

Online Booking System for BCIA

Li Tianxiang 2016010848

Department of Industrial Engineering, 61

1. Introduction

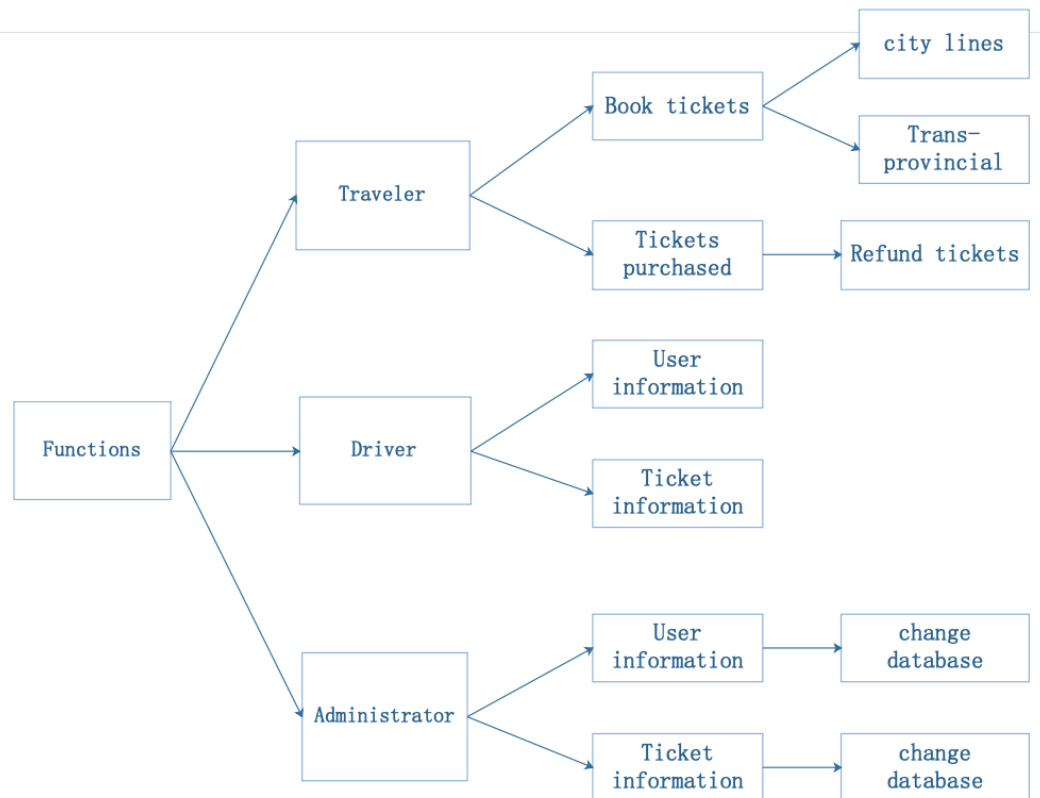
This online booking system is designed for the bus transportation system of Beijing Capital International Airport, whose core function is to allow people to book bus tickets online. The system is based on *python*, using package *sqlalchemy* to connect to the database, and using *Flask* to connect to the web.

2. Assumptions

- There are two kinds of lines: city lines and trans-provincial lines.
- The trans-provincial lines has timetable of departure, and traveler can choose the time and the seat *A, B, C, D, E*.
- In the city lines, since the departure time are not deterministic, they don't have timetable, so the traveler don't need to choose the time and the seat .
- On each trans-provincial bus there are 50 seats in total, each 10 for *A, B, C, D, E*
- Since the bus only travels between the airport and the station, so the traveler just need to choose the station name, and then choose the *direction: from airport to station or from station to airport*.
- Only part of the information on the current website of BCIA is stored in the database to show how the system works.

3. Functions

The system provides different functions to three groups of people: travelers, drivers and administrators. The following picture shows the main functions:



3.1 The travelers

Three parts of functions are provided to travelers: booking tickets, tickets record(including refund ticket), and comments/requirements.

In booking tickets part, two kinds of tickets can be booked: city lines and trans-provincial lines. City lines include stations in Beijing, and the traveler's operations are: choose station → choose direction and date. For trans-provincial lines, the traveler's operations are: choose station→choose direction and date→choose time and seat. The number of surplus tickets for each departure time and each kind of seat is provided by the system.

In tickets record part, the information about the tickets that have been purchased by the user will be provided. The function of refunding a ticket is also provided in this part.

In comments/requirements part, the user can write down his/her requirements or advice and submit it to the system. The information then will be updated to the database.

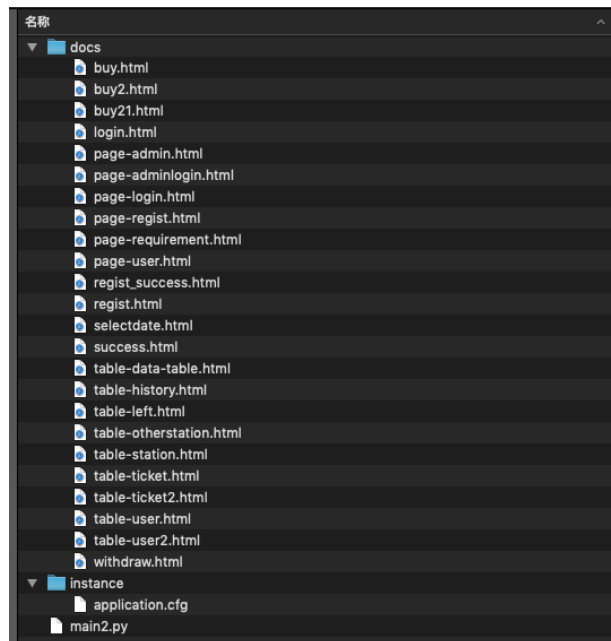
3.2 The administrator

On the administrator page, two kinds of information are provided: table of all the users and table of all the tickets. Also two input boxes will be shown on the page. As the administrator, they can directly input mysql orders in the boxes to operate the database.

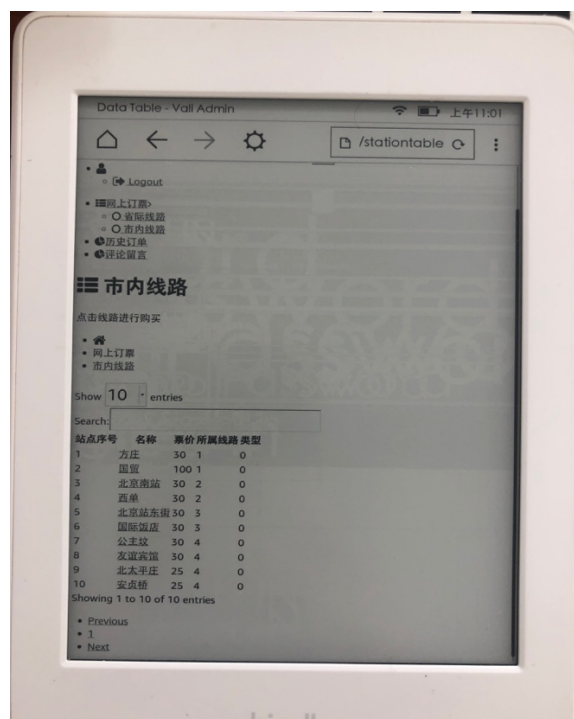
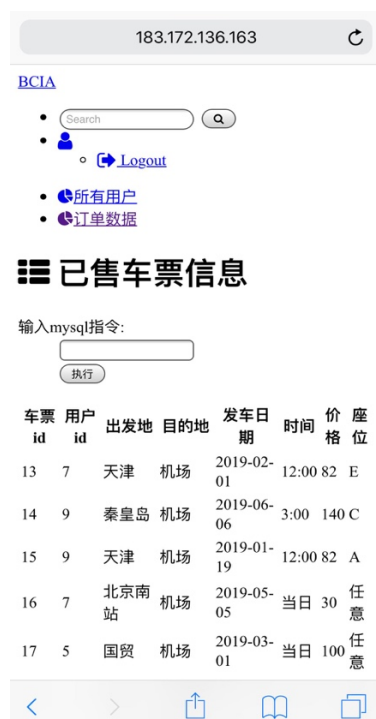
3.3 The drivers

The drivers need to check the information of the users and the tickets. So these two kind of information is also provided on the driver page. The difference is that there are no input boxes on this page so the drivers cannot change the information.

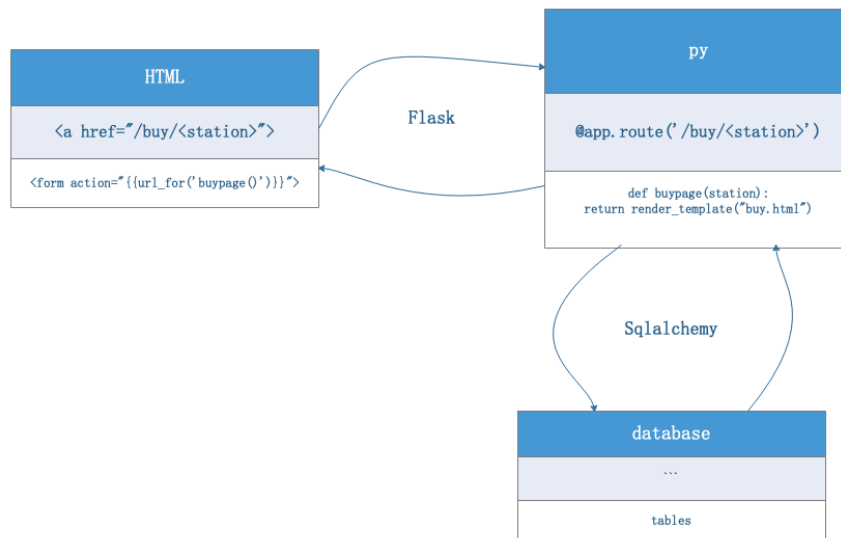
4. Structure and implementation



The structure of the procedure documents is shown above. The system is based on flask, so there are many html documents need to be programmed. And the core is the python file “*main2.py*”. The advantage of using flask is that the system can be used on any device that has a browser, not only computers, but also phones or even kindles.



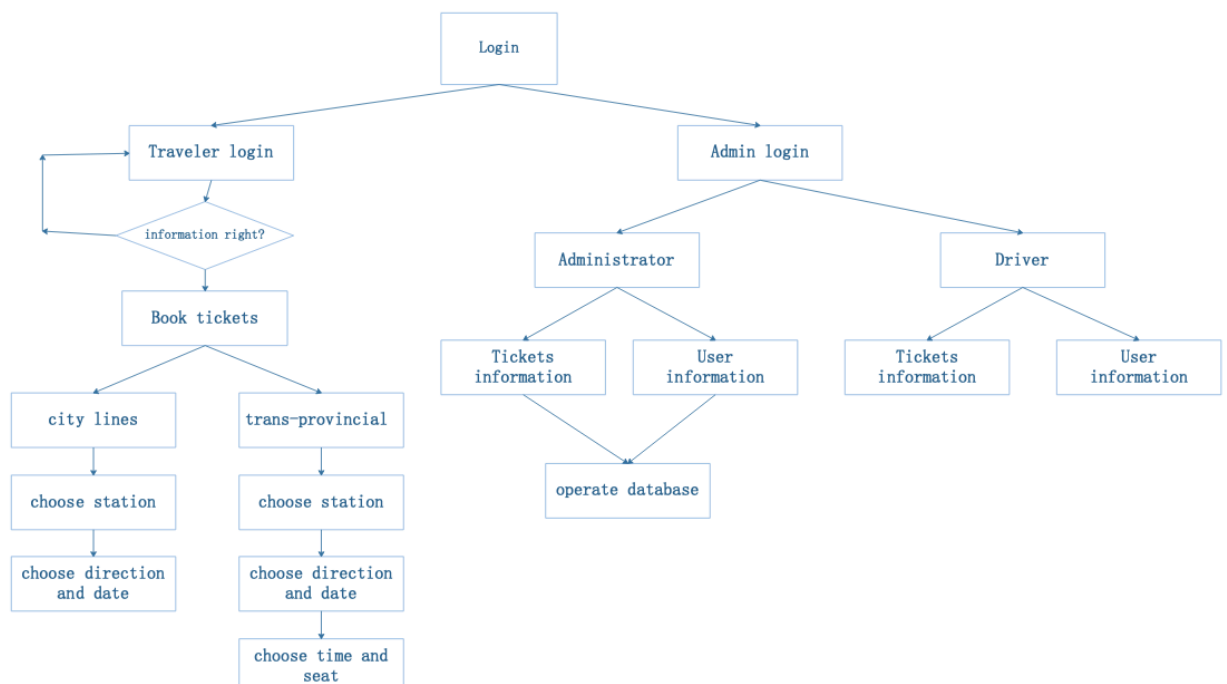
In the python file, package *sqlalchemy* and *flask* are used to connect the database with the web.



The picture shows how the system works. The `<a>` and `<form>` in the html file can transport information from the web to the python program. The code in python file “`@app.route()`” and `render_template()` can connect to the html file. The code “`engine.execute()`” and “`sqlsession.query()`” allow the python file to operate the database.

5. Process of the system

The overview of process is as follows:



5.1 Login/Regist

BICA
SIGN IN
USERNAME
PASSWORD
☐ Stay Signed in
[还没有账号?](#)
[管理员登录](#)

请选择方向和日期:
☒ 从机场到秦皇岛
☐ 从秦皇岛到机场
1 月 1 日

BICA
注册新账号
USERNAME
PASSWORD
真实姓名
手机号码
性别
电子邮箱
出生年份

The first page is the login page. The user can input his/her username and password, or the user can register for a new account.

The administrator and the drivers can choose “login for administrator”, and then input there username and password. They will enter different pages with the travelers.

5.2 Choose functions(User)

BCIA

-
- ☒ [网上订票](#)
 - ☐ [省际线路](#)
 - ☐ [市内线路](#)
- ☐ [历史订单](#)
- ☐ [评论留言](#)

After signed in, the user can choose the page that he/she wants.

5.2.1 “网上订票”

In this part, there are sub-options to choose the line.

省际线路
点击线路进行购买

- ☒ 网上订票
- ☐ [省际线路](#)

Show entries
Search:

站点序号	名称	票价	所属线路	类型	单程时间
11	天津	82	101	1	2小时30分
12	秦皇岛	140	102	1	4小时
13	沧州	100	103	1	3小时

Showing 1 to 3 of 3 entries

[Previous](#)
[1](#)
[Next](#)

票余量
点击对应座位购买

- ☒ 网上订票
- ☐ 省际线路
- ☐ [票余量](#)

Show entries
Search:

出发地	目的地	日期	时间	A	B	C	D	E
秦皇岛	机场	2019-1-1	6:30	10	10	10	10	10
秦皇岛	机场	2019-1-1	8:00	9	10	9	10	10
秦皇岛	机场	2019-1-1	12:00	9	9	10	10	10
秦皇岛	机场	2019-1-1	3:00	10	10	10	10	10

Showing 1 to 4 of 4 entries

For trans-provincial lines, the traveler should choose the station name firstly, and then choose the direction and date. After this, the number of surplus tickets will be shown, and at last the traveler can choose the time and seat he/she wants.

☰ 市内线路

点击线路进行购买

-  网上订票
- 市内线路

Show 10 entries

Search:

站点序号	名称	票价	所属线路	类型
1	方庄	30	1	0
2	国贸	100	1	0
3	北京南站	30	2	0
4	西单	30	2	0
5	北京站东街	30	3	0
6	国际饭店	30	3	0
7	公主坟	30	4	0
8	友谊宾馆	30	4	0
9	北太平庄	25	4	0
10	安贞桥	25	4	0

Showing 1 to 10 of 10 entries

请选择方向和日期:

☒ 从机场到北京南站

☐ 从北京南站到机场

5月7日 确认购买

For trans-provincial lines, the traveler should also choose the station name firstly, then he/she just needs to choose the direction and date.

5.2.2 “历史订单”

☰ 购票历史

点击退票可进行退票

-  历史订单

Show 10 entries

Search:

票号	用户代码	出发地	目的地	出行日期	出发时间	价格	座位	退票
29	15	机场	北京南站	2019-02-04	当日	30	任意	退票
30	15	机场	天津	2019-02-06	12:00	82	C	退票
31	15	秦皇岛	机场	2019-04-01	12:00	140	C	退票

Showing 1 to 3 of 3 entries

- [Previous](#)
- [1](#)
- [Next](#)

是否确定退票?

☒ 否

☐ 是 [提交](#)

In this part, the tickets have been purchased by the user will be shown.

If the user clicks on the “refund” button, then there will be a page to confirm the choice, and the user can decides what to do next.

5.2.3 “评论留言”

☰ 留言区

您可以在下方的文本框输入您的要求或建议:

-  [评论留言](#)

期待您的建议:

[提交](#)

In this page the user can write his/her requirements and advice and submits it to the system.

5.3 Choose functions(administrator)

BICA

管理员登录

USERNAME

PASSWORD

☐ Stay Signed in

BCIA

Search

If the user clicks “login for administrator”, then the page above will be shown. After he inputs the right username and password for the administrator, he can choose the two functions for the administrator.

4.3.1 All the users

已注册用户

输入mysql指令:

Show entries

Search:

用户id	用户名	真实姓名	性别	出生年份	手机号	电子邮件
13	u8	小八	男	1998	158888	88@888.com
14	u9	小九	男	1999	199	999@999.com
15	u1	小一	1	2011	111111	111@111.com
16	u2	小二	男	2012	12222	222@222.com

Showing 1 to 4 of 4 entries

已注册用户

输入mysql指令:

Show entries

Search:

用户id	用户名	真实姓名	性别	出生年份	手机号	电子邮件
13	u8	小八	男	1998	158888	88@888.com
14	u9	小九	男	1999	199	999@999.com
16	u2	小二	男	2012	12222	222@222.com

Showing 1 to 3 of 3 entries

The information of all the users will be shown in this page. The administrator can input mysql orders to operate the database as shown in the picture.

4.3.2 All the tickets

已售车票信息

输入mysql指令:

Show entries

Search:

车票id	用户id	出发地	目的地	发车日期	时间	价格	座位
13	7	天津	机场	2019-02-01	12:00	82	E
14	9	秦皇岛	机场	2019-06-06	3:00	140	C
15	9	天津	机场	2019-01-19	12:00	82	A
16	7	北京南站	机场	2019-05-05	当日	30	任意
17	5	国贸	机场	2019-03-01	当日	100	任意
18	5	机场	北京南站	2019-06-02	当日	30	任意
19	5	机场	国际饭店	2019-01-01	当日	30	任意
20	3	秦皇岛	机场	2019-01-01	8:00	140	A
22	3	天津	机场	2019-01-01	12:00	82	A
24	6	秦皇岛	机场	2019-01-01	12:00	140	A

Showing 1 to 10 of 16 entries

The information of all the tickets will be shown in this page. The administrator can input mysql orders to operate the database just like before.

5.4 Choose functions(drivers)

BICA

管理员登录

USERNAME

PASSWORD

☐ Stay Signed in

BCIA

Search

[所有用户](#)

[订单数据](#)

On the page of login for administrators, if the user name is driver and the password is correct, then the page for driver will be shown. The two part of the information are the same as the administrator, except that the driver has no access to operate the database.

已注册用户

Show entries

Search:

用户id	用户名	真实姓名	性别	出生年份	手机号	电子邮件
13	u8	小八	男	1998	158888 88@888.com	
14	u9	小九	男	1999	199 999@999.com	
16	u2	小二	男	2012	12222 222@222.com	

Showing 1 to 3 of 3 entries

- [Previous](#)
- [1](#)
- [Next](#)

已售车票信息

Show entries

Search:

车票id	用户id	出发地	目的地	发车日期	时间	价格	座位
13	7	天津	机场	2019-02-01	12:00	82	E
14	9	秦皇岛	机场	2019-06-06	3:00	140	C
15	9	天津	机场	2019-01-19	12:00	82	A
16	7	北京南站	机场	2019-05-05	当日	30	任意
17	5	国贸	机场	2019-03-01	当日	100	任意
18	5	机场	北京南站	2019-06-02	当日	30	任意
19	5	机场	国际饭店	2019-01-01	当日	30	任意
20	3	秦皇岛	机场	2019-01-01	8:00	140	A
22	3	天津	机场	2019-01-01	12:00	82	A
24	6	秦皇岛	机场	2019-01-01	12:00	140	A

Showing 1 to 10 of 16 entries

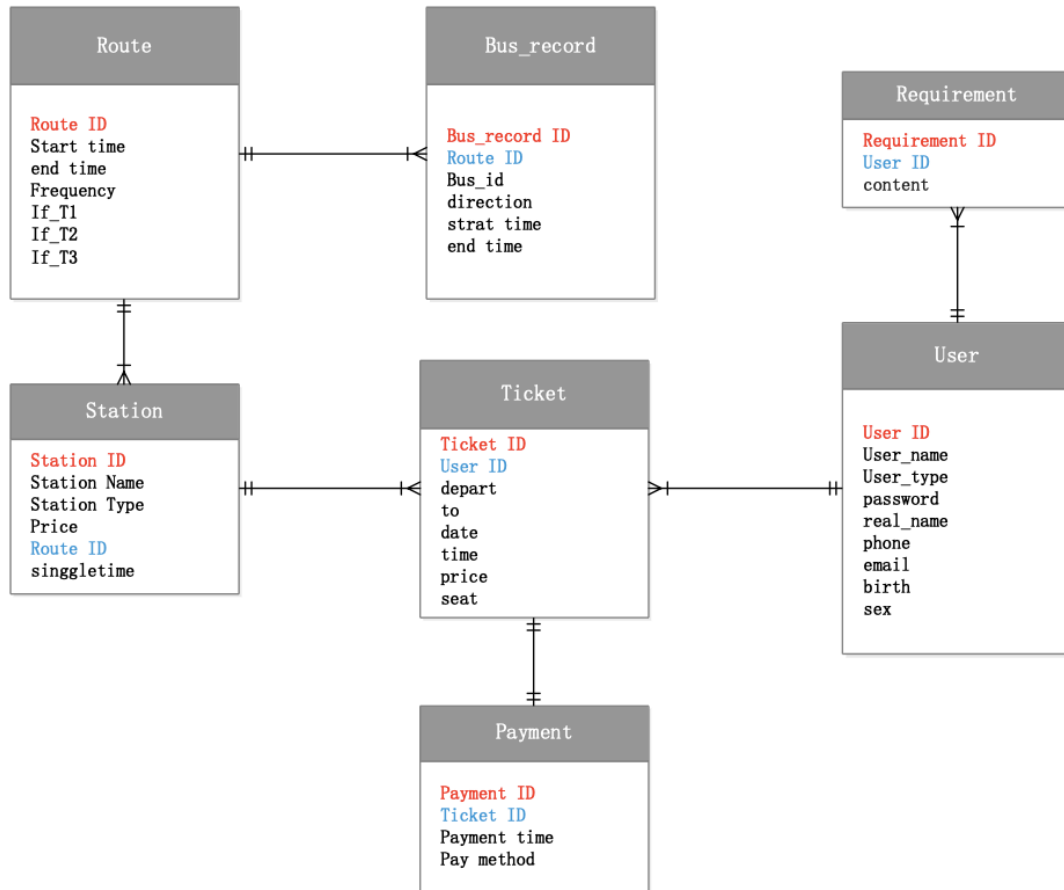
6. ERD

The entity-relationship diagram is as follows.

The Route table records the information of each route, like route 2 in Beijing, or route 101 for Tianjin. The other attributes are some information about the route.

The Bus_record table records the information every time the bus travels between the airport and the station, including the bus_id, the route_id and the time. It should be noted that since the time table are not deterministic, the bus id could be different even for the same route at the same time. That's why this table is needed.

The payment table records information of each payment of the ticket. Since the payment cannot be made in this simplified system, so it's not included in the codes.



7. Screen shots of operation

The mainly process has been shown in part five, but there are some other details not shown:

Search function:

The tables in the system have search functions, so that the user can find the information as quickly as possible, especially when there are a large number of rows:

Show entries

Search:

站点序号	名称	票价	所属线路	类型
1	方庄	30	1	0
2	国贸	100	1	0
3	北京南站	30	2	0
4	西单	30	2	0
5	北京站东街	30	3	0
6	国际饭店	30	3	0
7	公主坟	30	4	0
8	友谊宾馆	30	4	0
9	北太平庄	25	4	0
10	安贞桥	25	4	0

Showing 1 to 10 of 10 entries

Show entries

Search:

站点序号	名称	票价	所属线路	类型
3	北京南站	30	2	0

Showing 1 to 1 of 1 entries (filtered from 10 total entries)


Error message:

Type of error will be shown so that the user can find out the problem:

BICA

Error: Not exist!


 SIGN IN

USERNAME 
PASSWORD
☐ Stay Signed in

BICA

Error: wrong password

 SIGN IN

USERNAME 
PASSWORD
☐ Stay Signed in

8. Screen shots of data tables

User:

User_id	User_name	User_type	password	real_name	phone	email	birth	sex
13	u8	1	888	小八	158888	88@888.com	1998	男
14	u9	1	999	小九	199	999@999.com	1999	男
▶ 16	u2	1	222	小二	12222	222@222.com	2012	男
20	小明	1	xiaoming	李明	15821219863	tsing@sadh.com	1999	男
21	小红	1	xiaoming	王红	1512342153	tsasding@sh.com	1999	女

Ticket:

ticket_id	user_id	depart	to	date	time	price	seat
▶ 14	9	秦皇岛	机场	2019-06-06	3:00	140	C
15	9	天津	机场	2019-01-19	12:00	82	A
16	7	北京南站	机场	2019-05-05	当日	30	任意
17	5	国贸	机场	2019-03-01	当日	100	任意
18	5	机场	北京南站	2019-06-02	当日	30	任意
19	5	机场	国际饭店	2019-01-01	当日	30	任意
20	3	秦皇岛	机场	2019-01-01	8:00	140	A

Station:

station_...	station_name	station_type	price	route_id	singleti...
▶ 1	方庄	0	30	1	NULL
2	国贸	0	100	1	NULL
3	北京南站	0	30	2	NULL
4	西单	0	30	2	NULL
5	北京站东街	0	30	3	NULL
6	国际饭店	0	30	3	NULL
7	公主坟	0	30	4	NULL
8	友谊宾馆	0	30	4	NULL
9	北太平庄	0	25	4	NULL
10	安贞桥	0	25	4	NULL
11	天津	1	82	101	2小时3...
12	秦皇岛	1	140	102	4小时
13	沧州	1	100	103	3小时

Route:

route_id	starttime	endtime	frequency	ifT1	ifT2	ifT3
▶ 1	5:00	21:00	30	1	1	1
2	5:00	21:00	30	1	1	1
3	5:00	21:00	30	1	1	1
4	4:30	22:00	30	1	1	1
5	6:00	18:00	60	1	0	1
101	6:30	23:00	30	1	1	0

Bus_record:

	bus_record...	route_id	bus_id	directi...	startti...	endti...
▶	1	2	京HU123	0	12:00	1:05
	2	5	京YF653	1	1:00	1:35
	3	101	j冀AP58326	1	12:00	14:30
	4	9	京WE526	0	3:00	3:30

Requirement:

	requirement...	user_id	content
▶	1	11	还行
	2	9	站台在哪
	3	20	希望能控制空调温度
	4	101	五星好评
	5	23	等待时间过长