Contents

Introduction

Founded in 1996, Buddha Air is the largest airlines company of Nepal with greater than 100,000 hours of **flights**, 3 million satisfied passengers from 9 different domestic destinations. It has the highest capacity **aircraft**, all equipped with modern technology stuffs ensuring quality & safe flying.

Buddha Air has several **branches** in different **countries**. Most branches are in Nepal on many **states**. Its dedicated **employees** are keen to prove the quality service often recommended by its customers. Buddha Air is well known for low **airfare** for both way **routes** services across domestic customers.

Highly dedicated in customer services, Buddha Air offers several **discount** schemes for children and people with disabilities. Buddha Air has won multiple awards for its safety & reliability records of flying from national and international organizations.

Due to its high reliability, safety records and highly gained trusts from customers, Buddha Air is having more **transactions**, causing day to day expanding business activities hard to manage its operations. To ensure more flexible service for customers, it's highly recommended to implement and Airlines Reservation System, a computerized system that will help manage all information related to flight, **passengers**, their **contact details**, reservation, transactions, schedule publishing, air fare payments etc.

Current business activities

Buddha Air is operating on spot airline reservation, flight booking services with help of several travel agencies. It's not only causing inconvenience for customers but also raises the actual tariff that customer has to pay. Though having branches in multiple cities targeting high range of customers, employee something fails to satisfy customers in remote areas when they have to travel for reservation also when they need to travel for cancellation or flight day extension. Followings are the key operations of Buddha Air's day to day business:

1. Sales Transactions
   All sales transactions are related to flight ticket sales; advance reservations, reservation cancellations etc.

    a. Reservation
       Buddha Air provides flight pre-reservation to its customers. All customers are open to reserve flights to travel in future. Reservations are taken before 11 hour of flight. Pre-reservation insuring future sales forecast.

b. Cancellation
   No hard rules, as far as company does not have to lose anything. A customer is always can cancel their flights. Cancelled seats are released for re-sell instantly.
   Company denies canceling a sold ticket, if cancellation request is made within 6 hour of flight.

2. Flight scheduling
   Day to day flight scheduling, new flight arrangements according to sales potentiality, flight departure delay decisions all takes rooms in its daily flight scheduling activities etc.

3. Ticketing
   On spot ticket sales, online reservation sales, urgent sales, VVIP ticketing is done in its several branches, authorized agents from different travel agencies.

Business rules

Quality services to customers aren't possible with defined business principles. Buddha Air has several business rules that apply from its own staffs to third party sales agents and potential customers. For each, business rules are as per listed below:

1. Customers
   - They are welcome to those from different flight schedules those are available throughout a day depending upon their comfort, willingness and flexibility and of course upon flight availability.
   - All customers are required to submit valid contact details.
   - All customers must reserve a flight to travel. No on the gate sales are available. Also customers can't buy tickets at airports, instead they need to visit online store or a sales counter to get a ticket or reserve for future plans.
   - Full payments are necessary in-order to confirm a booking. Yes, there can be several discounts schemes which can be claimed by customers & is given upon proper alignment with discount descriptions.
   - Customers must be penalized for cancellation. How much **charges** they have to pay, depends when they are canceling the flights. If it's before 11 hour of flight they need to pay 10% of sales and if it's within 11 hour of flight – 33.33% will be deducted from actual sales amount.
   - Customers can demand the cancellation & 100% refund of flight is cancelled due to technical reason, bad weather.

- All customers are allowed up to 5 KG cargo free with each ticket. Exceeding 5 KG causes the additional fees.
- Each customer is eligible for $20,000 life insurance.
- Wheel chairs & oxygen is available for special passengers.

2. Employees (including sales agents)
    - All employees must be dressed according to company dress code with an ID card, easily visible to guests.
    - Employees are expected to be presence on their seat within duty hours.
    - All employees are assigned to serve client based on first come first services. Yes- there is a provision for special cure for urgent & national security matters.
    - Employees are hereby responsible for serving customers first, second their own jobs.
    - Employees are not allowed to take flight reservations within 11 hour of flight.

Database Design for Airline Reservation

Entities & their relevant attributes

Entity list

1. AirCrafts
2. Route
3. AirFare
4. Flight_Schedule
5. Discounts
6. Charges
7. Countries
8. State
9. Contact_Details
10. Passengers
11. Branches
12. Employee
13. Transactions

Entity structures with relevant attributes:

AirCrafts

Field	DataType	Description	Constraints
AcID	INT	Field will store unique row number.	Primary Key
AcNumber	Varchar(32)	Aircraft number that identifies the plane.	NOT ULL
Capacity	INT	No. of seats available.	NOT NULL
MfdBy	Varchar(128)	Manufacturing company.	NOT NULL
MfdOn	DATETIME	Manufactured date of aircraft.	NOT NULL

Route

Field	Data Type	Description	Constraints
RtID	INT	Stores unique row id.	Primary Key
Airport	Varchar(32)	From where the flight will take off.	NOT NULL
Destination	Varchar (32)	Flight destinations.	NOT NULL
RouteCode	Varchar(16)	A unique Route code generated using Source & Destination of flight.	NOT NULL UNIQUE

AirFare

Field	Data Type	Description	Constraints
AfID	INT	Stores unique row id.	Primary Key

Route	INT	Route id from Route table.	Foreign Key
Fare	Currency	Stores service charge amount.	NOT NULL
FSC	Currency	Stores fuel surcharge amount.	NOT NULL

Flight_Schedule

Field	Data Type	Description	Constraints
FlID	INT	Unique number to identify the flight.	Primary Key
FlightDate	DATETIME	Date of flight.	NOT NULL
Departure	DATETIME	Stores the departure time of flight.	
Arrival	DATETIME	Stores the arrival time of flight on destination.	
AirCraft	INT	Aircraft number that will fly, a number from Aircraft table.	Foreign Key
NetFare	INT	To determine total fare of flight, an ID from Air_Fare table.	Foreign Key

Discounts

Field	Data Type	Description	Constraints
DiID	INT	Unique row id.	Primary Key
Title	Varchar(32)	Label to know discount.	NOT NULL
Amount	INT	Discount amount in %	NOT NULL
Description	Varchar(255)	Discount remarks & details.	

Charges

Field	Data Type	Description	Constraints
ChID	INT	Unique row id.	Primary Key
Title	Varchar(32)	Label for charge.	NOT NULL
Amount	INT	Amount of charge in %.	NOT NULL
Description	Varchar(255)	Describe cause of charge.	

Countries

Field	Data Type	Description	Constraints
CtID	INT	Unique row id.	Primary Key
CountryName	Varchar(32)	Room to store country name	NOT NULL

State

Field	Data Type	Description	Constraints
StID	INT	Unique row id.	Primary Key
StateName	Varchar(32)	State name will take place here.	
Country	INT	PK from Country table.	Foreign Key

Contact_Details

Field	Data Type	Description	Constraints
CnID	INT	Unique row id.	Primary Key
Email	Varchar(16)	Passenger's contact email for transaction about flights.	NOT NULL
Cell	Varchar(16)	Passenger's contact cell no for transaction about flights.	NOT NULL
Tel	Varchar(16)	Passenger's contact telephone no. for transaction about flights.	
Street	Varchar(64)	Street address of the passengers.	NOT NULL
State	INT	PK from State table.	Foreign Key

Passengers

Field	Data Type	Description	Constraints
PsID	INT	Unique row id.	Primary Key
Name	Varchar(32)	Passenger's name	NOT NULL
Address	Varchar (64)	Passenger's address	NOT NULL
Age	INT	Passenger's age	NOT NULL
Nationalities	Varchar (16)	Nationality of the passenger.	NOT NULL
Contacts	INT	ContactID from Contact_Details table.	Foreign Key

Branches

Field	Data Type	Description	Constraints
BrID	INT	Unique id for each branches	Primary Key
Center	Varchar(16)	Branch Title	NOT NULL
Address	Varchar(32)	Address of the branch	NOT NULL
State	INT	State ID from state table	Foreign Key

Employees

Field	Data Type	Description	Constraints

EmpID	INT	Unique number to identity employee, unique on entire system.	Primary Key
Name	Varchar(32)	Employee name	NOT NULL
Address	Varchar(32)	Employee address	NOT NULL
Branch	INT	Associated branch id from Branch Table	Foreign Key
Designation	Varchar(32)	Working duty position.	NOT NULL
Email	Varchar(32)	Contact email of the employee	NOT NULL
Tel	Varchar(16)	Contact telephone number.	
Ext	INT	Ext number of employee cabinet, if applicable.	

Transactions

Field	**Data Type**	**Description**	**Constraints**
TsID	INT	Unique row id	Primary Key
BookingDate	Date/Time	Keeps the booking date.	NOT NULL
DepartureDate	Date/Time	Keeps the departure date.	NOT NULL
Passenger	INT	Transaction creator passengers row id to associate booking/cancellation, payments etc.	Foreign Key
Flight	INT	Flight no, a PK of Flight_Schedule to determine flying details & costs.	Foreign Key
Type	BIT	Reservation/Cancellation	NOT NULL
Employee	INT	Reservation agent, a row id of employee who helps the passenger to make transaction.	Foreign Key
Charges	INT	If transaction is cancellation, charges may apply as per business rules.	Foreign Key
Discount	INT	Discount offers may apply based on scheme criteria.	Foreign Key
Total	INT	Calculated value of actual payable cost by customer to make a transaction.	NOT NULL

Primary Keys & Foreign Keys

SN	Table	Primary Key	Foreign Keys	
			Column	References
1	AirCraft	AcID	-	-
2	Flight_Schedule	FlID	AirCraft	AirCraft.AcID
			Route	Route.RtID
			AirFare	AirFare.AfID
3	Route	RtID	-	-
4	AirFare	AfID	Route	Route.RtID
5	Discounts	DiID	-	-
6	Charges	ChID	-	-
7	Passengers	PsID	Contacts	Contact_Details.CnID
8	Contact_Details	CnID	State	State.StID
9	State	StID	Country	Country.CtID
10	Country	CtID	-	-
11	Transaction	TsID	Passenger	Passengers.PsID
			Flight	Flight_Schedule.FlID
			Employee	Employee.EmpID
			Charge	Charges.ChID
			Discount	Discounts.DiID
12	Employee	EmpID	Branch	Branch.BrID
13	Branch	BrID		

Data Definition Language implementations:

/* 0. Create Database & use it */

```
CREATE DATABASE BuddhAirBase;

USE BuddhaAirBase;
```

/* 1. Create AirCrafts table*/

```
CREATE TABLE AirCrafts(
        AcID INT Primary Key,
        AcNumber Varchar(32) NOT NULL,
        Capacity INT NOT NULL,
        MfdBy Varchar(128) NOT NULL,
        MfdOn Datetime NOT NULL
);
```

/* 1.1 Insert data into AirCrafts table*/

```
INSERT INTO AirCrafts
(AcID, AcNumber, Capacity, MfdBy, MfdOn)
VALUES
(1, "ATR 72-500", 75, "Alenia Aeronotica", "23 April 1998");
```

/* 2. Create Route table*/

```
CREATE TABLE Route(
        RtID INT,
        Airport Varchar(32) NOT NULL,
        Destination Varchar(32) NOT NULL,
        RouteCode Varchar(16) NOT NULL UNIQUE,
        PRIMARY KEY (RtID)
);
```

/* 2.1 Insert data into Route table*/

```
INSERT INTO Route
Values (1, "Kathmandu", "Pokhara", "KTM-PKR");
```

/* 3. Create AirFare table*/

```
CREATE TABLE AirFare(
        AfID INT,
        Route INT,
        Fare Currency,
        FSC Currency,
        PRIMARY KEY (AfID),
        CONSTRAINT fk_Route FOREIGN KEY (Route) REFERENCES
Route(RtID)
);
```

/* 3.1. Insert DATA into AirFare table*/

```
INSERT INTO AirFare
VALUES
(1, 1, 86, 12);
```

/* 4. Create Flight_Schedule table */

```
CREATE TABLE Flight_Schedule(
        FlID INT,
        FlightDate DATETIME,
        Departure DATETIME,
        Arrival DATETIME,
        AirCraft INT,
        NetFare INT,
        PRIMARY KEY (FlID),
        CONSTRAINT fk_AirCraft FOREIGN KEY (AirCraft) REFERENCES
AirCrafts(AcID),
        CONSTRAINT fk_NetFare FOREIGN KEY (NetFare) REFERENCES
AirFare(AfID)
);
```

/* 4.1 Insert DATA into Flight_Schedule */

```
INSERT INTO Flight_Schedule
VALUES
(1, 'January 23, 2012', '23:20', '1:20', 1, 1);
```

/* 5. Create Discounts table */

```
CREATE TABLE Discounts(
        DiID INT PRIMARY KEY,
        Title Varchar(32),
        Amount INT,
        Description Varchar (255)
)
```

/* 5.1 Insert data into Discounts table */

```
INSERT INTO Discounts
VALUES
(1,'Childrens', 10, 'Discount is provide all childrens under age of 10.');
```

/* 6. Create Charges table */

```
CREATE TABLE Charges(
        ChID INT PRIMARY KEY,
        Title Varchar(32),
        Amount INT,
        Description Varchar (255)
)
```

/* 6.1 Insert data into Charges table */

```
INSERT INTO Charges
VALUES
```

(2,'Urgent Cancellation', 33.33, '33.3% will be charged for cancellation for booking within 11 hrs from flight time');

/* 7. Crate Country table*/

```
CREATE TABLE Countries (
        CtID INT PRIMARY KEY,
        CountryName Varchar (32) NOT NULL
);
```

/* 7.1 Insert data into Country table */

```
INSERT INTO Countries
VALUES
(1, 'Nepal');
```

/* 8. Create State table*/

```
CREATE TABLE State(
        StID INT,
        StateName Varchar (32),
        Country INT,
        PRIMARY KEY (StID),
        CONSTRAINT fk_Country FOREIGN KEY (Country) REFERENCES
Countries(CtID)
);
```

/* 8.1. Insert data into State table*/

```
INSERT INTO State
VALUES
(1, 'Bagmati', 1);
```

/* 9. Create Contact_Details table*/

```
CREATE TABLE Contact_Details(
        CnID INT PRIMARY KEY,
        Email Varchar (16) NOT NULL,
        Cell Varchar (16) NOT NULL,
        Tel Varchar (16),
        Street Varchar (64),
        State INT NOT NULL,
        CONSTRAINT fk_State FOREIGN KEY (State) REFERENCES State(StID)
);
```

/* 9.1 Insert data into Contact_Details */

```
INSERT INTO Contact_Details
VALUES
(1,'hello@shekhardesigner.com', '9851121824', '01-4215384', 'Gandaki Marga', 1);
```

/* 10. Create Passengers table */

```
CREATE TABLE Passengers(
        PsID INT PRIMARY KEY,
        Name Varchar (32) NOT NULL,
```

```
        Address Varchar (64) NOT NULL,
        Age INT NOT NULL,
        Nationality Varchar(16) NOT NULL,
        Contacts INT NOT NULL,
        CONSTRAINT fk_Contacts FOREIGN KEY (Contacts) REFERENCES
Contact_Details(CnID)
);
```

/* 10.1 Insert data into Passengers table */

```
INSERT INTO Passengers
VALUES
(1,'Shekhar Kumar Sharma', 'Sinamanga-39, KTM', 23, 'Nepalese', 1);
```

/* 11. Create Branch table */

```
CREATE TABLE Branches(
        BrID INT PRIMARY KEY,
        Center Varchar(16) NOT NULL,
        Address Varchar(32) NOT NULL,
        State INT,
        CONSTRAINT fk_StateOfEmployee FOREIGN KEY (State) REFERENCES
State(StID)
);
```

/* 11.1 Insert data into branches table */

```
INSERT INTO Branches
VALUES
(1, 'Kathmandu', 'New Road, Kathmandu', 1);
```

/* 12. Create Employee table */

```
CREATE TABLE Employee
(
        EmpID INT PRIMARY KEY,
        Name Varchar (32) NOT NULL,
        Address Varchar (32) NOT NULL,
        Branch INT NOT NULL,
        Designation Varchar(32) NOT NULL,
        Email Varchar (16) NOT NULL,
        Tel Varchar (16) NOT NULL,
        Ext INT,
        CONSTRAINT fk_Branch FOREIGN KEY (Branch) REFERENCES
Branches(BrID)
);
```

/* 12.1 Insert data into Employee table */

```
INSERT INTO Employee
VALUES
(1, 'Diwan Adhikari', 'Bagbazaar - 11, KTM', 1, 'Sales Executive',
'the.one@yahoo.com', '01-4215254', 12);
```

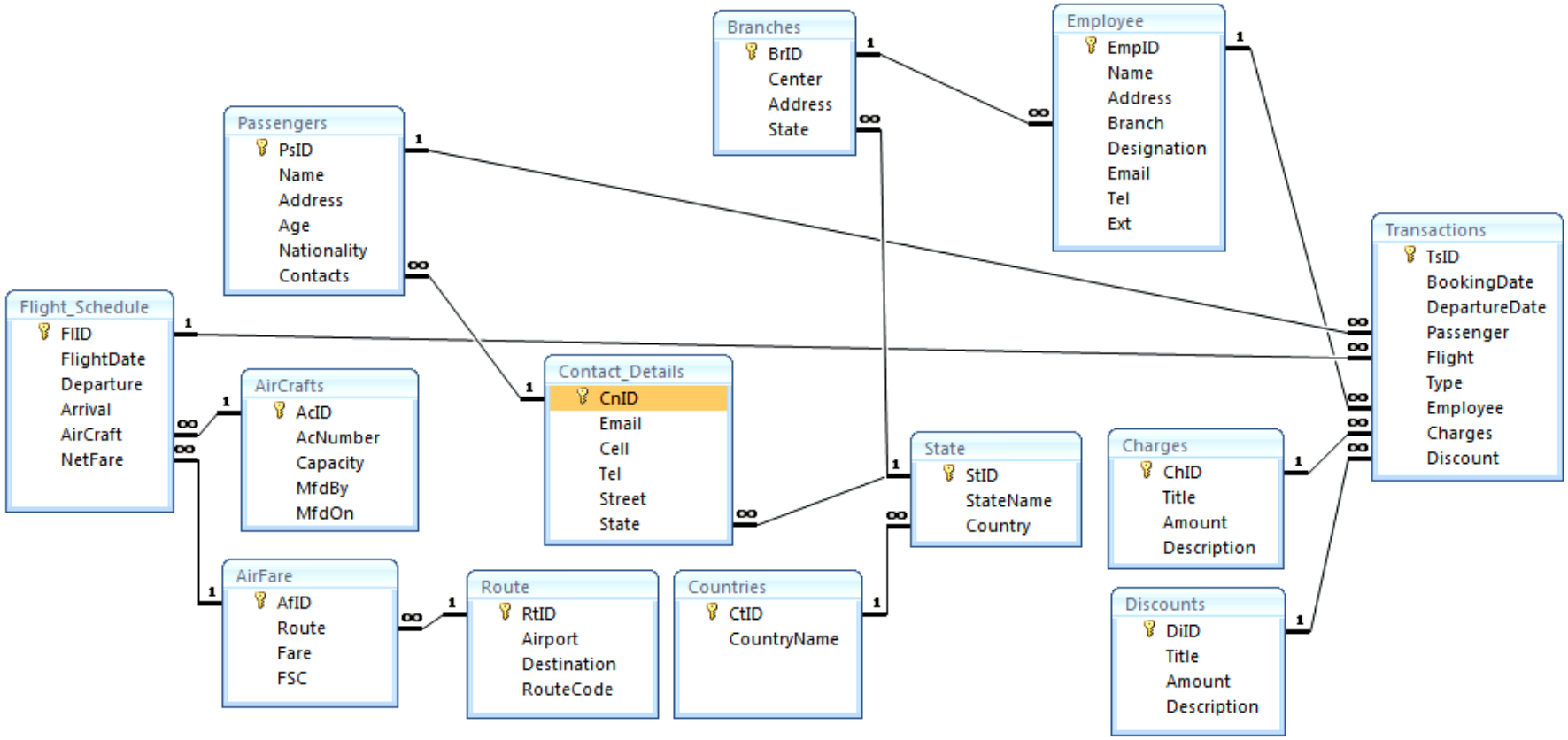
/* 13. Create table Transactions */

```
CREATE TABLE Transactions(
        TsID INT PRIMARY KEY,
        BookingDate DATETIME,
        DepartureDate DATETIME,
        Passenger INT,
        Flight INT,
        Type BIT,
        Employee INT,
        Charges INT,
        Discount INT,
        CONSTRAINT fk_Passenger FOREIGN KEY (Passenger) REFERENCES
Passengers(PsID),
        CONSTRAINT fk_Flight FOREIGN KEY (Flight) REFERENCES
Flight_Schedule(FlID),
        CONSTRAINT fk_Employee FOREIGN KEY (Employee) REFERENCES
Employee(EmpID),
        CONSTRAINT fk_Charges FOREIGN KEY (Charges) REFERENCES
Charges(ChID),
        CONSTRAINT fk_Discount FOREIGN KEY (Discount) REFERENCES
Discounts(DiID)
);
```

/* 13.1 Insert data into Transactions */

```
INSERT INTO Transactions
VALUES
(1,'12 November 2011', '21 December 2011', 1, 1, 0, 1, NULL, NULL);
```

Relationship between all entities

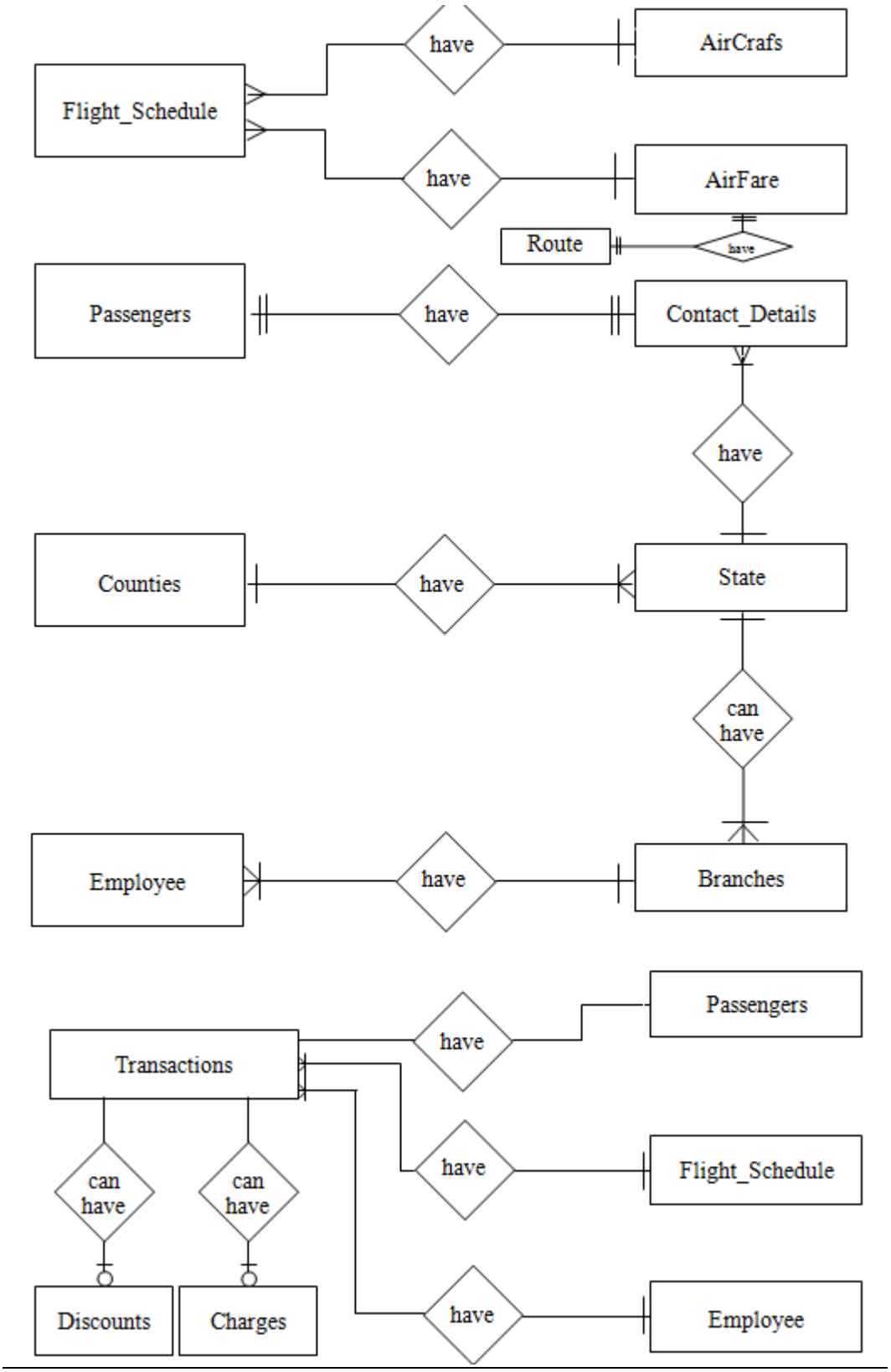


Cardinality

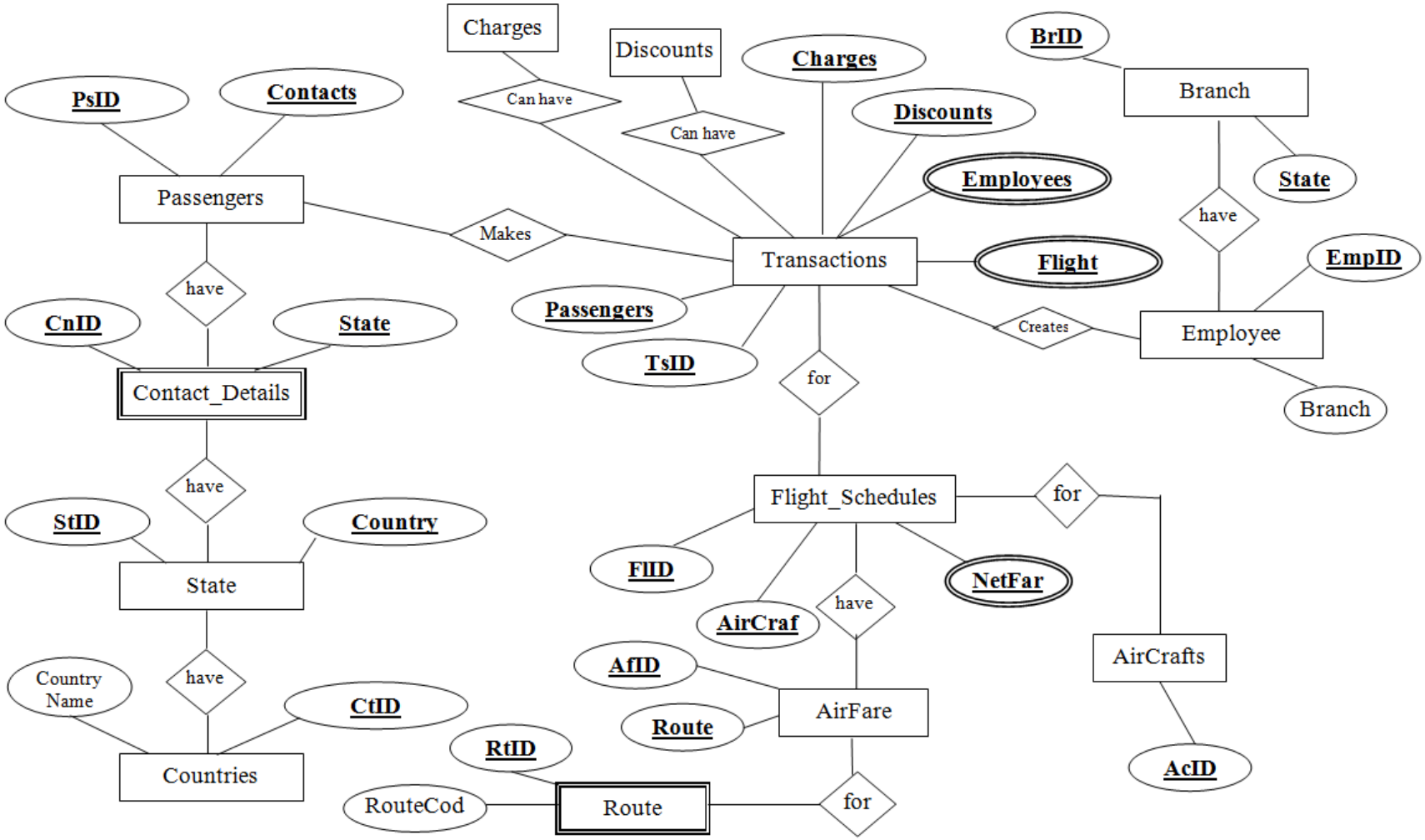
Cardinality notations, using *Chen style*.
M = many, N = 0, 1, 2 …

SN	Entities	Cardinality
1.	AirCrafts & Flight_Schedule	1 : M
2.	Route & AirFare	1 : 1
3.	AirFare & Flight_Schedule	1 ; M
4.	Discounts & Transactions	N : 1
5.	Charges & Transactions	N : 1
6.	Countries & State	1 : M
7.	State & Branches	1 : M
8.	Contact_Details & State	M : 1
9.	Passengers & Contact_Details	1 : 1
10	Passengers & Transactions	1 : 1
11.	Branches & Employee	1 : M
12.	Employees & Transactions	1 : M
13.	Transactions & Flight_Schedule	M : 1

Cardinality diagram (*Information engineering style notations*)



Final ER Diagram



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