ONLINE BUS BOOKING SYSTEM

Normalisation Case study

Case Study

- ABC is an online bus booking system. There are 3 important entities-
  (1) Bus
  (2) Passenger
  (3) Route
- Any user can login and check for schedule of buses using a username and e-mail address.
- The route table has the details of schedule of every bus.
- It has the attributes like departure date,departure time,bus number,capacity, seat number,status,fare,route name,source,destination and distance.

Case Study

- The status attribute checks whether any seat is available or not.
- Once,an available seat is viewed by the user,he goes ahead for booking.
- A user can book tickets for many passengers.
- Booking will generate a ticket which has attributes like ticket number and mode of payment.
- The mode of payment can be either by cash or by credit card.

NORMALISATION

- Normalization is a process in which a given set of relations is replaced by successive collections of relations that have a simpler and more regular structure.
- It transforms data from a problem into relations while ensuring data integrity and eliminating data redundancy.
- 4 most commonly used normal forms are first (1NF), second (2NF), third (3NF) and Boyce-Codd (BCNF) normal forms.

OBJECTIVES

- To make it feasible to represent any relation in the database.
- To free relations from undesirable insertion,
  update, and deletion anomalies.

3 Types of Functional Dependencies

- Full Dependency:-

  In a relation, the attribute(s) B is fully functional dependent on A if B is functionally dependent on A,but not on any proper subset of A.

- Partial Dependency:-

  If there is some attribute that can be removed from A and the dependency still holds.
  Eg. Pid,Pname->userid

Dependency contd…

- Transitive Dependency

  In a relation, if attribute(s) A->B and B->C, then C is transitively dependent on A via B (provided that A is not functionally dependent on B or C)

  Eg. Bus_no->Route_No and Route_No->Route_name

Unnormalized Normal Form (UNF)

- A table that contains one or more repeating groups.
- To create an unnormalized table
  - Transform the data from the information source
  - (e.g. form) into table format with columns and rows.

UNNORMALISED FORM(UNF)

ONLINE BUS BOOKING SYSTEM-
ABC travels

Booking_date: userid:
Username: email:

Ticket No: Seatno:
Departuredate: Departuretime:

PassengerId: PassengerName:
PassengerAddress: DOB:
GENDER: Phoneno:

Busno: Busname:
Capacity: type:
Routeno: Route-name:
Source: Destination:
Distance: Fare:
Modeof payment:

First Normal Form (1st NF)

- The table cells must be of single value.
- Eliminate repeating groups in individual tables.
- Create a separate table for each set of related data.
- Identify each set of related data with a primary key.

1st Normal Form

The new tables are as follows:
1)USER
(***userid,***username,u_email)

2)PASSENGER
(***Pid,phno***,pname,paddress, DOB ,gender)

3)BUS_ROUTE
(***routeno***,***busno***,routename,source,destination,distance,
fare,dept_time,bname,capacity,type,
dept_date)

3)RESERVATION
(***seatno,busno,*** status,bookingdate,
ticketno, mode_of_payment)

1st Nf

PASSENGER TABLE-(*Pid*,*Phno*->pname,paddress,Dob,gender**)**

Pid	phno	pname	paddress	DOB	gender
1	9676725456	Ram Sharma	Pune	6/1/1990	Male
2	9878767878	Siya Varma	sikar	3/5/1997	female
3	98786735	Siya Varma	sikar	3/5/1997	female

USER TABLE-(*userid*->username,u_email)

Userid	Username	U_email
111	Savita Marwal	savi@gmail.com
222	Himanish Mansinghani	himanish@yahoo.com

1Nf

BUS_ROUTE(***Busno,routeno***-> bname,capacity,type,routename,source, destination,distance,fare,dept_time, dept_date)

routeno	Busno	routename	source	destination	distance	fare	Dept_time	Dept_date	Busname	capacity	type
2000	10	Delhi-Jaipur	delhi	Jaipur	200km	2000	11:00 am	3/4/2012	AA	20	a/c
2001	11	Pune-mumbai	pune	mumbai	200kn	500	12:pm	4/4/2012	BB	25	Non a/c

RESERVATION TABLE-(***seatno,busno->***status,bookingdate,ticketno,mode_of_payment)

seatno	busno	status	bdate	ticketno	modeofpayment
1110	10	booked	1/4/2012	1122	Cash
1111	11	Booked	2/4/2012	1121	credit

Second Normal Form

- A table is in 2NF if it is in 1NF and if all non-key attributes are dependent on all of the key.

2nd NF (Remove Partial Dependencies)

1)USER
(***userid***->username,u_email)

2)PASSENGER
(pid-> pname,paddress, DOB, gender,userid)

3) **CONTACTS**
(***pid,phid***->phno)

4)BUS_ROUTE
(***routeno,busno***->bname,capacity,type,
source,destination,distance,fare,Dept_time,dept_date)

5)RESERVATION
(***seatno,busno->***status,
bookingdate,ticketno, mode_of_payment)

2nd Nf (Remove Partial Dependencies)

PASSENGER TABLE- (Pid(pk)->pname,paddress,Dob,gender,userid)

Pid	pname	paddress	DOB	gender	userid
101	Ram Sharma	Pune	6/1/1990	Male	111
102	Siya Varma	sikar	3/5/1997	female	112
102	Siya Varma	sikar	3/5/1997	female	112

CONTACTS TABLE - (phid(pk)->phno)

Phid	pid	phno
1	101	9887656789
2	102	9878789098
3	202	9767352453

Third Normal Form

- **A table is in 3NF if it is in 2NF and if it has no transitive dependencies.**

3rd NF(Remove transitive dependencies)

1)USER
(***userid->***username,u_email)

2)**PASSENGER**
(***pid***->pname,paddress,DOB, gender,userid)

3)CONTACTS
(***pid,phno***->phno)

(As, busno->routeno and routeno->distance)
Break **BUS_ROUTE relation** into 2 tables-

a)BUS
(***busno***->bname,capacity,type,routeno)

b)ROUTE
(***routeno***->routename,source,destination,
dept_date,dept_time,distance,fare)

BREAK BUS_ROUTE RELATION-

a)BUS (***busno***->bname,capacity,type,routeno)

busno	bname	capacity	type	routeno
10	AA	20	A/C	2000
11	BB	25	NON A/C	2001

b)ROUTE (***routeno***->routename,source,destination, dept_date,dept_time,distance,fare)

routeno	routename	source	destination	Dept_date	Dept_time	distance	fare
2000	Delhi-Jaipur	Delhi	Jaipur	3/4/2012	11:00a.m	2000	2000
2001	Pune-Mumbai	Pune	Mumbai	4/4/2012	12:00p.m	200	500

3NF

FROM RESERVATION-*{seatno->ticketno and ticketno->modeof payment}*

A)BOOKING
(***seatno***->pid,busno,status,ticketno)

B) TICKET
(***ticketno-***>bookingdate,mode_of_payment)

Boyce-Codd Normal Form (BCNF)

- A table is in BCNF if it is in 3NF and if every determinant is a candidate key.

- BCNF is a stronger form of 3NF
- BCNF => 3NF
- 3NF ≠> BCNF

Boyce-Codd Normal Form (BCNF)

1)BOOKING

(seatno-> pid,busno,status)

seatno	pid	busno	status
1001	101	10	booked
1008	102	11	booked

- Here,all the attributes other than seatno acts as a candidate key.
- Eg,pid can act as a primary key alone.
- Busno can also act as a primary key.
- Status is not unique(i.e.either booked or available),so we use(seatno and status) as candidate key.

4th Normal Form (4NF)

- A table is in 4NF if it is in BCNF and if it has no multi-valued dependencies.

5th Normal Form (5NF)

- A table is in 5NF, also called "Projection-Join Normal Form" (PJNF), if it is in 4NF and if every join dependency in the table is a consequence of the candidate keys of the table.

ERD FOR BUS BOOKING SYSTEM