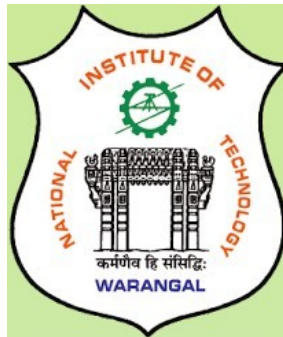# NATIONAL INSTITUTE OF TECHNOLOGY

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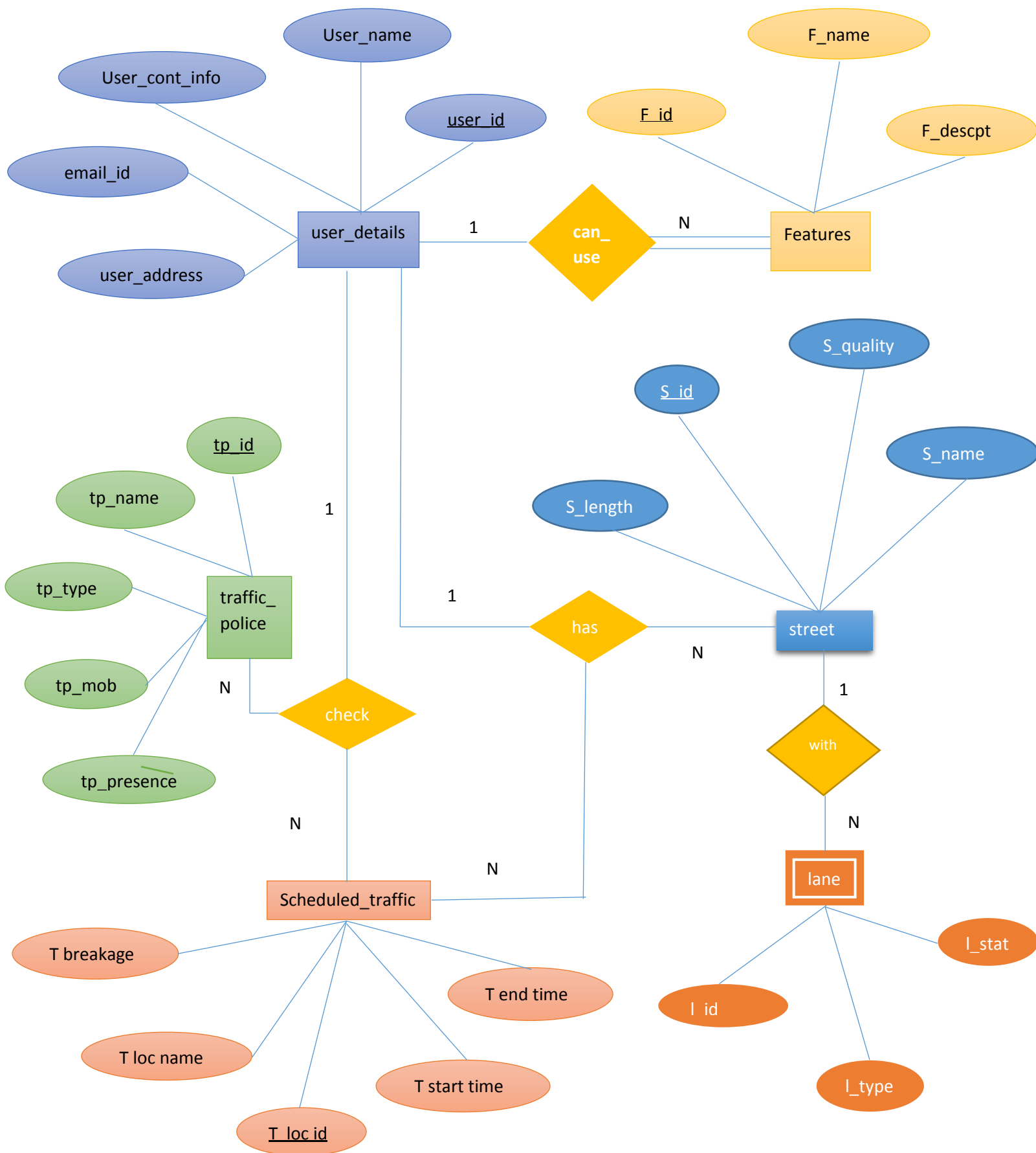

DEPARTMENT

OF

COMPUTER SCIENCE & ENGINEERING

DATABASE MANAGEMENT SYSTEM PROJECT

ON

TRAFFIC MONITORING SYSTEM

Date: January-26, 2019

ER DIAGRAM

user_details entity with attributes: User_cont_info, User_name, email_id, user_id, user_address

Features entity with attributes: F_name, F_id, F_descpt

can_use relationship: user_details 1 — N Features

traffic_police entity with attributes: tp_id, tp_name, tp_type, tp_mob, tp_presence

street entity with attributes: S_id, S_quality, S_name, S_length

has relationship: user_details 1 — N street

check relationship: traffic_police N — N Scheduled_traffic (user_details 1)

Scheduled_traffic entity with attributes: T breakage, T loc name, T loc id, T start time, T end time

with relationship: street 1 — N lane
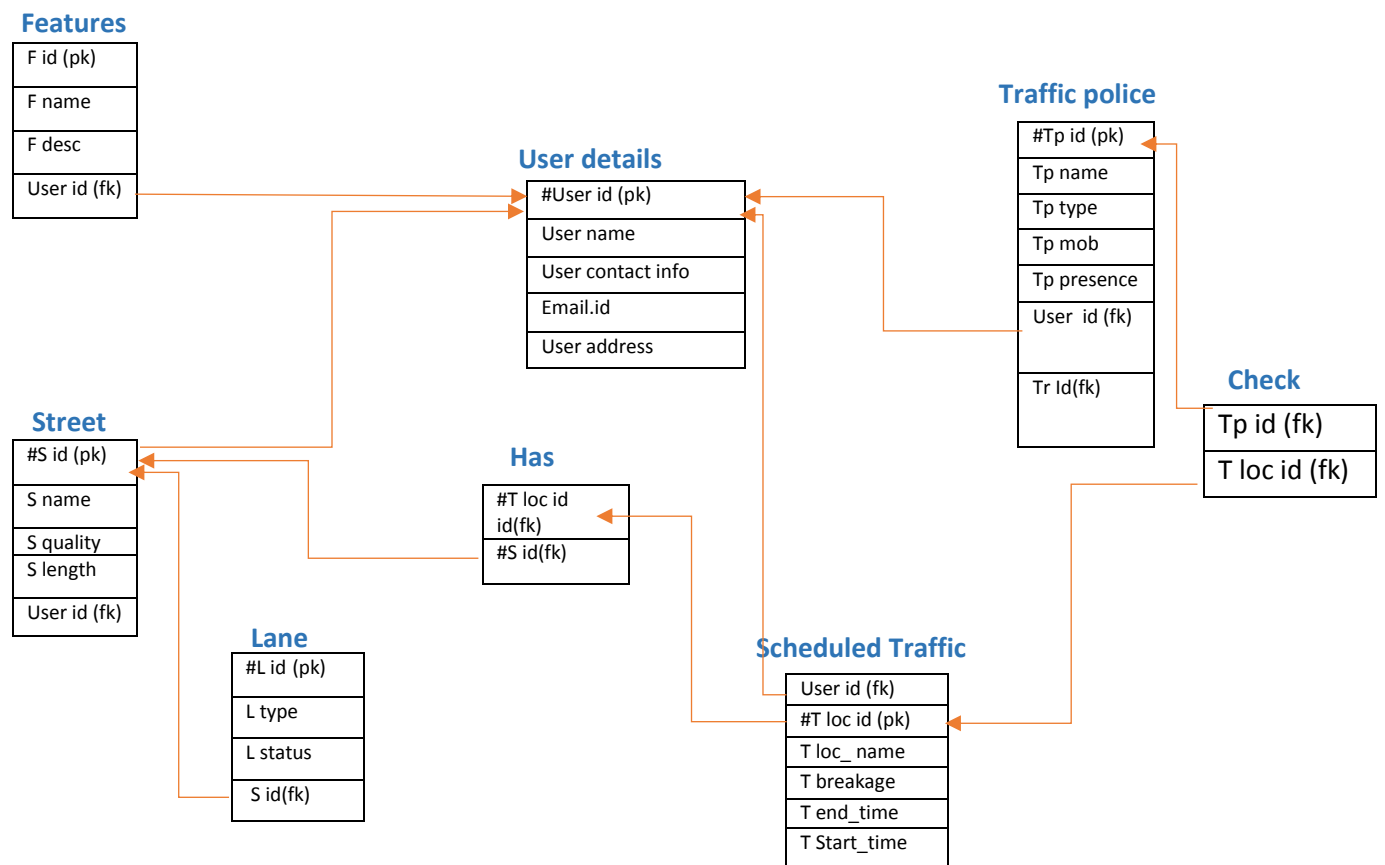
lane entity with attributes: l_id, l_stat, l_type

Relational Database Schema

A **relational database schema** is the tables, columns and relationships that link together the components into a **database**. A **schema** contains objects, which could be tables, columns, data types, views, stored procedures, relationships, primary keys, foreign keys, etc.

database schema can be represented in a visual diagram, which shows the database objects and their relationship with each other .It is helpful when we design a new database or existing database is modified to incorporate new functionality.

Features

F id (pk)
F name
F desc
User id (fk)

User details

#User id (pk)
User name
User contact info
Email.id
User address

Traffic police

#Tp id (pk)
Tp name
Tp type
Tp mob
Tp presence
User id (fk)
Tr Id(fk)

Check

Tp id (fk)
T loc id (fk)

Street

#S id (pk)
S name
S quality
S length
User id (fk)

Has

#T loc id id(fk)
#S id(fk)

Lane

#L id (pk)
L type
L status
S id(fk)

Scheduled Traffic

User id (fk)
#T loc id (pk)
T loc_ name
T breakage
T end_time
T Start_time

Entity Relationship Model

The ER or (Entity Relationship) Model is a high-level conceptual data model diagram. Entity-Relation model is based on the notion of real-world entities and the relationship between them. ER modeling helps you to analyze data requirements systematically to produce a well-designed database. So, it is considered a best practice to complete ER modeling before implementing your database.

We are implementing the ER module on *Traffic Monitoring system*.

For our project, we are taking some of the following enlisted entities.

Entities:

1. USER_DETAILS
2. FEATURES
3. SCHEDULED_TRAFFIC
4. STREET
5. LANE
6. TRAFFIC_POLICE

USER_DETAILS

These are the details required to create a user-account and use our project's app. Once saved, user needn't re-login time to time and have smooth experience while using this app.

The user's saved address will be used to enjoy our various features of the apps, also mentioned below, like knowing the current traffic situations of his nearby locations, etc. More details of the other features have been discussed in the latter parts.

Candidate Keys:

{user_id}, {user_cont_info}, {email_id}.

Primary Key selected:
{user_id}.

Secondary or Alternative Keys:
{user_cont_info}, {email_id}.

Non-Key Attributes:
{user_name}, {user_address}.

Non_Prime Attributes:
{user_name}, {user_cont_info}, {email_id},
{user_address}.

Functional Dependencies:
{user_id} -> {user_name}
{user_id} -> {user_cont_info}
{user_id} -> {email_id}
{user_id} -> {user_address}

FEATURES

These are the various options available in our app that a particular user can enjoy like locating his/her current location , locating desired destination, doing analysis of his/her best in checking out for some other shortcut or alternative ways depending upon the current traffic status of his/her usual traveling lanes.
More other kinds of features can be seen in the output table for the Features entity in the latter part.

Candidate Keys:
{f_id}, {f_descpt}

Primary Key selected:
{f_id}

Secondary or Alternative Keys:
    {f_descpt}

Non-Key Attributes:
    {f_name}

Non_Prime Attributes:
    {f_name}, {f_descpt}

Functional Dependencies:
    {f_id} -> {f_name}
    {f_id} -> {f_descpt}

SCHEDULED_TRAFFIC

These are kinds of preset traffic schedules at any particular traffic location or more simply at any particular junction where more than one streets meet.
These are preset in the sense preset through some software means to the particular traffic lights of any particular junction/location.
More broadly, these are the number of traffics a particular junction are timed to for executing them throughout the whole 24 hour day.

Each Traffic moment will have their own timings i.e. starting time and ending time.

More than one junction may have at least one or even more than one traffic schedules in common. Or, more than one junction may have all the traffic schedules in common with any particular junction.
Similarly, among all the traffic schedules of any particular junction, there can be more than one schedules having same traffic duration or traffic length.

Candidate Keys:
    {t_loc_dur_id}

{t_loc_dur_id}

Secondary or Alternative Keys:
Not Available

Non-Key Attributes:
{t_loc_name}, {t_start_time}, {t_end_time}, {t_breakage}

Non_Prime Attributes:
{t_loc_name}, {t_start_time}, {t_end_time}, {t_breakage}

Functional Dependencies:
{t_loc_dur_id} -> {t_loc_name}
{t_loc_dur_id} -> {t_start_time}
{t_loc_dur_id} -> {t_end_time}
{t_loc_dur_id} -> {t_breakage}

STREET

Here, Street has been considered as an edge between two vertices/points of a graphical plot.

Such vertices are nothing but the traffic location or more simply are the junction where more than one streets/edges meet.

And, Street is nothing but the collection of lanes, lanes of both sides, lanes going from one junction to the other as well as lanes coming from the other junction to the same particular junction.

Candidate keys:
{s_id int}, {s_name}

Primary Key selected:
{s_id int}

Secondary or Alternative Keys:

{s_name}

Non-Key Attributes:
        {s_length_in_km},   {s_quality} Non_Prime   Attributes:
        {s_name},   {s_length_in_km}, {s_quality}

Functional Dependencies:
        {s_id} -> {s_name}
        {s_id} -> {s_length_in_km}
        {s_id} -> {s_quality}

LANE

Here, Lanes are the sub-parts of a street/edge. Each Lane is like the region/area between two margins/lining on a street.
Moreover, Lanes are like number of ways, both outgoing and incoming, in any highway/expressway/or some other kinds of roadways.

Each Lane will have its own unique; or even sometimes common; usage depending upon the basis of vehicle restrictions on that particular lane, depending upon the particular junction; or even more broadly the other streets; it will lead/reach/take towards to.

Vehicle restrictions means which particular/(or which which) kind/(s) of vehicles are allowed in any particular lane.
More than one lane of a particular street may have common vehicle restriction/allowance.

The other streets, other than the current street, any particular vehicle might want to enter into may be either straight away from the current street or through some turnings. Turnings in the sense means street which are at almost around 90 degrees or around some other degrees other than the 0 degree(in graphical manner) either to the left or to the right side of the current street.

Other Street which is at 0 degree to the current street is nothing but the same kind of street, as mentioned above, which are straight away from the current street.

So in overall, depending upon the angular positions of the other street, a vehicle want to enter into from its current street, each lane will have its own usage on this basis also i.e. the other street a particular lane will take towards to from a particular current street.

Candidate keys:
    {l_id}

Primary Key selected:
    {l_id}

Secondary or Alternative Keys:
    Not available

Non-Key Attributes:
    {l_type}, {l_restrictions}, {l_status}

Non_Prime Attributes:
    {l_type}, {l_restrictions}, {l_status}

Functional Dependencies:
    {l_id} -> {l_type}
    {l_id} -> {l_restrictions}
    {l_id} -> {l_status}

TRAFFIC_POLICE

Well this entity was not of that much importance to our ER model, though we felt of including it too as one of the entity set of our ER model for some emergency circumstances.

Emergency circumstances in the sense means situations like when you have forgotten your license or some important documents related to your vehicle or related to you that verifies for your

driving qualification, that verifies your ownership with the vehicle you are currently in.

More other situations might be like some health related cases when you are trying to reach out to some nearby health_posts in hurried manner without carrying your license or/and vehicle documents.

In such situations, sometimes you wanna escape from the unnecessary traffic_police's legal actions when you are really in hurry to reach out to your desired destination.

A feature available in our app will let you know the presence of traffic_police at your desired locations/junctions so that you can analyze at your best for some alternative ways to reach out to escaping from Traffic_Police(s).

Candidate keys:
    {tp_duty_id}, {tp_mob}, {t_loc_dur_id}

Primary Key selected:
    {tp_duty_id}

Secondary or Alternative Keys:
    {tp_mob}, {t_loc_dur_id}

Non-Key Attributes:
    {tp_name}, {tp_type}, {tp_presence}

Non_Prime Attributes:
    {tp_mob},   {t_loc_dur_id},   {tp_name},   {tp_type}, {tp_presence}

Functional Dependencies:
    {tp_duty_id} -> {tp_name}
    {tp_duty_id} -> {tp_type}
    {tp_duty_id} -> {tp_mob}
    {tp_duty_id} -> {t_loc_dur_id}
    {tp_duty_id} -> {tp_presence}

TABLES CREATION AND INSERTION

USER_DETAILS

```
create table user_details(user_id int, user_name varchar(40),
user_cont_info int, email_id varchar(40), user_address
varchar(40), primary key(user_id));


insert into user_details values( 1, 'A!1', 9939939420,
'a_1@gmail.com', 'Street-1');
insert into user_details values( 2, 'B@2', 9939939430,
'b_1@gmail.com', 'Street-1');
insert into user_details values( 3, 'C#3', 9939939440,
'c_1@gmail.com', 'Street-2');
insert into user_details values( 4, 'A!1', 9939939450,
'd_1@gmail.com', 'Street-3');
insert into user_details values( 5, 'C#3', 9939939460,
'e_1@gmail.com', 'Street-4');
insert into user_details values( 6, 'D^6', 9939939470,
'f_1@gmail.com', 'Street-4');


drop table user_details;

select * from user_details;
```

USER_ID	USER_NAME	USER_CONT_INFO	EMAIL_ID	USER_ADDRESS
1	A!1	9939939420	a_1@gmail.com	Street-1
2	B@2	9939939430	b_1@gmail.com	Street-1
3	C#3	9939939440	c_1@gmail.com	Street-2
4	A!1	9939939450	d_1@gmail.com	Street-3
5	C#3	9939939460	e_1@gmail.com	Street-4
6	D^6	9939939470	f_1@gmail.com	Street-4

Download CSV
6 rows selected.

Candidate Keys:
    {user_id}, {user_cont_info}, {email_id}.

Primary Key selected:
    {user_id}.

Secondary or Alternative Keys:
    {user_cont_info}, {email_id}.

Non-Key Attributes:
    {user_name}, {user_address}.

Non_Prime Attributes:
    {user_name}, {user_cont_info}, {email_id},
{user_address}.

Functional Dependencies:
    {user_id} -> {user_name}
    {user_id} -> {user_cont_info}
    {user_id} -> {email_id}
    {user_id} -> {user_address}

Highest Normal Form:

    4 NF

FEATURES

```
create table features(f_id int, f_name char(40), f_descpt
char(40), primary key(f_id));
```

```sql
insert into features values( 101, 'Locate', 'Current location');
insert into features values( 102, 'Locate', 'Desired
destination');

insert into features values( 201, 'Check', 'Shortcut ways');
insert into features values( 202, 'Check', 'Tolls');
insert into features values( 203, 'Check', 'Restricted
streets');
insert into features values( 204, 'Check', 'Restricted lanes');
insert into features values( 205, 'Check', 'Traffic police
presence');

insert into features values( 301, 'Track', 'Current Move');
insert into features values( 302, 'Track', 'Arriving Vehicles');
insert into features values( 303, 'Track', 'Departed Vehicles');

insert into features values( 401, 'Find', 'Nearby recently
occurred accidents');
insert into features values( 402, 'Find', 'Nearby ongoing road
rallies');
insert into features values( 403, 'Find', 'Nearby ongoing
strikes');
insert into features values( 404, 'Find', 'Nearby ongoing road
events');

insert into features values( 501, 'Know', 'Traffic Strength');
insert into features values( 502, 'Know', 'Traffic Breakage');


drop table features;

select * from features;
```

F_ID	F_NAME	F_DESCPT
101	Locate	Current location
102	Locate	Desired destination
201	Check	Shortcut ways
202	Check	Tolls
203	Check	Restricted streets
204	Check	Restricted lanes
205	Check	Traffic police presence
301	Track	Current Move
302	Track	Arriving Vehicles
303	Track	Departed Vehicles
401	Find	Nearby recently occured accidents
402	Find	Nearby ongoing road rallies
403	Find	Nearby ongoing strikes
404	Find	Nearby ongoing road events
501	Know	Traffic Strength
502	Know	Traffic Breakage

Download CSV
16 rows selected.

Candidate Keys:
{f_id}, {f_descpt}

Primary Key selected:
{f_id}

Secondary or Alternative Keys:
{f_descpt}

Non-Key Attributes:
{f_name}

Non_Prime Attributes:
{f_name}, {f_descpt}

    {f_id} -> {f_name}
    {f_id} -> {f_descpt}

    4 NF

SCHEDULED_TRAFFIC

```
create table scheduled_traffic(t_loc_dur_id int, t_loc_name
varchar(40), t_start_time(40) timestamp, t_end_time(40)
timestamp, t_breakage char(40), primary key(t_loc_dur_id));


insert into scheduled_traffic values( 1000101, 'Junction_1',
'06:00:00 AM', '06:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000102, 'Junction_1',
'06:30:00 AM', '06:40:00 AM', 'As usual');
insert into scheduled_traffic values( 1000103, 'Junction_1',
'07:00:00 AM', '07:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000104, 'Junction_1',
'07:30:00 AM', '07:40:00 AM', 'Typical conditions');
insert into scheduled_traffic values( 1000105, 'Junction_1',
'08:00:00 AM', '08:10:00 AM', 'Much slower than usual');
insert into scheduled_traffic values( 1000106, 'Junction_1',
'08:30:00 AM', '08:40:00 AM', 'Faster than usual');

insert into scheduled_traffic values( 1000201, 'Junction_2',
'07:30:00 AM', '07:40:00 AM', 'As usual');
insert into scheduled_traffic values( 1000202, 'Junction_2',
'08:00:00 AM', '08:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000203, 'Junction_2',
'08:30:00 AM', '08:40:00 AM', 'Typical conditions');
```

```sql
insert into scheduled_traffic values( 1000204, 'Junction_2',
'09:00:00 AM', '09:10:00 AM', 'Much slower than usual');
insert into scheduled_traffic values( 1000205, 'Junction_2',
'09:30:00 AM', '09:40:00 AM', 'Faster than usual');
insert into scheduled_traffic values( 1000206, 'Junction_2',
'10:00:00 AM', '10:10:00 AM', 'Much faster than usual');

insert into scheduled_traffic values( 1000301, 'Junction_3',
'06:30:00 AM', '06:40:00 AM', 'Much slower than usual');
insert into scheduled_traffic values( 1000302, 'Junction_3',
'07:00:00 AM', '07:10:00 AM', 'Typical conditions');
insert into scheduled_traffic values( 1000303, 'Junction_3',
'07:30:00 AM', '07:40:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000304, 'Junction_3',
'08:00:00 AM', '08:10:00 AM', 'As usual');
insert into scheduled_traffic values( 1000305, 'Junction_3',
'08:30:00 AM', '08:40:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000306, 'Junction_3',
'09:00:00 AM', '09:10:00 AM', 'Faster than usual');

insert into scheduled_traffic values( 1000401, 'Junction_4',
'06:00:00 AM', '06:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000402, 'Junction_4',
'06:30:00 AM', '06:40:00 AM', 'As usual');
insert into scheduled_traffic values( 1000403, 'Junction_4',
'07:00:00 AM', '07:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000404, 'Junction_4',
'07:30:00 AM', '07:40:00 AM', 'Typical conditions');
insert into scheduled_traffic values( 1000405, 'Junction_4',
'08:00:00 AM', '08:10:00 AM', 'Much slower than usual');
insert into scheduled_traffic values( 1000406, 'Junction_4',
'08:30:00 AM', '08:40:00 AM', 'Faster than usual');

insert into scheduled_traffic values( 1000501, 'Junction_5',
'07:30:00 AM', '07:40:00 AM', 'As usual');
insert into scheduled_traffic values( 1000502, 'Junction_5',
'08:00:00 AM', '08:10:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000503, 'Junction_5',
'08:30:00 AM', '08:40:00 AM', 'Typical conditions');
insert into scheduled_traffic values( 1000504, 'Junction_5',
'09:00:00 AM', '09:10:00 AM', 'Much slower than usual');
```

```sql
insert into scheduled_traffic values( 1000505, 'Junction_5',
'09:30:00 AM', '09:40:00 AM', 'Faster than usual');
insert into scheduled_traffic values( 1000506, 'Junction_5',
'10:00:00 AM', '10:10:00 AM', 'Much faster than usual');

insert into scheduled_traffic values( 1000601, 'Junction_6',
'06:30:00 AM', '06:40:00 AM', 'Much slower than usual');
insert into scheduled_traffic values( 1000602, 'Junction_6',
'07:00:00 AM', '07:10:00 AM', 'Typical conditions');
insert into scheduled_traffic values( 1000603, 'Junction_6',
'07:30:00 AM', '07:40:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000604, 'Junction_6',
'08:00:00 AM', '08:10:00 AM', 'As usual');
insert into scheduled_traffic values( 1000605, 'Junction_6',
'08:30:00 AM', '08:40:00 AM', 'Slower than usual');
insert into scheduled_traffic values( 1000606, 'Junction_6',
'09:00:00 AM', '09:10:00 AM', 'Faster than usual');


drop table scheduled_traffic;

select * from scheduled_traffic;
```

T_LOC_DUR_ID	T_LOC_NAME	T_START_TIME	T_END_TIME	T_BREAKAGE
1000101	Junction_1	06:00:00 AM	06:10:00 AM	Slower than usual
1000102	Junction_1	06:30:00 AM	06:40:00 AM	As usual
1000103	Junction_1	07:00:00 AM	07:10:00 AM	Slower than usual
1000104	Junction_1	07:30:00 AM	07:40:00 AM	Typical conditions
1000105	Junction_1	08:00:00 AM	08:10:00 AM	Much slower than usual
1000106	Junction_1	08:30:00 AM	08:40:00 AM	Faster than usual
1000201	Junction_2	07:30:00 AM	07:40:00 AM	As usual
1000202	Junction_2	08:00:00 AM	08:10:00 AM	Slower than usual
1000203	Junction_2	08:30:00 AM	08:40:00 AM	Typical conditions
1000204	Junction_2	09:00:00 AM	09:10:00 AM	Much slower than usual
1000205	Junction_2	09:30:00 AM	09:40:00 AM	Faster than usual
1000206	Junction_2	10:00:00 AM	10:10:00 AM	Much faster than usual
1000301	Junction_3	06:30:00 AM	06:40:00 AM	Much slower than usual
1000302	Junction_3	07:00:00 AM	07:10:00 AM	Typical conditions
1000303	Junction_3	07:30:00 AM	07:40:00 AM	Slower than usual
1000304	Junction_3	08:00:00 AM	08:10:00 AM	As usual
1000305	Junction_3	08:30:00 AM	08:40:00 AM	Slower than usual
1000306	Junction_3	09:00:00 AM	09:10:00 AM	Faster than usual
1000401	Junction_4	06:00:00 AM	06:10:00 AM	Slower than usual
1000402	Junction_4	06:30:00 AM	06:40:00 AM	As usual
1000403	Junction_4	07:00:00 AM	07:10:00 AM	Slower than usual
1000404	Junction_4	07:30:00 AM	07:40:00 AM	Typical conditions
1000405	Junction_4	08:00:00 AM	08:10:00 AM	Much slower than usual
1000406	Junction_4	08:30:00 AM	08:40:00 AM	Faster than usual
1000501	Junction_5	07:30:00 AM	07:40:00 AM	As usual
1000502	Junction_5	08:00:00 AM	08:10:00 AM	Slower than usual
1000503	Junction_5	08:30:00 AM	08:40:00 AM	Typical conditions
1000504	Junction_5	09:00:00 AM	09:10:00 AM	Much slower than usual
1000505	Junction_5	09:30:00 AM	09:40:00 AM	Faster than usual
1000506	Junction_5	10:00:00 AM	10:10:00 AM	Much faster than usual
1000601	Junction_6	06:30:00 AM	06:40:00 AM	Much slower than usual
1000602	Junction_6	07:00:00 AM	07:10:00 AM	Typical conditions
1000603	Junction_6	07:30:00 AM	07:40:00 AM	Slower than usual
1000604	Junction_6	08:00:00 AM	08:10:00 AM	As usual
1000605	Junction_6	08:30:00 AM	08:40:00 AM	Slower than usual
1000606	Junction_6	09:00:00 AM	09:10:00 AM	Faster than usual

Download CSV
36 rows selected.

Candidate Keys:
   {t_loc_dur_id}

Primary Key selected:
   {t_loc_dur_id}

Sceondary or Alternative Keys:
   Not Available

Non-Key Attributes:
   {t_loc_name}, {t_start_time}, {t_end_time}, {t_breakage}

Non_Prime Attributes:
   {t_loc_name}, {t_start_time}, {t_end_time}, {t_breakage}

Functional Dependencies:
   {t_loc_dur_id} -> {t_loc_name}
   {t_loc_dur_id} -> {t_start_time}
   {t_loc_dur_id} -> {t_end_time}
   {t_loc_dur_id} -> {t_breakage}

Highest Normal Form:
   4 NF

STREET

```
create table street(s_id int, s_name char(40), s_length_in_km
float, s_quality char(40), primary key(s_id));

insert into street values( 601, 'S_A', 20, 'Piched');
insert into street values( 602, 'S_B', 40, 'Piched');
```

```
insert into street values( 603, 'S_C', 60, 'Graveled');
insert into street values( 604, 'S_D', 30, 'Piched');
insert into street values( 605, 'S_E', 50, 'Raw');
insert into street values( 606, 'S_F', 80, 'Raw');


drop table street;

select * from street;
```

S_ID	S_NAME	S_LENGTH_IN_KM	S_QUALITY
601	S_A	20	Piched
602	S_B	40	Piched
603	S_C	60	Graveled
604	S_D	30	Piched
605	S_E	50	Raw
606	S_F	80	Raw

Download CSV
6 rows selected.

Candidate keys:
    {s_id int}, {s_name}

Primary Key selected:
    {s_id int}

Secondary or Alternative Keys:
    {s_name}

Non-Key Attributes:
    {s_length_in_km}, {s_quality}

Non_Prime Attributes:
    {s_name}, {s_length_in_km}, {s_quality}

Functional Dependencies:
    {s_id} -> {s_name}
    {s_id} -> {s_length_in_km}
    {s_id} -> {s_quality}

Highest Normal Form:

      4 NF

LANE

[*A weak entity set*]

```
create table lane(l_id int, l_type varchar(40), l_restrictions
char(100), l_status char(40), s_id int, foreign key(s_id)
references street(s_id));
```

```
insert into lane values( 10201, '2-Lane', 'No Trucks & Buses',
'In use', 601);
```

```
insert into lane values( 10202, '2-Lane', 'No Trucks & Buses',
'In use', 601);
```

```
insert into lane values( 10401, '4-Lane', 'No Trucks & Buses',
'Under construction', 602);
```
```
insert into lane values( 10402, '4-Lane', 'No 2-Wheelers', 'In
use', 602);
```

```
insert into lane values( 10403, '4-Lane', 'No Trucks & Buses',
'In use', 602);
```
```
insert into lane values( 10404, '4-Lane', 'No 2-Wheelers', 'In
use', 602);
```

```sql
insert into lane values( 20201, '2-Lane', 'No Trucks', 'Under construction', 603);

insert into lane values( 20202, '2-Lane', 'No Trucks', 'Under construction', 603);



insert into lane values( 10601, '6-Lane', 'No Trucks & Buses', 'In use', 604);
insert into lane values( 10602, '6-Lane', 'Only Trucks', 'In use', 604);
insert into lane values( 10603, '6-Lane', 'No Trucks', 'Under construction', 604);

insert into lane values( 10604, '6-Lane', 'No Trucks & Buses', 'In use', 604);
insert into lane values( 10605, '6-Lane', 'Only Trucks', 'Under construction', 604);
insert into lane values( 10606, '6-Lane', 'No Trucks', 'Under construction', 604);



insert into lane values( 30201, '2-Lane', 'No Trucks', 'In use', 605);

insert into lane values( 30202, '2-Lane', 'No Trucks', 'In use', 605);



insert into lane values( 10100, '1-Lane', 'Only 2-Wheelers', 'In use', 606);



drop table lane;

select * from lane;
```

L_ID	L_TYPE	L_RESTRICTIONS	L_STATUS	S_ID
10201	2-Lane	No Trucks & Buses	In use	601
10202	2-Lane	No Trucks & Buses	In use	601
10401	4-Lane	No Trucks & Buses	Under construction	602
10402	4-Lane	No 2-Wheelers	In use	602
10403	4-Lane	No Trucks & Buses	In use	602
10404	4-Lane	No 2-Wheelers	In use	602
20201	2-Lane	No Trucks	Under construction	603
20202	2-Lane	No Trucks	Under construction	603
10601	6-Lane	No Trucks & Buses	In use	604
10602	6-Lane	Only Trucks	In use	604
10603	6-Lane	No Trucks	Under construction	604
10604	6-Lane	No Trucks & Buses	In use	604
10605	6-Lane	Only Trucks	Under construction	604
10606	6-Lane	No Trucks	Under construction	604
30201	2-Lane	No Trucks	In use	605
30202	2-Lane	No Trucks	In use	605
10100	1-Lane	Only 2-Wheelers	In use	606

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17 rows selected.

Candidate keys:
    {l_id}

Primary Key selected:
    {l_id}

Secondary or Alternative Keys:
    Not available

Non-Key Attributes:
    {l_type}, {l_restrictions}, {l_status}

Non_Prime Attributes:
    {l_type}, {l_restrictions}, {l_status}

Functional Dependencies:

{l_id} -> {l_type}
{l_id} -> {l_restrictions}
{l_id} -> {l_status}

Highest Normal Form:

4 NF

TRAFFIC_POLICE

```
create table traffic_police(tp_duty_id int, tp_name char(5),
tp_type char(10), tp_mob int, t_loc_dur_id int, tp_presence
char(5), primary key(tp_duty_id), foreign key(t_loc_dur_id)
references scheduled_traffic(t_loc_dur_id));

insert into traffic_police values( 91101, 'T_A', 'sub',
9841626678, 1000101, 'Yes');
insert into traffic_police values( 91102, 'T_A', 'sub',
9841626678, 1000203, 'Yes');
insert into traffic_police values( 91103, 'T_A', 'sub',
9841626678, 1000305, 'No');
insert into traffic_police values( 91104, 'T_A', 'sub',
9841626678, 1000501, 'Yes');

insert into traffic_police values( 91201, 'T_B', 'main',
9841626679, 1000102, 'Yes');
insert into traffic_police values( 91202, 'T_B', 'main',
9841626679, 1000204, 'No');
insert into traffic_police values( 91203, 'T_B', 'main',
9841626679, 1000306, 'Yes');
insert into traffic_police values( 91204, 'T_B', 'main',
9841626679, 1000502, 'No');
```

```sql
insert into traffic_police values( 91205, 'T_B', 'main',
9841626679, 1000601, 'No');

insert into traffic_police values( 91301, 'T_C', 'sub',
9841626680, 1000103, 'No');
insert into traffic_police values( 91302, 'T_C', 'sub',
9841626680, 1000205, 'Yes');
insert into traffic_police values( 91303, 'T_C', 'sub',
9841626680, 1000401, 'Yes');
insert into traffic_police values( 91304, 'T_C', 'sub',
9841626680, 1000503, 'Yes');

insert into traffic_police values( 91401, 'T_D', 'main',
9841626681, 1000104, 'No');
insert into traffic_police values( 91402, 'T_D', 'main',
9841626681, 1000206, 'Yes');
insert into traffic_police values( 91403, 'T_D', 'main',
9841626681, 1000402, 'No');
insert into traffic_police values( 91404, 'T_D', 'main',
9841626681, 1000504, 'No');

insert into traffic_police values( 91501, 'T_B', 'main',
9841626682, 1000105, 'Yes');
insert into traffic_police values( 91502, 'T_B', 'main',
9841626682, 1000301, 'No');
insert into traffic_police values( 91503, 'T_B', 'main',
9841626682, 1000403, 'Yes');
insert into traffic_police values( 91504, 'T_B', 'main',
9841626682, 1000505, 'No');
insert into traffic_police values( 91505, 'T_B', 'main',
9841626682, 1000602, 'No');
insert into traffic_police values( 91506, 'T_B', 'main',
9841626682, 1000606, 'Yes');

insert into traffic_police values( 91601, 'T_E', 'sub',
9841626683, 1000106, 'No');
insert into traffic_police values( 91602, 'T_E', 'sub',
9841626683, 1000302, 'Yes');
insert into traffic_police values( 91603, 'T_E', 'sub',
9841626683, 1000404, 'No');
```

```sql
insert into traffic_police values( 91604, 'T_E', 'sub',
9841626683, 1000506, 'Yes');
insert into traffic_police values( 91605, 'T_E', 'sub',
9841626683, 1000603, 'No');

insert into traffic_police values( 91701, 'T_A', 'sub',
9841626683, 1000201, 'Yes');
insert into traffic_police values( 91702, 'T_A', 'sub',
9841626683, 1000303, 'Yes');
insert into traffic_police values( 91703, 'T_A', 'sub',
9841626683, 1000405, 'Yes');
insert into traffic_police values( 91704, 'T_A', 'sub',
9841626683, 1000604, 'Yes');

insert into traffic_police values( 91801, 'T_D', 'sub',
9841626683, 1000202, 'No');
insert into traffic_police values( 91802, 'T_D', 'sub',
9841626683, 1000304, 'No');
insert into traffic_police values( 91803, 'T_D', 'sub',
9841626683, 1000406, 'No');
insert into traffic_police values( 91804, 'T_D', 'sub',
9841626683, 1000605, 'No');


drop table traffic_police;

select * from traffic_police;
```

TP_DUTY_ID	TP_NAME	TP_TYPE	TP_MOB	T_LOC_DUR_ID	TP_PRESENCE
91101	T_A	sub	9841626678	1000101	Yes
91102	T_A	sub	9841626678	1000203	Yes
91103	T_A	sub	9841626678	1000305	No
91104	T_A	sub	9841626678	1000501	Yes
91201	T_B	main	9841626679	1000102	Yes
91202	T_B	main	9841626679	1000204	No
91203	T_B	main	9841626679	1000306	Yes
91204	T_B	main	9841626679	1000502	No
91205	T_B	main	9841626679	1000601	No
91301	T_C	sub	9841626680	1000103	No
91302	T_C	sub	9841626680	1000205	Yes
91303	T_C	sub	9841626680	1000401	Yes
91304	T_C	sub	9841626680	1000503	Yes
91401	T_D	main	9841626681	1000104	No
91402	T_D	main	9841626681	1000206	Yes
91403	T_D	main	9841626681	1000402	No
91404	T_D	main	9841626681	1000504	No
91501	T_B	main	9841626682	1000105	Yes
91502	T_B	main	9841626682	1000301	No
91503	T_B	main	9841626682	1000403	Yes
91504	T_B	main	9841626682	1000505	No
91505	T_B	main	9841626682	1000602	No
91506	T_B	main	9841626682	1000606	Yes
91601	T_E	sub	9841626683	1000106	No
91602	T_E	sub	9841626683	1000302	Yes
91603	T_E	sub	9841626683	1000404	No
91604	T_E	sub	9841626683	1000506	Yes
91605	T_E	sub	9841626683	1000603	No
91701	T_A	sub	9841626683	1000201	Yes
91702	T_A	sub	9841626683	1000303	Yes
91703	T_A	sub	9841626683	1000405	Yes
91704	T_A	sub	9841626683	1000604	Yes
91801	T_D	sub	9841626683	1000202	No
91802	T_D	sub	9841626683	1000304	No
91803	T_D	sub	9841626683	1000406	No
91804	T_D	sub	9841626683	1000605	No

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36 rows selected.

{tp_duty_id}, {tp_mob}, {t_loc_dur_id}

Primary Key selected:

{tp_duty_id}

Secondary or Alternative Keys:

{tp_mob}, {t_loc_dur_id}

Non-Key Attributes:

{tp_name}, {tp_type}, {tp_presence}

Non_Prime Attributes:

{tp_mob}, {t_loc_dur_id}, {tp_name}, {tp_type},
{tp_presence}

Functional Dependencies:

{tp_duty_id} -> {tp_name}
{tp_duty_id} -> {tp_type}
{tp_duty_id} -> {tp_mob}
{tp_duty_id} -> {t_loc_dur_id}
{tp_duty_id} -> {tp_presence}

Highest Normal Form:

4 NF

HAS

[A Many-To-Many Relationship Set
Between Street And Scheduled_Traffic]

```
create table has(s_id int, t_loc_dur_id int, foreign key(s_id)
references street(s_id), foreign key(t_loc_dur_id) references
scheduled_traffic(t_loc_dur_id));



insert into has values( 601, 1000101);
insert into has values( 601, 1000102);
insert into has values( 601, 1000103);
insert into has values( 601, 1000104);
insert into has values( 601, 1000105);
insert into has values( 601, 1000106);

insert into has values( 601, 1000201);
insert into has values( 601, 1000202);
insert into has values( 601, 1000203);
insert into has values( 601, 1000204);
insert into has values( 601, 1000205);
insert into has values( 601, 1000206);



insert into has values( 602, 1000201);
insert into has values( 602, 1000202);
insert into has values( 602, 1000203);
insert into has values( 602, 1000204);
insert into has values( 602, 1000205);
insert into has values( 602, 1000206);

insert into has values( 602, 1000301);
insert into has values( 602, 1000302);
insert into has values( 602, 1000303);
insert into has values( 602, 1000304);
insert into has values( 602, 1000305);
insert into has values( 602, 1000306);



insert into has values( 603, 1000201);
insert into has values( 603, 1000202);
insert into has values( 603, 1000203);
```

```
insert into has values( 603, 1000204);
insert into has values( 603, 1000205);
insert into has values( 603, 1000206);

insert into has values( 603, 1000601);
insert into has values( 603, 1000602);
insert into has values( 603, 1000603);
insert into has values( 603, 1000604);
insert into has values( 603, 1000605);
insert into has values( 603, 1000606);



insert into has values( 604, 1000101);
insert into has values( 604, 1000102);
insert into has values( 604, 1000103);
insert into has values( 604, 1000104);
insert into has values( 604, 1000105);
insert into has values( 604, 1000106);

insert into has values( 604, 1000501);
insert into has values( 604, 1000502);
insert into has values( 604, 1000503);
insert into has values( 604, 1000504);
insert into has values( 604, 1000505);
insert into has values( 604, 1000506);



insert into has values( 605, 1000301);
insert into has values( 605, 1000302);
insert into has values( 605, 1000303);
insert into has values( 605, 1000304);
insert into has values( 605, 1000305);
insert into has values( 605, 1000306);

insert into has values( 605, 1000401);
insert into has values( 605, 1000402);
insert into has values( 605, 1000403);
insert into has values( 605, 1000404);
insert into has values( 605, 1000405);
```

```
insert into has values( 605, 1000406);
```

```
drop table has;
```

```
select * from has;
```

S_ID	T_LOC_DUR_ID
601	1000101
601	1000102
601	1000103
601	1000104
601	1000105
601	1000106
601	1000201
601	1000202
601	1000203
601	1000204
601	1000205
601	1000206
602	1000201
602	1000202
602	1000203
602	1000204
602	1000205
602	1000206
602	1000301
602	1000302
602	1000303
602	1000304
602	1000305
602	1000306
603	1000201
603	1000202
603	1000203
603	1000204

603	1000205
603	1000206
603	1000601
603	1000602
603	1000603
603	1000604
603	1000605
603	1000606
604	1000101
604	1000102
604	1000103
604	1000104
604	1000105
604	1000106
604	1000501
604	1000502
604	1000503
604	1000504
604	1000505
604	1000506
605	1000301
605	1000302
605	1000303
605	1000304
605	1000305
605	1000306
605	1000401
605	1000402
605	1000403
605	1000404
605	1000405
605	1000406

^_^ THE END ^_^