In [1]:
```
import pandas as pd
import numpy as np
import requests
import time
import datetime
from sqlalchemy import create_engine
```

In [2]:
```
# Import API keys
from config import open_weather_key
```

Open CSV from previous notebook

In [3]:
```
launches_output_file = "launches.csv"
launches_read = pd.read_csv(launches_output_file)
launches_read
```

Out[3]:

	Unnamed: 0	Satellite Name	Launch Date	Launch Site	lat	lon
0	0	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023
1	1	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023
2	2	COSMOS 2543	25 November 2019 17:52	Plesetsk, Russia	62.927545	40.575023
3	3	COSMOS 2543 (GLONASS	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023
4	4	FREGAT R/B	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023
...	...	...	...	...	...	...
120	120	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185
121	121	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185
122	122	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185
123	123	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN
124	124	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN

125 rows × 6 columns

Run OpenWeather API for each location

In [14]:
```
for index, launch in launches_read.iterrows():
    try:
        temp = 0
        weather = ""
        lat = launch["lat"]
        lon = launch["lon"]
        sat = launch["Satellite Name"]
        url = f"http://api.openweathermap.org/data/2.5/weather?lat={lat}&lon=
{lon}&appid={open_weather_key}"
        weather_response = requests.get(url).json()
        time.sleep(3)
        weather = weather_response["weather"][0]['description']
        temp = weather_response["main"]["feels_like"]
        temp = round(((temp - 273.15) * (9 / 5)) + 32)
        current_weather = pd.DataFrame({"weather": weather, "temperature": tem
p}, index=index)
        launches_weather = launches_weather.append(current_weather)
    except:
        print("Could not find weather")
```

```
COSMOS 2491 DEB,few clouds,39
COSMOS 2491 DEB,few clouds,39
COSMOS 2543,few clouds,39
COSMOS 2543 (GLONASS,few clouds,39
FREGAT R/B,few clouds,39
GONETS M 14 (M26),few clouds,39
GONETS M 15 (M27),few clouds,39
GONETS M 16 (M28),few clouds,39
OBJECT D,few clouds,39
COSMOS 2491 DEB,few clouds,39
COSMOS 2491 DEB,few clouds,39
GONETS M 14 (M26),few clouds,39
GONETS M 15 (M27),few clouds,39
GONETS M 16 (M28),few clouds,39
OBJECT D,few clouds,39
COSMOS 2491 DEB,few clouds,39
COSMOS 2491 DEB,few clouds,39
FLOCK 4P 12,broken clouds,95
FLOCK 4P 4,broken clouds,95
FLOCK 4P 3,broken clouds,95
FLOCK 4P 1,broken clouds,95
FLOCK 4P 8,broken clouds,95
FLOCK 4P 7,broken clouds,95
FLOCK 4P 6,broken clouds,95
FLOCK 4P 5,broken clouds,95
TYVAK-0092,broken clouds,95
Tyvak-0129,broken clouds,95
OBJECT C,broken clouds,95
LEMUR 2 JPGSQUARED,broken clouds,95
QPS-SAR-1 IZANAGI,broken clouds,95
RISAT-2BR1,broken clouds,95
OBJECT G,broken clouds,95
IHOPSAT-TD,broken clouds,95
LEMUR 2 HIMOMANDDAD,broken clouds,95
LEMUR 2 PAPPY,broken clouds,95
PSLV R/B,broken clouds,95
LEMUR 2 THEODOSIA,broken clouds,95
GAOFEN 12,few clouds,65
CZ-4C R/B,few clouds,65
JILIN-01 GAOFEN 2B,few clouds,65
KZ-1A R/B,few clouds,65
OBJECT A,few clouds,65
OBJECT B,few clouds,65
OBJECT C,few clouds,65
OBJECT D,few clouds,65
OBJECT E,few clouds,65
OBJECT F,few clouds,65
KZ-1A R/B,few clouds,65
OBJECT A,few clouds,65
OBJECT B,few clouds,65
OBJECT C,few clouds,65
OBJECT D,few clouds,65
CBERS 4A,few clouds,65
OBJECT F,few clouds,65
OBJECT G,few clouds,65
OBJECT H,few clouds,65
OBJECT J,few clouds,65
```

```
CZ-4B R/B,few clouds,65
OBJECT L,few clouds,65
OBJECT M,few clouds,65
OBJECT N,few clouds,65
DRAGON CRS-19,clear sky,73
DRAGON CRS-19 DEB,clear sky,73
DRAGON CRS-19 DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR R/B DEB,clear sky,73
JCSAT 18,clear sky,73
FALCON 9 R/B,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
ATLAS 5 CENTAUR DEB,clear sky,73
CST-100 STARLINER,clear sky,73
CST-100 STARLINER,clear sky,73
ALE-2,light rain,55
ELECTRON KICK STAGE R/B,light rain,55
ELECTRON R/B,light rain,55
NOOR 1A,light rain,55
NOOR 1B,light rain,55
FOSSASAT-1,light rain,55
TRSI,light rain,55
ATL-1,light rain,55
SMOG-P,light rain,55
PROGRESS MS-13,clear sky,66
PROGRESS MS-13,clear sky,66
SL-4 R/B,clear sky,66
SL-4 R/B,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
SL-12 DEB,clear sky,66
ELEKTRO-L 3,clear sky,66
ELEKTRO-L 3,clear sky,66
BLOCK DM-SL R/B,clear sky,66
BLOCK DM-SL R/B,clear sky,66
ELEKTRO-L 3,clear sky,66
ELEKTRO-L 3,clear sky,66
BLOCK DM-SL R/B,clear sky,66
BLOCK DM-SL R/B,clear sky,66
BEIDOU 3M19,clear sky,83
BEIDOU 3M20,clear sky,83
YZ-1 R/B,clear sky,83
CZ-3B R/B,clear sky,83
CSG-1,overcast clouds,81
```

```
CHEOPS,overcast clouds,81
ASAP -S,overcast clouds,81
ANGELS,overcast clouds,81
EYESAT-NANO,overcast clouds,81
OPS-SAT,overcast clouds,81
SJ-7 DEB,scattered clouds,68
SJ-7 DEB,scattered clouds,68
SJ-7 DEB,scattered clouds,68
SJ-7 DEB,scattered clouds,68
Could not find weather
Could not find weather
```

In [8]:
```
#uniques = launches_weather["temperature"].unique()
#weather_json
weather_df = pd.read_csv("weather.csv")
weather_df = weather_df[["weather", "temperature"]]
weather_df
```

Out[8]:

	weather	temperature
0	few clouds	39.0
1	few clouds	39.0
2	few clouds	39.0
3	few clouds	39.0
4	few clouds	39.0
...	...	...
120	scattered clouds	68.0
121	scattered clouds	68.0
122	scattered clouds	68.0
123	NaN	NaN
124	NaN	NaN

125 rows × 2 columns

Combined table with launches and weather

In [9]:
```
launches_combined = launches_weather.join(weather_df ,how='left', lsuffix='_left', rsuffix='_right')
launches_combined
```

Out[9]:

	Unnamed: 0	Satellite Name	Launch Date	Launch Site	lat	lon	weather	temperature
0	0	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0
1	1	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0
2	2	COSMOS 2543	25 November 2019 17:52	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0
3	3	COSMOS 2543 (GLONASS	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0
4	4	FREGAT R/B	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0
...	...	...	...	...	...	...	...	...
120	120	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0
121	121	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0
122	122	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0
123	123	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN	NaN	NaN
124	124	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN	NaN	NaN

125 rows × 8 columns

Convert column names to database column names

In [55]:
```
launches_weather_db = launches_weather_db[["satellite_name",
                                           "launch_date",
                                           "launch_site",
                                           "lat", "lon",
                                           "weather",
                                           "temperature"]]
launches_weather_db['index'] = range(1, len(launches_weather_db) + 1)
launches_weather_db
```

Out[55]:

	satellite_name	launch_date	launch_site	lat	lon	weather	temperature	inde
0	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0	
1	COSMOS 2491 DEB	25 December 2013 00:31	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0	
2	COSMOS 2543	25 November 2019 17:52	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0	
3	COSMOS 2543 (GLONASS	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0	
4	FREGAT R/B	11 December 2019 08:54	Plesetsk, Russia	62.927545	40.575023	few clouds	39.0	
...	...	...	...	...	...	...	...	
120	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0	12
121	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0	12
122	SJ-7 DEB	05 July 2005 22:40	Jiuquan Satellite Launch Center, China	40.984523	100.191185	scattered clouds	68.0	12
123	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN	NaN	NaN	12
124	RS-44	26 December 2019 23:11	Amateur radio	NaN	NaN	NaN	NaN	12

125 rows × 8 columns

Open PostGres connection and store table to database

In [56]:
```
connection_string = "postgres:postgres@localhost:5432/launches_weather"
engine = create_engine(f'postgresql://{connection_string}')
engine
```

Out[56]:
```
Engine(postgresql://postgres:***@localhost:5432/launches_weather)
```

In [57]:
```
engine.table_names()
```

Out[57]:
```
['launches_weather']
```

In [59]:
```
launches_weather_db.to_sql(name='launches_weather', con=engine, if_exists='append', index=False)
```