

TIS 3351

ADVANCED DATABASE

ASSIGNMENT 1

DATA WAREHOUSE FOR AIRASIA BOOKING SYSTEM

BY

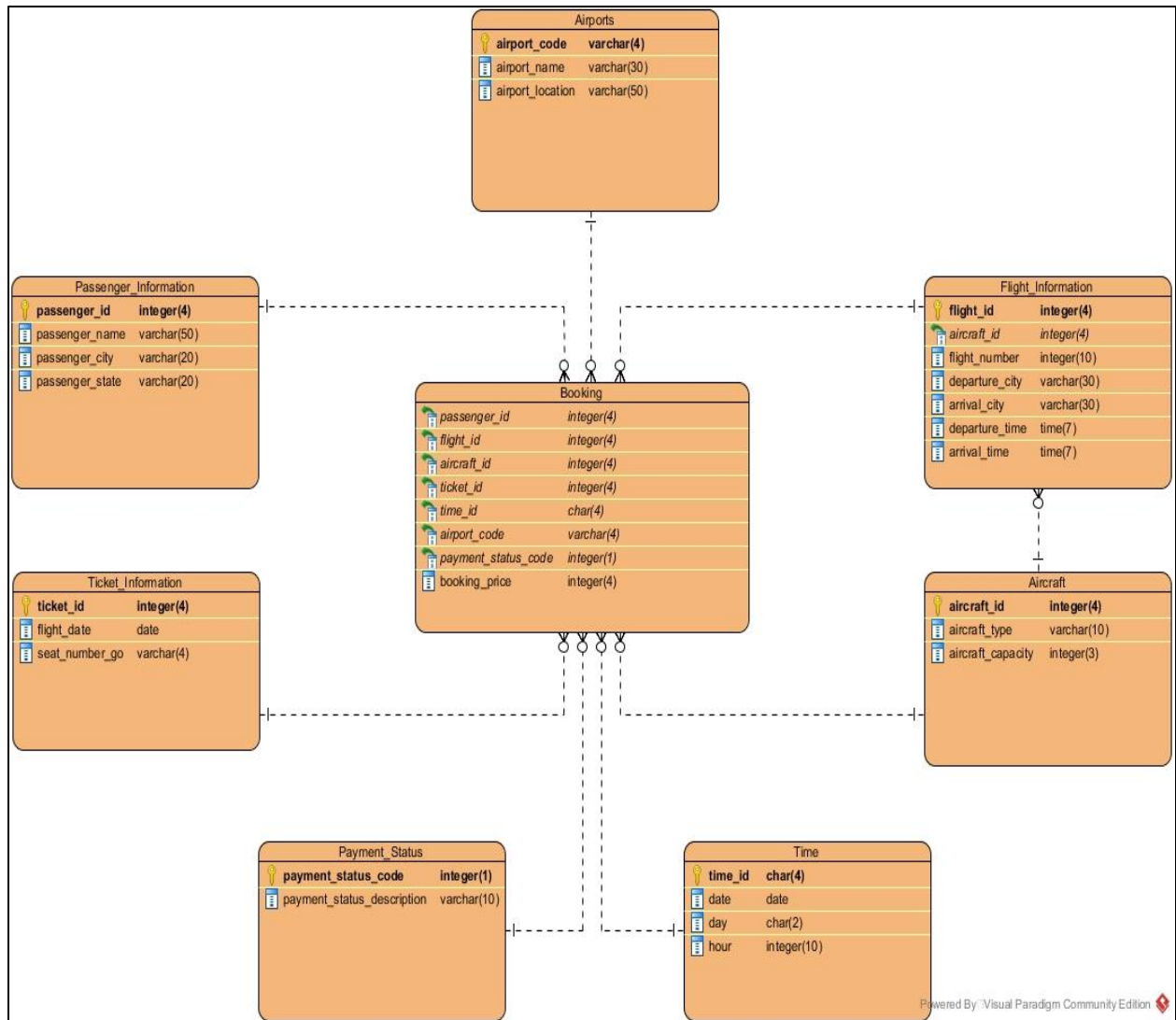
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1. Based on the chose case study, explain the differences of operational database and data warehouse for the company.

Operational Database	Data Warehouse
provides all flight-related data accurately and efficiently in a real-time environment	Provides large amount of data for long-term usage
focus on the different information requirements of the various users like registration and billing	focus on the data collection for analysis and accessing information
Only all flight-event relevant information is listed and recorded to enables smooth processing of flight	Only the most important part of information stored that can be used to make decision making
supplies specific information to airport personnel in the various departments, to airlines, passengers, visitors and authorities operating at the airport	The information's stored to help decided for the future will be only used by the upper level manager, corporate manager (CEOs)

2. Draw the conceptual schema for the data warehouse either by using star schema or snowflake schema. Your conceptual schema should be drawn using CA ERWin Data Modeler/ or any other modeling tools. The data warehouse should be designed to assist long term decision making process.



3. Include the data dictionary.

Table Name	Attribute Name	Data Type	Format	Nullable	PK/FK	FK Reference Table
Passenger	Passenger_id	Integer(4)	012345	No	PK	
	Passenger_name	Varchar(50)	Xxxxx			
	Passenger_city	Varchar(20)	Xxxxx			
	Passenger_state	Varchar(20)	Xxxxx			
	Passenger_zipcode	Integer(5)	012345			
Airports	Airport_code	Varchar(4)	Xxxxx	No	PK	
	Airport_name	Varchar(20)	Xxxxx			
	Airport_location	Varchar(50)	Xxxxx			
Flight_Information	Flight_id	Integer(4)	012345	No	PK	
	Aircraft_id	Integer(2)	012345	No	FK	Aircraft
	Flight_number	Integer(10)	012345			
	Departure_city	Varchar(10)	Xxxxx			
	Arrival_city	Varchar(10)	Xxxxx			
	Departure_time	datetime	YYYY/MM/DD			
	Arrival_time	datetime	YYYY/MM/DD			
Payment_Status	Payment_status_code	Integer(1)	012345	No		
	Payment_status_desc	Varchar(10)	xxxxx			
Aircraft	Aircraft_id	Integer(4)	012345	No	PK	
	Aircraft_type	Varchar(10)	Xxxxx			
	Aircraft_capacity	Integer(3)	012345			
Ticket_Information	Ticket_id	Integer(4)	012345	No	PK	
	Gate_number	Char(5)	Xxxxx			
	Seat_number	Varchar(5)	YYYY/MM/DD			
	return_date	date	YYYY/MM/DD			
Time	Time_id	Char(4)	Xxxxx	No	PK	
	Date	Date	YYYY/MM/DD			
	Day	Char(2)	Xxxxx			
	hour	Integer(2)	012345			
Booking	Passenger_id	Integer(4)	012345	No	FK	Passenger_Information
	Flight_id	Integer(4)	012345	No	FK	Flight_Information
	Aircraft_id	Integer(4)	012345	No	FK	Aircraft
	Ticket_id	Integer(4)	012345	No	FK	Ticket_Information
	Time_id	Char(4)	Xxxxx	No	FK	Time
	Airport_code	Varchar(4)	Xxxxx	No	FK	Airports
	Payment_status_code	Integer(1)	012345	No	FK	Payment_Status
	Booking_price	Integer(4)	012345			
	Booking_count	Integer(4)	012345			

4. Show calculation for the fact table size and storage in the database schema.

Facts Table Size and Storage

Size of Facts Table (Rows)

Total rows Airports Table = 3 records

Total rows Passenger_Information Table = 4 records

Total rows Ticket_Information Table = 3 records

Total rows Aircrafts Table = 3 records

Total rows Payment_Status Table = 2 records

Total rows Flight_Information = 7 records

Total rows Time = 4 records

Total rows of facts table (Booking Facts) = $3 * 4 * 3 * 3 * 2 * 7 * 4$
= 6048 numbers of rows

Size of Facts Table (Bytes)

Passenger_Id = 4

Flight_id = 4

Aircraft_Id = 4

Ticket_Id = 4

Time_Id = 4

Airport _code = 4

Payment_Status_Code = 1

Booking_Price = 4

Total = 29 bytes

Total Storage needed = 29 bytes * 6048 rows
= 175,392 bytes
= 0.167267 MB
= 0.17 MB

Size of Facts Table = numbers of rows * size of facts table (rows) * average field size in facts table

Size of Facts Table = 6048 rows * 7 * 4
= 169,344 bytes

Average Field Size in Facts Table = $(4 + 4 + 4 + 4 + 4 + 4 + 1 + 4) / 7$
= 4.1428
 ≈ 4

5. Implement the data warehouse on IBM DB2 using SQL commands (Data Definition Language (DDL)).

Creating tables

```
Create table Passenger_Information (  
passenger_id int not null primary key,  
passenger_name varchar(50),  
passenger_city varchar(20),  
passenger_state varchar(20),  
);
```

```
Create table Flight_Information (  
flight_id int not null primary key,  
aircraft_id int,  
departure_city varchar(30),  
arrival_city varchar(30),  
departure_time time,  
arrival_time time,  
Foreign key (aircraft_id) references Aircraft  
);
```

```
Create table Airport (  
airport_code varchar(4) not null primary key,  
airport_name varchar(30),  
airport_location varchar(50)  
);
```

```
Create table Aircraft (  
aircraft_id int not null primary key,  
aircraft_type varchar(10),  
aircraft_capacity int  
);
```

```
Create table Time (  
time_id char(4) not null primary key,  
date date not null,  
Day char(2) not null CHECK ( Day IN ( 'Mo', 'Tu', 'We', 'Th', 'Fr',  
'Sa', 'Su' ) ),  
Hour int not null CHECK (Hour>-1 AND Hour<24),  
);
```

```
Create table Payment_Status (  
payment_status_code int not null primary key,  
payment_status_description varchar(10)  
);
```

```
Create table Ticket_Information (  
ticket_id int not null primary key,  
flight_date date,  
seat_number_go varchar(5)  
);
```

```
Create table Booking (  
passenger_id int,  
flight_id int,  
aircraft_id int,  
ticket_id int,  
time_id char(4),  
airport_code varchar(4),  
payment_status_code int,  
booking_price int,  
Foreign key (passenger_id) references Passenger_Information,  
Foreign key (flight_id) references Flight_Information,  
Foreign key (aircraft_id) references Aircraft,  
Foreign key (ticket_id) references Ticket_Information,  
Foreign key (airport_code) references Airport,  
Foreign key (payment_status_code) references Payment_Status  
);
```

6. Enter sample data into the data warehouse, at least 20 records into each table using SQL commands (Data Manipulation Language (DML)).

```
Insert into Passenger_Information values (1100, 'Mike Tyson' , 'Kuala Lumpur', 'Selangor')
Insert into Passenger_Information values (1101, 'Arif Danial' , 'Kluang', 'Johor')
Insert into Passenger_Information values (1102, 'Nabil Ahmad' , 'Rembau', 'Negeri Sembilan')
Insert into Passenger_Information values (1103, 'Zizan Razak' , 'Shah Alam', 'Selangor')
Insert into Passenger_Information values (1104, 'Kamal Haziq' , 'Klang Lama', 'Selangor')
Insert into Passenger_Information values (1105, 'Lee Kuan Yew' , 'Kuala Pilah', 'Negeri Sembilan')
Insert into Passenger_Information values (1106, 'Lim Kit Siang' , 'Bandar Melaka', 'Melaka')
Insert into Passenger_Information values (1107, 'Jackie Lew' , 'Batu Pahat', 'Johor')
Insert into Passenger_Information values (1108, 'Kevin Gavinraj' , 'Kuala Terengganu', 'Terengganu')
Insert into Passenger_Information values (1109, 'Syed Putra' , 'Pekan', 'Pahang')
Insert into Passenger_Information values (1110, 'Abdul Rahman' , 'Genting Highland', 'Pahang') Inset
Insert into Passenger_Information values (1111, 'Abdul Hussein' , 'Alor Setar', 'Kedah')
Insert into Passenger_Information values (1112, 'Lee Chong Wei' , 'Bukit Mertajam', 'Pulau Pinang')
Insert into Passenger_Information values (1113, 'Thanabalan Singram' , 'Tanjung Malim', 'Perak')
Insert into Passenger_Information values (1114, 'Rahman Putra' , 'Kuala Lumpur', 'Selangor')
```

```
Select * from Passenger_Information
```

```
db2 => select * from Passenger_Information
```

PASSENGER_ID	PASSENGER_NAME	PASSENGER_CITY	PASSENGER_STATE
1100	Mike Tyson	Kuala Lumpur	Selangor
1101	Arif Danial	Kluang	Johor
1102	Nabil Ahmad	Rembau	Negeri Sembilan
1103	Zizan Razak	Shah Alam	Selangor
1104	Kamal Haziq	Klang Lama	Selangor
1105	Lee Kuan Yew	Kuala Pilah	Negeri Sembilan
1106	Lim Kit Siang	Bandar Melaka	Melaka
1107	Jackie Lew	Batu Pahat	Johor
1108	Kevin Gavinraj	Kuala Terengganu	Terengganu
1109	Syed Putra	Pekan	Pahang
1110	Abdul Rahman	Genting Highland	Pahang
1111	Abdul Hussein	Alor Setar	Kedah
1112	Lee Chong Wei	Bukit Mertajam	Pulau Pinang
1113	Thanabalan Singram	Tanjung Malim	Perak
1114	Rahman Putra	Kuala Lumpur	Selangor

```
15 record(s) selected.
```


Insert into Flight_Information values (2400, 100, 'Kuala Lumpur', 'Samut Prakan', '14:30:00', '16:00:00')
 Insert into Flight_Information values (2401, 101, 'Kuala Lumpur', 'Shanghai', '22:00:00', '06:00:00')
 Insert into Flight_Information values (2402, 102, 'Tokyo', 'Kuala Lumpur', '00:00:00', '10:00:00')
 Insert into Flight_Information values (2403, 103, 'Singapore', 'Kuala Lumpur', '12:00:00', '12:40:00')
 Insert into Flight_Information values (2404, 104, 'Kuala Lumpur', 'Jakarta', '16:30:00', '18:00:00')
 Insert into Flight_Information values (2405, 105, 'Dubai', 'Kuala Lumpur', '18:00:00', '00:00:00')
 Insert into Flight_Information values (2406, 106, 'London', 'Singapore', '20:30:00', '19:15:00')
 Insert into Flight_Information values (2407, 107, 'Shanghai', 'Singapore', '11:00:00', '21:00:00')
 Insert into Flight_Information values (2408, 108, 'Kuala Lumpur', 'London', '12:00:00', '22:20:00')
 Insert into Flight_Information values (2409, 109, 'Shanghai', 'Kuala Lumpur', '00:45:00', '10:00:00')
 Insert into Flight_Information values (2410, 110, 'Jakarta', 'Singapore', '17:45:00', '19:00:00')
 Insert into Flight_Information values (2411, 201, 'Dubai', 'Singapore', '00:15:00', '06:00:00')
 Insert into Flight_Information values (2412, 202, 'Kuala Lumpur', 'Tokyo', '13:25:00', '23:25:00')
 Insert into Flight_Information values (2413, 203, 'London', 'Kuala Lumpur', '21:00:00', '19:05:00')
 Insert into Flight_Information values (2414, 204, 'Kuala Lumpur', 'Dubai', '19:45:00', '03:45:00')

Select * from Flight_Information

```
db2 => select * from Flight_Information
```

FLIGHT_ID	AIRCRAFT_ID	DEPARTURE_CITY	ARRIVAL_CITY	DEPARTURE_TIME	ARRIVAL_TIME
2400	100	Kuala Lumpur	Samut Prakan	14:30:00	16:00:00
2401	101	Kuala Lumpur	Shanghai	22:00:00	06:00:00
2402	102	Tokyo	Kuala Lumpur	00:00:00	10:00:00
2403	103	Singapore	Kuala Lumpur	12:00:00	12:40:00
2404	104	Kuala Lumpur	Jakarta	16:30:00	18:00:00
2405	105	Dubai	Kuala Lumpur	18:00:00	00:00:00
2406	106	London	Singapore	20:30:00	19:15:00
2407	107	Shanghai	Singapore	11:00:00	21:00:00
2408	108	Kuala Lumpur	London	12:00:00	22:20:00
2409	109	Shanghai	Kuala Lumpur	00:45:00	10:00:00
2410	110	Jakarta	Singapore	17:45:00	19:00:00
2411	201	Dubai	Singapore	00:15:00	06:00:00
2413	203	London	Kuala Lumpur	21:00:00	19:05:00
2414	204	Kuala Lumpur	Dubai	19:45:00	03:45:00
2412	202	Kuala Lumpur	Tokyo	13:25:00	23:25:00

15 record(s) selected.

Insert into Airport values ('KL01', 'KLIA', 'Kuala Lumpur')
Insert into Airport values('KL02', 'KLIA2', 'Kuala Lumpur')
Insert into Airport values('SB30', 'Subang Airport', 'Subang Jaya')
Insert into Airport values('SA45', 'Suvarnabhumi Airport', 'Samut Prakan')
Insert into Airport values ('DB12', 'Dubai International Airport', 'Dubai')
Insert into Airport values ('S007', 'Singapore Changi Airport', 'Singapore')
Insert into Airport values ('LD24', 'London Heathrow Airport', 'London')
insert into Airport values ('TY68', 'Tokyo Haneda Airport', 'Tokyo')
Insert into Airport values ('SH77', 'Shanghai Pudong Airport', 'Shanghai')
Insert into Airport values ('SJ60', 'Soekarno Hatta Airport', 'Jakarta')

*Select * from Airport*

```
db2 => select * from Airport
```

AIRPORT_CODE	AIRPORT_NAME	AIRPORT_LOCATION
KL01	KLIA	Kuala Lumpur
KL02	KLIA2	Kuala Lumpur
SB30	Subang Airport	Subang Jaya
SA45	Suvarnabhumi Airport	Samut Prakan
DB12	Dubai International Airport	Dubai
S007	Singapore Changi Airport	Singapore
LD24	London Heathrow Airport	London
TY68	Tokyo Haneda Airport	Tokyo
SH77	Shanghai Pudong Airport	Shanghai
SJ60	Soekarno Hatta Airport	Jakarta

10 record(s) selected.

```

insert into Aircraft values (100, 'AIRBUS A220', 130)
insert into Aircraft values (101, 'AIRBUS A300', 254)
insert into Aircraft values (102, 'AIRBUS A310', 187)
insert into Aircraft values (103, 'AIRBUS A318', 107)
insert into Aircraft values (104, 'AIRBUS A319', 124)
insert into Aircraft values (105, 'AIRBUS A320', 150)
insert into Aircraft values (106, 'AIRBUS A321', 185)
insert into Aircraft values (107, 'AIRBUS A330', 300)
insert into Aircraft values (108, 'AIRBUS A340', 380)
insert into Aircraft values (109, 'AIRBUS A350', 350)
insert into Aircraft values (110, 'AIRBUS A380', 555)
insert into Aircraft values (200, 'BOEING 737', 215)
insert into Aircraft values (201, 'BOEING 747', 605)
insert into Aircraft values (202, 'BOEING 767', 375)
insert into Aircraft values (203, 'BOEING 777', 550)
insert into Aircraft values (204, 'BOEING 787', 330)

```

Select * from Aircraft

```
db2 => select * from Aircraft
```

AIRCRAFT_ID	AIRCRAFT_TYPE	AIRCRAFT_CAPACITY
100	AIRBUS A220	130
101	AIRBUS A300	254
102	AIRBUS A310	187
103	AIRBUS A318	107
104	AIRBUS A319	124
105	AIRBUS A320	150
106	AIRBUS A321	185
107	AIRBUS A330	300
108	AIRBUS A340	380
109	AIRBUS A350	350
110	AIRBUS A380	555
200	BOEING 737	215
201	BOEING 747	605
202	BOEING 767	375
203	BOEING 777	550
204	BOEING 787	330

16 record(s) selected.

```

Insert into Time values ( '1701', '2018-07-09', 'Tu', 9)
Insert into Time values ( '1702', '2018-07-13', 'Mo', 13)
Insert into Time values ( '1703', '2018-06-19', 'Fr', 10)
Insert into Time values ( '1704', '2018-06-30', 'We', 9)
Insert into Time values ( '1705', '2018-07-19', 'Mo', 14)
Insert into Time values ( '1706', '2018-06-15', 'Mo', 14)
Insert into Time values ( '1707', '2018-07-11', 'Sa', 8)
Insert into Time values ( '1708', '2018-06-10', 'Th', 11)
Insert into Time values ( '1709', '2018-05-30', 'Fr', 9)
Insert into Time values ( '1710', '2018-07-28', 'We', 15)
Insert into Time values ( '1711', '2018-06-29', 'Tu', 9)
Insert into Time values ( '1712', '2018-05-24', 'Mo', 13)
Insert into Time values ( '1713', '2018-04-26', 'Fr', 10)
Insert into Time values ( '1714', '2018-05-23', 'Mo', 9)
Insert into Time values ( '1715', '2018-06-23', 'Mo', 14)
Insert into Time values ( '1716', '2018-06-21', 'Mo', 14)
Insert into Time values ( '1717', '2018-07-16', 'Sa', 8)
Insert into Time values ( '1718', '2018-06-28', 'Th', 11)
Insert into Time values ( '1719', '2018-07-27', 'Fr', 9)
Insert into Time values ( '1720', '2018-06-30', 'We', 15)

```

```
select * from Time
```

```

db2 => select * from Time

TIME_ID  DATE          DAY  HOUR
-----  -
1701     07/09/2018   Tu      9
1702     07/13/2018   Mo     13
1703     06/19/2018   Fr     10
1704     06/30/2018   We      9
1705     07/19/2018   Mo     14
1706     06/15/2018   Mo     14
1707     07/11/2018   Sa      8
1708     06/10/2018   Th     11
1709     05/30/2018   Fr      9
1710     07/28/2018   We     15
1711     06/29/2018   Tu      9
1712     05/24/2018   Mo     13
1713     04/26/2018   Fr     10
1714     05/23/2018   Mo      9
1715     06/23/2018   Mo     14
1716     06/21/2018   Mo     14
1717     07/16/2018   Sa      8
1718     06/28/2018   Th     11
1719     07/27/2018   Fr      9
1720     06/30/2018   We     15

20 record(s) selected.

```

insert into Payment_Status values (0,'Pending')
insert into Payment_Status values (1,'Accepted')
into Payment_Status values (2,'Rejected')

*Select * from Payment_Status*

```
db2 => select * from Payment_Status

PAYMENT_STATUS_CODE PAYMENT_STATUS_DESCRIPTION
-----
0 Pending
1 Accepted
2 Rejected

3 record(s) selected.
```

Insert into Ticket_Information values (500, '2018-08-13', 'A01')
 Insert into Ticket_Information values (501, '2018-08-13', 'B02')
 Insert into Ticket_Information values (502, '2018-08-13', 'A02')
 Insert into Ticket_Information values (503, '2018-08-13', 'A03')
 Insert into Ticket_Information values (504, '2018-08-13', 'B01')
 Insert into Ticket_Information values (505, '2018-08-20', 'C25')
 Insert into Ticket_Information values (506, '2018-08-25', 'E26')
 Insert into Ticket_Information values (507, '2018-08-20', 'C27')
 Insert into Ticket_Information values (508, '2018-08-30', 'C28')
 Insert into Ticket_Information values (509, '2018-08-20', 'C29')
 Insert into Ticket_Information values (510, '2018-09-05', 'F54')
 Insert into Ticket_Information values (511, '2018-08-30', 'H44')
 Insert into Ticket_Information values (512, '2018-09-05', 'A05')
 Insert into Ticket_Information values (513, '2018-09-07', 'A08')
 Insert into Ticket_Information values (514, '2018-09-15', 'G16')
 Insert into Ticket_Information values (515, '2018-09-15', 'B27')
 Insert into Ticket_Information values (516, '2018-09-19', 'F12')
 Insert into Ticket_Information values (517, '2018-09-21', 'I12')
 Insert into Ticket_Information values (518, '2018-09-22', 'E08')
 Insert into Ticket_Information values (519, '2018-09-23', 'D20')
 Insert into Ticket_Information values (520, '2018-09-23', 'D21')

Select * from Ticket_Information

```
db2 => select * from Ticket_Information
```

TICKET_ID	FLIGHT_DATE	SEAT_NUMBER_GO
500	08/13/2018	A01
501	08/13/2018	B02
502	08/13/2018	A02
503	08/13/2018	A03
504	08/13/2018	B01
506	08/25/2018	E26
507	08/20/2018	C27
508	08/30/2018	C28
509	08/20/2018	C29
510	09/05/2018	F54
511	08/30/2018	H44
512	09/05/2018	A05
513	09/07/2018	A08
514	09/15/2018	G16
516	09/19/2018	F12
517	09/21/2018	I12
518	09/22/2018	E08
519	09/23/2018	D20
520	09/23/2018	D21
515	09/15/2018	B27

20 record(s) selected.

Insert into Booking values ('1701', 1100, 2404, 500, 'KL01', 0, 300)
 Insert into Booking values ('1702', 1101, 2404, 501, 'KL01', 1, 300)
 Insert into Booking values ('1703', 1107, 2404, 502, 'KL01', 2, 300)
 Insert into Booking values ('1704', 1107, 2404, 503, 'KL01', 0, 300)
 Insert into Booking values ('1705', 1109, 2404, 504, 'KL01', 1, 300)
 Insert into Booking values ('1706', 1109, 2407, 506, 'SH77', 0, 4800)
 Insert into Booking values ('1707', 1103, 2403, 508, 'S007', 1, 500)
 Insert into Booking values ('1708', 1111, 2403, 509, 'S007', 0, 500)
 Insert into Booking values ('1709', 1114, 2402, 510, 'TY68', 1, 5000)
 Insert into Booking values ('1711', 1104, 2409, 511, 'SH77', 2, 4750)
 Insert into Booking values ('1712', 1110, 2410, 512, 'SJ60', 0, 450)
 Insert into Booking values ('1713', 1110, 2405, 513, 'DB12', 1, 2500)
 Insert into Booking values ('1714', 1106, 2400, 514, 'KL02', 2, 600)
 Insert into Booking values ('1715', 1112, 2406, 515, 'LD24', 0, 8000)
 Insert into Booking values ('1716', 1112, 2403, 516, 'S007', 1, 500)
 Insert into Booking values ('1717', 1102, 2401, 517, 'KL02', 2, 4500)
 Insert into Booking values ('1718', 1113, 2402, 518, 'TY68', 0, 5000)
 Insert into Booking values ('1719', 1107, 2403, 519, 'KL02', 1, 500)
 Insert into Booking values ('1720', 1107, 2403, 520, 'KL02', 2, 500)

Select * from Booking

```
db2 => select * from Booking
```

TIME_ID	PASSENGER_ID	FLIGHT_ID	TICKET_ID	AIRPORT_CODE	PAYMENT_STATUS_CODE	BOOKING_PRICE
1701	1100	2404	500	KL01	0	300
1702	1101	2404	501	KL01	1	300
1703	1107	2404	502	KL01	2	300
1704	1107	2404	503	KL01	0	300
1705	1109	2404	504	KL01	1	300
1706	1109	2407	506	SH77	0	4800
1707	1103	2403	508	S007	1	500
1708	1111	2403	509	S007	0	500
1709	1114	2402	510	TY68	1	5000
1711	1104	2409	511	SH77	2	4750
1712	1110	2410	512	SJ60	0	450
1713	1110	2405	513	DB12	1	2500
1714	1106	2400	514	KL02	2	600
1715	1112	2406	515	LD24	0	8000
1716	1112	2403	516	S007	1	500
1717	1102	2401	517	KL02	2	4500
1718	1113	2402	518	TY68	0	5000
1719	1107	2403	519	KL02	1	500
1720	1107	2403	520	KL02	2	500

19 record(s) selected.