### **NEXTRAIL**

Replacing IRCTC sem by sem

DBMS | CSE 202

#### **Group 23**

Aadit Kant Jha | Abhik S Basu | Mohit Jain | Sohum Sikdar

# Table of **Contents**

- Project Scope
- Relational Schema
- Views and Grants
- SQL Queries
- Indexing
- Triggers
- Project Snapshots

## **Project Scope**

The Indian Railways has been an integral part of the Indian Economy since it's dawn. The whole ecosystem of Railways generates tons of data daily which needs to be structured and queried properly for a better user experience in terms of both comfort, easy, and speed and for better RnD for further development of such an integral part of the out country. This is where we come in with NEXTRAIL.

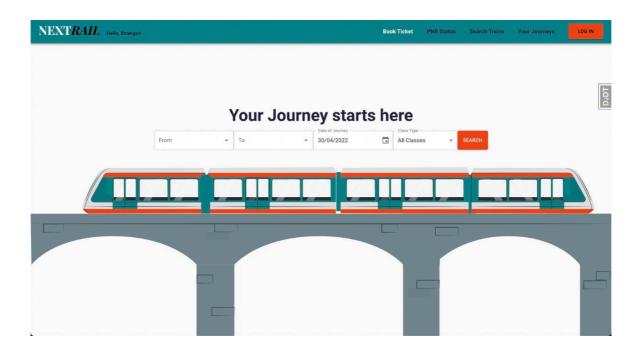
The user gets to book tickets with ease while choosing whatever class they wish to book while paying with their choice of payment method securely, choose their choice of meals, cancel current tickets, view previous tickets, view their current tickets status and get technical help whenever they require.

The tech-team can with ease update the schedules of existing trains, add new trains or delete existing trains. Further the workforce on field like the catering services would be able to fetch passenger preferences for better productivity.

Further, all the data that we collect and generate is kept in a structured manner that can be used by RnD teams for research purposes. During the midsem evaluation, the feedback given to our entities, relationships and ER diagram has helped us into making the final projects. While there were not any major issues in our midsem

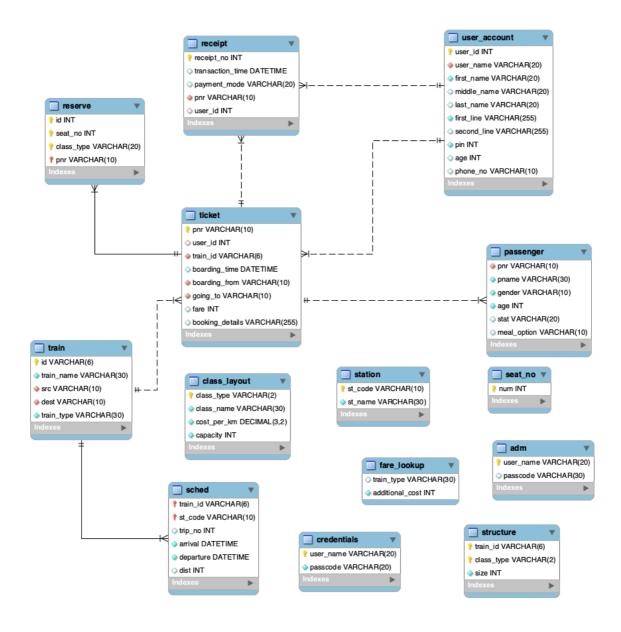
project as such. However we did face one shortcoming which was that we had not implemented any views in our code. As a result of which we have made sure to include views this time.

Furthermore, for our project we have made a user interface as well which is trying to model the real world IRCTC as much as possible. For this we have created a full stack project which involves usage of **React JS** and the **Material UI** framework on the front end side. And as far as the back end is concerned we used **Django** and queries were made using the **MySQL** workbench.



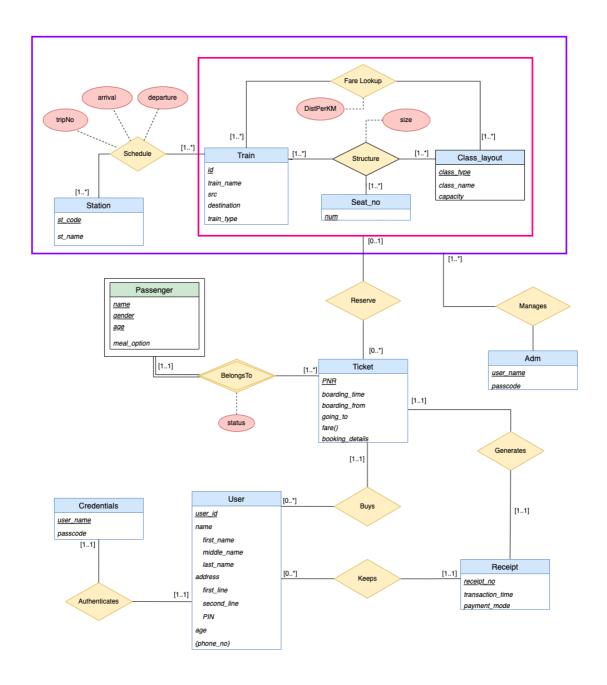
### **Relational Schema**

#### The following is our relational schema diagram



#### The following is our entity relationship diagram

#### **ER DIAGRAM OF NEXTRAIL**



All other valid information on our stakeholders, entities, relations and constraints can be found in our midsem evaluation report (<a href="https://github.com/MohitJain617/Railway-Reservation-System/blob/main/NEXTRAIL\_ProjectReport.pdf">https://github.com/MohitJain617/Railway-Reservation-System/blob/main/NEXTRAIL\_ProjectReport.pdf</a>)

### **Views and Grants**

### **Views**

#### -- Waiting List View with ranks

```
drop view if exists waiting_list;

CREATE VIEW waiting_list as

SELECT dense_rank() over (order by R.transaction_time) as priority, P.pid, T.pnr, T.train_no, T.boarding_from,

T.going_to, T.week_no, T.trip_no, P.class_type

FROM passenger as P, ticket as T, receipt as R

WHERE P.pnr = T.pnr

AND P.pnr = R.pnr

AND P.stat = 'WL'

ORDER by priority,pid;
```

# -- displays ticket details with everything from pnr to fare, dist, actual time and other stuff

```
drop view if exists ticket_view;
create view ticket_view as
select T.pnr, T.train_no,
```

```
(select train name from train as T2 where T2.id =
T.train no) as train name,
    ((select dist from time table as T2 where T2.train no =
T.train no and T2.st code = T.going to)-
    (select dist from time table as T2 where T2.train no =
T.train_no and T2.st_code = T.boarding_from)) as dist,
    TIMESTAMP(Date add(get daytime(week no,trip no-1)
    INTERVAL ((select day_no from time_table as TT
where TT.train no = T.train no and TT.st code =
T.boarding from)-1) day),
    (select departure from time table as T2 where
T2.train no = T.train no and T2.st code = T.boarding from))
as srctime,
    TIMESTAMP(Date add(get daytime(week no,trip no-1)
    INTERVAL ((select day no from time_table as TT
where TT.train no = T.train no and TT.st code =
T.going to)-1) day),
    (select arrival from time table as T2 where T2.train no
= T.train no and T2.st code = T.going to)) as desttime,
    T.boarding from, T.going to, T.fare
    from ticket as T:
drop view if exists seats_view;
create view seats view as
SELECT S.train no,
    S.class type as coach, SN2.num as coach no,
SN.num as seat_no FROM struct AS S,
    class layout as C, seat no AS SN2, seat no as SN
```

WHERE S.class\_type = C.class\_type AND SN2.num <= S.size

AND SN.num <= C.capacity;

drop view if exists stations\_view; create view stations\_view as select st\_code,st\_name,arrival,departure,dist,day\_no from time\_table natural join station order by dist;

### **Grants**

CREATE ROLE 'Admins'@'localhost', 'Passenger'@'localhost', 'Financials'@'localhost', 'Ministry'@'localhost', 'Employees'@'localhost';

GRANT ALL ON \*
TO 'Admins'@'localhost';

GRANT SELECT
ON waiting\_list\_count
TO 'Employees'@'localhost', 'Ministry'@'localhost', 'Passenger'@'localhost';

GRANT SELECT
ON waiting\_list
TO 'Employees'@'localhost', 'Ministry'@'localhost', 'Passenger'@'localhost';

GRANT SELECT ON ticket\_view

```
TO
```

'Passenger'@'localhost','Financials'@'localhost','Employees' @'localhost';

#### **GRANT SELECT**

ON seats\_view

TO 'Passenger'@'localhost'; Employees'@'localhost';

#### **GRANT ALL ON seats view**

TO 'Ministry'@'localhost';

#### **GRANT SELECT**

ON stations view

TO 'Employees'@'localhost', 'Passenger'@'localhost';

#### **GRANT SELECT**

ON station

TO 'Employees'@'localhost', 'Passenger'@'localhost';

#### **GRANT ALL**

ON station

TO 'Ministry'@'localhost';

**GRANT ALL** 

ON train

TO 'Ministry'@'localhost';

**GRANT ALL** 

ON time\_table

TO 'Ministry'@'localhost';

**GRANT ALL** 

ON sched

TO 'Ministry'@'localhost';

**GRANT ALL** 

ON class\_layout

```
TO 'Ministry'@'localhost';
GRANT ALL
ON seat no
TO 'Ministry'@'localhost';
GRANT SELECT
ON station
TO 'Employees'@'localhost', 'Passenger'@'localhost';
GRANT SELECT
ON sched
TO 'Employees'@'localhost'; Passenger'@'localhost';
GRANT SELECT
ON train
TO 'Employees'@'localhost'; Passenger'@'localhost';
GRANT SELECT
ON fare lookup
TO 'Employees'@'localhost'; Passenger'@'localhost';
GRANT SELECT
ON class layout
TO 'Employees'@'localhost'; Passenger'@'localhost';
GRANT SELECT
ON receipt
TO 'Financials'@'localhost';
GRANT UPDATE
ON receipt
TO 'Financials'@'localhost';
GRANT SELECT
ON fare lookup
```

TO 'Financials'@'localhost';

GRANT SELECT
ON class\_layout
TO 'Financials'@'localhost';

### **SQL Queries**

```
1)Query for trains between two stations --
-- -----QUERY-----
SELECT T.train no, T.departure FROM time table as T
NATURAL JOIN sched as S
WHERE T.st code = @tempsrc
    AND (T.day_no+S.trip_no-1) = @tempdayno
    AND EXISTS (
         SELECT * FROM time_table as T2 NATURAL JOIN
sched as S2
        WHERE S2.trip_no = S.trip_no
             AND S2.train_no = S.train_no
             AND (T.dist) < (T2.dist)
             AND T2.st code = @tempdest
    )
  AND (
    (@classReg = FALSE) OR EXISTS (
         SELECT * FROM struct as STR
    WHERE STR.train no = T.train no
    AND STR.class type = @classPref
);
2) Query for trains between two stations sorted by
Departure time at source --
-- -----QUERY-----
SELECT T.train no, T.departure FROM time table as T
NATURAL JOIN sched as S
```

```
WHERE T.st code = @tempsrc
    AND (T.day_no+S.trip_no-1) = @tempdayno
    AND EXISTS (
         SELECT * FROM time table as T2 NATURAL JOIN
sched as S2
        WHERE S2.trip_no = S.trip_no
             AND S2.train no = S.train no
             AND (T.dist) < (T2.dist)
             AND T2.st code = @tempdest
    )
  AND (
    (@classReq = FALSE) OR EXISTS (
         SELECT * FROM struct as STR
    WHERE STR.train no = T.train no
    AND STR.class_type = @classPref
    )
) ORDER BY T.departure;
3) Query to find all seats given a train
-- -----SETUP-----
SET @temptrain = '11123';
-- -----QUERY-----
SELECT S.train no, S.class type as coach, SN2.num as
coach no, SN.num as seat no
FROM structure AS S, class layout as C, seat no AS SN2,
seat no as SN
WHERE S.train no = @temptrain
    AND S.class type = C.class type
  AND SN2.num <= S.size
    AND SN.num <= C.capacity
```

```
ORDER BY (coach_no,seat_no);
```

# 4)Query for avaiable seats between two stations for a train and a given date, src, and dest

```
-- -----QUERY-----
SELECT S.train no, S.class type as coach, SN2.num as
coach no, SN.num as seat no
FROM struct AS S, class_layout as C, seat_no AS SN2,
seat no as SN
WHERE S.train_no = @temptrain
  AND S.class type = C.class type
  AND SN2.num <= S.size
  AND SN.num <= C.capacity
  AND NOT EXISTS (
         SELECT * FROM reserve as R, ticket as T,
passenger as P
         WHERE T.train no = S.train no AND R.class type
= S.class type AND R.coach no = SN2.num AND R.seat no
= SN.num
    AND R.pnr = T.pnr
    AND T.pnr = P.pnr AND P.stat='CNF'
         AND T.train no = @temptrain
         AND T.trip no = @tripno
         AND T.week no = @tripweek
         AND NOT(
             (
                  (SELECT dist FROM time table as TT1
                  WHERE TT1.train no = T.train no
                  AND TT1.st code = @tempdest)
                  <=
```

```
(SELECT dist FROM time_table as TT2
WHERE TT2.train_no = T.train_no
AND TT2.st_code = T.boarding_from)
)
OR
(
(SELECT dist FROM time_table as TT1
WHERE TT1.train_no = T.train_no
AND TT1.st_code = @tempsrc)
>=
(SELECT dist FROM time_table as TT2
WHERE TT2.train_no = T.train_no
AND TT2.st_code = T.going_to)
)
)
))
))
))
```

#### 5) Calculate the waiting list queue for a given train

```
(SELECT dist FROM time_table as TT2
    WHERE TT2.train_no = W.train_no
    AND TT2.st_code = W.boarding_from)
)
OR
(
    (SELECT dist FROM time_table as TT1
    WHERE TT1.train_no = W.train_no
    AND TT1.st_code = @tempsrc)
>=
    (SELECT dist FROM time_table as TT2
    WHERE TT2.train_no = W.train_no
    AND TT2.st_code = W.going_to)
)
) GROUP BY class_type;
```

# 6) Get the count of available seats on a specific train and class type

```
SELECT count(*) as Avail, S.class_type as class_type
FROM struct AS S, class_layout as C, seat_no AS SN2,
seat_no as SN
WHERE S.train_no = @trainNo
AND S.class_type = C.class_type
AND SN2.num <= S.size
AND SN.num <= C.capacity
AND NOT EXISTS (
SELECT * FROM reserve as R, ticket as T,
passenger as P
```

```
WHERE T.train no = S.train no AND R.class type
= S.class type AND R.coach no = SN2.num AND R.seat no
= SN.num
    AND R.pnr = T.pnr
    AND T.pnr = P.pnr AND P.stat='CNF'
         AND T.train_no = @trainNo
         AND T.trip_no = @tripno
         AND T.week_no = @tripweek
         AND NOT(
              (
                  (SELECT dist FROM time_table as TT1
                  WHERE TT1.train_no = T.train_no
                  AND TT1.st code = @tempdest)
                  <=
                  (SELECT dist FROM time table as TT2
                  WHERE TT2.train no = T.train no
                  AND TT2.st code = T.boarding from)
              OR
                  (SELECT dist FROM time table as TT1
                  WHERE TT1.train no = T.train no
                  AND TT1.st code = @tempsrc)
                  >=
                  (SELECT dist FROM time table as TT2
                  WHERE TT2.train_no = T.train_no
                  AND TT2.st_code = T.going_to)
    ) GROUP BY S.class_type;
```

# 7) Calculating duration of time it takes to reach station (in seconds)

```
SELECT T1.st_code,
TIME_TO_SEC(TIMEDIFF(T1.arrival,T2.departure))
+86400*(T1.day_no-T2.day_no) as seconds
FROM time_table as T1, time_table as T2
WHERE T1.train_no = @trainno
AND T2.train_no = @trainno
AND T2.dist = 0
ORDER BY seconds;
```

# 8) Query to check all the passengers in waiting list for a specific train info, and given them seat if it's available now

```
SELECT *

FROM waiting_list as W

WHERE W.train_no = @trainNo

AND W.week_no = @tripweek

AND W.trip_no = @tripno

AND W.class_type = @classtype

AND NOT EXISTS (

SELECT *

FROM waiting_list as W2

WHERE W.train_no = W2.train_no

AND W.class_type = W2.class_type

AND W.class_type = W2.class_type

AND ((W.priority > W2.priority) OR ((W.priority = W2.priority) AND (W.pid > W2.pid)))
```

```
-- W2 lies between tempsrc and tempdest
AND(
         (SELECT dist FROM time_table as TT1
         WHERE TT1.train_no = W2.train_no
         AND TT1.st_code = @tempsrc)
         <=
         (SELECT dist FROM time table as TT2
         WHERE TT2.train_no = W2.train_no
         AND TT2.st code = W2.boarding from)
    AND
         (SELECT dist FROM time_table as TT1
         WHERE TT1.train no = W2.train no
         AND TT1.st code = @tempdest)
         >=
         (SELECT dist FROM time table as TT2
         WHERE TT2.train_no = W2.train_no
         AND TT2.st code = W2.going to)
-- and intersection between W1 and W2
AND NOT(
         (SELECT dist FROM time table as TT1
         WHERE TT1.train no = W2.train no
         AND TT1.st code = W2.going to)
         <=
         (SELECT dist FROM time table as TT2
         WHERE TT2.train no =W.train no
```

```
AND TT2.st code = W.boarding from)
         )
         OR
              (SELECT dist FROM time_table as TT1
              WHERE TT1.train_no = W2.train_no
              AND TT1.st code = W2.boarding from)
              (SELECT dist FROM time table as TT2
              WHERE TT2.train_no = W.train_no
              AND TT2.st code = W.going to)
    )
)
-- W1 lies between tempsrc and tempdest
AND(
         (SELECT dist FROM time table as TT1
         WHERE TT1.train no = W.train no
         AND TT1.st code = @tempsrc)
         <=
         (SELECT dist FROM time table as TT2
         WHERE TT2.train_no = W.train_no
         AND TT2.st code = W.boarding from)
    )
    AND
    (
         (SELECT dist FROM time table as TT1
         WHERE TT1.train_no = W.train_no
         AND TT1.st_code = @tempdest)
         >=
```

```
(SELECT dist FROM time_table as TT2
WHERE TT2.train_no = W.train_no
AND TT2.st_code = W.going_to)
)
)
;
```

# 9) Query for all tickets booked by a user along with additional values

```
-----QUERY-----
select T.pnr, T.train_no,
(select train name from train as T2 where T2.id =
T.train no) as train name,
((select dist from time_table as T2 where T2.train_no =
T.train no and T2.st code = T.going to)-
    (select dist from time table as T2 where T2.train no =
T.train no and T2.st code = T.boarding from)) as dist,
TIMESTAMP(Date add(get daytime(week no,trip no-1),
    INTERVAL ((select day no from time table as TT
where TT.train no = T.train no and TT.st code =
T.boarding from)-1) day),
    (select departure from time table as T2 where
T2.train no = T.train no and T2.st code = T.boarding from))
as srctime.
TIMESTAMP(Date add(get daytime(week no,trip no-1),
    INTERVAL ((select day no from time table as TT
where TT.train no = T.train no and TT.st code =
T.going to)-1) day),
  (select arrival from time table as T2 where T2.train no =
T.train no and T2.st code = T.going to)) as desttime,
T.boarding from, T.going to, T.fare
```

# 10) Given pid of passenger calculate the waiting list number if it's waiting listed

```
-- -----QUERY-----
SELECT count(*) as WL
FROM waiting list as W, waiting list as W2
WHERE W.train no = W2.train no
    AND W.week no = W2.week no
    AND W.trip no = W2.trip no
  AND W.class type = W2.class type
  AND W2.pid = @ppid
  AND W2.pid <> W.pid
  AND ((W2.priority > W.priority) or ((W2.priority =
W.priority) and (W2.pid >= W.pid)))
    AND NOT(
         (
             (SELECT dist FROM time_table as TT1
             WHERE TT1.train no = W.train no
             AND TT1.st code = W2.going to)
             <=
```

```
(SELECT dist FROM time table as TT2
              WHERE TT2.train_no =W.train_no
              AND TT2.st code = W.boarding from)
         )
         OR
              (SELECT dist FROM time_table as TT1
              WHERE TT1.train_no = W.train_no
              AND TT1.st_code = W2.boarding_from)
              >=
              (SELECT dist FROM time table as TT2
              WHERE TT2.train_no = W.train_no
              AND TT2.st code = W.going to)
    );
-- Extras:
-- Calculate fare
SET @pcnt = 1;
SET @dist = 1384;
SET @classType = 'A';
SET @trainno = '22210';
select @pcnt*(@dist)*(select distinct cost_per_km from
class layout as C where C.class type=@classType) +
(SELECT DISTINCT FL. additional cost FROM fare lookup
as FL, train as T WHERE T.id=@trainno AND
T.train type=FL.train type) as fare;
```

## **Indexing**

```
CREATE INDEX station_index ON station (st_name);
CREATE INDEX trainname_index ON train (train_name);
CREATE INDEX traintype_index ON train (train_type);
CREATE INDEX ticket_index ON ticket (trip_no, week_no);
CREATE INDEX ticket_fare ON ticket(fare);
CREATE INDEX receipt_index ON receipt (pnr);
CREATE INDEX passenger_index ON passenger(pnr);
CREATE INDEX class_layout_index ON class_layout
(class_name);
CREATE INDEX time_table_index ON time_table (train_no);
```

## **Triggers**

#### find additional cost given a train type

-- TRIGGER FOR UPDATION IN FARE COST AS
PASSENGERS ARE ADDED
DELIMITER \$\$
CREATE TRIGGER fare\_update
AFTER INSERT ON passenger FOR EACH ROW
begin

-- CALCULATE DISTANCE

SET @distsrc = (SELECT dist FROM time\_table as T, ticket as TC

WHERE TC.pnr = NEW.pnr AND T.train\_no = TC.train\_no AND T.st code =

TC.boarding\_from);

SET @distdest = (SELECT dist FROM time\_table as T, ticket as TC

WHERE TC.pnr = NEW.pnr AND T.train\_no = TC.train\_no AND T.st\_code = TC.going\_to);

**UPDATE** ticket

SET fare = fare+(@distdest-@distsrc)\*(select distinct cost\_per\_km from class\_layout as C where C.class\_type=NEW.class\_type)

WHERE pnr = NEW.pnr;

END;

\$\$

DELIMITER;

#### **Trigger for auto generation of receipt**

drop trigger if exists gen\_receipt;

```
DELIMITER $$
CREATE TRIGGER gen receipt
AFTER INSERT ON ticket FOR EACH ROW
begin
         SET @lastval = (select max(receipt no) from
receipt);
    SET @lastval = ifnull(@lastval,0);
         INSERT INTO receipt VALUES
    (@lastval+1,now(),'Pending',NEW.pnr, NEW.username);
END;
$$
DELIMITER;
Trigger for assigning seat to a passenger
drop trigger if exists book_seat_if_avail;
DELIMITER $$
CREATE TRIGGER book_seat_if_avail
BEFORE INSERT ON passenger FOR EACH ROW
begin
    SET @seatavail = false;
    SET @temptrain = (SELECT train no from ticket where
pnr = NEW.pnr);
    SET @tempsrc = (SELECT boarding from from ticket
where pnr = NEW.pnr);
    SET @tempdest = (SELECT going_to from ticket
```

set @tripno = (SELECT trip no from ticket where pnr =

where pnr = NEW.pnr);

NEW.pnr);

```
set @tripweek = (SELECT week no from ticket where
pnr = NEW.pnr);
    set @tempclass = NEW.class type;
    -- different variables
    SET @coachno = null;
    SET @seatno = null;
    SET @coachtype = null;
    SELECT S.class_type, SN2.num, SN.num
  INTO @coachtype, @coachno, @seatno
    FROM struct AS S, class layout as C, seat no AS
SN2, seat no as SN
    WHERE S.train no = @temptrain
         AND S.class_type = @tempclass
    AND S.class_type = C.class_type
    AND SN2.num <= S.size
    AND SN.num <= C.capacity
    AND NOT EXISTS (
              SELECT * FROM reserve as R. ticket as T.
passenger as P
             WHERE T.train no = S.train no AND
R.class type = S.class type AND R.coach no = SN2.num
AND R.seat no = SN.num
    AND R.pnr = T.pnr
    AND T.pnr = P.pnr AND P.stat='CNF'
              AND T.train no = @temptrain
             AND T.trip no = @tripno
             AND T.week no = @tripweek
              AND NOT(
                  (
```

```
(SELECT dist FROM time_table as
TT1
                       WHERE TT1.train_no = T.train_no
                       AND TT1.st code = @tempdest)
                       <=
                       (SELECT dist FROM time_table as
TT2
                       WHERE TT2.train_no = T.train_no
                       AND TT2.st_code =
T.boarding_from)
                   )
                   OR
                       (SELECT dist FROM time_table as
TT1
                       WHERE TT1.train_no = T.train_no
                       AND TT1.st code = @tempsrc)
                       >=
                       (SELECT dist FROM time_table as
TT2
                       WHERE TT2.train_no = T.train_no
                       AND TT2.st code = T.going to)
                   )
         ) LIMIT 1;
         IF (@seatno IS NULL) then
              SET NEW.stat = 'WL';
         ELSE
              SET NEW.stat = 'CNF';
              INSERT INTO reserve VALUES (@coachno,
@seatno, @coachtype, NEW.pnr);
```

```
END IF;
```

END; \$\$

DELIMITER;

# **Project Snapshots**

