

**CS2102**

**Project Report**

**Topic D – Car Pooling**

**Group 8**

1. Ang Wei Ming, A0168721B
2. Benjamin Chin Choon Kiat, A0168698B
3. Lee Yu Choy, A0177151H
4. Yeo Cheng Hong, A0168369L

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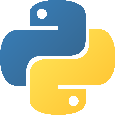
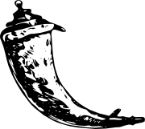
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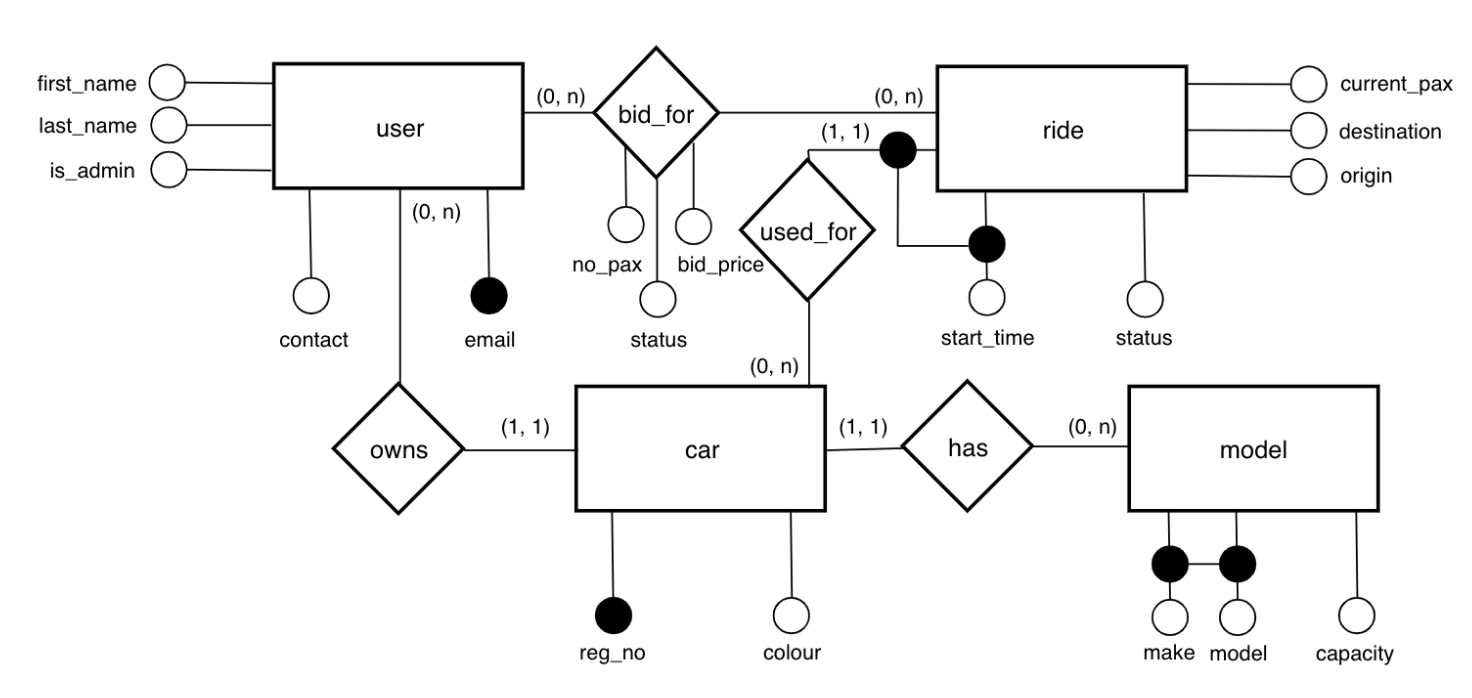
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# General Architecture



* Server Language – Python 3.7.0
* Web Server - Python Flask 1.0.2
* Database – PostgreSQL 11.0

# ER Diagram



# DDL

### User Schema

create table if not exists "user" -- `"` used because PostgreSQL use 'user' as a keyword  
(  
email varchar(256) not null constraint user\_pkey primary key,  
contact numeric(8),  
first\_name varchar(50) not null,  
last\_name varchar(50) not null,  
is\_admin boolean default false not null,  
password varchar(512) not null  
)  
;  
​

### Car Model Schema

create table if not exists model  
(  
model varchar(256) not null,  
make varchar(256) not null,  
capacity integer not null constraint capacity\_min check (capacity > 0),  
constraint model\_pk primary key (model, make)  
)  
;  
​

### Car Schema

create table if not exists car  
(  
reg\_no varchar(8) not null constraint car\_pkey primary key,  
colour varchar(50),  
email varchar(256) not null constraint car\_email\_fkey references "user",  
make varchar(50) not null,  
model varchar(50) not null,  
constraint car\_make\_fkey foreign key (make, model) references model (make, model)  
)  
;  
​

### Car Ride Schema

create table if not exists ride  
(  
start\_time timestamp not null,  
status varchar(11) not null constraint ride\_status\_type  
check (((status)::text = 'in progress'::text) OR ((status)::text = 'completed'::text)),  
current\_pax integer not null,  
destination varchar(256) not null,  
origin varchar(256) not null,  
reg\_no varchar(8) not null constraint ride\_reg\_no\_fkey references car,  
constraint ride\_pkey primary key (start\_time, reg\_no)  
)  
;  
​

### ​Car Ride Bid Schema

create table if not exists ride\_bid  
(  
email varchar(256) not null constraint ride\_bid\_email\_fkey references "user",  
start\_time timestamp not null,  
reg\_no varchar(8) not null,  
no\_pax integer not null constraint min\_pax check (no\_pax > 0),  
bid\_price double precision check (bid\_price > 0),  
status varchar(13) default 'pending'::character varying not null constraint bid\_status\_type check (((status)::text = 'pending'::text) OR ((status)::text = 'successful'::text) OR ((status)::text = 'unsuccessful'::text)),  
constraint ride\_bid\_pkey primary key (email, start\_time, reg\_no),  
constraint ride\_bid\_start\_time\_fkey foreign key (start\_time, reg\_no) references ride

)  
;  
​

### Transaction Log Schema

create table if not exists audit\_log  
(  
start\_time timestamp not null,  
end\_time timestamp not null,  
status varchar(11) not null constraint ride\_status\_type check ((status)::text = 'completed'::text),  
current\_pax integer not null,  
destination varchar(256) not null,  
origin varchar(256) not null,  
reg\_no varchar(8) not null constraint ride\_reg\_no\_fk references car,  
constraint ride\_pk primary key (start\_time, reg\_no)  
)  
;

## Triggers and Functions

### ​After Approval Checks

This trigger will check if a bid have been changed from pending/unsuccessful to successful.

If this is true, it will update the ride current passenger to the number of passenger in the bid.

Which is follow by rejection all ‘pending’ bids which have their number of passenger greater than remaining seats

create or replace function on\_approval\_update\_pax() returns trigger  
language plpgsql  
as $$  
BEGIN  
IF NEW.status = 'successful' and OLD.STATUS <> 'successful'  
THEN  
UPDATE ride  
SET current\_pax = current\_pax + NEW.no\_pax  
WHERE reg\_no = NEW.reg\_no  
AND start\_time = NEW.start\_time;  
 UPDATE ride\_bid rb  
   SET status = 'unsuccessful'  
 FROM ride r, car c, model m  
 WHERE r.reg\_no = rb.reg\_no  
 AND r.start\_time = rb.start\_time  
 AND r.reg\_no = c.reg\_no  
 AND c.make = m.make  
 AND c.model = m.model  
 AND rb.reg\_no = NEW.reg\_no  
 AND rb.start\_time = NEW.start\_time  
 AND rb.status = 'pending'  
 AND rb.no\_pax > (m.capacity - r.current\_pax);  
END IF;  
​  
RETURN NULL;  
END  
$$  
;  
​  
​  
create trigger approval\_update  
after update  
on ride\_bid  
for each row  
execute procedure on\_approval\_update\_pax()  
;  
​

### Constrain checks before bidding.

This function will reject insertion/update if the bids have its numbers of passengers exceed the remaining seats.

It will also reject insertion if the bids is bid by the driver himself.

create or replace function capacity\_checker()  
returns trigger  
language plpgsql  
as $$  
BEGIN  
IF (SELECT (r.current\_pax + NEW.no\_pax <= m.capacity)  
     FROM ride r  
            inner join car c on r.reg\_no = c.reg\_no  
            INNER JOIN model m on c.make = m.make and c.model = m.model  
                                    AND r.reg\_no = NEW.reg\_no  
                                    AND r.start\_time = NEW.start\_time)  
THEN  
 --  
 -- Do nothing  
ELSE  
  RAISE EXCEPTION 'Exceeded maximum capacity, please reduce your number of passenger';  
END IF;  
IF (SELECT (1)  
     FROM ride r  
            INNER JOIN car c on r.reg\_no = c.reg\_no  
     where r.reg\_no = NEW.reg\_no  
       AND r.start\_time = NEW.start\_time  
       AND c.email = NEW.email)  
THEN RAISE EXCEPTION 'Cannot Bid for Own Ride';  
ELSE  
  RETURN NEW;  
END IF;  
END  
$$;  
​  
create trigger cap\_check  
before insert OR update  
on ride\_bid  
for each row  
execute procedure capacity\_checker()  
;

### Insert into audit table.

This trigger is used to insert into a similar table which help in querying transaction history. The end time of the ride will also be updated upon completion.

This extra table although is redundant, but it can help to maintain integrity of the logs, as there will not be any updates in this table. (Only Insertion)

create or replace function audit() returns trigger  
language plpgsql  
as $$  
BEGIN  
IF NEW.status = 'completed' THEN  
 INSERT INTO audit\_log(start\_time,end\_time,status,current\_pax,destination,origin,reg\_no)  
 VALUES (OLD.start\_time,now(),NEW.status,OLD.current\_pax,OLD.destination,OLD.origin,OLD.reg\_no);  
END IF;  
​  
RETURN NEW;  
END;  
$$  
;  
​  
create trigger to\_audit  
before update  
on ride  
for each row  
execute procedure audit()  
;

# Sample SQL

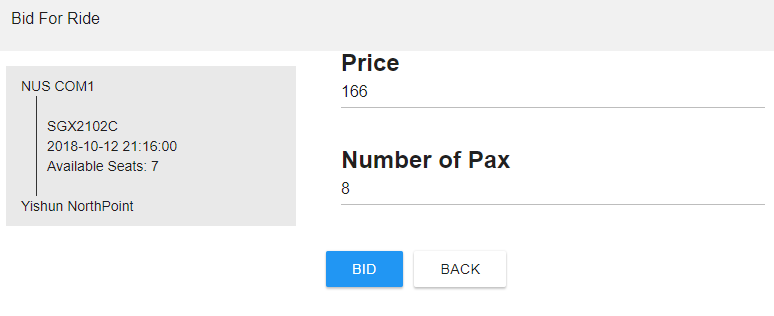
## Search Ride

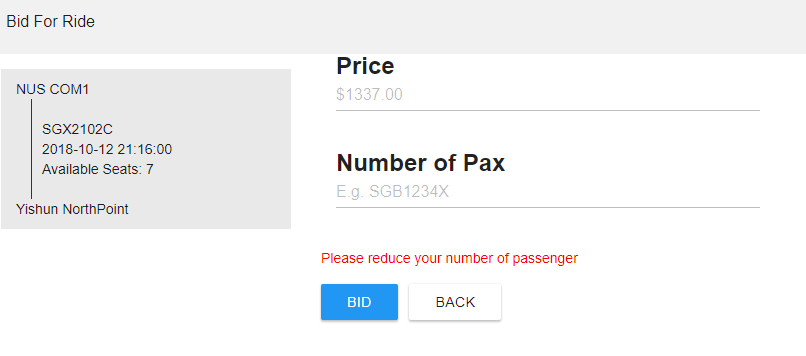
If origin and destination is NULL, return all rides

SELECT u.first\_name,u.email,r.origin,r.destination,r.status,r.reg\_no, r.start\_time, r.current\_pax, (m.capacity - r.current\_pax) as pax\_left,  
EXISTS (SELECT c1.email FROM car c1 WHERE c1.reg\_no = c.reg\_no AND c1.email = %s) as is\_driver,  
EXISTS (SELECT rb.email FROM ride\_bid rb WHERE rb.reg\_no = c.reg\_no AND rb.email = %s AND rb.status = 'successful' AND rb.start\_time = r.start\_time) as has\_success\_bid,  
EXISTS (SELECT rb.email FROM ride\_bid rb WHERE rb.reg\_no = c.reg\_no AND rb.email = %s AND rb.status = 'unsuccessful' AND rb.start\_time = r.start\_time) as has\_unsuccessful\_bid,  
EXISTS (SELECT rb.email FROM ride\_bid rb WHERE rb.reg\_no = c.reg\_no AND rb.email = %s AND rb.status = 'pending' AND rb.start\_time = r.start\_time) as has\_pending\_bid  
FROM ride r, "user" u, car c,model m  
WHERE r.reg\_no = c.reg\_no  
and c.email = u.email  
and LOWER(r.origin) LIKE LOWER(%s) and LOWER(r.destination) like LOWER(%s)  
and r.status = 'in progress'  
and c.make = m.make  
and c.model = m.model  
ORDER BY r.start\_time ASC

## Rejection of ride bid

When the car ride available capacity is below what the user is bidding for, the system will reject the transaction via trigger





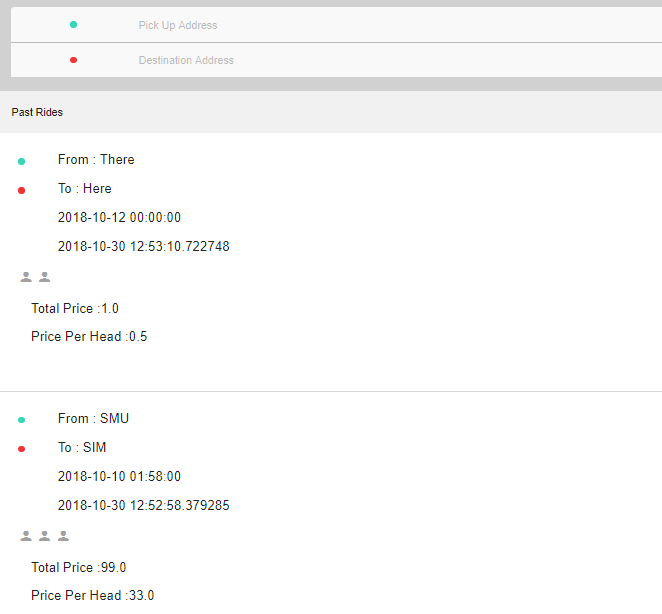
### Trigger behind assert

create or replace function capacity\_checker() returns trigger  
language plpgsql  
as $$  
BEGIN  
  IF ( SELECT (r.current\_pax + NEW.no\_pax <= m.capacity)  
   FROM ride r  
  inner join car c on r.reg\_no = c.reg\_no  
  INNER JOIN model m on c.make = m.make and c.model =m.model  
   AND r.reg\_no = NEW.reg\_no  
   AND r.start\_time = NEW.start\_time)  
    THEN  
    RETURN NEW;  
ELSE  
RAISE EXCEPTION 'Exceeded maximum capacity, please reduce your number of passenger';  
    END IF;  
END  
$$  
;  
create trigger cap\_check  
before insert  
on ride\_bid  
for each row  
execute procedure capacity\_checker()  
;

### Simple Insert Query

INSERT INTO ride\_bid (email,start\_time,reg\_no,no\_pax,bid\_price) VALUES (%s,%s,%s,%s,%s)

## Ride History



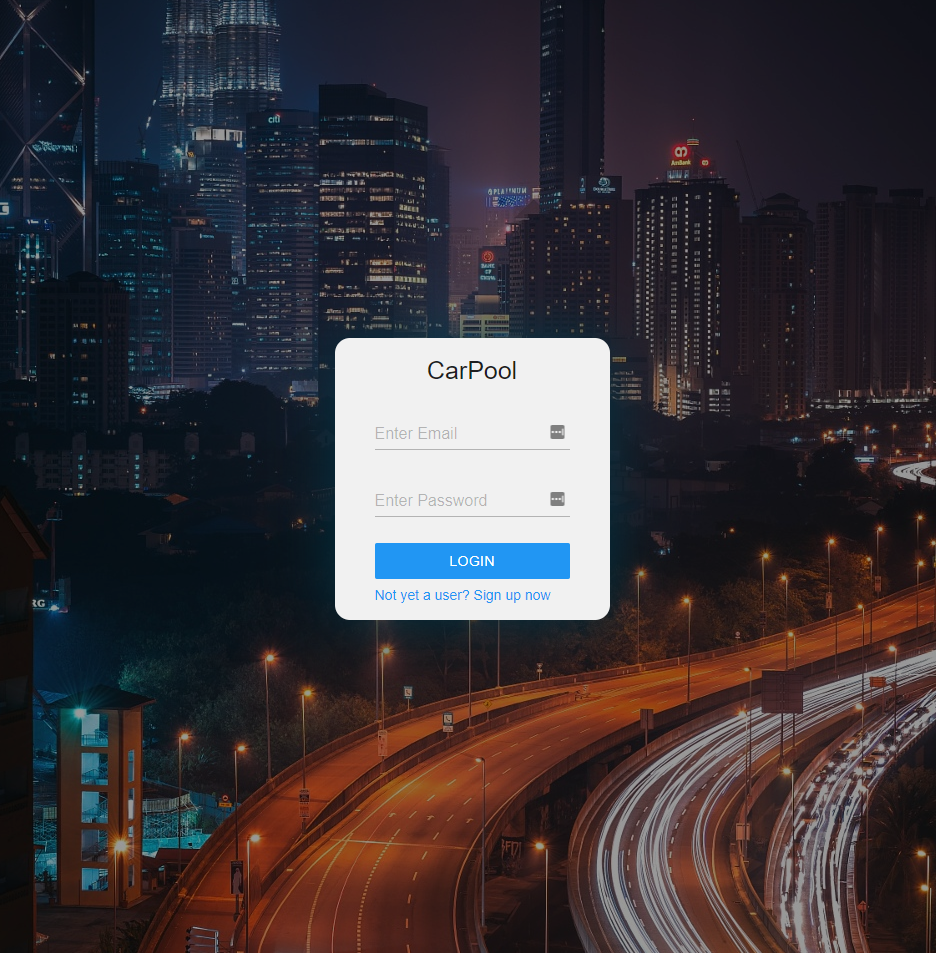
### Trigger

create or replace function audit() returns trigger  
language plpgsql  
as $$  
BEGIN  
IF NEW.status = 'completed' THEN  
 INSERT INTO audit\_log(start\_time,end\_time,status,current\_pax,destination,origin,reg\_no)  
 VALUES (OLD.start\_time,now(),NEW.status,OLD.current\_pax,OLD.destination,OLD.origin,OLD.reg\_no);  
END IF;  
​  
RETURN NEW;  
END;  
$$  
;  
​  
create trigger to\_audit  
before update  
on ride  
for each row  
execute procedure audit()  
;

### Simple Update Query

UPDATE ride  
   SET origin = %s, destination = %s, status = %s  
   WHERE reg\_no = %s AND start\_time = %s

# Screen shots

Login Page:

Index Page:

