In [1]:

```
import sqlite3
import pandas as pd
import numpy as np
```

Read crawled data

In [2]:

```
crawled_df = pd.read_csv('Q1_Mudah_PropAds.csv')
crawled_df.head()
```

Out[2]:

	list_title	url	price	area	category	prop_type	prop_title1	p
0	New Luxury Freehold Residence 4min Walk to Mid...	https://www.mudah.my/New+Luxury+Freehold+Resid...	597000	Mid Valley City	Apartments	Condo / Services residence / Penthouse / Townh...	Freehold	
1	Sri Putramas 1 1100sqft Jalan Kuching Below Ma...	https://www.mudah.my/Sri+Putramas+1+1100sqft+J...	405000	Jalan Kuching	Apartments	Condo / Services residence / Penthouse / Townh...	Freehold	
2	0% DOWNPAYMENT Arena Green 750SF Bukit Jalil [...	https://www.mudah.my/0+DOWNPAYMENT+Arena+Green...	320000	Bukit Jalil	Apartments	Condo / Services residence / Penthouse / Townh...	Freehold	
3	[Duplex Penthouse] Silk Residence Duplex Doubl...	https://www.mudah.my/+Duplex+Penthouse+Silk+Re...	900000	Cheras	Apartments	Condo / Services residence / Penthouse / Townh...	Freehold	
4	BELOW MARKET!! Menara D'Sara Condo Sri Damansa...	https://www.mudah.my/BELOW+MARKET+Menara+D+Sar...	380000	Sri Damansara	Apartments	Condo / Services residence / Penthouse / Townh...	Freehold	

In [3]:

```
crawled_df.columns
```

Out[3]:

```
Index(['list_title', 'url', 'price', 'area', 'category', 'prop_type',
       'prop_title1', 'prop_title2', 'bedrooms', 'bathroom', 'facilities',
       'size', 'size_unit'],
      dtype='object')
```

Create SQLite3 file

In [4]:

```
import os
import sqlite3

db_path = 'Q2_sqlite3_data.db'
if os.path.exists(db_path):
    os.remove(db_path)

conn = sqlite3.connect(db_path)
conn.close()
```

Define Tables

We want our database to have 1 fact table and 5 dimension tables:

- Listings (Fact Table)
- Category (Dimension)
- Area (Dimension)
- prop_type (Dimension)
- size_unit (Dimension)
- prop_title (Dimension)

Create Area dimension table

In [5]:

```
print(crawled_df['area'].unique())
areaID_table = pd.DataFrame([[i, x.strip()] for i, x in enumerate(crawled_df['area'].unique(),1)], columns=['areaID',
'area']).set_index('areaID')
display(areaID_table.head())

# save into sqlite3
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE area
                 (areaID int NOT NULL PRIMARY KEY, area text)''')

    areaID_table.to_sql(name='area', con=conn, if_exists='append')
```

```
['Mid Valley City' 'Jalan Kuching' 'Bukit Jalil' 'Cheras' 'Sri Damansara'
 'Pandan Indah' 'Taman Desa' 'Kuchai Lama' 'Sungai Besi' 'Bangsar'
 'Others' 'Kepong' 'KL City' 'Setiawangsa' 'Wangsa Maju' 'Jalan Ampang'
 'Desa Petaling' 'Setapak' 'Old Klang Road' 'Jalan Ipoh' 'KL Sentral'
 'Pandan Jaya' 'Taman Melawati' 'Sentul' 'Bangsar South' 'Ampang Hilir'
 'Desa Pandan' 'KLCC' 'City Centre' 'Bandar Menjalara' 'Sri Petaling'
 'Mont Kiara' 'Damansara Heights' 'Serdang' 'Sri Hartamas' 'Salak Selatan'
 'Gombak' 'Puchong' 'Keramat' 'OUG' 'Damansara' 'Bukit Bintang' 'Segambut'
 'Pandan Perdana']
```

	area
areaID	
1	Mid Valley City
2	Jalan Kuching
3	Bukit Jalil
4	Cheras
5	Sri Damansara

Create Property Type dimension table

In [6]:

```
print(crawled_df['prop_type'].unique())
prop_typeID_table = pd.DataFrame([[i, x.strip()] for i, x in enumerate(crawled_df['prop_type'].unique(),1)], columns=[
'prop_typeID', 'prop_type']).set_index('prop_typeID')
display(prop_typeID_table.head())

# save into sqlite3
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE 'property_type'
                 (prop_typeID int NOT NULL PRIMARY KEY, prop_type text)''')

    prop_typeID_table.to_sql(name='property_type', con=conn, if_exists='append')
```

```
['Condo / Services residence / Penthouse / Townhouse' 'Apartment/ Flat'
 'Double storey' 'Shop lot' 'Single storey' 'Office space'
 'Two and a half storey' 'Bungalow / Villa / Cluster houses'
 'Semi detached' 'Triple storey' 'Townhouse' 'Agricultural']
```

	prop_type
prop_typeID	
1	Condo / Services residence / Penthouse / Townh...
2	Apartment/ Flat
3	Double storey
4	Shop lot
5	Single storey

Create Size_unit Type dimension table

In [7]:

```
print(crawled_df['size_unit'].unique())
size_unitID_table = pd.DataFrame([[i, x.strip()] for i, x in enumerate(crawled_df['size_unit'].unique(),1)], columns=[
'size_unitID', 'size_unit']).set_index('size_unitID')
display(size_unitID_table.head())


# save into sqlite3
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE size_unit
                 (size_unitID int NOT NULL PRIMARY KEY, size_unit text)''')

    size_unitID_table.to_sql(name='size_unit', con=conn, if_exists='append')
```

```
['sq.ft.' 'Acres']
```

	size_unit
size_unitID	
1	sq.ft.
2	Acres

Create Property Title1 and Title 2 dimension table

In [8]:

```python
print(crawled_df['prop_title1'].unique())
prop_title1ID_table = pd.DataFrame([[i, x.strip()] for i, x in enumerate(crawled_df['prop_title1'].unique(),1)], columns=['prop_title1ID', 'prop_title1']).set_index('prop_title1ID')
display(prop_title1ID_table.head())
# save into sqlite3
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE prop_title1
                 (prop_title1ID int NOT NULL PRIMARY KEY, prop_title1 text)''')

    prop_title1ID_table.to_sql(name='prop_title1', con=conn, if_exists='append')
```

```
['Freehold' 'Leasehold']
```

	prop_title1
prop_title1ID	
1	Freehold
2	Leasehold

In [9]:

```python
print(crawled_df['prop_title2'].unique())
prop_title2ID_table = pd.DataFrame([[i, x.strip()] for i, x in enumerate(crawled_df['prop_title2'].unique(),1)], columns=['prop_title2ID', 'prop_title2']).set_index('prop_title2ID')
display(prop_title2ID_table.head())
# save into sqlite3
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE prop_title2
                 (prop_title2ID int NOT NULL PRIMARY KEY, prop_title2 text)''')

    prop_title2ID_table.to_sql(name='prop_title2', con=conn, if_exists='append')
```

```
['Non Bumi Lot' 'Bumi Lot' 'Malay Reserved']
```

	prop_title2
prop_title2ID	
1	Non Bumi Lot
2	Bumi Lot
3	Malay Reserved

Create Category dimension table

In [10]:

```
categoryID_table = crawled_df.groupby(['category','prop_type'])['url'].count().reset_index().iloc[:,:2].merge(prop_typ
eID_table.reset_index()).drop('prop_type', axis=1)
categoryID_table['categoryID'] = range(1, len(categoryID_table)+1)
categoryID_table.set_index('categoryID', inplace=True)
display(categoryID_table.head())


with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE category
                 (categoryID int NOT NULL PRIMARY KEY, category text, prop_typeID int,
                 FOREIGN KEY (prop_typeID) REFERENCES property_type(prop_typeID))''')

    categoryID_table.to_sql(name='category', con=conn, if_exists='append')
```

	category	prop_typeID
categoryID		
1	Apartments	2
2	Apartments	1
3	Commercial	6
4	Commercial	4
5	Houses	8

Create fact table for Mudah Property Ads

In [11]:

```
# Convert facilities into one-hot encodings
facilities_list = np.unique([x for row in crawled_df['facilities'].astype(str).unique() for x in row.split(', ') if le
n(x) > 1])
facilities_list = facilities_list[facilities_list != 'Gymnasium,']
for item in facilities_list:
    crawled_df[item] = (crawled_df['facilities'].str.find(item)>= 0)
crawled_df = crawled_df.rename(columns={'nan':'No Facilities'}).drop('facilities', axis=1)
```

In [12]:

```
fact_table = crawled_df.copy()
for dimension in [prop_title1ID_table, prop_title2ID_table, areaID_table, prop_typeID_table, size_unitID_table]:
    fact_table = fact_table.merge(dimension.reset_index()).drop(dimension.columns[0],axis=1)


fact_table = fact_table.merge(categoryID_table.reset_index(), on=['category', 'prop_typeID']).drop(['category', 'prop_
typeID'], axis=1)
```

In [13]:

```
# Reorder the columns
columns_order = ['list_title', 'url', 'categoryID', 'areaID', 'prop_title1ID',
                 'prop_title2ID', 'size_unitID', 'size', 'price',
                 'bedrooms', 'bathroom', '24 Hour Security', 'Balcony/Patio',
                 'Cable TV', 'Gymnasium', 'Jogging Track',
                 'Mini Market', 'Playground','Squash Court', 'Swimming Pool',
                 'Tennis Court', 'No Facilities']

fact_table = fact_table.loc[:,columns_order]
fact_table['adsID'] = range(1,len(fact_table)+1)
fact_table.set_index('adsID', inplace=True)
fact_table.head()
```

Out[13]:

	list_title	url	categoryID	areaID	prop_title1ID	prop_title2ID	size_unit
adsID							
1	New Luxury Freehold Residence 4min Walk to Mid...	https://www.mudah.my/New+Luxury+Freehold+Resid...	2	1	1	1	
2	Nearby Mid Valley I Freehold I 100%Fully Furni...	https://www.mudah.my/Nearby+Mid+Valley+I+Freeh...	2	1	1	1	
3	Sri Putramas 1 1100sqft Jalan Kuching Below Ma...	https://www.mudah.my/Sri+Putramas+1+1100sqft+J...	2	2	1	1	
4	[Freehold] Sri Putramas 2 Condo Jalan Kuching ...	https://www.mudah.my/+Freehold+Sri+Putramas+2+...	2	2	1	1	
5	[CORNER LOT+GREAT VIEW] Sri Putramas 1 Condo J...	https://www.mudah.my/+CORNER+LOT+GREAT+VIEW+Sr...	2	2	1	1	

5 rows × 22 columns

In [14]:

```
with sqlite3.connect(db_path) as conn:
    c = conn.cursor()

    # Create table
    c.execute('''CREATE TABLE mudah_prop_ads
                 (adsID int NOT NULL PRIMARY KEY, list_title text, url text,
                 categoryID int, areaID int, prop_title1ID int,
                 prop_title2ID int, size_unitID int, size real, price int,
                 bedrooms int, bathroom int, '24 Hour Security' int,
                 'Balcony/Patio' int, 'Cable TV' int, 'Gymnasium' int,
                 'Jogging Track' int, 'Mini Market' int, 'Playground' int,
                 'Squash Court' int, 'Swimming Pool' int,
                 'Tennis Court' int, 'No Facilities' int,
                 FOREIGN KEY (categoryID) REFERENCES category(categoryID),
                 FOREIGN KEY (areaID) REFERENCES area(areaID),
                 FOREIGN KEY (prop_title1ID) REFERENCES prop_title1(prop_title1ID),
                 FOREIGN KEY (prop_title2ID) REFERENCES prop_title2(prop_title2ID),
                 FOREIGN KEY (size_unitID) REFERENCES size_unit(size_unitID))''')

    fact_table.to_sql(name='mudah_prop_ads', con=conn, if_exists='append')
```

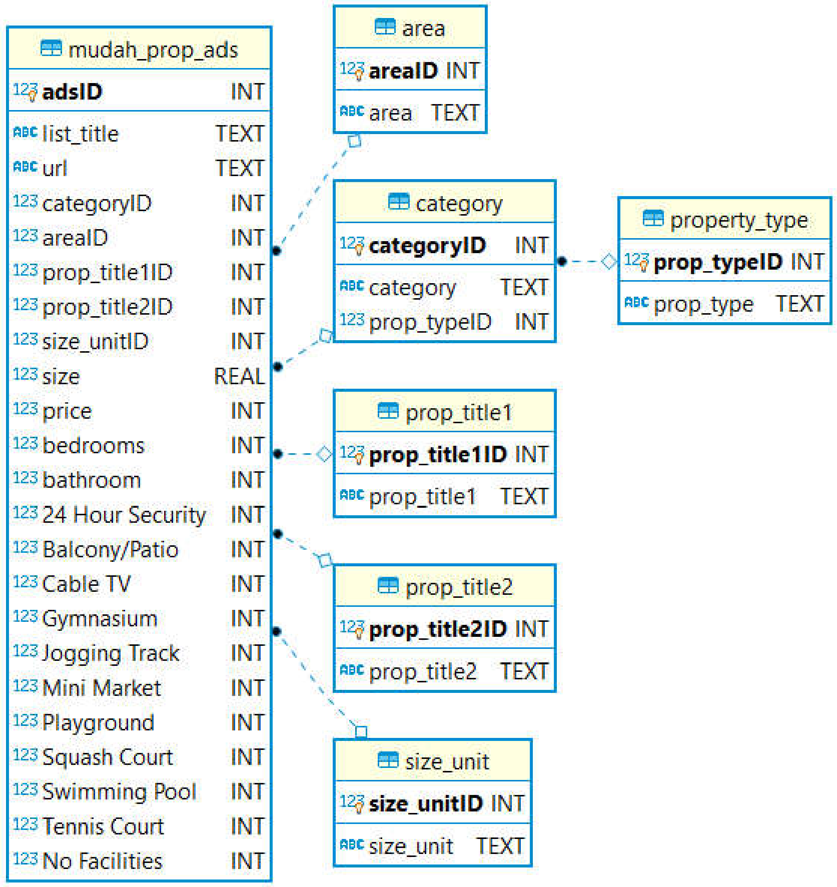
```
C:\Users\EnJunz-Win10\Anaconda3\lib\site-packages\pandas\core\generic.py:2663: UserWarning: The spaces in
these column names will not be changed. In pandas versions < 0.14, spaces were converted to underscores.
  method=method,
```

Show Snow Flake Schema

In [16]:

```
from PIL import Image
Image.open('Q2_SnowFlakeSchema.png')
```

Out[16]:



mudah_prop_ads	
adsID	INT
list_title	TEXT
url	TEXT
categoryID	INT
areaID	INT
prop_title1ID	INT
prop_title2ID	INT
size_unitID	INT
size	REAL
price	INT
bedrooms	INT
bathroom	INT
24 Hour Security	INT
Balcony/Patio	INT
Cable TV	INT
Gymnasium	INT
Jogging Track	INT
Mini Market	INT
Playground	INT
Squash Court	INT
Swimming Pool	INT
Tennis Court	INT
No Facilities	INT

area	
areaID	INT
area	TEXT

category	
categoryID	INT
category	TEXT
prop_typeID	INT

property_type	
prop_typeID	INT
prop_type	TEXT

prop_title1	
prop_title1ID	INT
prop_title1	TEXT

prop_title2	
prop_title2ID	INT
prop_title2	TEXT

size_unit	
size_unitID	INT
size_unit	TEXT

In [ ]: