identifier of the departure airport, from which the plane sets off.
hour	NO	Contains the definite time in a specific format hh:mm:ss (hour, minutes, seconds) etc. 07:08:00	Determines the specific hour of departure/arrival time.
price	NO	Numeric(7,2)	Monetary unit of dollars ($), which describes the value of the route
day_of_week	NO	Varchar(10)	Describes the particular day of the week, when the route should go ahead.

Set of entity 5: Planes			
Description			
Quantity: about 50 Describes the aircraft, its identification number, and the number of available seats.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idPlane	YES	Varchar(7)	Unique identifier of a plane
noSE	NO	Integer	Presents the number of free seats in economy class
noSB	NO	Integer	Presents the number of free seats in business class
noSI	NO	Integer	Presents the number of free seats in invalid class

Set of entity 6: Passengers			
Description			
Quantity: about 80 000 000 Describes the passenger, their identification number, surname, first name, address, and phone number.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idPassenger	YES	integer	Unique identifier of a passenger
surname	NO	Varchar(30)	The surname of the passenger
names	NO	Varchar(30)	Names of the passenger
numer_phone	NO	Varchar(12)	Number phone of the passenger

Set of entity 7: Positions			
Description			
Quantity: 38 Describes the positions in which employees can work.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idPosition	YES	Integer	Unique identifier of the position
name	NO	Varchar(50)	Name of the specific position

Set of entity 8: Functions			
Description			
Quantity: 62 Describes the functions that an employee in a given position can perform.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idFunction	YES	Integer	Unique identifier of a function
idPosition	YES	Integer	Unique identifier of the position
name	NO	Varchar(100)	Name of the specific function

Set of entity 9: Workers			
Description			
Quantity: 50 Describes the employee, his surname, first names and salary, and the position in which he works.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idWorker	YES	Integer	Unique identifier of a worker
idPosition	NO	Integer	Unique identifier of the position
surname	NO	Varchar(30)	The surname of the worker
names	NO	Varchar(30)	First names of the worker
salary	NO	Numeric	Money, which workers get for doing their job

Set of entity 10: Flight_Crew			
Description			
Quantity: 22 Describes the flight crew with specific functions.			
Attributes			
Name	**Primary key**	**Type**	**Description**
idCrew	YES	Integer	Unique identifier of a worker
idFlight	NO	Varchar(7)	Unique identifier of the flight
function	NO	Varchar (255)	Name of the specific function

Set of entity 11: Param_Price			
Description			
Quantity: 10 Describes the parameter price which depends on number of sold tickets for specific flight. Basically it can be higher than 0 and lower than 10 (by default it is assigned to 0).			
Attributes			
Name	**Primary key**	**Type**	**Description**
No_sold_tickets	YES	Integer	Number of sold tickets per flight
Price_new	NO	Numeric	Monetary unit of dollars ($), which describes the new value of the flight, which was created after

			calculating the parameter price from basic value of flight

Description of Relationships:

Name of relationship	Set of entities		Count of relationship	Description
	Set of entity 1	Set of entity 2		
include	Positions	Functions	1 : 0..n	Represents that positions require some assigned to them functions. They may include zero or many functions, while functions can be exploited by exactly one position.
occupy	Positions	Workers	1 : 1..n	Represents that workers have special responsibilities which are depending on their status of work. Since, workers might occupy exactly one position, positions can be taken by one or many workers.
operate	Workers	Flight_Crews	1…n : 0..n	Represents that employees from the crew have detailed duties on the plane. So, workers might operate zero or many shifts on plane, while the flight crew's duty can be operated by exactly one or many workmen.
buy	Passengers	Tickets	1 : 0..n	Represents that passengers have opportunity to buy tickets on chosen flight. Since, they might purchase zero or many tickets, tickets are assigned to exactly one passenger.
assigned to	Tickets	Flights	0..n : 1	Represents that tickets concern particular flights, they cannot be used on different flight. So, tickets are assigned to exactly one flight, while flights can be occupied by zero or many tickets.
service	Flights	Planes	0..n : 1	Represents that particular planes are assigned to flights, which means they might service zero (cancelled flights) or many flights. So, appropriate flights are serviced by exactly one plane.

handle	Flights	Routes	0..n : 1	Represents that flights determine earlier planned routes. Which means, they handle exactly one route, while routes are handled by zero or many flights.
to	Routes	Airports	1..n : 1	Represents the way which has to be recorded to the final position. Which means it determines the specific route to exactly one arrival airport, while arrival airport is serviced by one or many routes.
from	Routes	Airports	1..n : 1	Represents the way which has to be recorded from the initial position. Which means it determines the specific route from exactly one departure airport, while departure airport is serviced by one or many routes.
involve	Flight_Crews	Flights	1..n : 0..1	Represents that flight crew work on specific flights. Since workers' shifts might involve exactly zero or one flight, flights can be involved by one or many flight crew' shifts.
depend on	Tickets	Param_Prices	0..n : 1	Represents that parameter price depends on the number of sold tickets. Since, tickets might depend on zero or many parameter prices, parameter prices can be dependent on exactly one factor.

RDS SCHEMA:

1. Functions (idFunction, idPosition REF Positions, name)
2. Positions (idPosition, name)
3. Workers (idWorker, surname, name, salary,

idPosition REF Positions)

4. Flight_Crews (idCrew, function, idWorker REF Workers, idFlight REF Flights)
5. Operating(idCrew REF Flight_Crews, idWorker REF Workers)
6. Flights (idFlight, idPlane REF Planes, data, freeSB, freeSE, freeSI, price, idRoute REF Routes)
7. Planes (idPlane, noSI, soSB, noSE)
8. Routes (idRoute, hour, price , day_of_week, idAirportA REF Airports, idAirportD REF Airports)
9. Airports (idAirport, country, city, name)
10. Param_Price (No_tickets_sold, price_new)
11. Tickets (idTicket, price, noBag, luggage-weight, idFlight REF Flights, idPlane REF Flights, idPassenger REF Passengers, No_tickets_sold REF Param_Prices)
12. Passengers (idPassenger, surname, name, number_phone)