DBMS
Course Design Report

Design Topic:	**online airplane management database**
Mentor	Assistant teacher of prof. Chen jianxia
Profession	**prof. Chen jianxia**
Class	19lc software engineering
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Date	14-12-2020

Catalog

System operation environment description

System overview

Develop an Internet airline reservation system in two different ways. ***Both systems shall be client server systems****. The first is to apply all the business logic in the thin client and server. Then, the system should be refactored into a system with thick clients, in which as much business logic as possible is executed by the clients. When a* ***customer opens the client page****, there should be a way to select the city of departure and destination and the date of travel. You can also choose an airline. The system should be able to find and Book itineraries by merging flights from different airlines. Each airline has its own database. When merging flights, the time required for connecting airports should be considered, i.e. connection time. When booking all flights of the same airline, the price will be discounted according to the airline's own discount (%).*

System requirements analysis Requirement

The system shall have the following use cases:

1. find the best (price or time) itinerary between a and B, including the following use cases:

    - *Choose the city of departure,*
    - *Select the destination city,*
    - *Select the date,*
    - *Choose to sort by price or by travel time,*
    - *Choose the number of people. Only consider flights with enough seats.*

2. Use the following sub use case to book travel:

    - *select trip from the previous use case,*
    - *select seat preference (window, aisle or middle),*
    - *input passenger data,*
    - *submit the booking and get a receipt.*

3. Cancel the trip.

Other use cases can also be considered

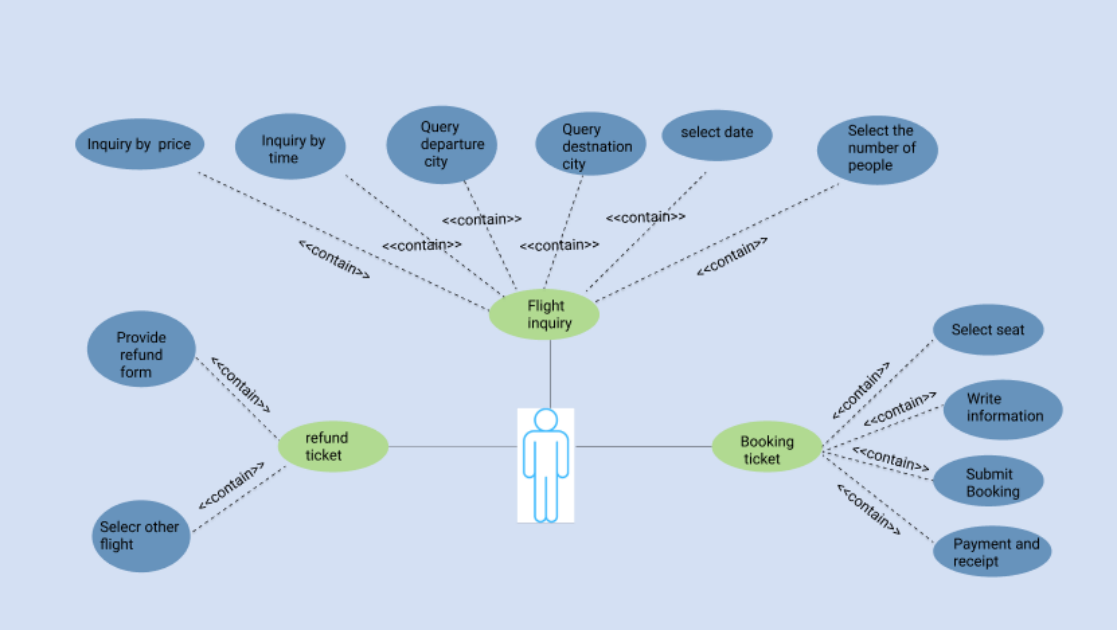
1.2 team division

This project made by 苏贝尔. 1811562127

Organization chart and Data flow graph and data dictionary

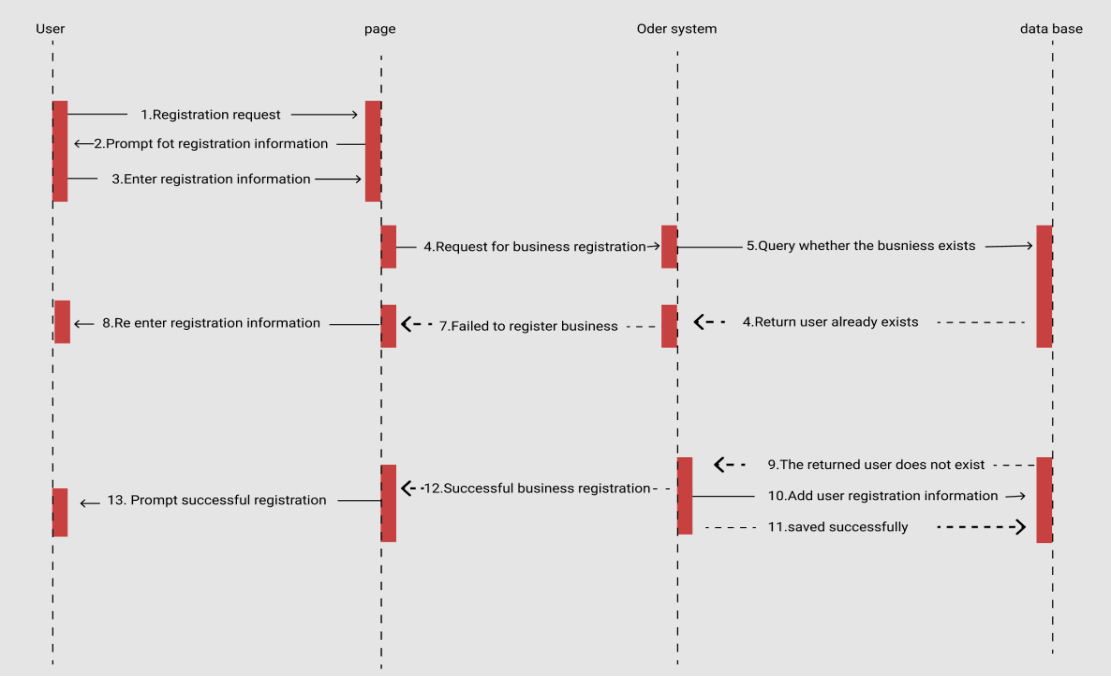
3 UML modeling

3.1 Use case diagram

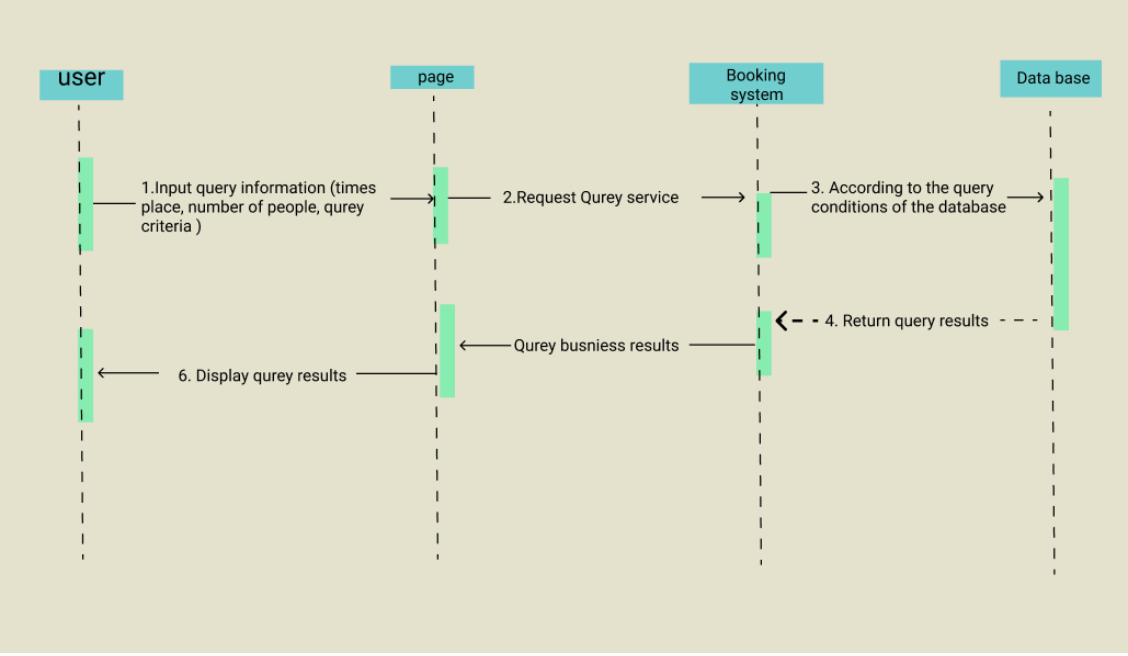


3.2Three layer C / S structure

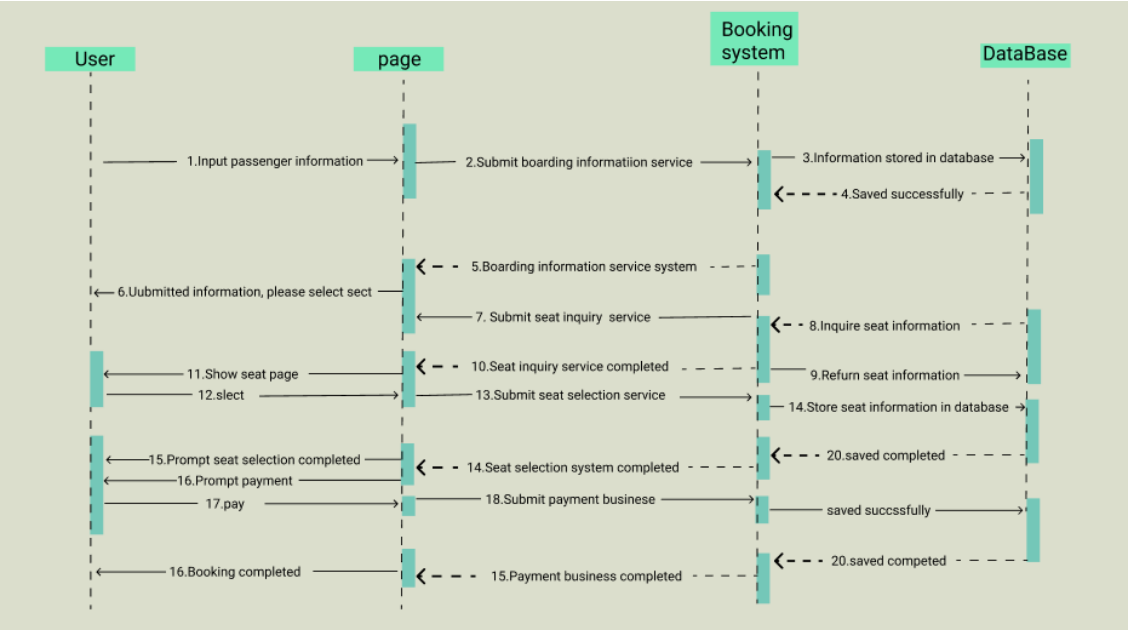
3.2.1 user registration sequence diagram



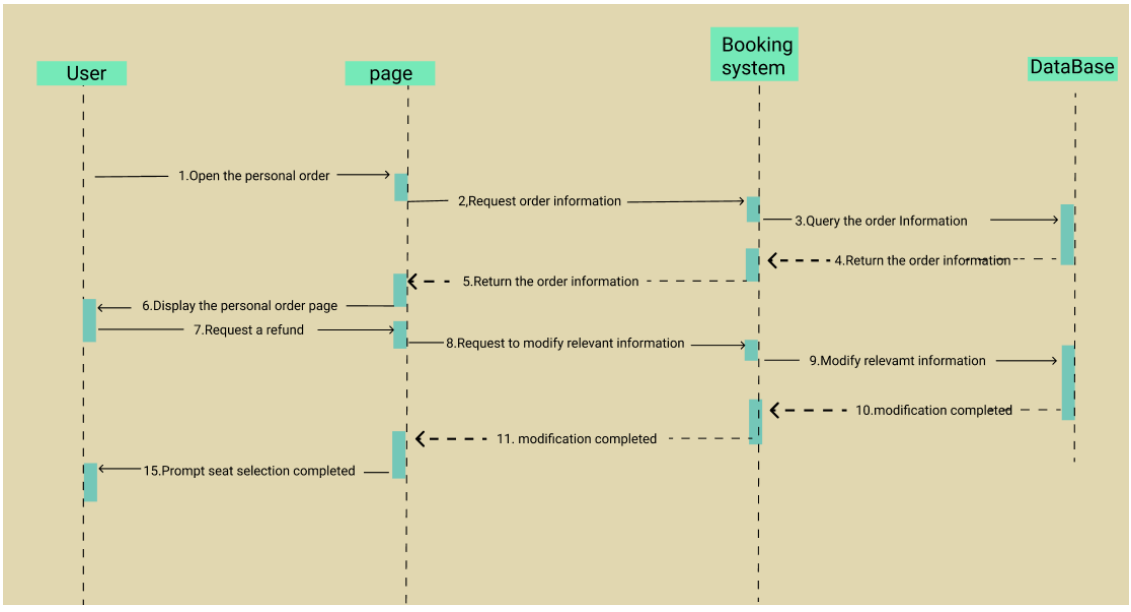
3.2.2 flight query sequence diagram



3.2.3 User booking sequence diagram

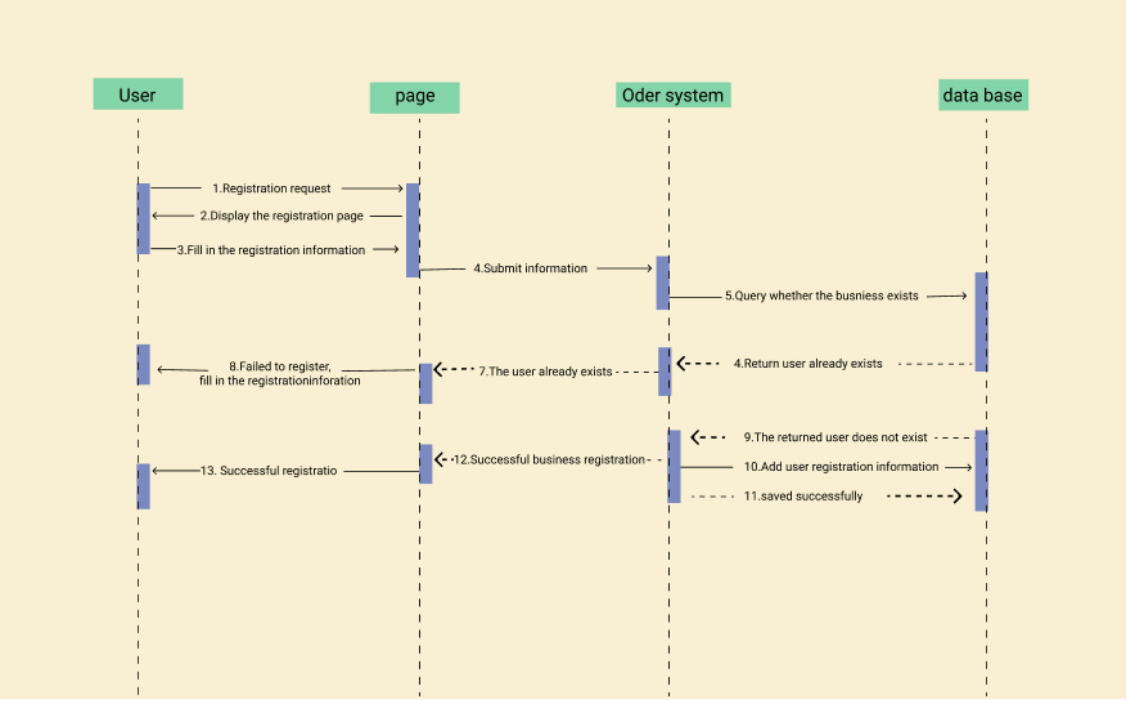


3.2.4 User refund sequence diagram

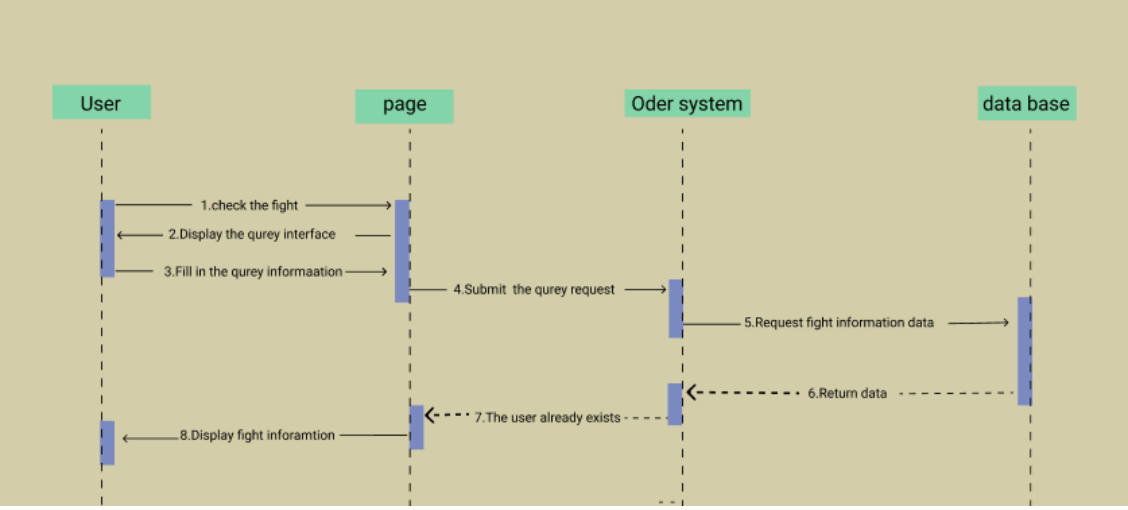


3.3 two-layer C / S structure

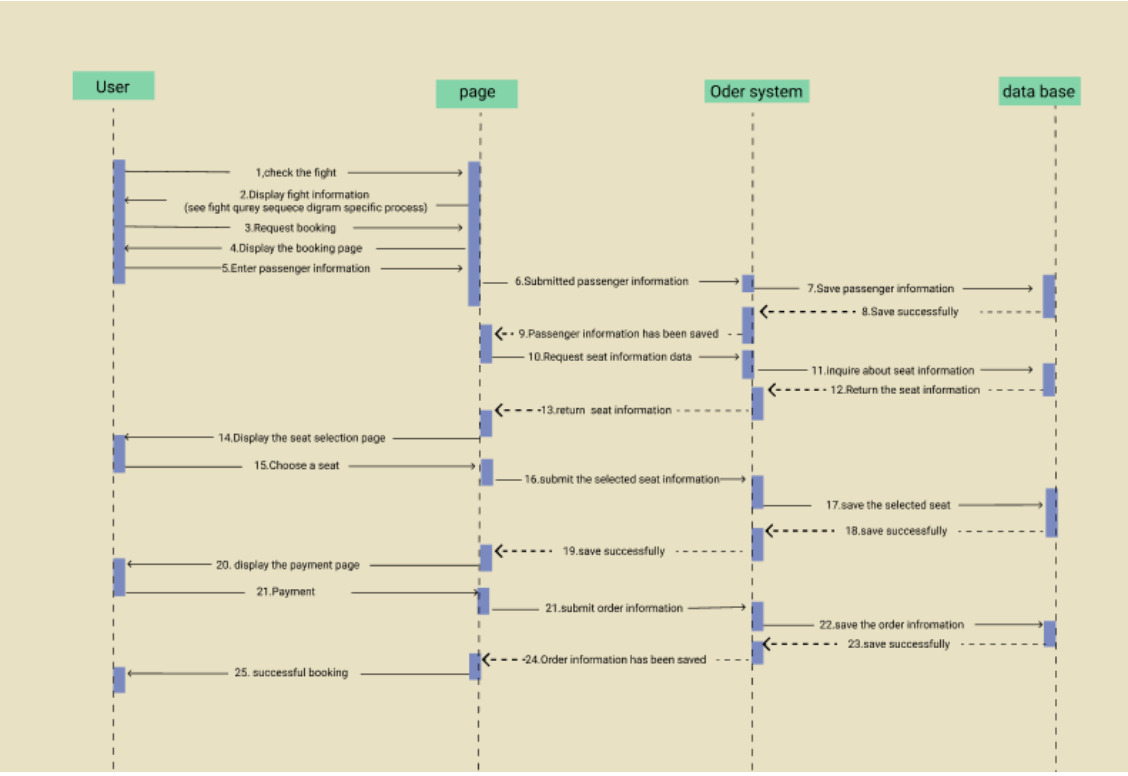
3.3.1 User registration timing chart



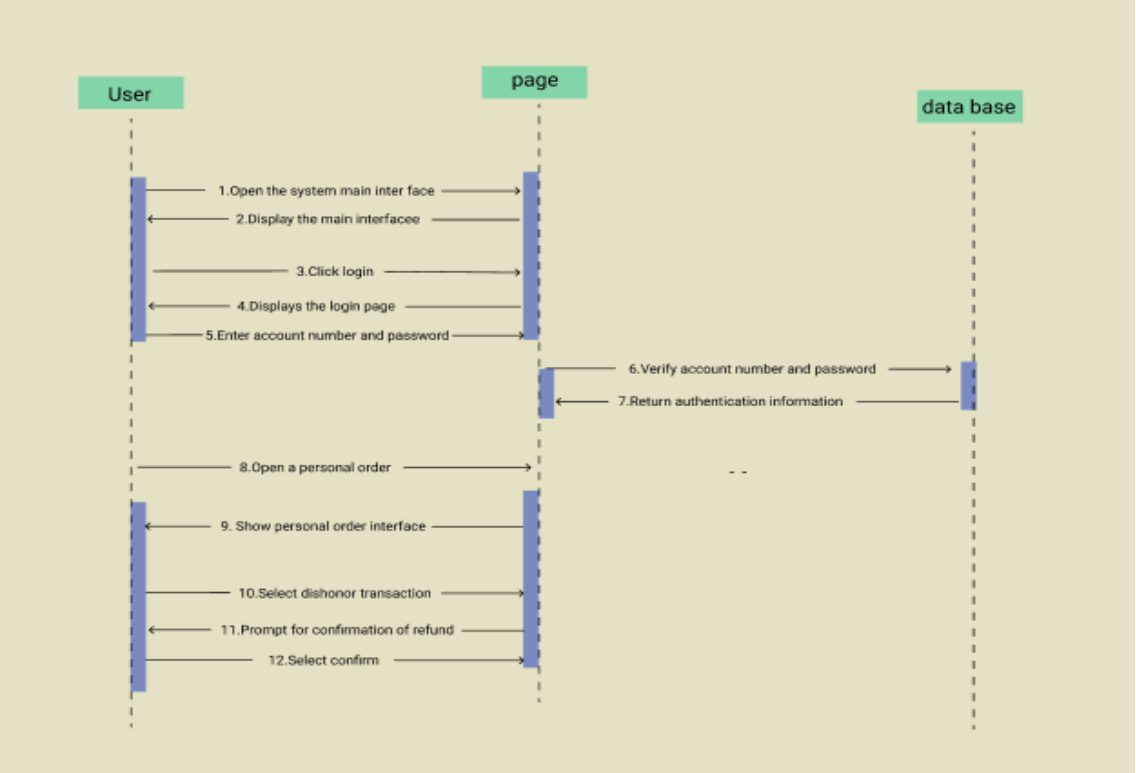
3.3.2 Fight inquiry sequence diagram



3.3.3 User booking sequence diagram



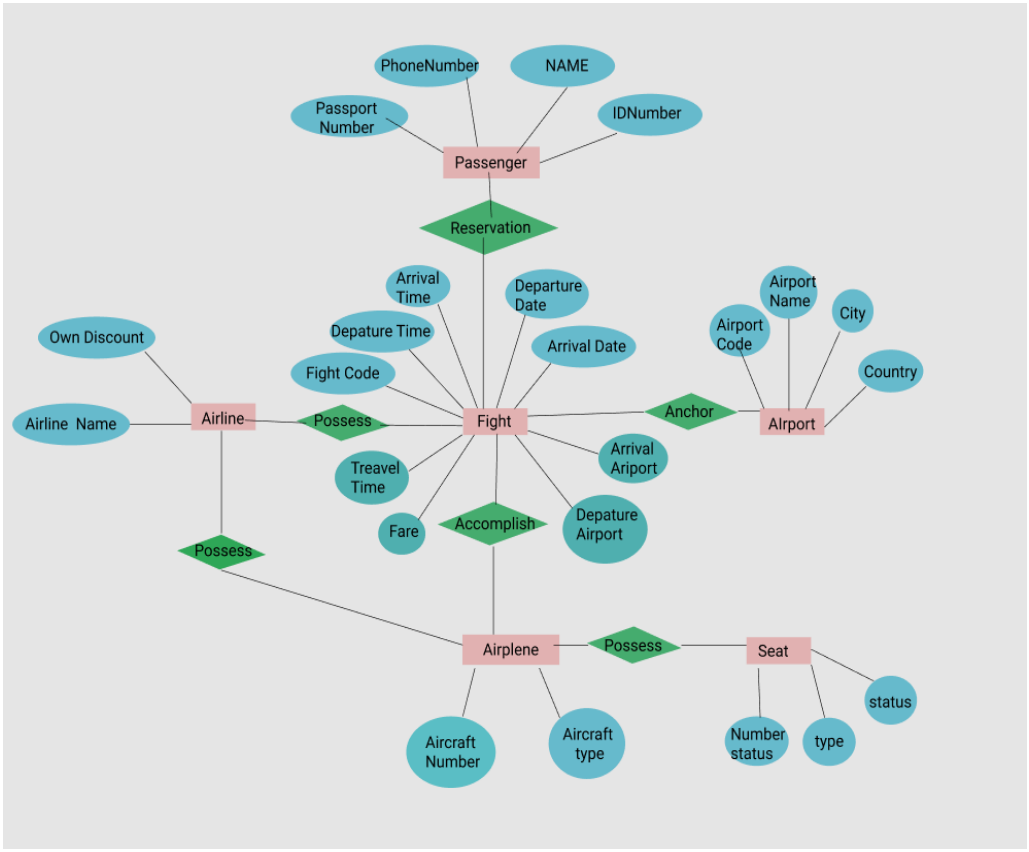
3.3.4 User refund sequence diagram



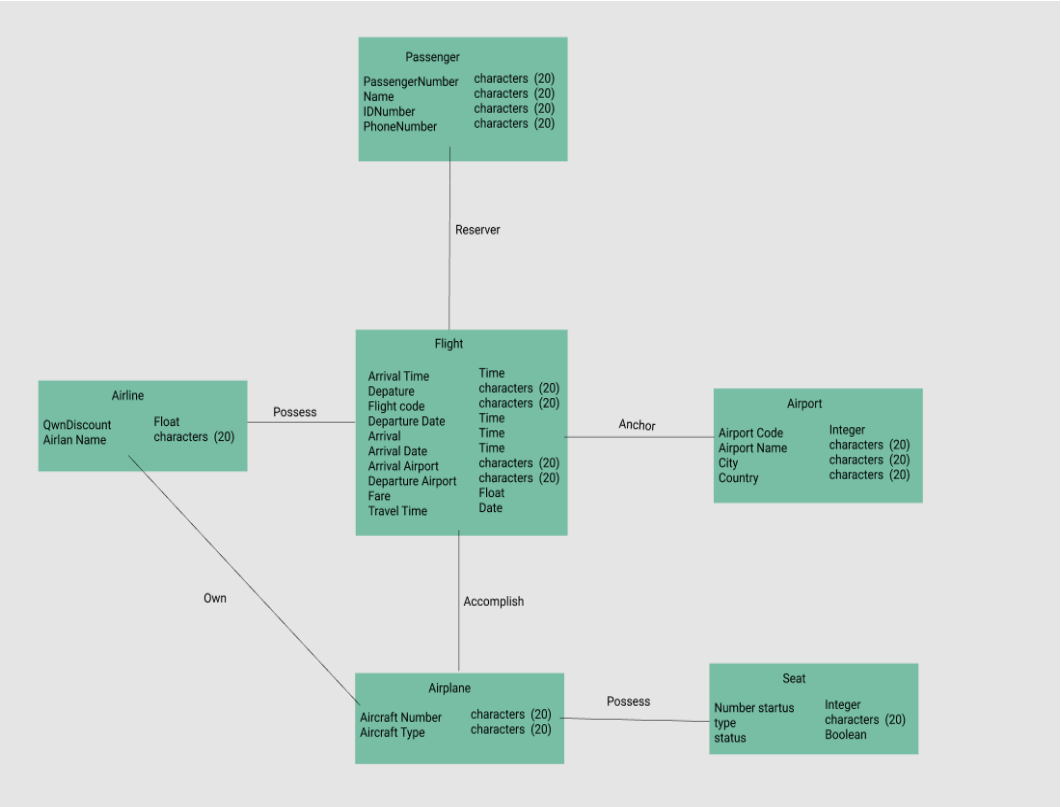
Database design

4.1Conceptual structure design

E-R diagram:



Conceptual structure of design:


Passenger
PassengerNumber characters (20)
Name characters (20)
IDNumber characters (20)
PhoneNumber characters (20)
Reserver
Flight
Arrival Time Time
Depature characters (20)
Flight code characters (20)
Departure Date Time
Arrival Time
Arrival Date Time
Arrival Airport characters (20)
Departure Airport characters (20)
Fare Float
Travel Time Date
Airline
QwnDiscount Float
Airlan Name characters (20)
Possess
Anchor
Airport
Airport Code Integer
Airport Name characters (20)
City characters (20)
Country characters (20)
Own
Accomplish
Airplane
Aircraft Number characters (20)
Aircraft Type characters (20)
Possess
Seat
Number startus Integer
type characters (20)
status Boolean

4.2 Logical structure design

The ER graph is transformed into a relational schema, and the attributes, functional dependencies, candidate codes and external codes of each relationship are determined, and the relational schema is normalized to at least 3NF:

Passengers (passport number, name, ID number, mobile phone number)

Reservation (passport number, flight number)

Flight (flight number, company name, aircraft number, departure date, departure time, arrival date, arrival time, departure airport, destination airport, travel time, cost)

Airlines (company name, discount)

Parking (airport number, flight number)

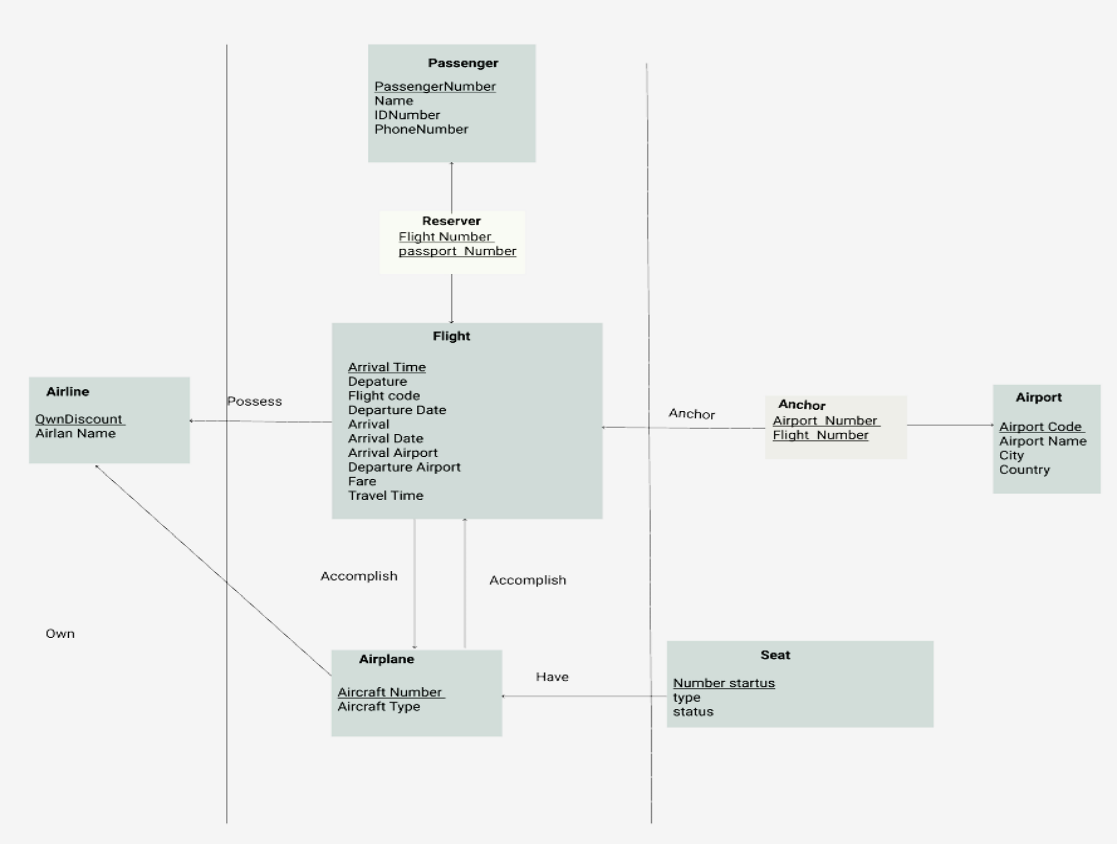
Airport (airport number, airport name, city, country)

Aircraft (aircraft number, flight number, company name, aircraft type)

Seat (seat number, aircraft number, type, status)

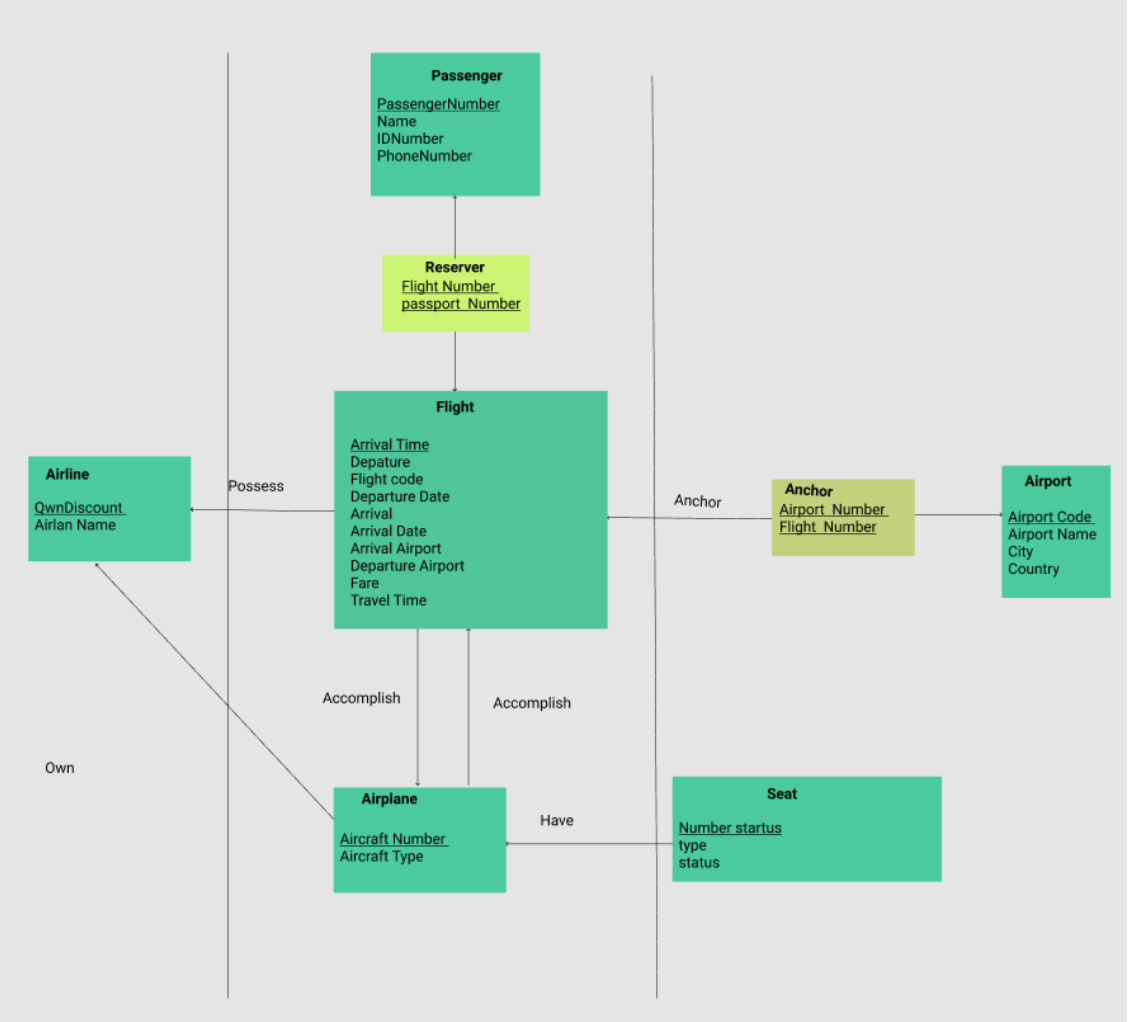
In the above relational mode, the underline is the main code of horizontal line, and the underline is the outer code of wavy line

Logical structure diagram of design：



4.3 Physical structure design

Physical structure diagram of design:



5. Database implementation and operation

5.1 System design and Implementation

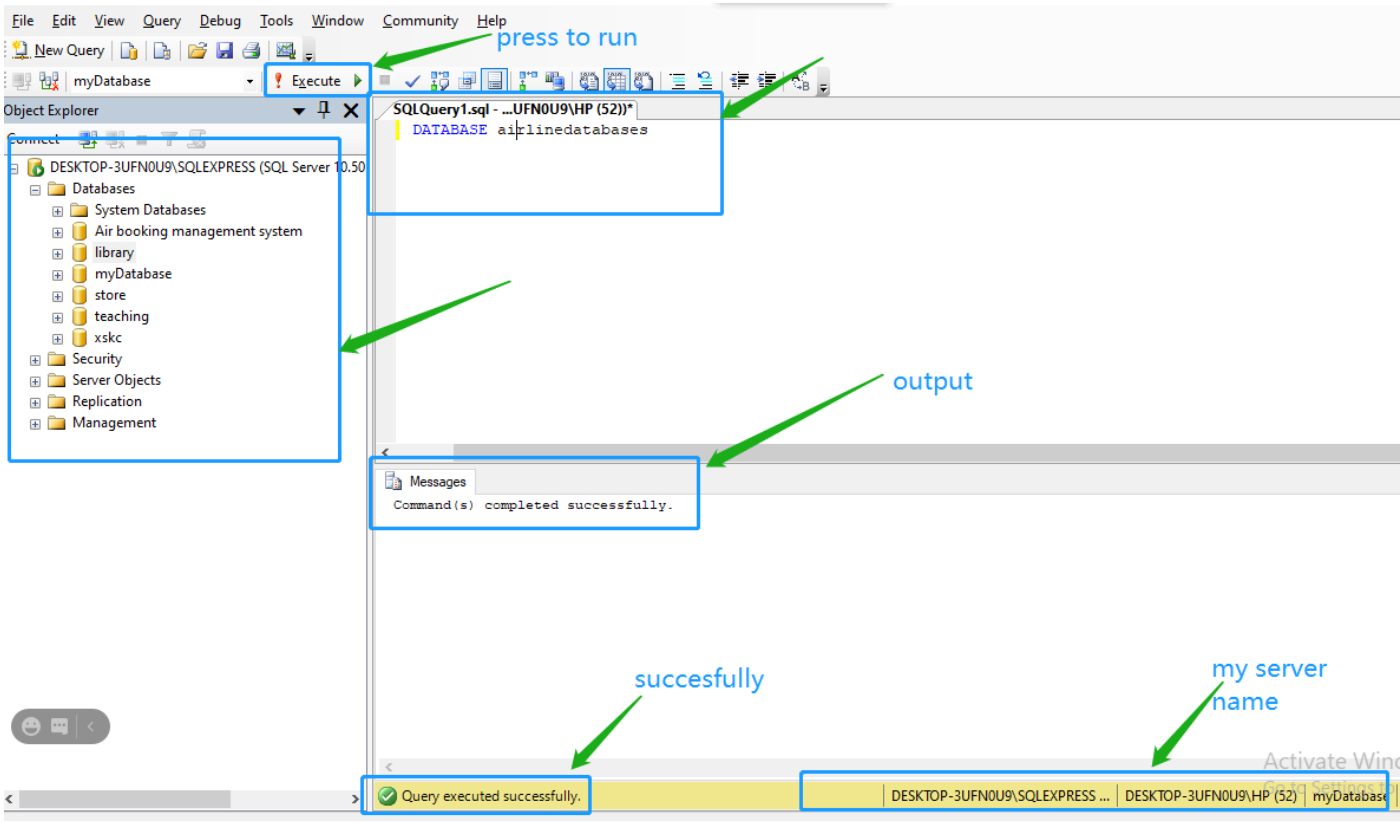
Starting from the database design, the database is designed according to the data involved in the system and their relations and constraints. Then, according to the basic access operation of the database, the basic Dao is designed for the later complex functions. According to the requirements, **we divide the function into three main parts: vote, reservation and refund**. Based on this, the

front-end page is designed, and then according to the data required by the front-end page, the servlet is used to process the data retrieved from the database and the data returned from the front-end page to realize the interaction between the front-end and the front-end.

The main design idea of front-end page is simple and clear, and then unify the distribution and style of each page. The front page is responsible for display and response. The back-end designs the servlet program according to the three use case diagrams of ballot, booking and refund. It stores the flight information, passenger information and seat selection information selected by the user into the session domain. Once the transaction submission fails, the data is rolled back, and the user's **temporary seat selection number** is displayed back to the seat selection page with the servlet. When the user clicks on the ticket reservation, the user's information will be preserved when the user returns the ticket, the booking information of the user in the database will be deleted and the session field will be cleared. The data used by the servlet is obtained from the database by Dao, and the data processed by the servlet is also stored in the **database by Dao**, so **as to realize the information interaction between the front-end, business processing and database layers.**

5.2 Database creation and data entry

Database creation, table creation and data entry code screenshot:



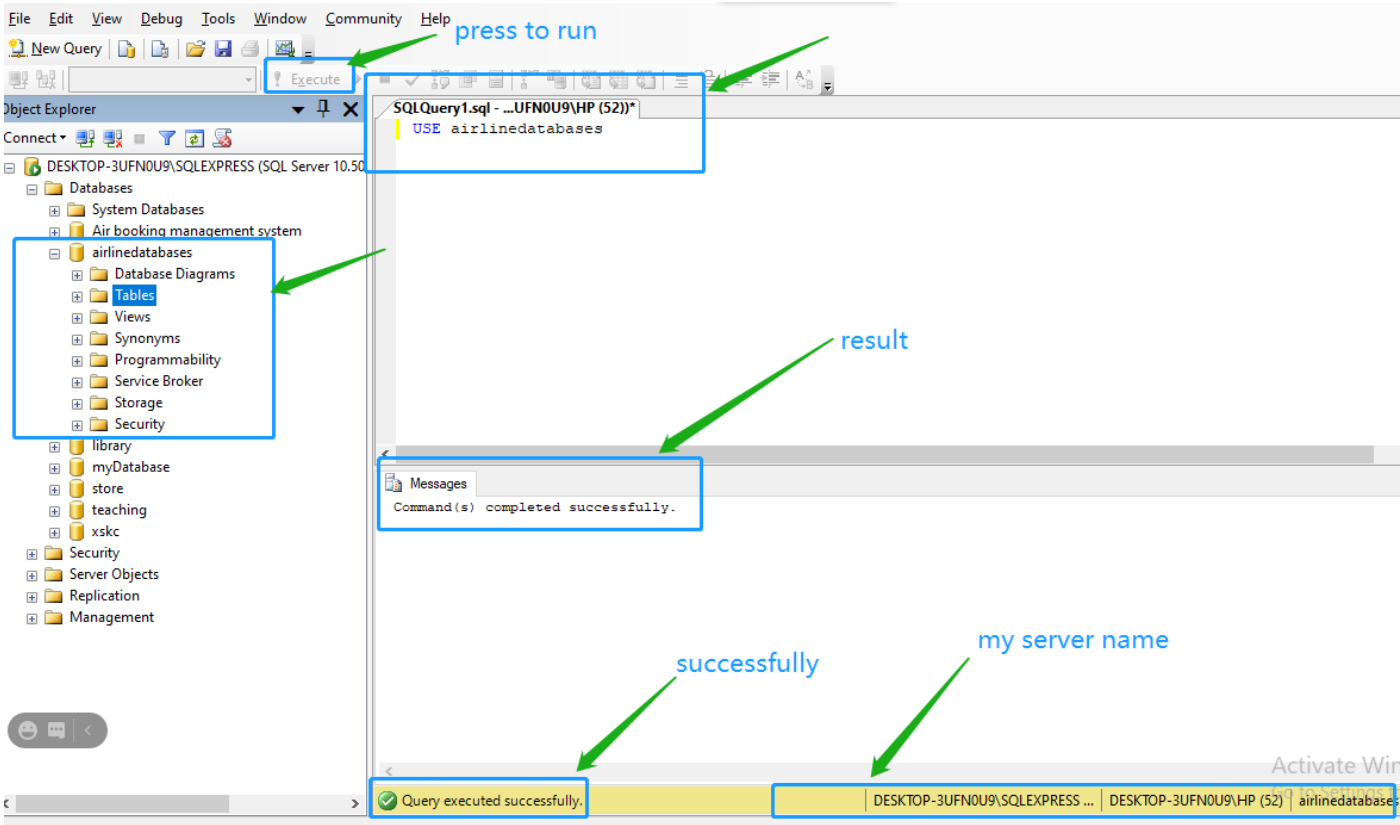
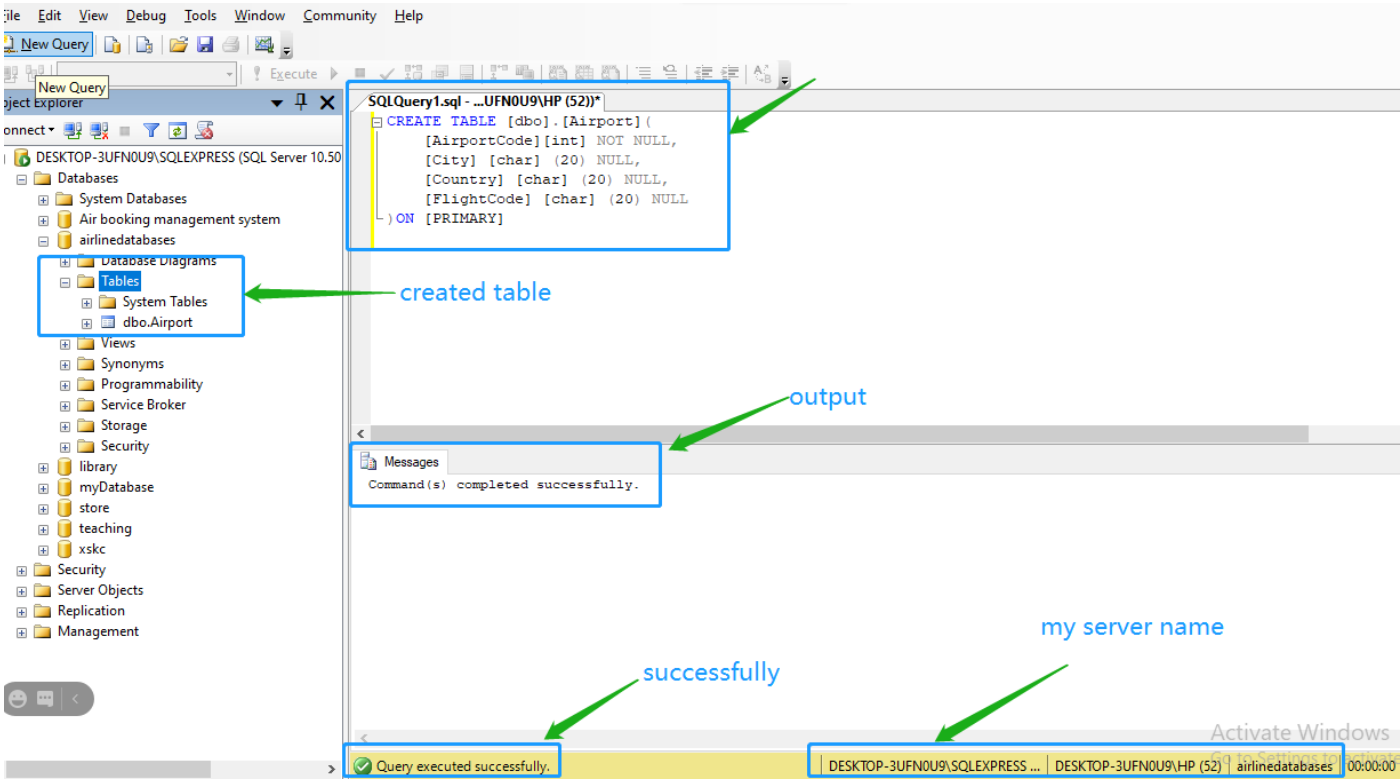
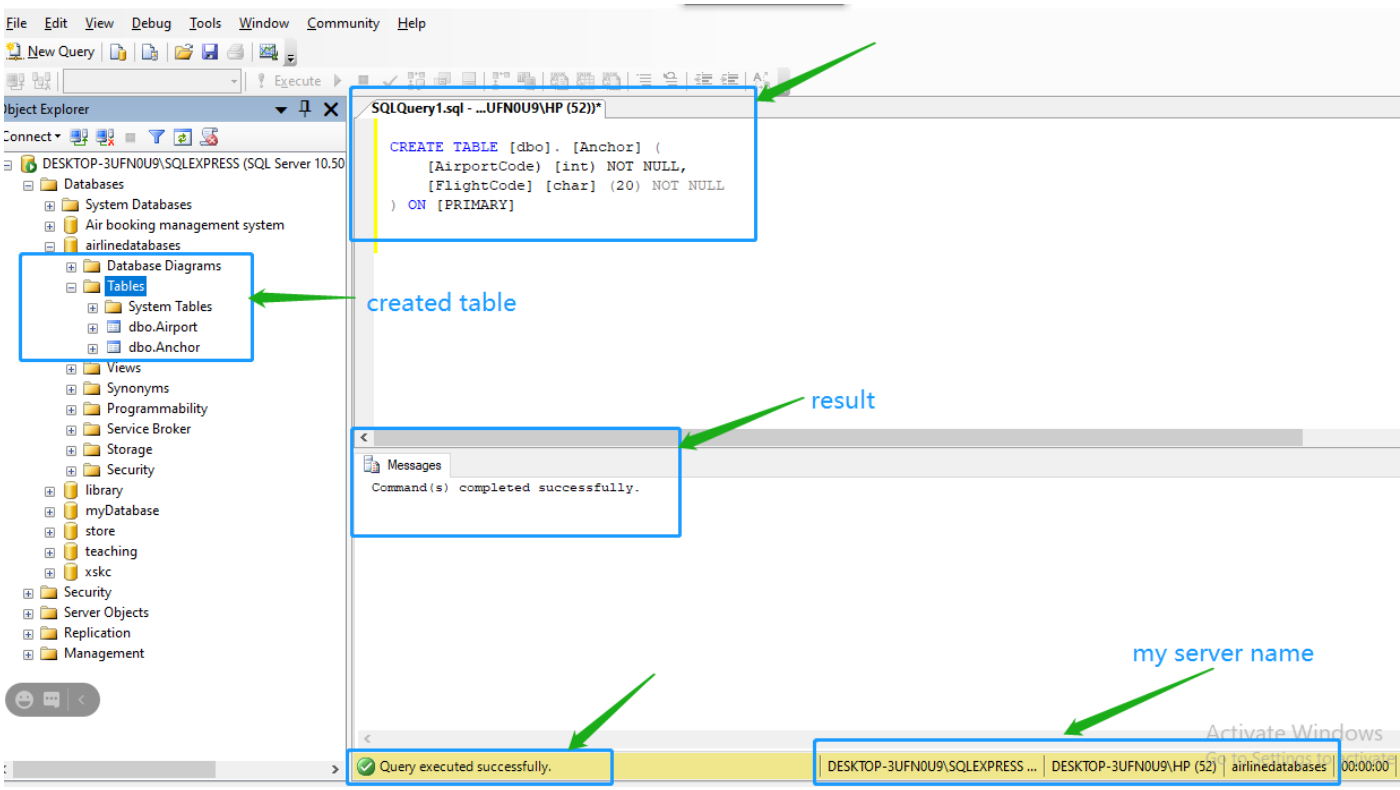


Table creation:

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Replication
Management
SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo]. [Anchor] (
[AirportCode) [int) NOT NULL,
[FlightCode] [char] (20) NOT NULL
) ON [PRIMARY]
created table
result
Messages
Command(s) completed successfully.
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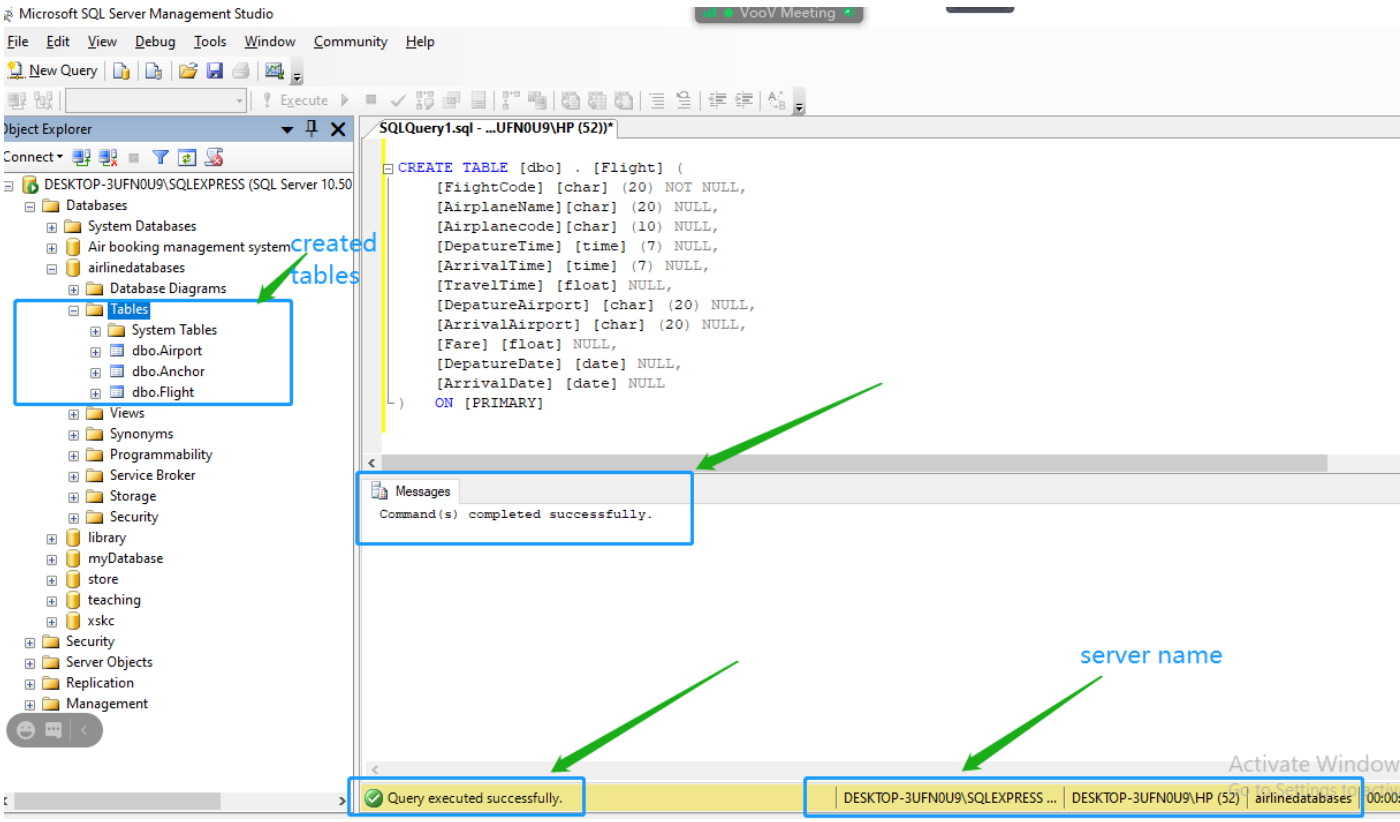
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created tables
SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo] . [Flight] (
[FiightCode] [char] (20) NOT NULL,
[AirplaneName][char] (20) NULL,
[Airplanecode][char] (10) NULL,
[DepatureTime] [time] (7) NULL,
[ArrivalTime] [time] (7) NULL,
[TravelTime] [float] NULL,
[DepatureAirport] [char] (20) NULL,
[ArrivalAirport] [char] (20) NULL,
[Fare] [float] NULL,
[DepatureDate] [date] NULL,
[ArrivalDate] [date] NULL
) ON [PRIMARY]
Messages
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Query executed successfully.
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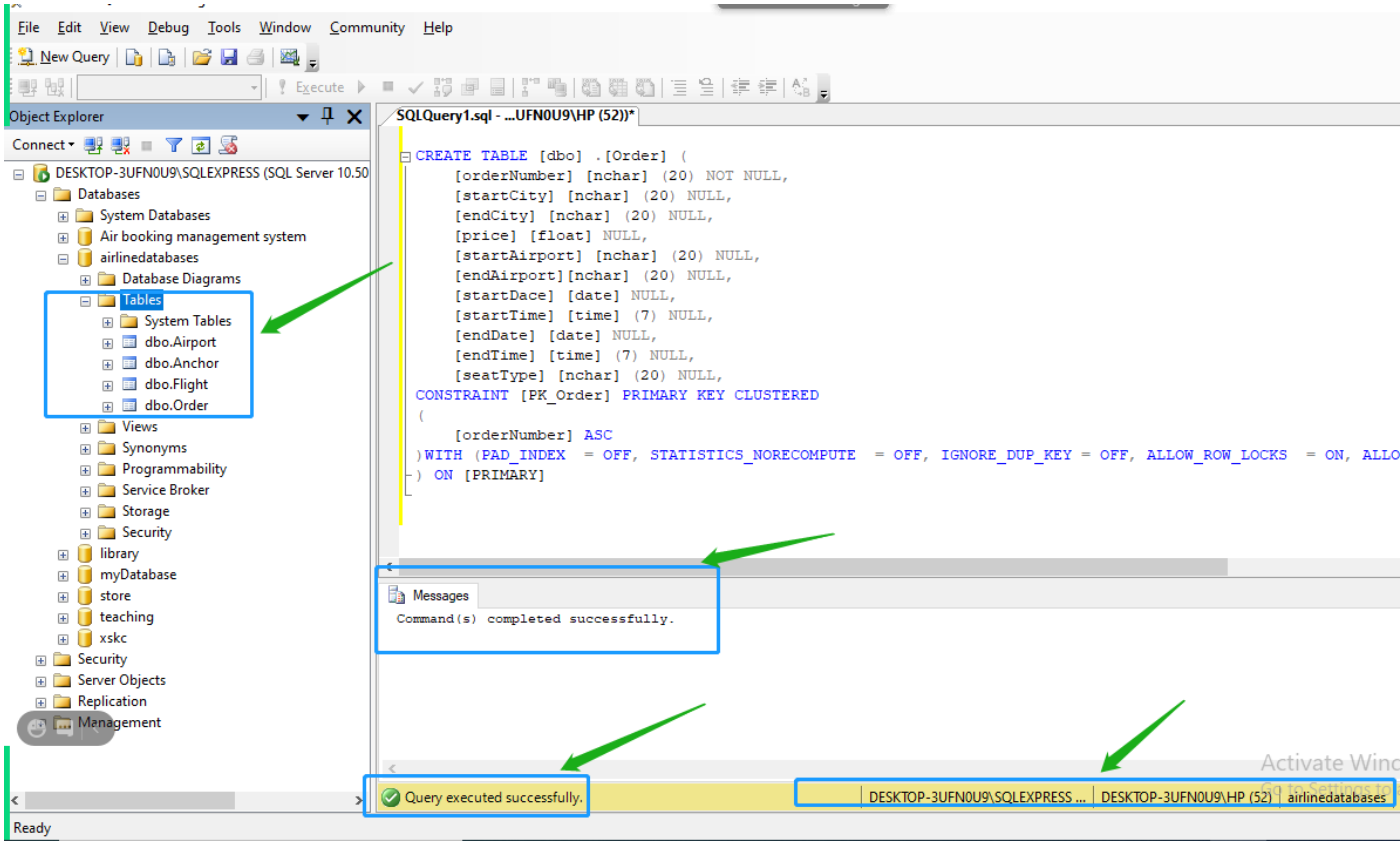
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SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo] .[Order] (
[orderNumber] [nchar] (20) NOT NULL,
[startCity] [nchar] (20) NULL,
[endCity] [nchar] (20) NULL,
[price] [float] NULL,
[startAirport] [nchar] (20) NULL,
[endAirport][nchar] (20) NULL,
[startDace] [date] NULL,
[startTime] [time] (7) NULL,
[endDate] [date] NULL,
[endTime] [time] (7) NULL,
[seatType] [nchar] (20) NULL,
CONSTRAINT [PK_Order] PRIMARY KEY CLUSTERED
(
[orderNumber] ASC
)WITH (PAD_INDEX = OFF, STATISTICS_NORECOMPUTE = OFF, IGNORE_DUP_KEY = OFF, ALLOW_ROW_LOCKS = ON, ALLO
) ON [PRIMARY]
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Query executed successfully.
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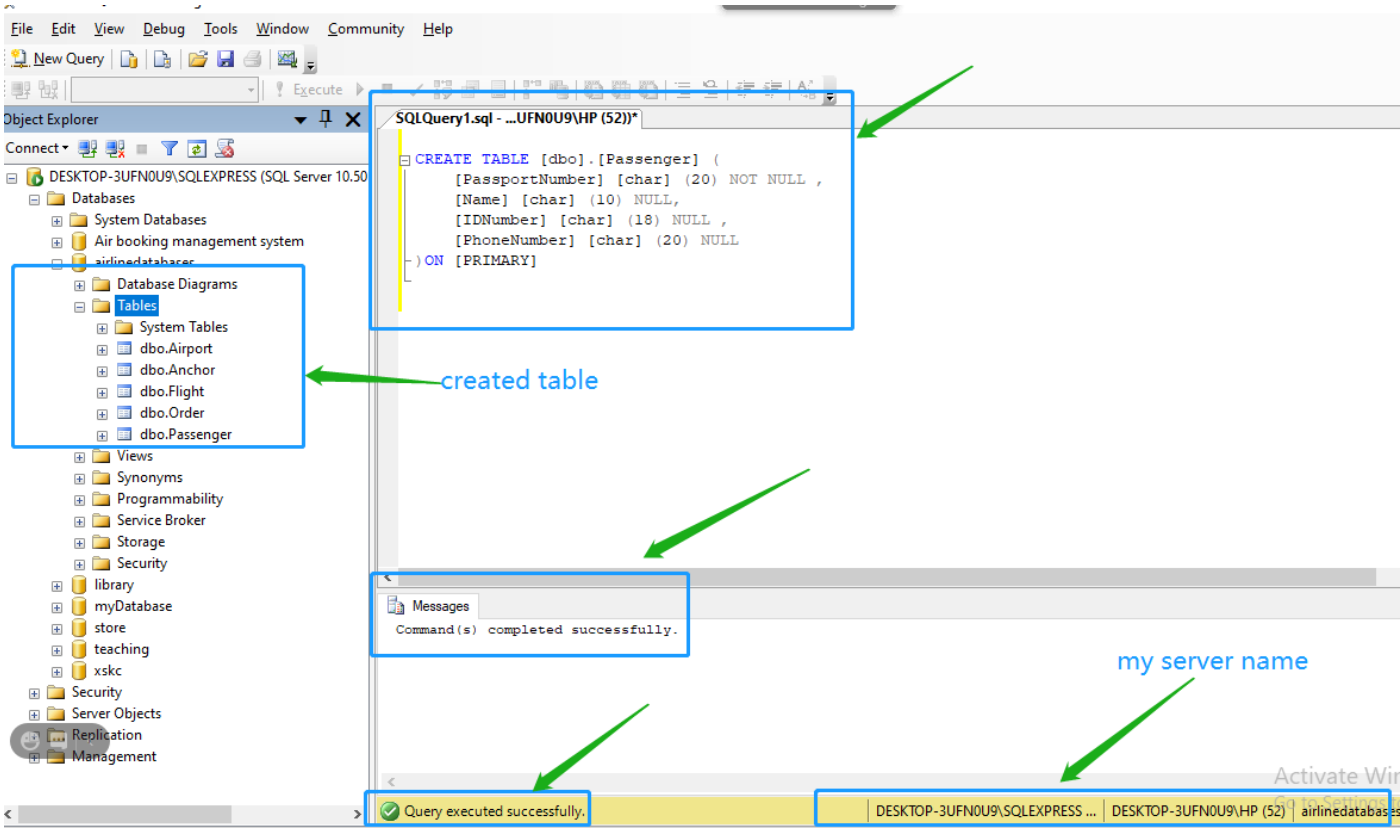
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xskc
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SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo].[Passenger] (
[PassportNumber] [char] (20) NOT NULL ,
[Name] [char] (10) NULL,
[IDNumber] [char] (18) NULL ,
[PhoneNumber] [char] (20) NULL
)ON [PRIMARY]
created table
Messages
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Query executed successfully.
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DESKTOP-3UFN0U9\HP (52)
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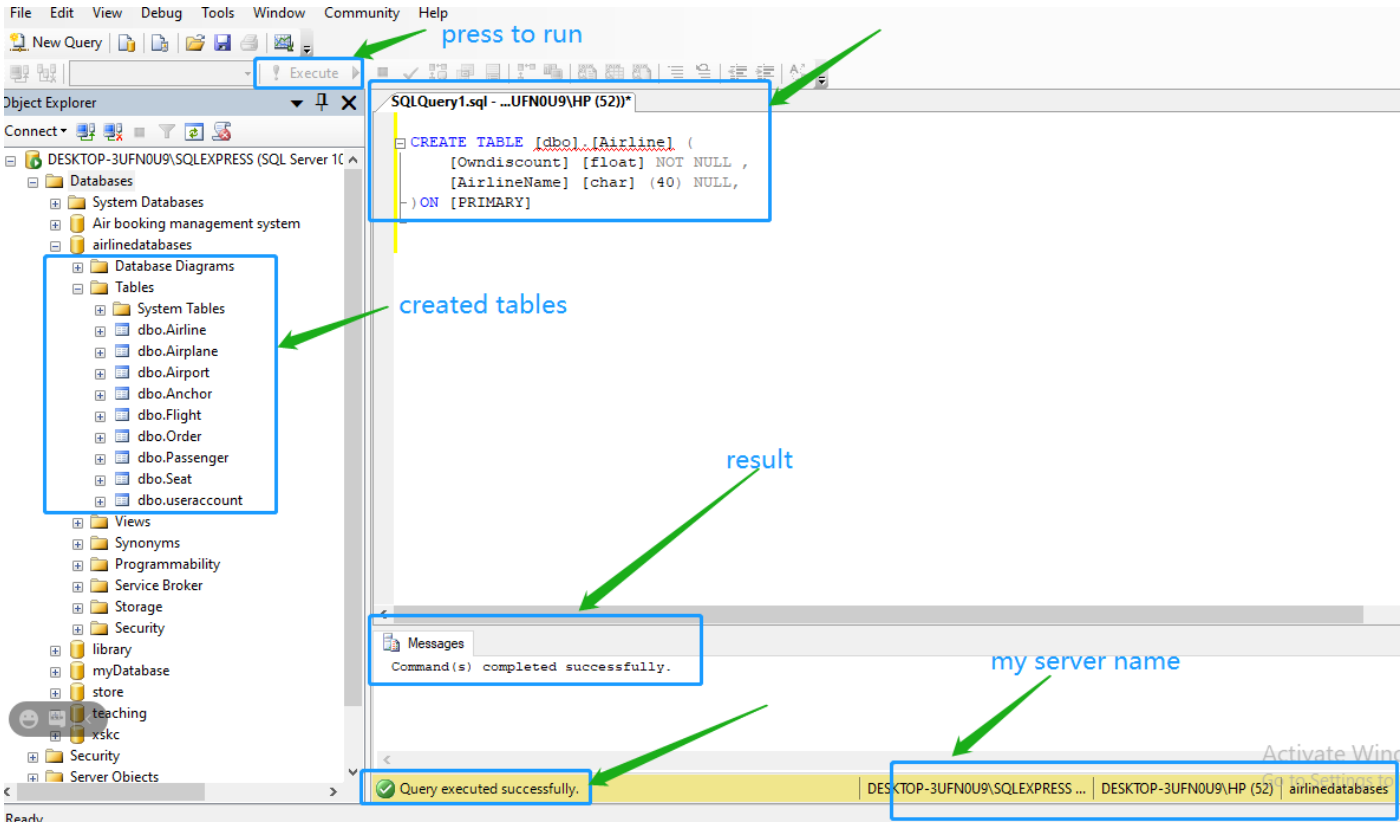
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Server Objects
SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo].[Airline] (
[Owndiscount] [float] NOT NULL ,
[AirlineName] [char] (40) NULL,
)ON [PRIMARY]
created tables
result
Messages
Command(s) completed successfully.
my server name
Query executed successfully.
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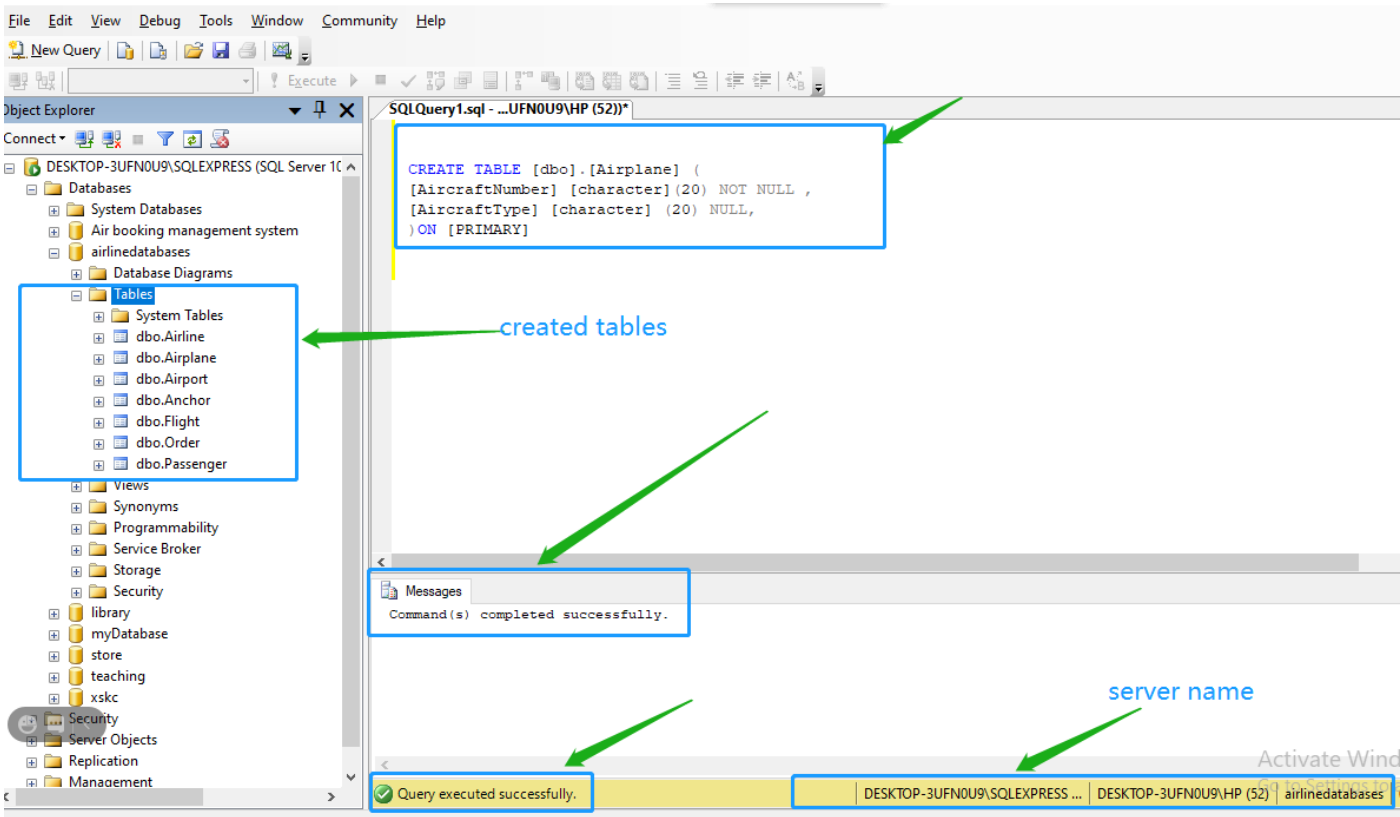
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SQLQuery1.sql - ...UFN0U9\HP (52))*
CREATE TABLE [dbo].[Airplane] (
[AircraftNumber] [character](20) NOT NULL ,
[AircraftType] [character] (20) NULL,
)ON [PRIMARY]
created tables
Messages
Command(s) completed successfully.
server name
Query executed successfully.
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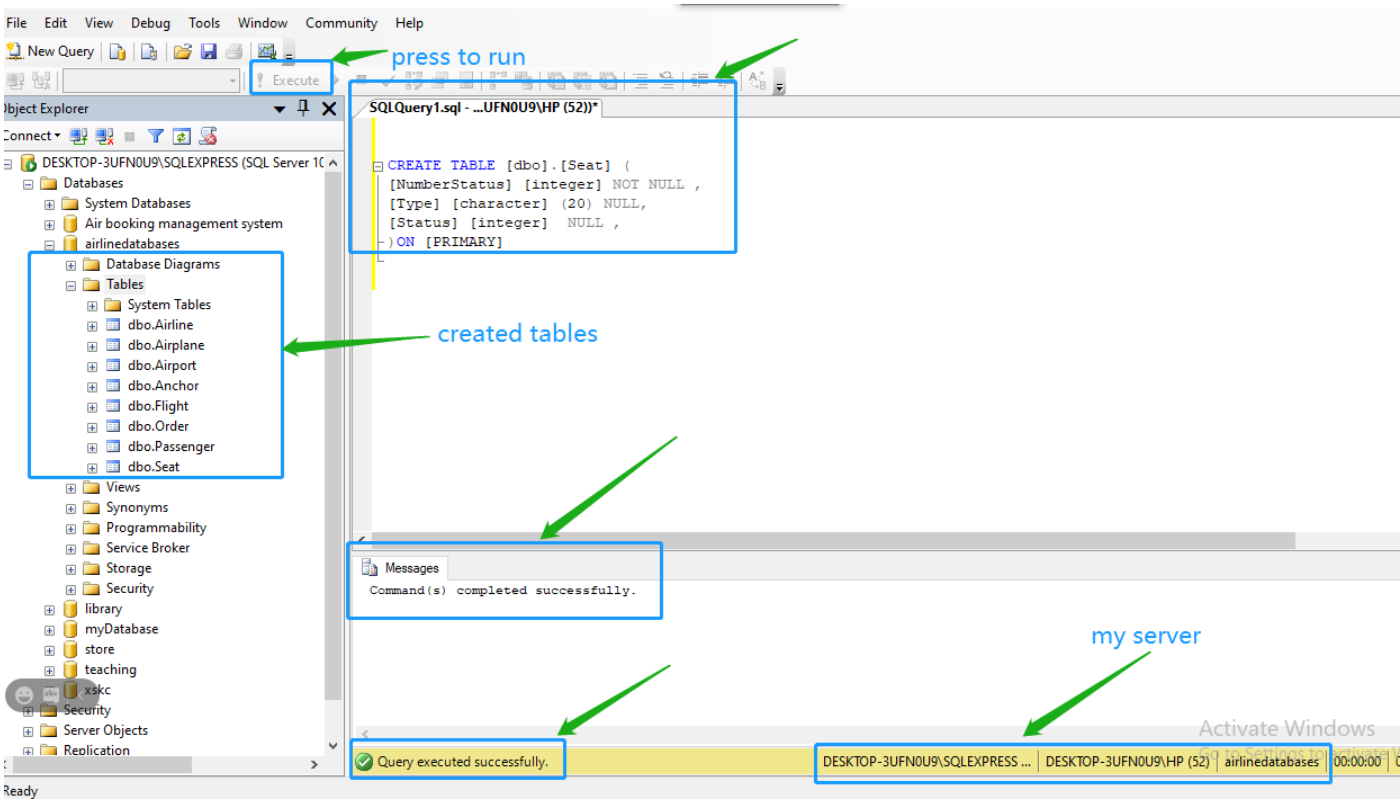
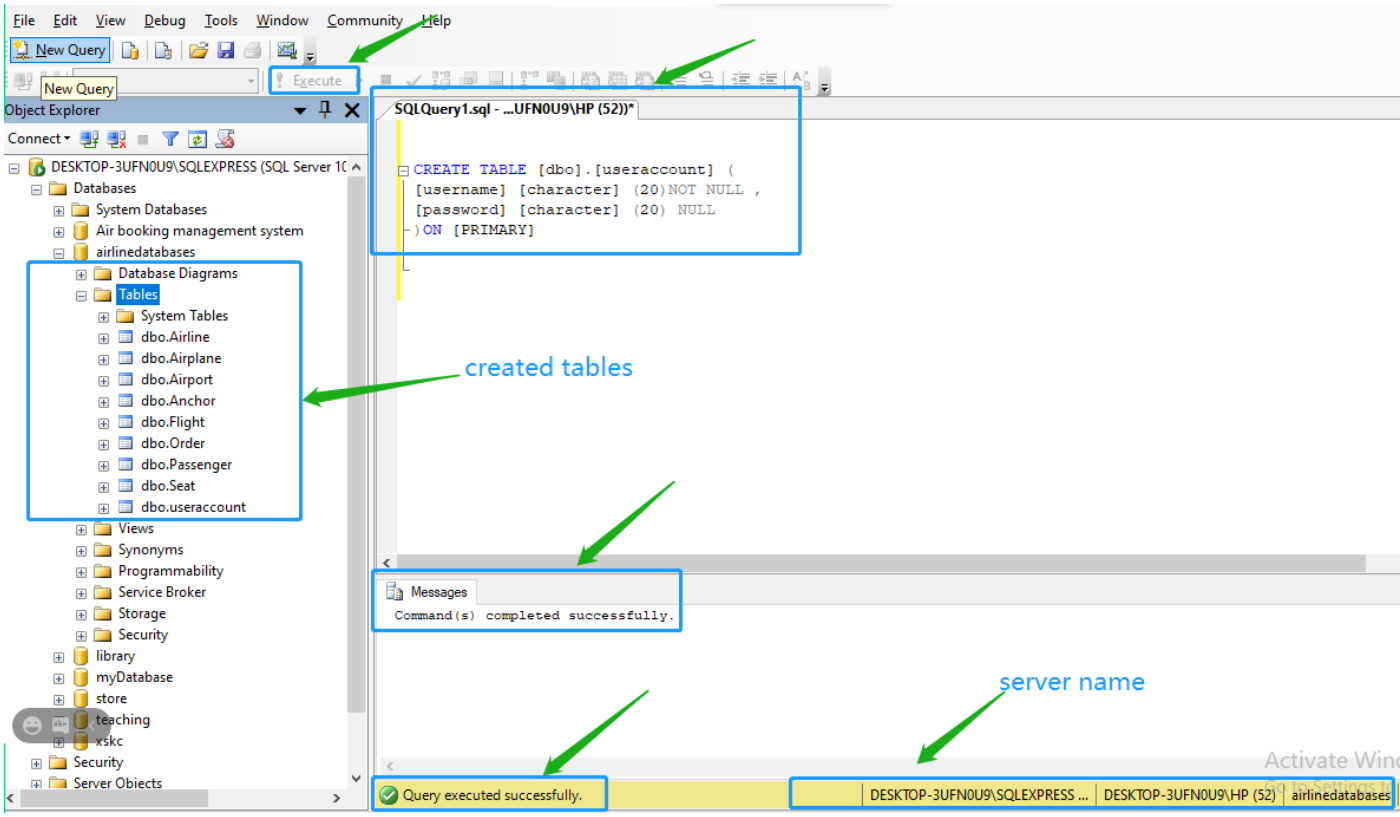
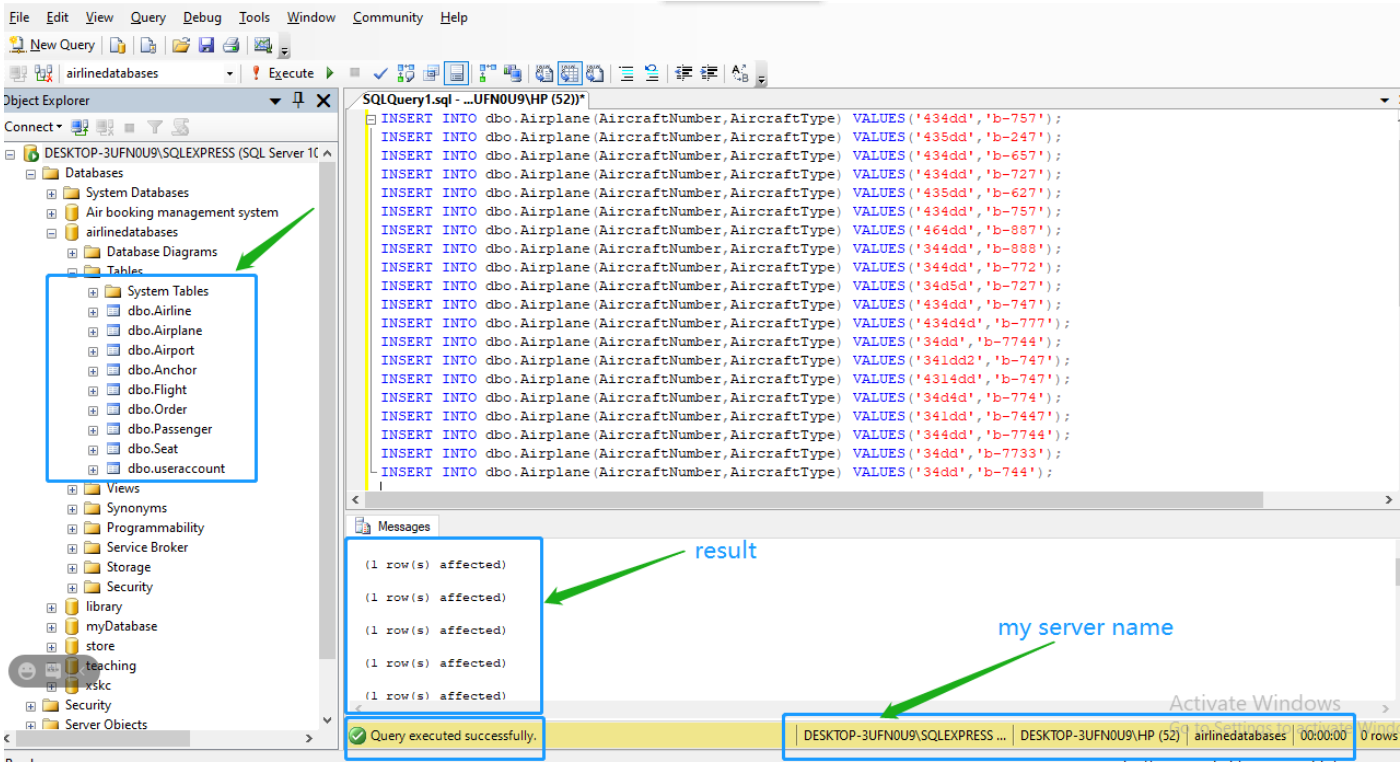


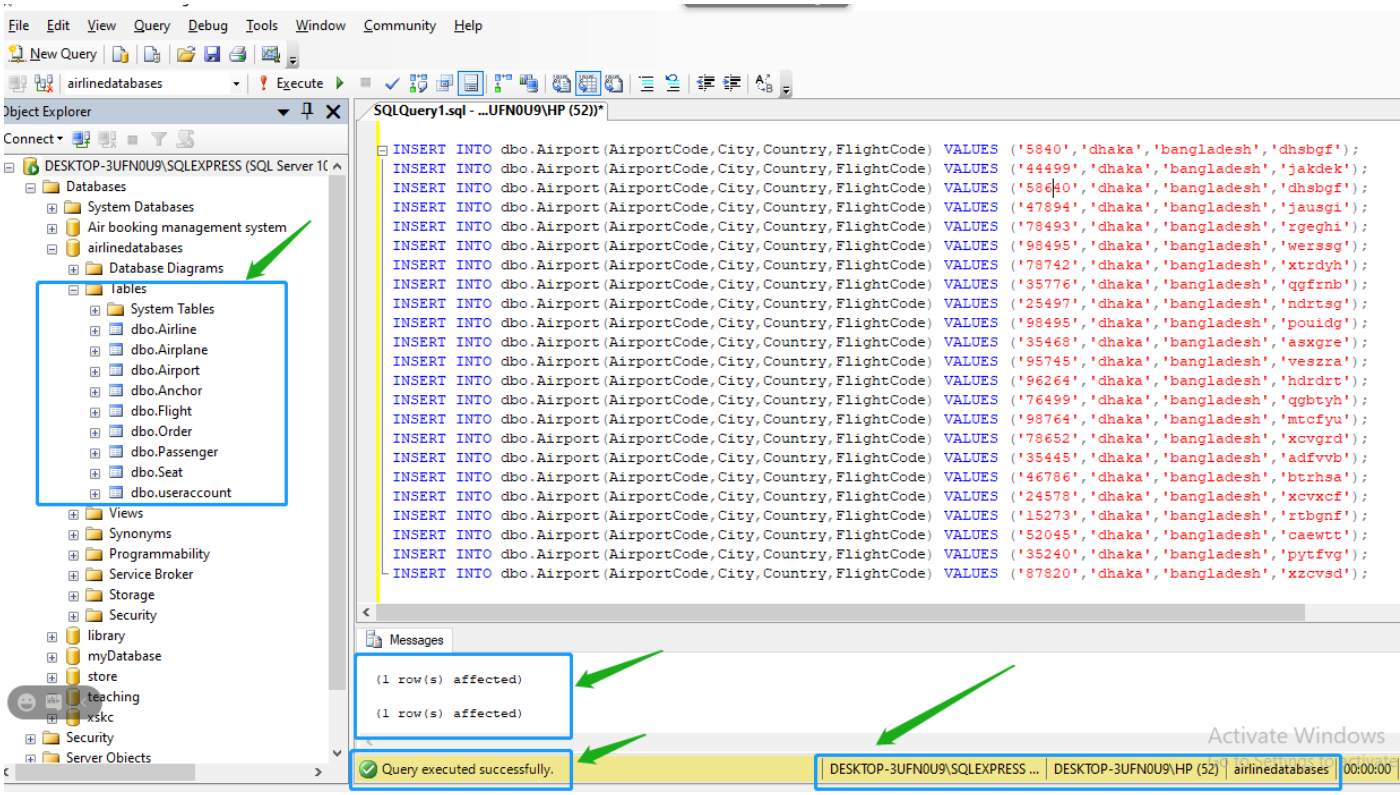


##(part -02) Database query:

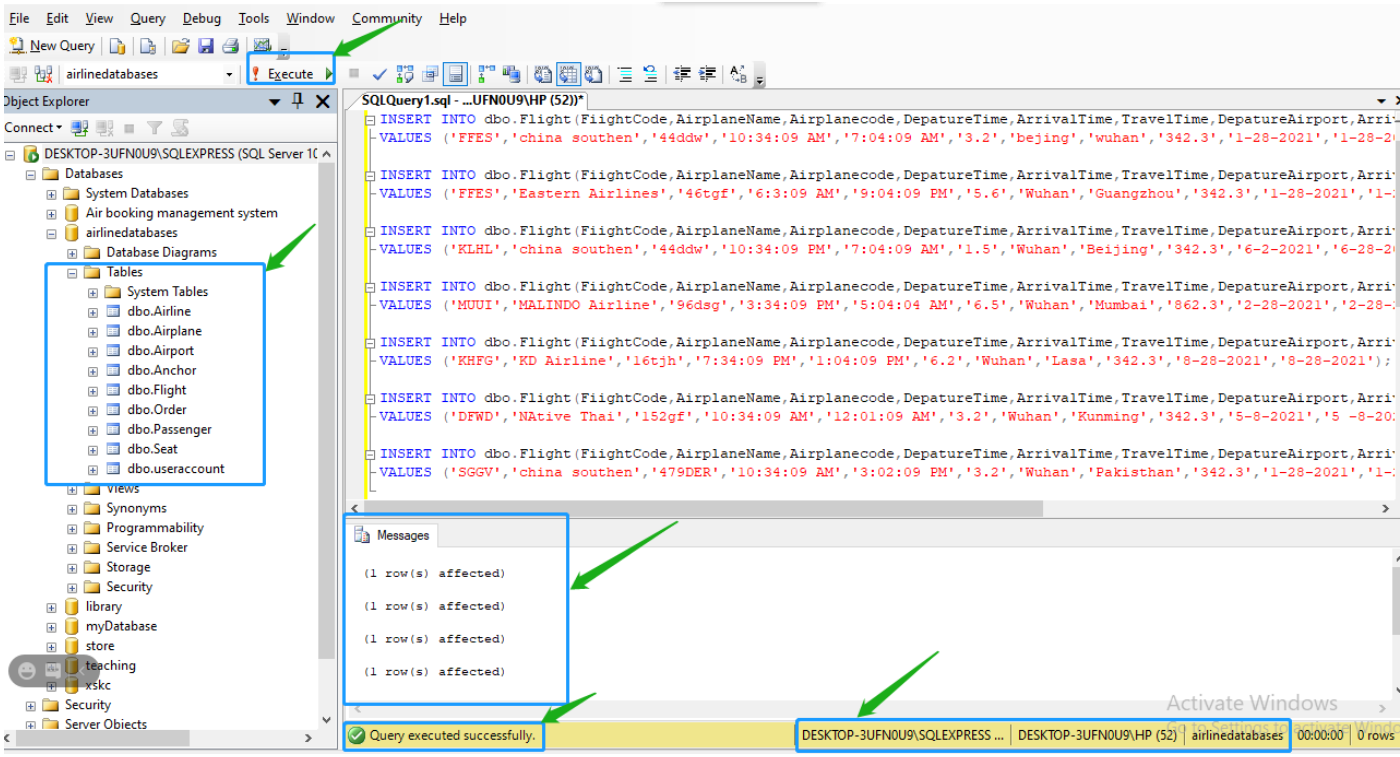
Data insert at airplane table



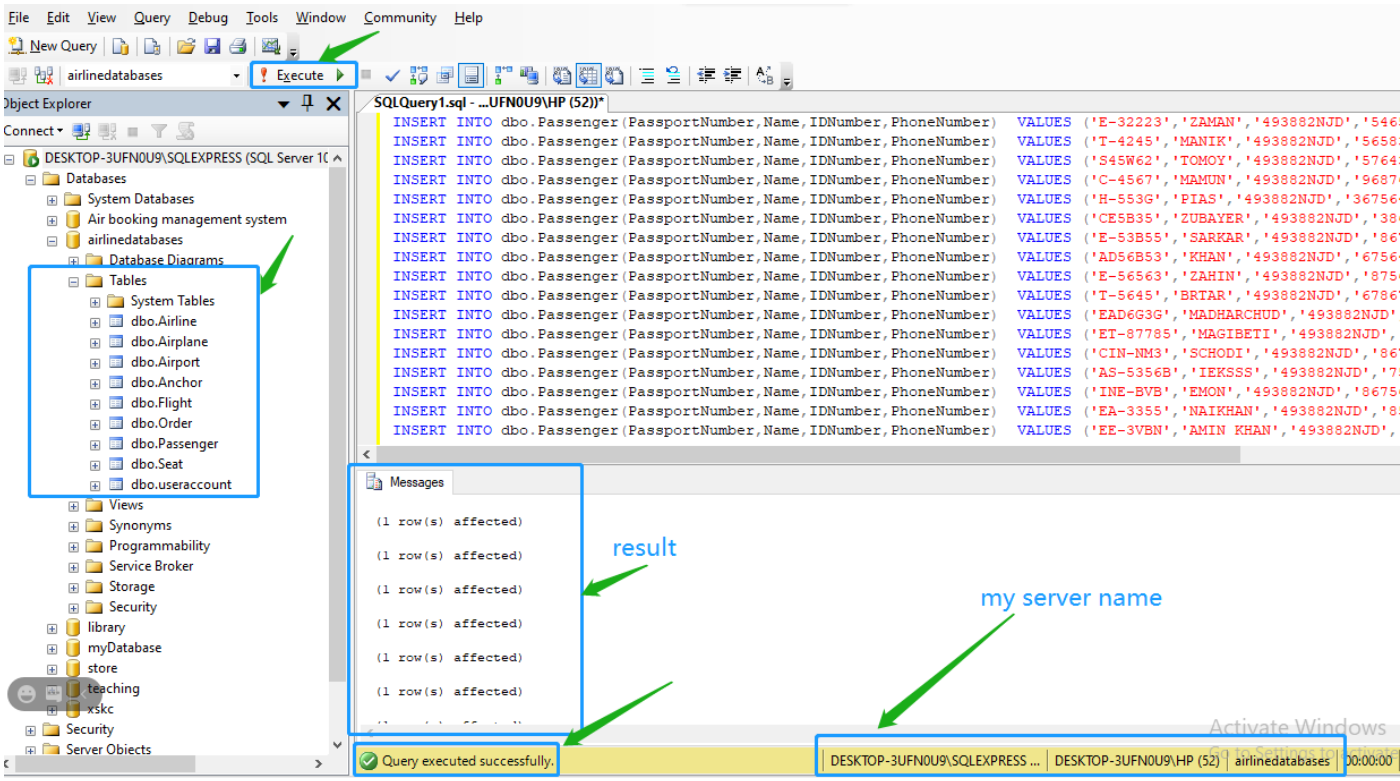
Data insert at airport table



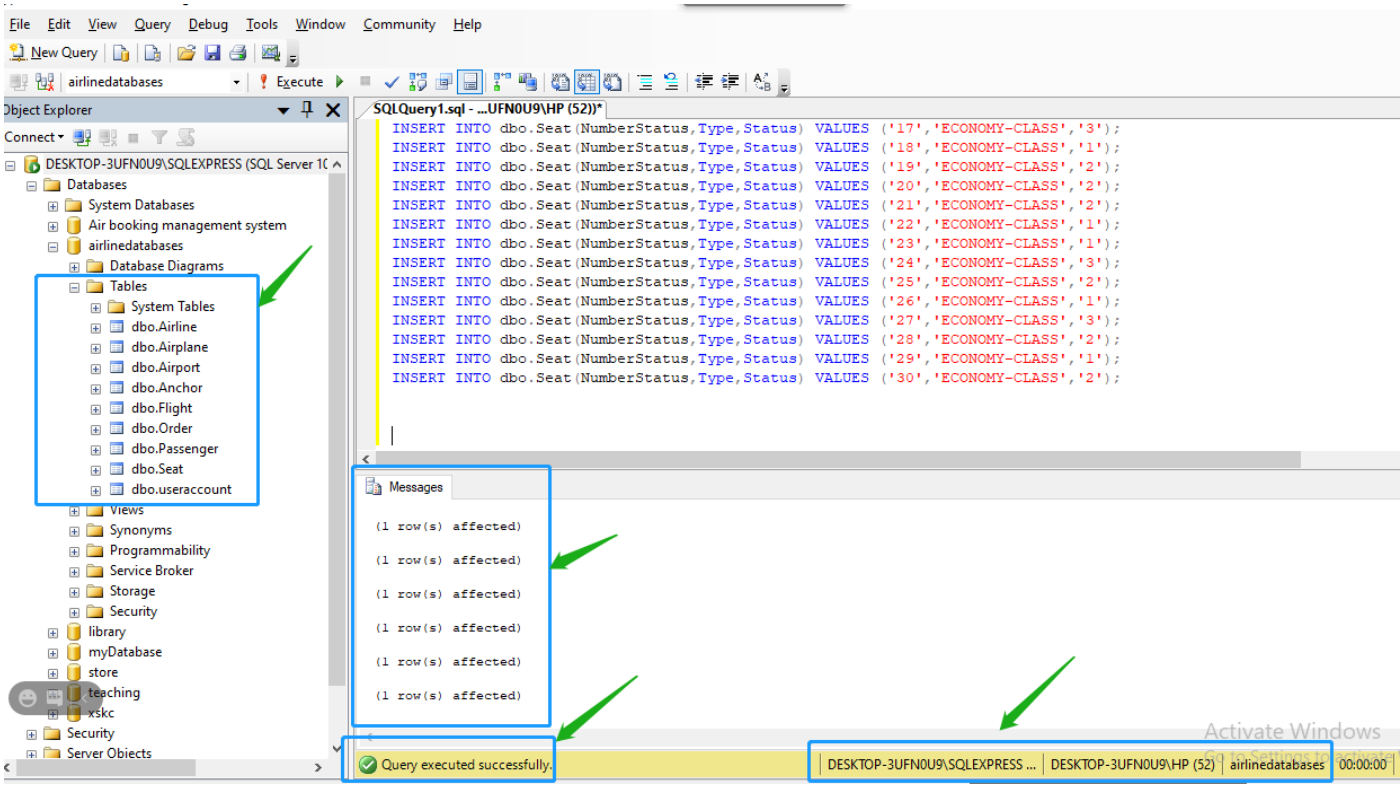
Data insert at Flight table



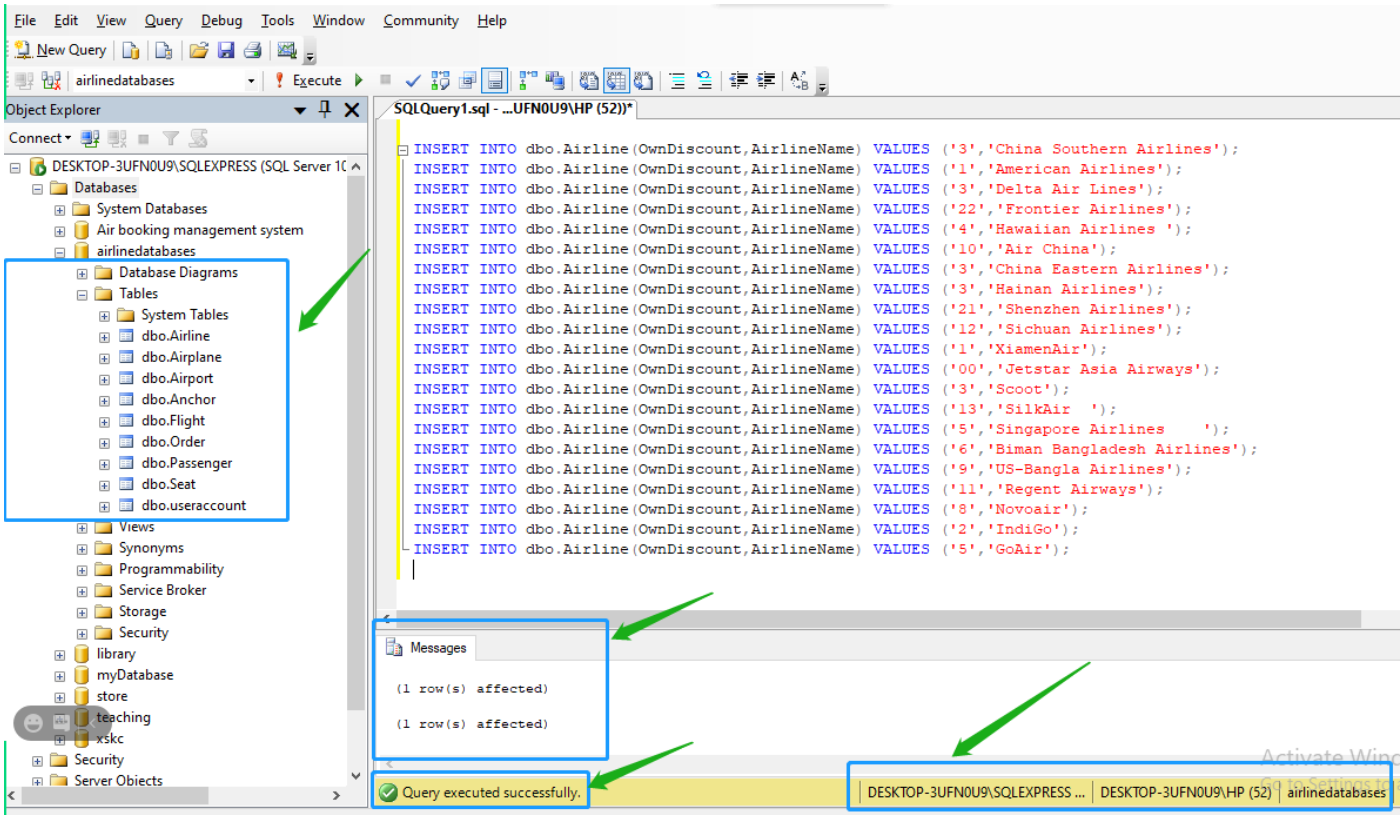
Data insert for Passenger table



Data insert for Seat table



Data insert for Airline table



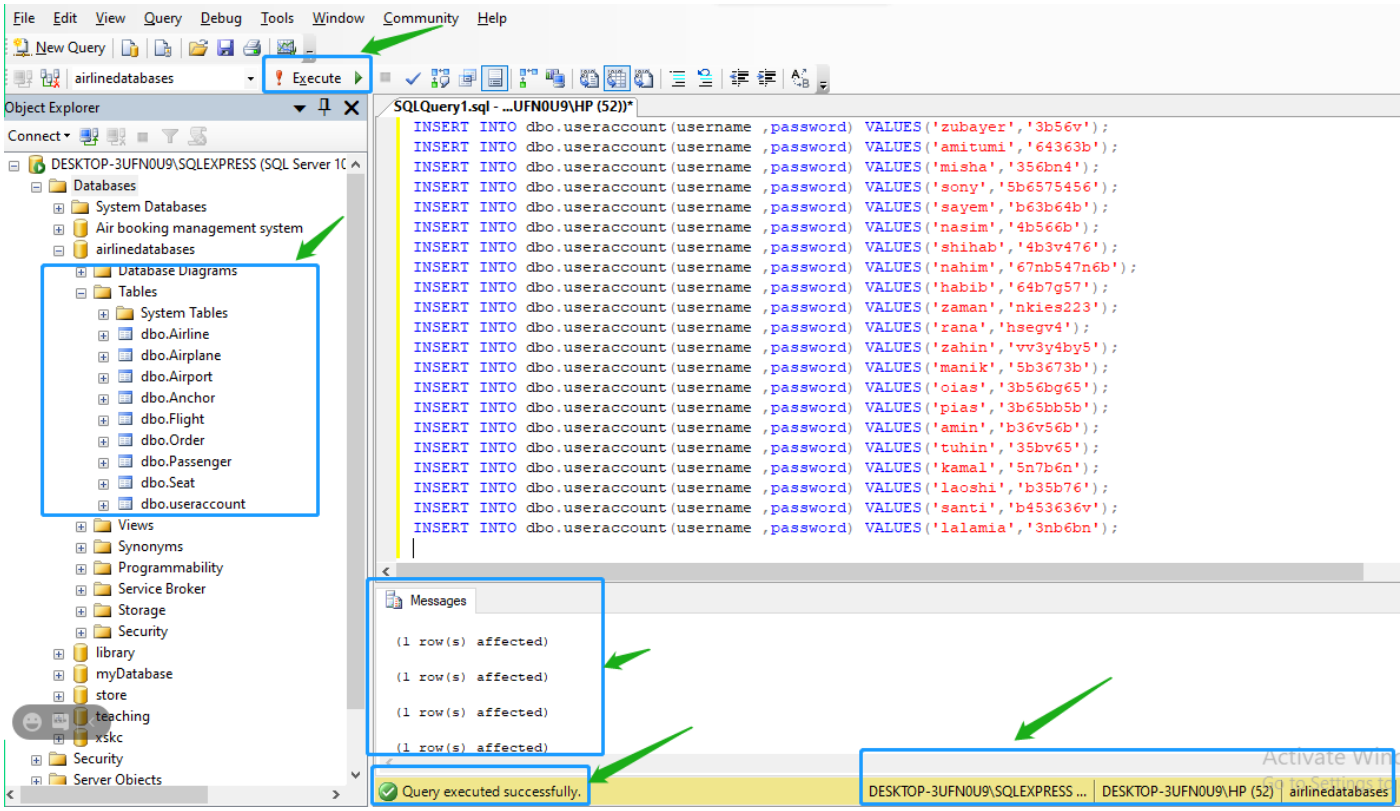
In here I face some problem, its "call string or binary would be truncated."

Then I overcome this problem by using proper size of string.

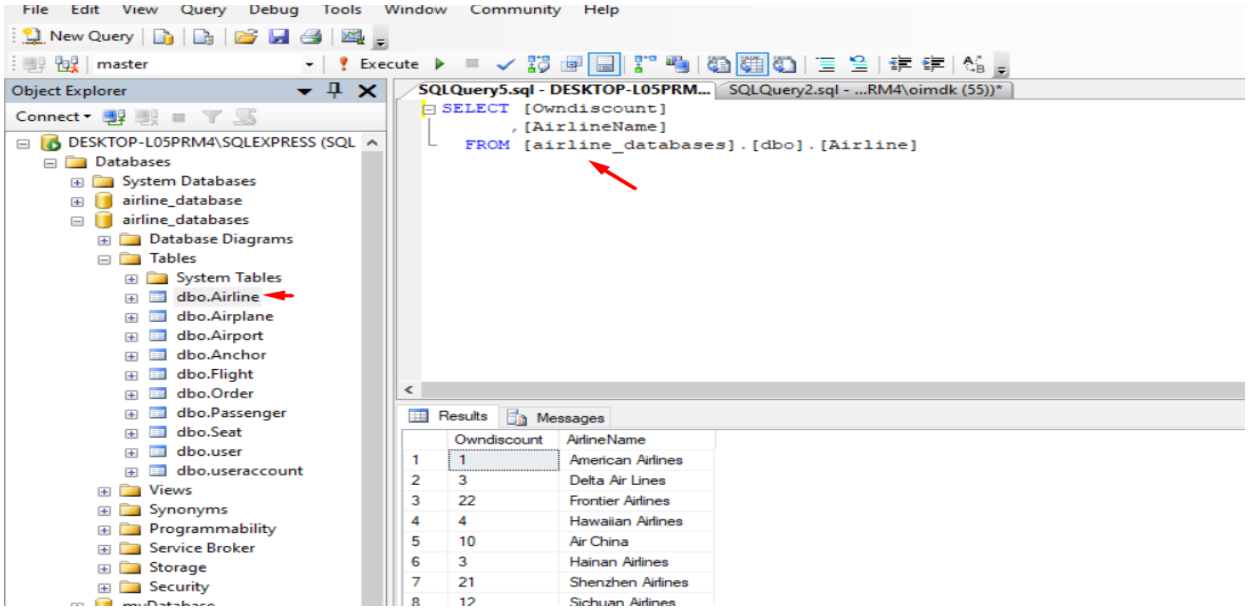
Its data insert for a passenger user account information.

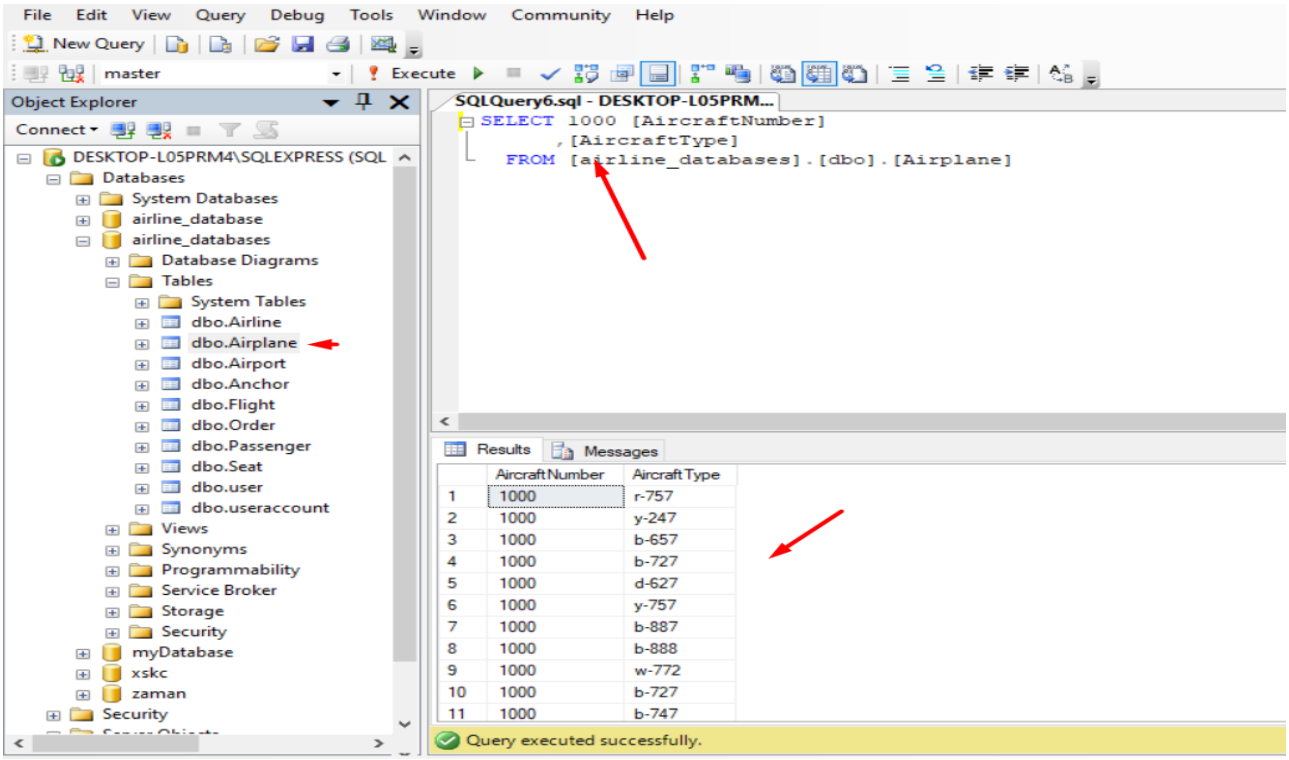
When a passenger come and use my website/application for search or query she/he should create account/login.

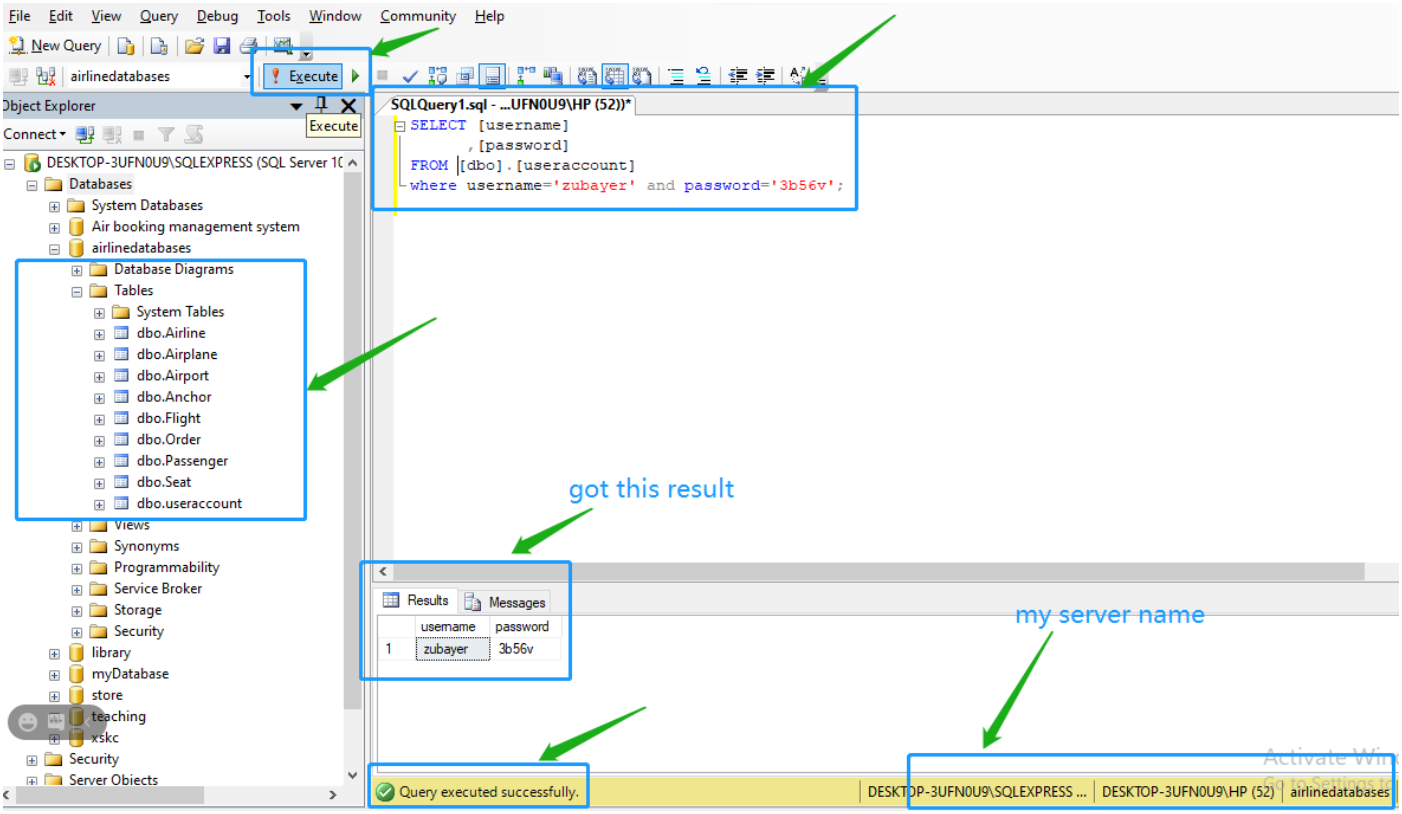
So we need to store client user name and password.



5.3 Database query






File Edit View Query Debug Tools Window Community Help
New Query
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Execute
Object Explorer
Connect
DESKTOP-3UFN0U9\SQLEXPRESS (SQL Server 10
Databases
System Databases
Air booking management system
airlinedatabases
Database Diagrams
Tables
System Tables
dbo.Airline
dbo.Airplane
dbo.Airport
dbo.Anchor
dbo.Flight
dbo.Order
dbo.Passenger
dbo.Seat
dbo.useraccount
Views
Synonyms
Programmability
Service Broker
Storage
Security
library
myDatabase
store
teaching
xskc
Security
Server Objects
SQLQuery1.sql - ...UFN0U9\HP (52))*
SELECT [username]
,[password]
FROM [dbo].[useraccount]
where username='zubayer' and password='3b56v';
got this result
Results
Messages
username
password
1
zubayer
3b56v
my server name
Query executed successfully.
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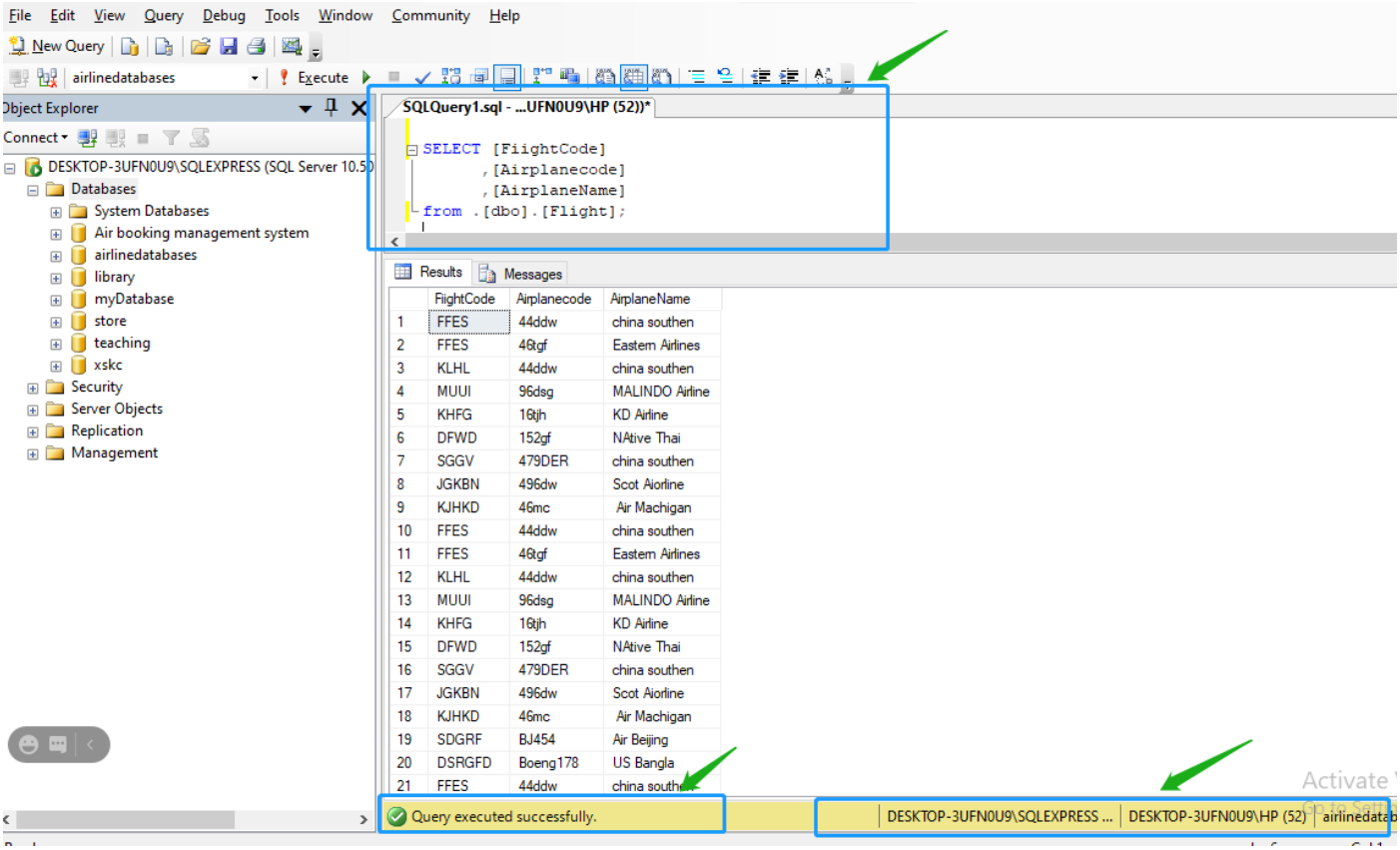
airlinedatabases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Air booking management system
airlinedatabases
library
myDatabase
store
teaching
xskc
Security
Server Objects
Replication
Management
SQLQuery1.sql - ...UFN0U9\HP (52))*
SELECT [FiightCode]
,[Airplanecode]
,[AirplaneName]
from .[dbo].[Flight];
Results
Messages
FiightCode
Airplanecode
AirplaneName
1 FFES 44ddw china southen
2 FFES 48tgf Eastern Airlines
3 KLHL 44ddw china southen
4 MUUI 96dsg MALINDO Airline
5 KHFG 18tjh KD Airline
6 DFWD 152gf NAtive Thai
7 SGGV 479DER china southen
8 JGKBN 496dw Scot Aiorline
9 KJHKD 46mc Air Machigan
10 FFES 44ddw china southen
11 FFES 48tgf Eastern Airlines
12 KLHL 44ddw china southen
13 MUUI 96dsg MALINDO Airline
14 KHFG 18tjh KD Airline
15 DFWD 152gf NAtive Thai
16 SGGV 479DER china southen
17 JGKBN 496dw Scot Aiorline
18 KJHKD 46mc Air Machigan
19 SDGRF BJ454 Air Beijing
20 DSRGFD Boeng178 US Bangla
21 FFES 44ddw china southen
Query executed successfully.
DESKTOP-3UFN0U9\SQLEXPRESS ...
DESKTOP-3UFN0U9\HP (52)

Architecture assessment

The software architecture involved in this experiment is two modes of C / S structure: ***fat client mode and thin client mode****, i.e. two-stage structure and three-dimensional structure. The server of fat client mode is only responsible for data management, while the client is responsible for interactive interface and business processing. The thin client joins the application server to deal with the business logic and rules, so that* ***the client's task is only responsible for representation, which simplifies the task.***

In this experiment, the aircraft reservation system stores all kinds of data including ***airport, flight and seat****. Business logic includes the corresponding flight, seat, passenger access, and the cost of flight comparison and evaluation to select a better flight. The presentation layer is mainly used to* ***select flights, seats and orders.***

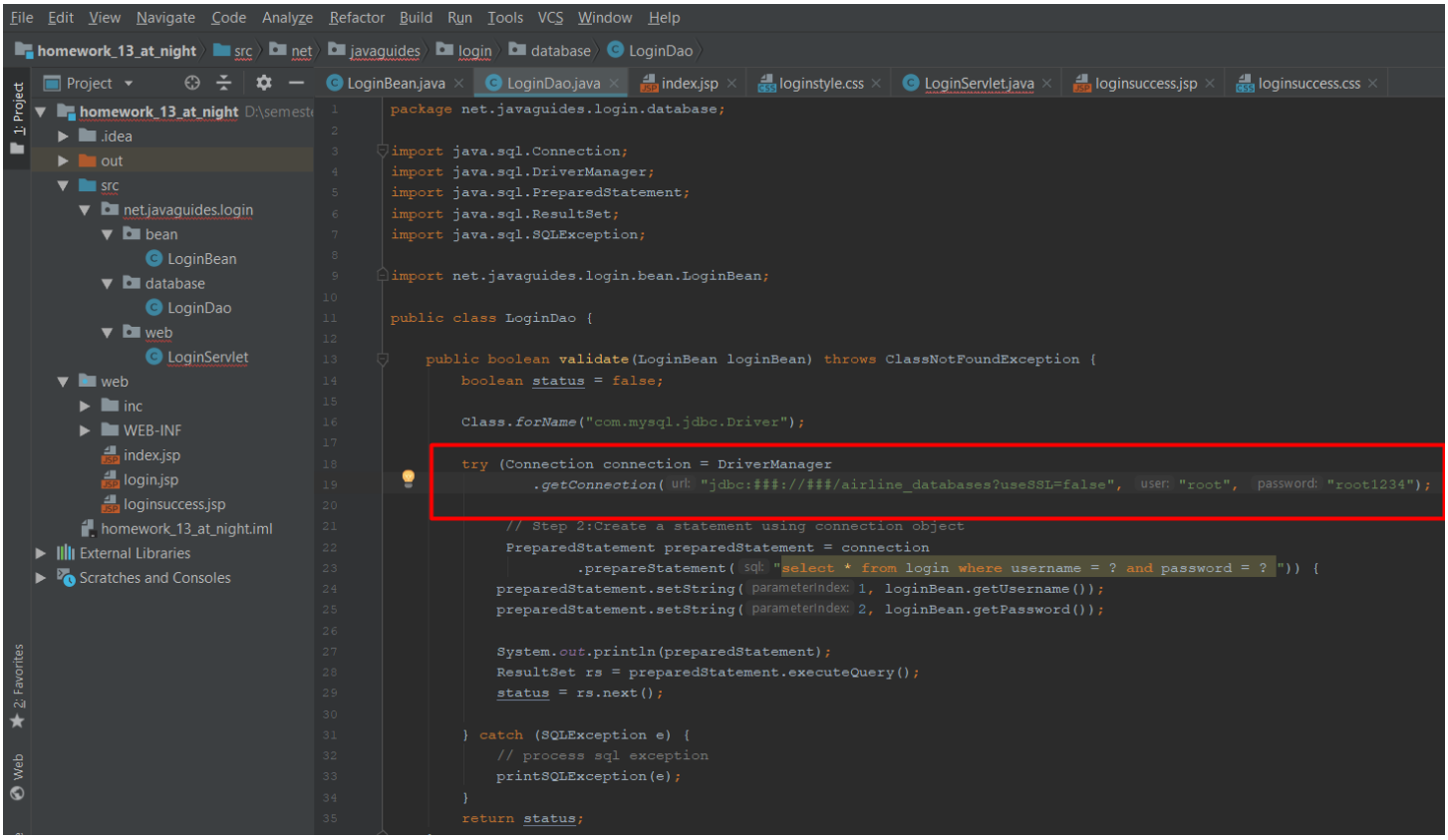
If the two-tier C / S structure is selected, the server is only responsible for data management, and the logical processing, including flight comparison, will be carried out directly on the presentation page. That is to use java code to process data in JSP page, and then display the data on this page. If it is a three-tier C / S structure, we will use the servlet to process the data, and the JSP page will submit the form to the servlet. ***In terms of security, the two-tier structure directly interacts with the database, which is less secure than the three-tier structure.*** *In terms of performance, the two-tier client takes on more tasks, and the page loading is slower than the three-tier structure, so the performance is not dominant. Moreover, the coupling of the three-layer structure is looser, which is more convenient for modification.*

If the number of databases, users and aircraft companies of the system is further increased, the two-tier client will be easier in data management and database sharing due to its simple task. ***However, due to the heavy task of logical processing, the page loading will be further slow, which will make the user experience decline.***

Program design description

6.1 Database connection

Connect to my local database and enter my account password (create java Dao class + servlet)



6.2 System menu

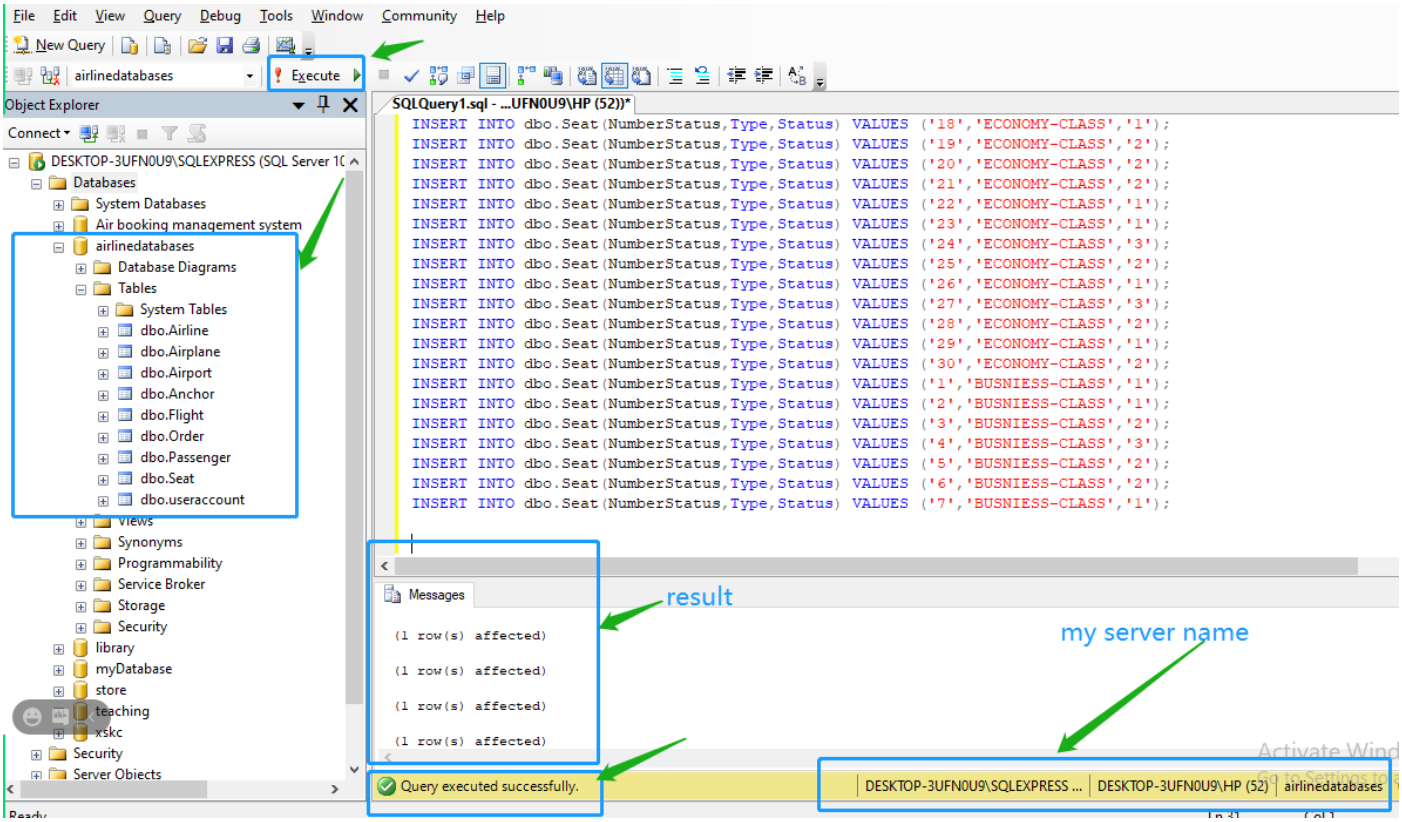
1. **Customer opens the client page----------**
    - **Select the city of departure**
    - **destination**
    - **Date of travel.**
    - **Choose an airline.**
    - **Price**

2. System program-----

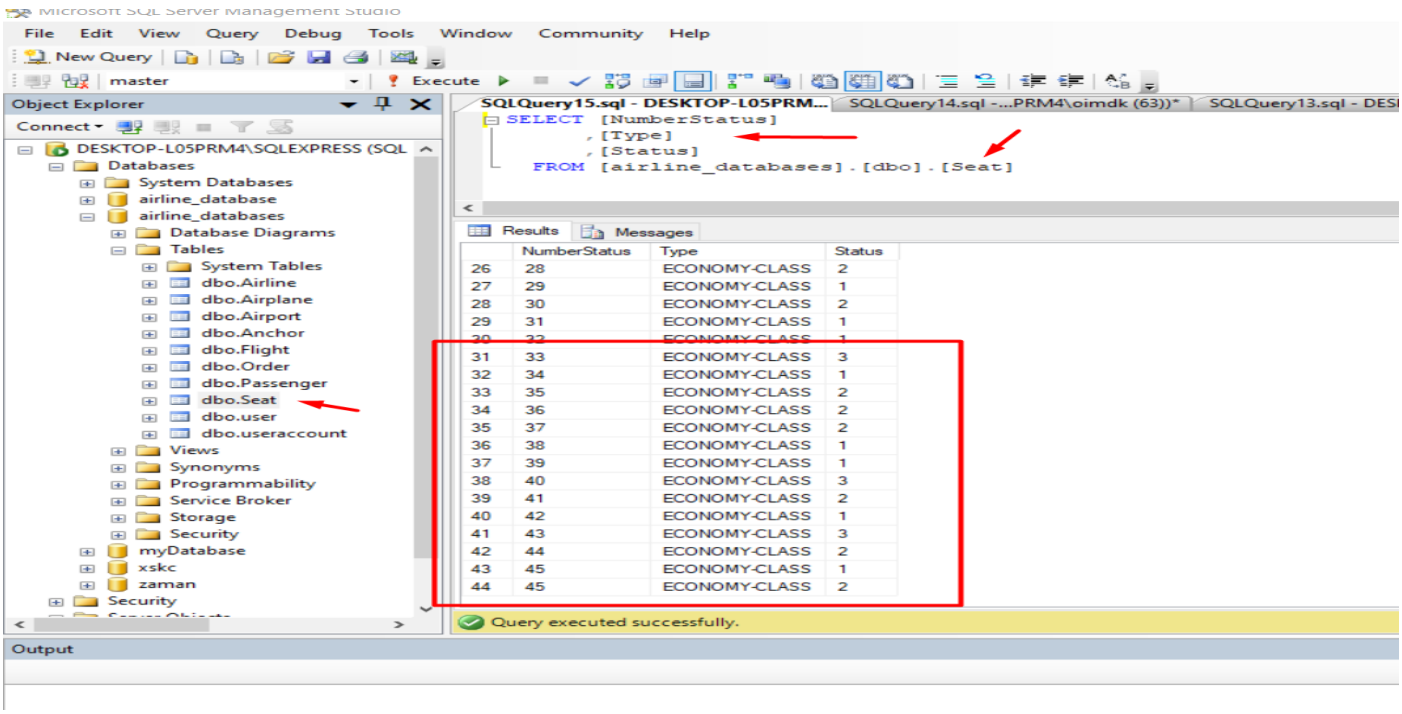
- ***Query of airline has its own database***.
- *When **merging flights**, the time required for **connecting airports should be considered**, i.e. connection time. When **booking** all flights of the **same airline**, the price will be discounted **according** to the airline's **own discount (%).***

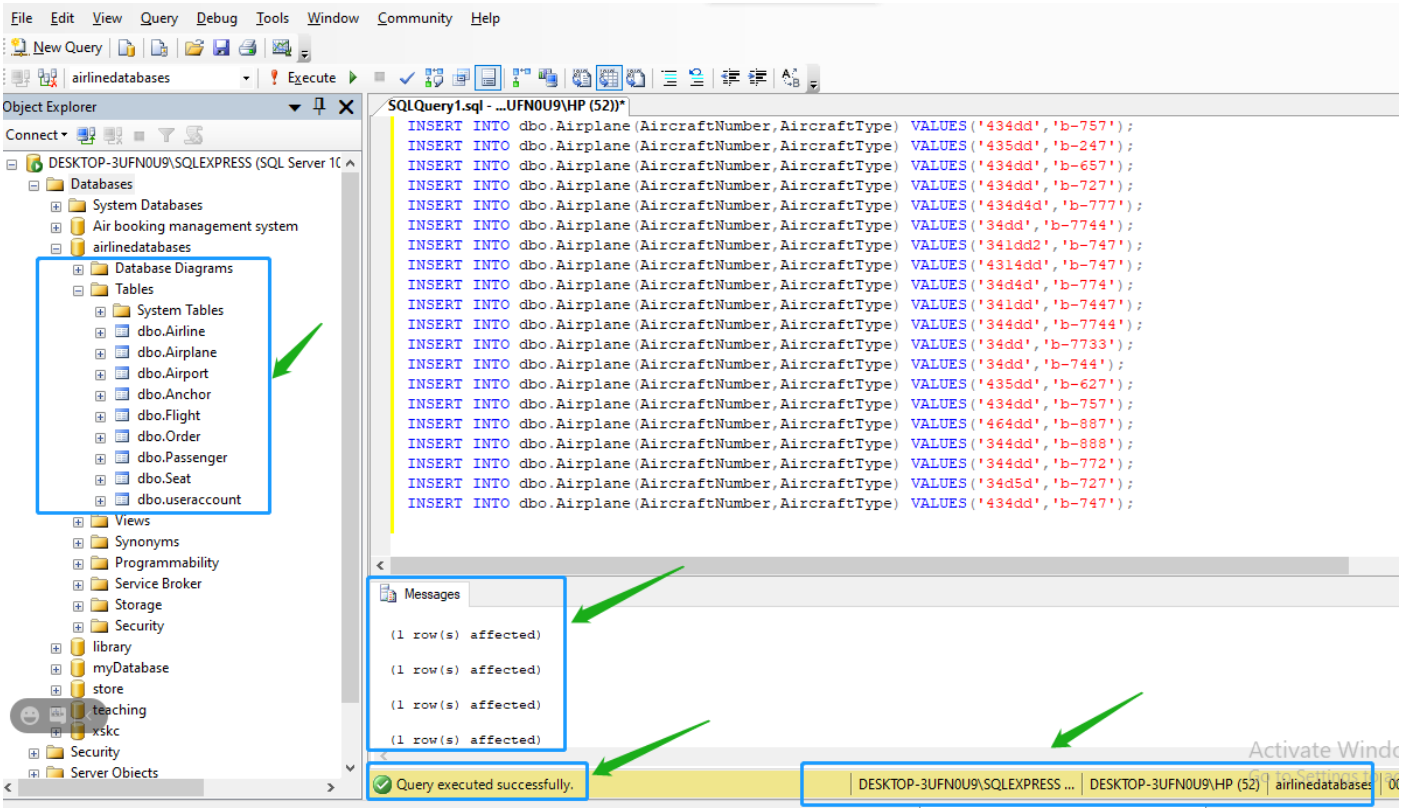
6.3 Data entry, modification and deletion

Data entry:

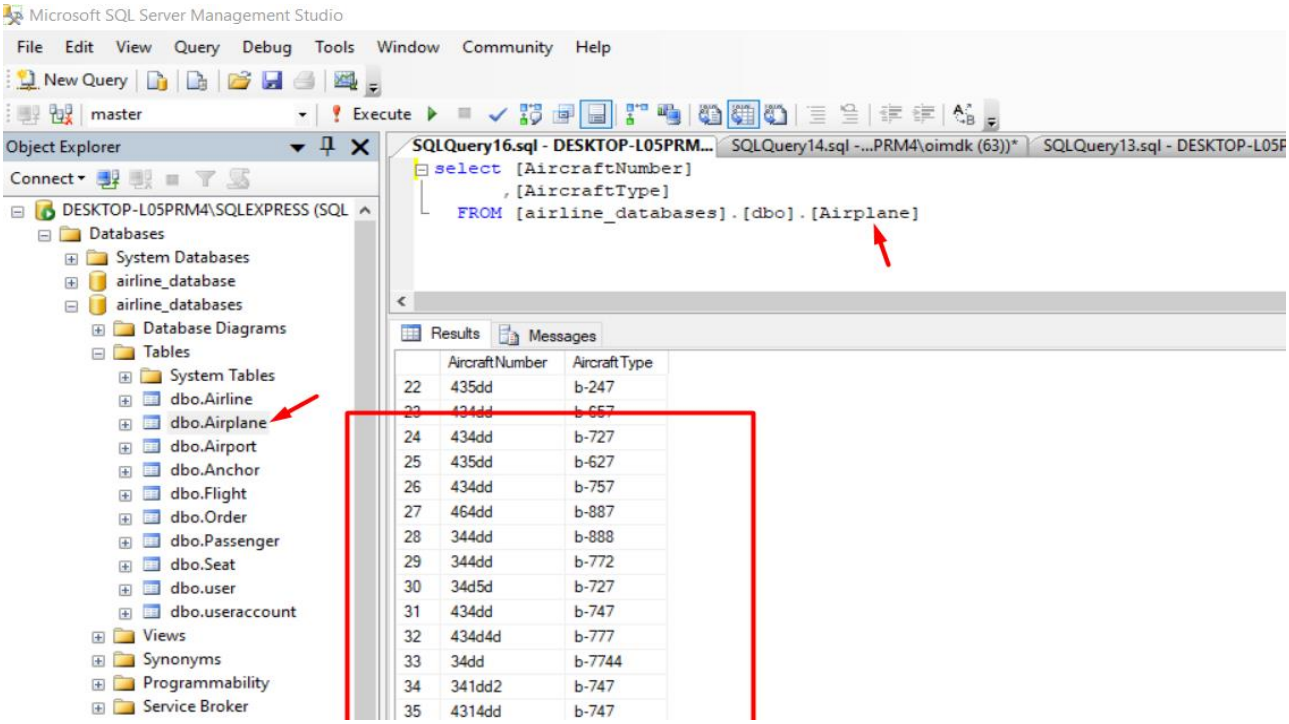


Entry successful::





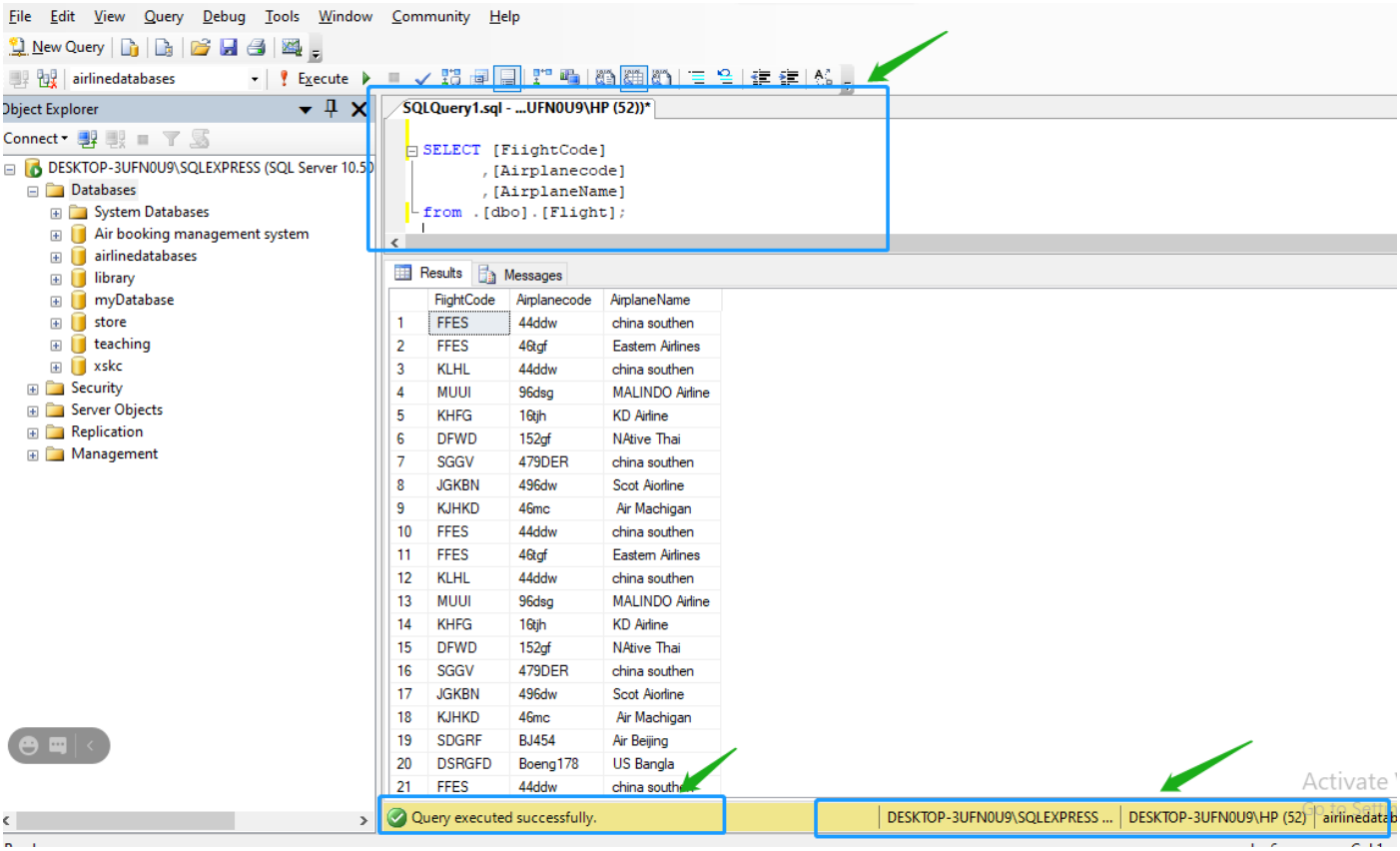
Insert data again:



Modification:

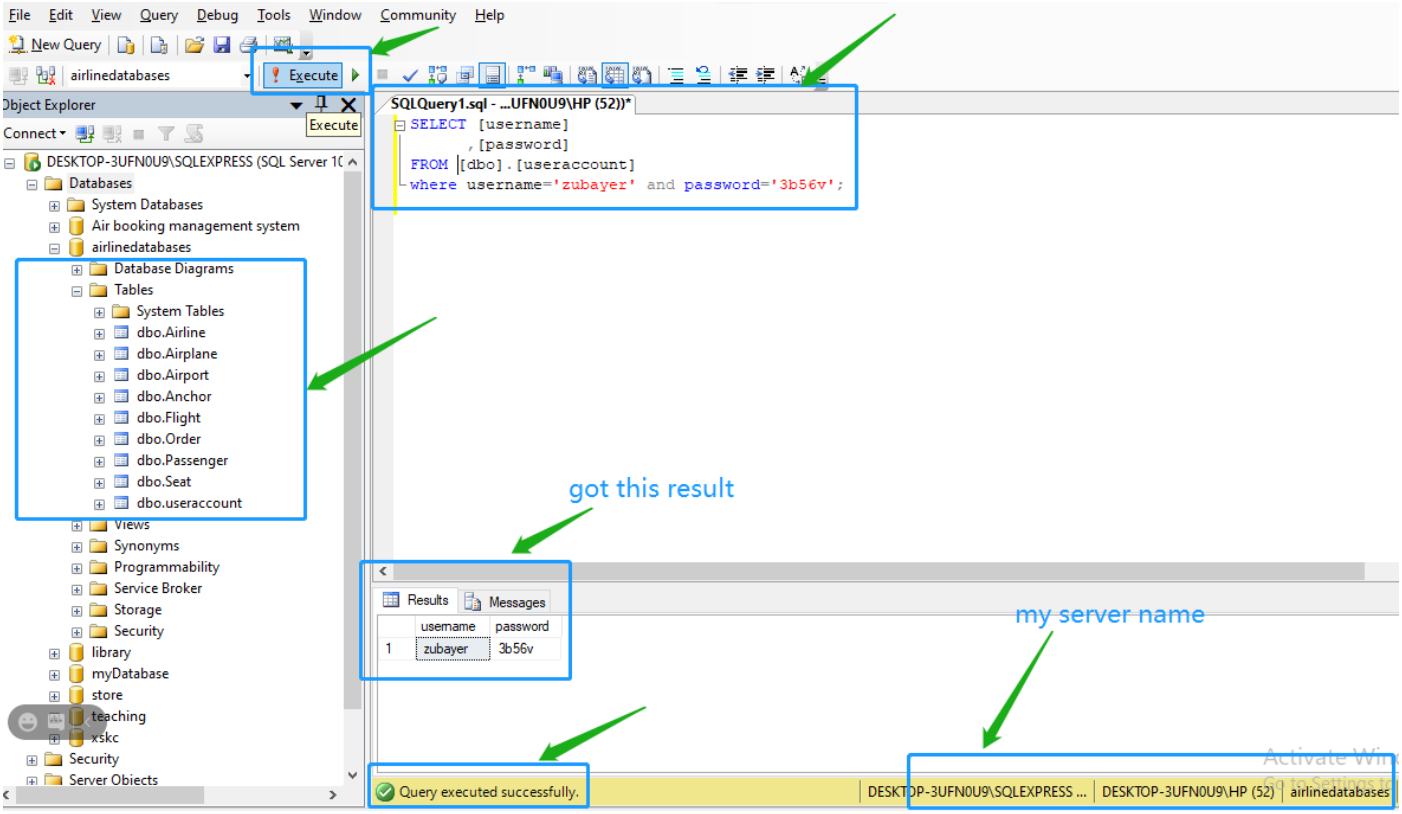
Airplane fare has been change by this query :

Update result:



6.5 Database query

User login query ….

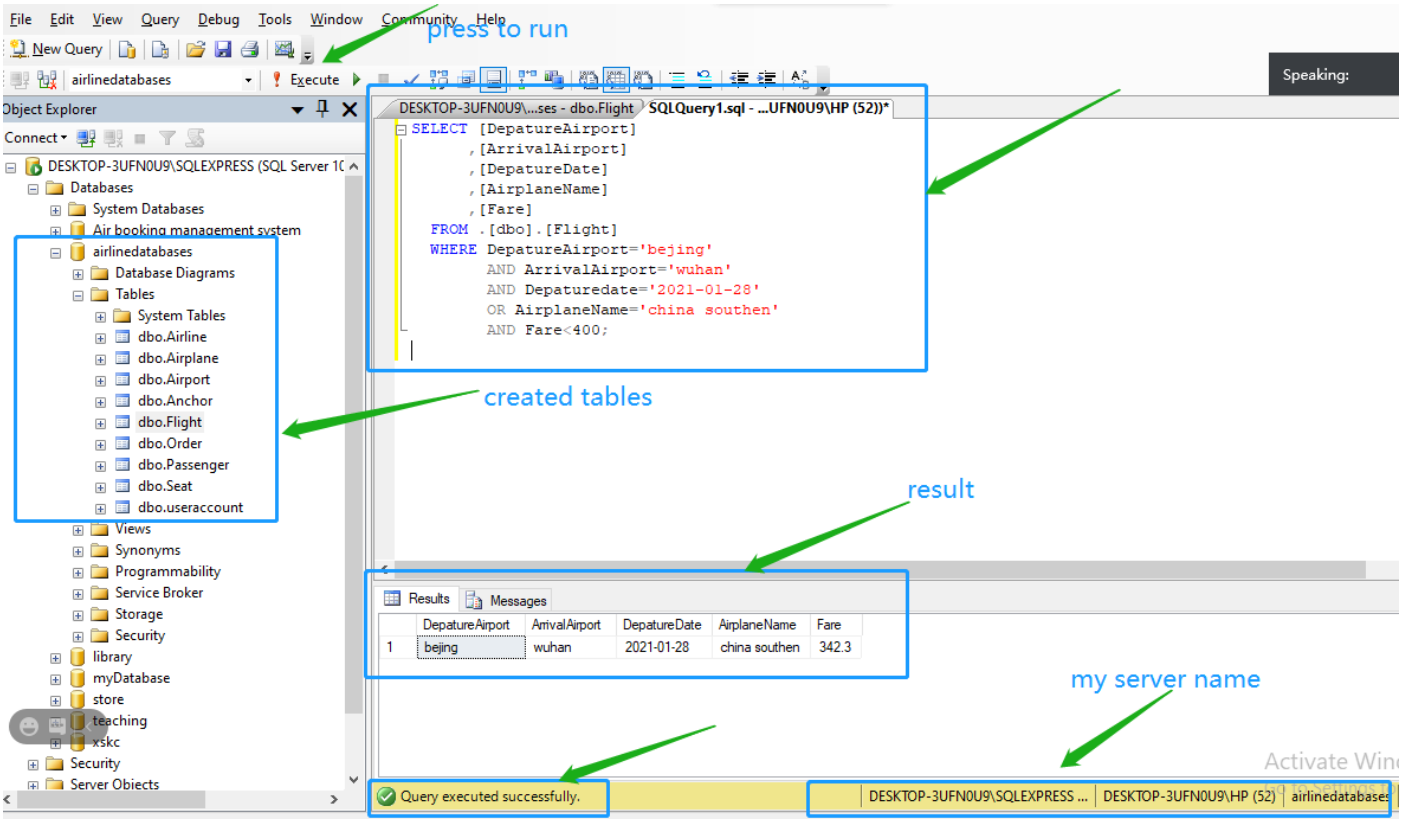


User login is successful

User fight-fare query or search

```
SELECT [DepatureAirport]
      ,[ArrivalAirport]
      ,[DepatureDate]
      ,[AirplaneName]
      ,[Fare]
  FROM .[dbo].[Flight]
  WHERE DepatureAirport='bejing'
        AND ArrivalAirport='wuhan'
        AND Depaturedate='2021-01-28'
```

```
    OR AirplaneName='china southen'
    AND Fare<400;
```



In here, a user search his/her requirement flight, this query in taking its own action and **find some flight details**.

Summary of Course Design

1. Problems and solutions in curriculum design

*1. **Haven't deep knowledge** about store process in database*

*After complete this project, know me able to **connect, modify the remote connection.***

*2. Now I am able to insertion and values. And have **knowledge modify values** which are already inserted in a table.*

*3. If has there any kind of type defined error like string, varchar, char, int, float etc. Now I am able to **resolve.***

2. Analysis of existing problems

*In this database project (airplane database management) we are used to **insertion** data in our **local database directly** (means an operators only they can insert).*

But I future, it's can update like real time data insertion.

*If we create an application it's can be able to **call (.json) API** from Airlines Company and airport management center. And then our application can **modify API data** and convert it SQL language and real-time dynamic insert, modify and deletion on database.*

3. Experience of curriculum design

In the project curriculum design

- *Connect a local database software like Ms SQL 2008, MySQL etc.*
- *Create/build database*
- *Create table*
- *Create schema*
- *Create or make relationship between a table to another table*
- *Insert data, modification and deletion by (database management operator)*
- *Passenger query*

*I also learn **java** (database connection servlet and Dao class) how to create a java class and how connect a. In additional to these, how to overcome my **database by Dao class** laziness, How to **find a quick and accurate** solution using the **Internet (Google)**. Special from https://stackoverflow.com/ how to get my answer.*

And a best website for learning Database is https://www.geeksforgeeks.org/dbms/

THANK YOU

苏贝尔-1811562127-ZUBAYER S M