KING FAHAD UNIVERSITY OF PETROLEUM & MINERALS

COLLEGE OF MATHEMATICS AND COMPUTING

DEPARTMENT OF INFORMATION AND COMPUTER SCIENCE

DATABASE SYSTEMS – ICS324

PROJECT REPORT

PHASE 1

09 / 04 / 2022

Project Members		
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CONSTRAINTS AND BUSINESS RULES

Here we state all database constraints and bossiness rules. Any assumptions made will be noted clearly

serial	Table	Attribute	Constraint	Notes
1	Passenger	PSsn	Primary key	
2	Passenger	LName	Not null	
3	Passenger	FName	Not null	
4	Passenger	Birth_date	Not null	
5	Passenger	Phone	Not null	
6	Passenger	PSsn	Domain	int
7	Passenger	Phone	Domain	Char
8	Passenger	LName	Domain	char
9	Passenger	FName	Domain	char
10	Passenger	Address	Domain	char
11	Passenger	Special_need	Domain	Boolean
12	Passenger	Birth_date	Domain	date
13	Ticket	TId	Primary key	
14	Ticket	Class	Not null	
15	Ticket	Check_in	Not null	
16	Ticket	Gate	Not null	
17	Ticket	Seat_number	Not null	
18	Ticket	Successful	Not null	
19	ticket	Purchase_date	Not null	
20	ticket	amount	Not null	
21	Ticket	TId	Domain	int
22	Ticket	Class	Domain	char
23	Ticket	Check_in	Domain	Boolean
24	Ticket	Seat_number	Domain	Char
25	Ticket	Gate	Domain	Char

26	Ticket	Weight	Domain	int
27	Ticket	Volume	Domain	Int
28	Ticket	Quantity	Domain	Int
29	Ticket	Successful	Domain	boolean
30	ticket	Purchase_date	Domain	date
31	ticket	amount	Domain	number
32	Ticket	PSsn	Foreign key	From passenger
33	Ticket	Flight_Code	Foreign key	From flight
34	Ticket	Transaction_id	Foreign key	From payment_methods
35	Flight	Flight_Code	Primary key	
36	Flight	Date	Not null	
37	Flight	Active	Not null	
38	Flight	Destination	Not null	
39	Flight	Source_city	Not null	
40	Flight	Flight_code	Domain	int
41	Flight	Date	Domain	date
42	Flight	Active	Domain	Boolean
43	Flight	Destination	Domain	char
44	Flight	Source_city	Domain	Char
45	Flight	Delay	Domain	Date
46	Flight	PlaneId	Foreign key	From plane
47	Waiting_list	Flight_code	Primary key	
48	Waiting_list	Flight_code	foreign key	From flight
49	Waiting_list	Pssn	Primary key	
50	Waiting_list	Pssn	foreign key	From passenger
51	Waiting_list	Class	Not null	
52	Waiting_list	Flight_code	Domain	Int
53	Waiting_list	PSsn	domain	int
54	Waiting_list	Class	Domain	Char

55	Plane	PlaneId	Primary key	
56	Plane	First_flight	Not null	
57	Plane	Total_seats	Not null	
58	Plane	PlaneId	Domain	Int
59	Plane	First_flight	Domain	Date
60	Plane	Total_seats	Domain	Int
61	Plane	Last_maintenance	Domain	date
62	Plane	next_maintenance	Domain	date
63	Plane	Aircart_Model	Foreign key	From aircraft
64	Aircraft	Aircraft_Model	Primary key	
65	Aircraft	Type	Not null	
66	Aircraft	Aircraft_Model	Domain	Char
67	Aircraft	Type	Domain	Char
68	Aircraft	Class_id	Foreign key	From class
69	First	Class_id	Primary key	
70	First	Price	Not null	
71	First	Total_seats	Not null	
72	First	Price	Domain	Number
73	First	Total_seats	Domain	Int
74	business	Class_id	Primary key	
75	Business	Price	Not null	
76	business	Total_seats	Not null	
77	business	Price	Domain	Number
78	business	Total_seats	Domain	Int
79	economy	Class_id	Primary key	
80	economy	Price	Not null	
81	economy	Total_seats	Not null	
82	economy	Price	Domain	Number
83	economy	Total_seats	Domain	Int
84	Payment_methods	Transacation_id	Primary key	

85	Payment_methods	Tax	Domain	Number
86	Cash	Transacation_id	Primary key	
87	Cash	Transacation_id	foreign key	From payment_methods
88	Apply_pay	Transacation_id	Primary key	
89	Apply_pay	Transacation_id	foreign key	From payment_methods
90	Apply_pay	Apple_id	Not null	
91	Apply_pay	Apple_id	Domain	char
92	Apply_pay	Device	Domain	Char
93	paypal	Transacation_id	Primary key	
94	Paypal	Transacation_id	foreign key	From payment_methods
95	Paypal	Account_id	Not null	
96	paypal	Account_id	Domain	char
97	Credit	Transacation_id	Primary key	
98	Credit	Transacation_id	foreign key	From payment_methods
99	Credit	Name	Not null	
100	Credit	Number	Not null	
101	Credit	Expire_date	Not null	
102	Credit	Name	Domain	char
103	Credit	Number	Domain	int
104	Credit	Expire_date	Domain	date
105	Has_classes	Aircraft-model	Primary key	
106	Has_classes	Class_id	Primary key	
107	Has_classes	Aircraft_model	Foreign key	From aircraft
108	Has_classes	Class_id	Foreign key	From class

BUSSINESS RULES

Here listed constraints and rules not to be applied to the database, but to the application layer.

Serial	Rule
1	Passenger can book a seat unless he/she has done so.
2	Wait list capacity is 10 seats in economy class.
3	Wait list capacity is 3 seats in business and first class.
4	Passenger can book 10 seats, at most, for a flight.
5	Passenger can reuse a ticket with 90 days.
6	Fines for cancelation and missing flight.
7	Notification once a seat booked and paid.
8	Passenger can book on-way trip or round trip.
9	A seat can be booked once, at most, in the same flight.
10	

Notes:

- We keep the passenger payment details.
- Notification is sent for any changes, or delay.
- 3% of ticket cost paid to cancel a flight.
- 90% of the ticket cost paid for missing a flight, 10% is refund.

EER AND RELATIONAL SCHEMA

EER DIAGRAM

In out project we follow the enhanced entity relational (EER) diagram.

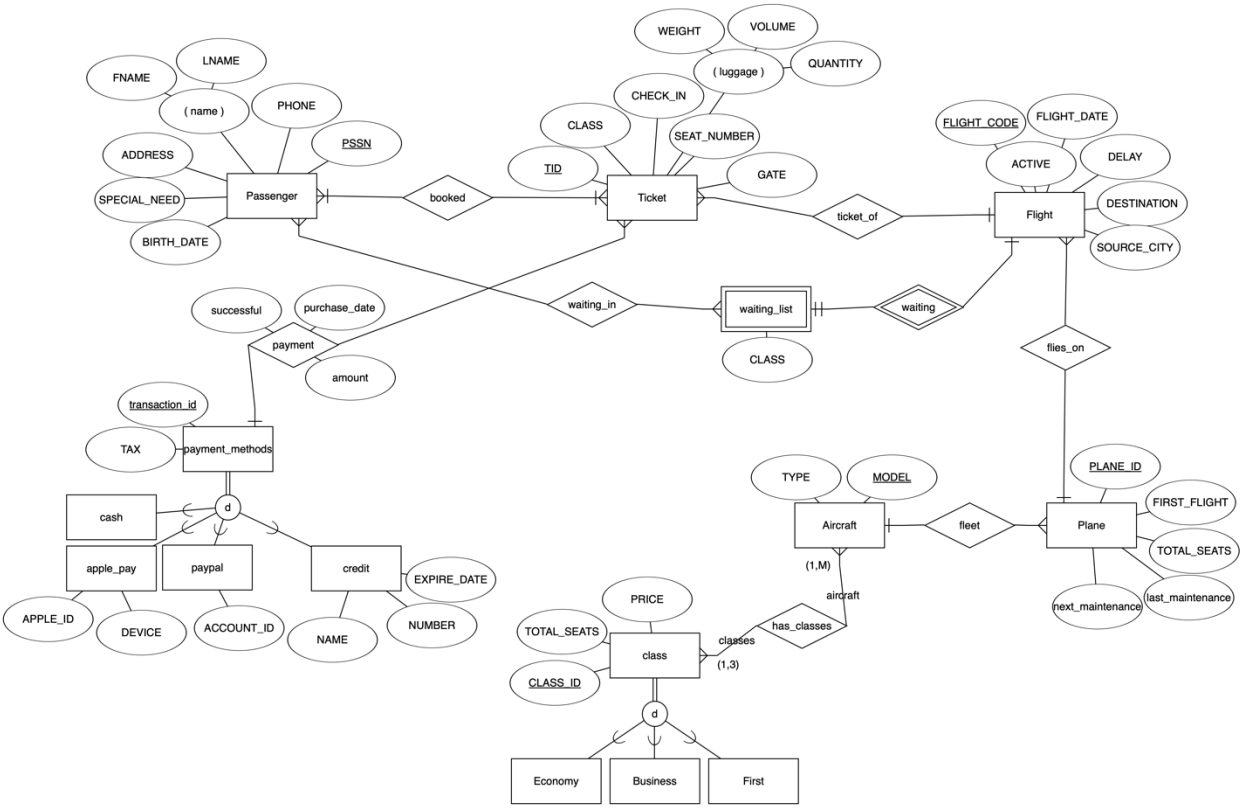


FIGURE 1: MAIN EER DIAGRAM

Remarks:

- In total 7 entities, 7 subclasses, and 8 relationships
- `class` class is a generalization of the flight classes: economy, Business, and first.
- `payment_methods` is a generalization of the payment methods passenger can use: cash, apple pay, PayPal, credit, and cash.
- `wait_list` entity type is weak entity and its identifying enity is `Flight` entity type.

MAPPING RELATIONAL

Using the above EER diagram we map that diagram into tables

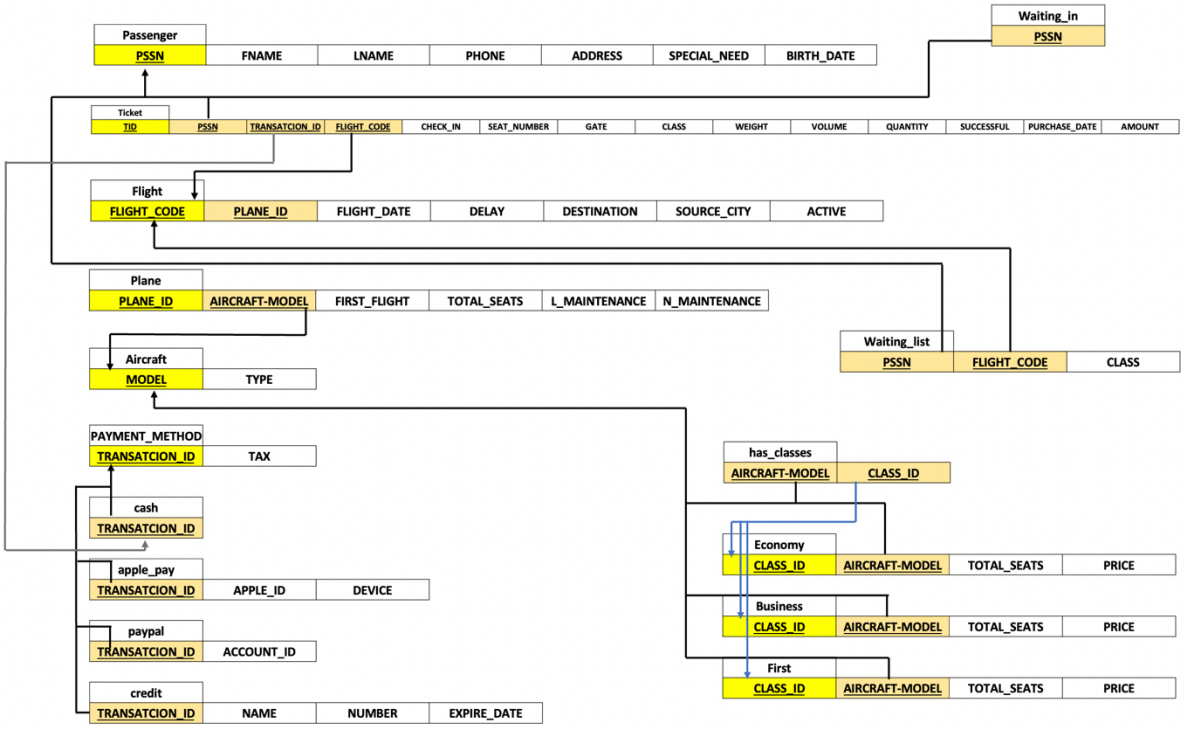


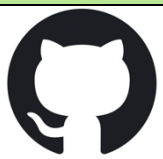
FIGURE 2: MAPPING RELATIONAL OF EER DIAGRAM FROM FIGURE1. THE YELLOW INDICATES PRIMARY KEY, WHILE ORANGE SHOWS THE FOREIGN KEYS

NORMALIZATION

Since there are no repeated columns, no multivalued attribute and there is no partial or transitive dependence, those table are on the third normalization form.

TECHNOLOGIES & RESOURCES

We write here the main tools and technologies that our tame use effectively helping speed up and making collaboration even easier.

Technologies			
 Notion Project management: due dates, tracking and distribute tasks	 Git Version control system, keep track of project code files changes	 GitHub To make members collaborate in writing code & open issues	 WhatsApp Fastest communications method to share thoughts and progress
 Used to write report present tables, and connecting them	 MS Teams Setting online meetings to work together	 PostgreSQL An example of SQL, easy to use with many frameworks we have	

WORK DISTRIBUTION

In aim of professional managing and effectively balancing the work weigh for each teammate, we use the following table to distribute and assign tasks to each person.

Serial	Task	Responsible teammate
1	First ER Draft	Alfaifi
2	Improved EER diagram	Abu-Rub, Alharthi
3	Mapping to tables	Alharthi
4	Find relationships' type with domain	Alharthi, Abu-Rub
5	Managing & writing notes in notion	Abu-Rub, Alfaifi
6	Writing & summarizing constraints	Abu-Rub
7	Writing first report draft & stylizing	Alfaifi
8	Review last EER design	Abu-Rub, Alfaifi, Alharthi
9	Review final report – phase 1	Abu-Rub, Alfaifi, Alharthi
10	Submitting to Bb	Alfaifi