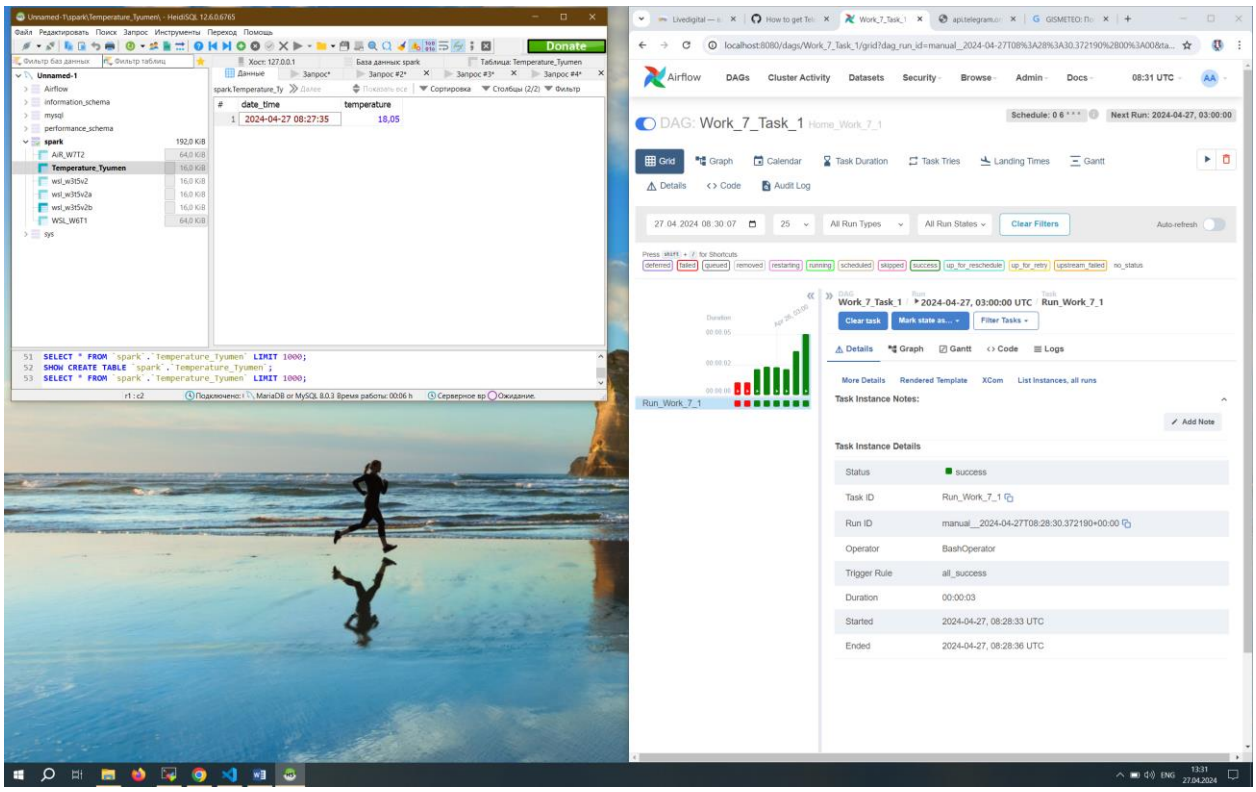
### Урок 7. Построение пайплайнов и визуализация потоков данных в Airflow

1. Ваша задача с использование пандас, записать полученную температуру в таблицу mysql. Таблица должна содержать как минимум текущее время и температуру (т.е. два поля). Таблицу не удаляем, используем append.

```
from sqlalchemy import create_engine
from datetime import datetime
from pandas.io import sql
import requests

# Получаем API ключ OpenWeatherMap
api_key = 'bc6d51747326a116e97fbc66146b6deb'
city = 'Tyumen'

# Функция для получения температуры и даты со временем из API OpenWeatherMap
def openwear_get_temp(api_key, city):
    url =
f'https://api.openweathermap.org/data/2.5/weather?q={city}&appid={api_key}'
    response = requests.get(url)
    data = response.json()
    temperature = data['main']['temp']
    timestamp = data['dt']
    date_time = datetime.utcfromtimestamp(timestamp).strftime('%Y-%m-%d
%H:%M:%S')
    return round(float(temperature) - 273.15, 2), date_time


# Функция для записи температуры и текущего времени в базу данных
def save_weather(api_key, city):
    temperature, date_time = openwear_get_temp(api_key, city)

    con = create_engine("mysql://root:1@localhost:33061/spark")
    sql.execute("""drop table if exists spark.`Temperature_Tyumen`""",con)
    sql.execute("""CREATE TABLE if not exists spark.`Temperature_Tyumen`
                (`date_time` TIMESTAMP NULL DEFAULT NULL, `temperature` FLOAT
NULL DEFAULT NULL)
                COLLATE='utf8mb4_general_ci' ENGINE=InnoDB""",con)

    with con.connect() as connection:
        ins = f"INSERT INTO spark.`Temperature_Tyumen` (date_time, temperature)
VALUES ('{date_time}', {temperature})"
        connection.execute(ins)

# Получаем данные погоды и записываем ее в базу данных
save_weather(api_key, city)
```



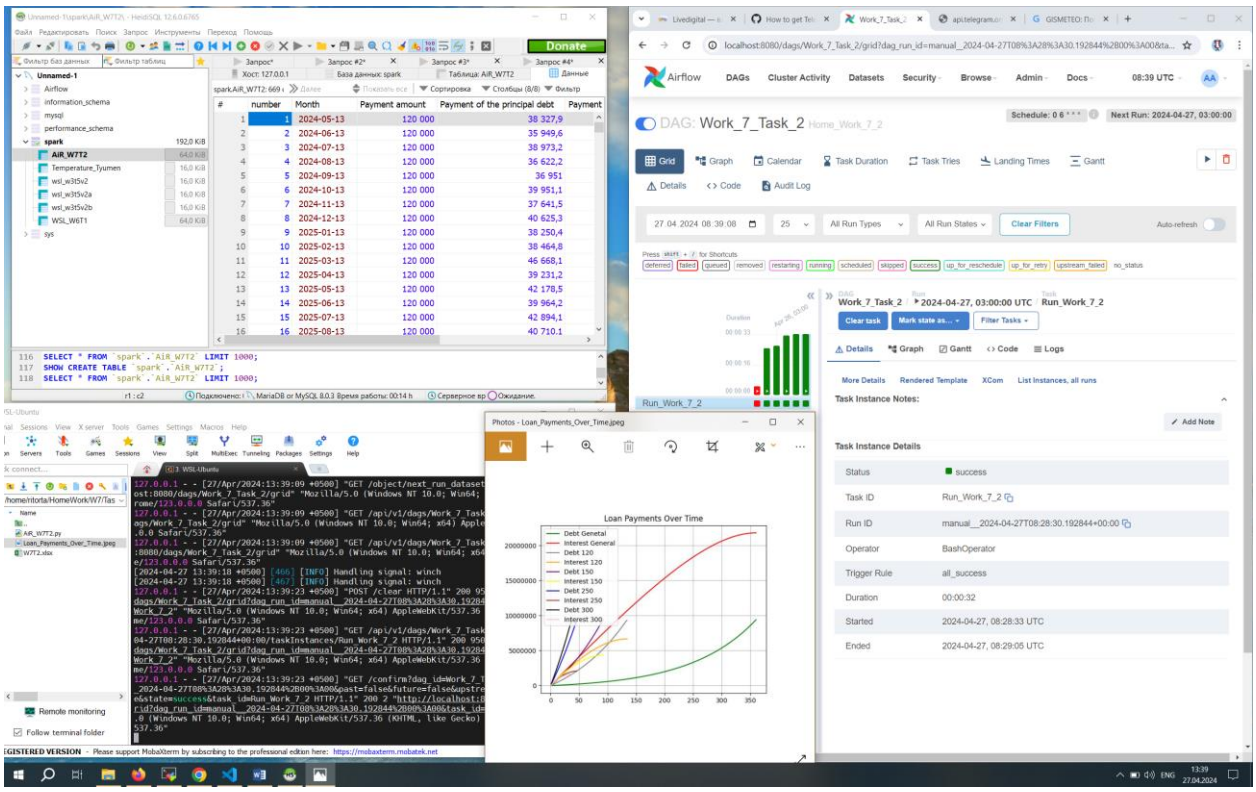
2. То что мы делали на четвертом семинаре (Д34) задача с гарфиком. Нужно с помощью аирфлоу (PythonOperator) сохранить этот график в png/jpeg. Используйте пандас, считайте им таблицу из mysql, постройте график и сохраните его в указанную директорию. На проверку ДЗ высылайте код и скриншоты аирфлоу выполненных задач, логов и сохраненного файла (в pdf).

```
import time, sys, os
from pyspark.sql.session import SparkSession
from pyspark.sql.functions import col, lit
import matplotlib.pyplot as plt
from sqlalchemy import create_engine
from pandas.io import sql
import warnings

warnings.filterwarnings("ignore")
t0=time.time()
con=create_engine("mysql://root:1@localhost:33061/spark")
os.environ['PYSPARK_PYTHON'] = sys.executable
os.environ['PYSPARK_DRIVER_PYTHON'] = sys.executable
spark=SparkSession.builder.appName("AiR Home Work №7").getOrCreate()

sql.execute("""drop table if exists spark.`AiR_W7T2`""",con)
sql.execute("""CREATE TABLE if not exists spark.`AiR_W7T2` (
        `number` INT(10) NULL DEFAULT NULL,
        `Month` DATE NULL DEFAULT NULL,
        `Payment amount` FLOAT NULL DEFAULT NULL,
        `Payment of the principal debt` FLOAT NULL DEFAULT NULL,
        `Payment of interest` FLOAT NULL DEFAULT NULL,
        `Balance of debt` FLOAT NULL DEFAULT NULL,
        `interest` FLOAT NULL DEFAULT NULL,
        `debt` FLOAT NULL DEFAULT NULL
```

```
)
COLLATE='utf8mb4_general_ci'
ENGINE=InnoDB""",con)

from pyspark.sql.window import Window
from pyspark.sql.functions import sum as sum1
w =
Window.partitionBy(lit(1)).orderBy("number").rowsBetween(Window.unboundedPrecedin
g, Window.currentRow)
dfG = spark.read.format("com.crealytics.spark.excel")\
        .option("dataAddress", "'General'!A1:F361")\
        .option("useHeader", "false")\
        .option("treatEmptyValuesAsNulls", "false")\
        .option("inferSchema", "true").option("addColorColumns", "true")\
        .option("usePlainNumberFormat","true")\
        .option("startColumn", 0)\
        .option("endColumn", 99)\
        .option("timestampFormat", "MM-dd-yyyy HH:mm:ss")\
        .option("maxRowsInMemory", 20)\
        .option("excerptSize", 10)\
        .option("header", "true")\
        .format("excel")\
        .load("/home/ritorta/HomeWork/W7/Task_2/W7T2.xlsx").limit(1000)\
        .withColumn("interest", sum1(col("Payment of interest")).over(w))\
        .withColumn("debt", sum1(col("Payment of the principal debt")).over(w))

df120 = spark.read.format("com.crealytics.spark.excel")\
        .option("dataAddress", "'120'!A1:F135")\
        .option("useHeader", "false")\
        .option("treatEmptyValuesAsNulls", "false")\
        .option("inferSchema", "true").option("addColorColumns", "true")\
        .option("usePlainNumberFormat","true")\
        .option("startColumn", 0)\
        .option("endColumn", 99)\
        .option("timestampFormat", "MM-dd-yyyy HH:mm:ss")\
        .option("maxRowsInMemory", 20)\
        .option("excerptSize", 10)\
        .option("header", "true")\
        .format("excel")\
        .load("/home/ritorta/HomeWork/W7/Task_2/W7T2.xlsx").limit(1000)\
        .withColumn("interest", sum1(col("Payment of interest")).over(w))\
        .withColumn("debt", sum1(col("Payment of the principal debt")).over(w))

df150 = spark.read.format("com.crealytics.spark.excel")\
        .option("dataAddress", "'150'!A1:F93")\
        .option("useHeader", "false")\
        .option("treatEmptyValuesAsNulls", "false")\
        .option("inferSchema", "true").option("addColorColumns", "true")\
        .option("usePlainNumberFormat","true")\
        .option("startColumn", 0)\
        .option("endColumn", 99)\
```

```
        .option("timestampFormat", "MM-dd-yyyy HH:mm:ss")\
        .option("maxRowsInMemory", 20)\
        .option("excerptSize", 10)\
        .option("header", "true")\
        .format("excel")\
        .load("/home/ritorta/HomeWork/W7/Task_2/W7T2.xlsx").limit(1000)\
        .withColumn("interest", sum1(col("Payment of interest")).over(w))\
        .withColumn("debt", sum1(col("Payment of the principal debt")).over(w))

df250 = spark.read.format("com.crealytics.spark.excel")\
        .option("dataAddress", "'250'!A1:F47")\
        .option("useHeader", "false")\
        .option("treatEmptyValuesAsNulls", "false")\
        .option("inferSchema", "true").option("addColorColumns", "true")\
        .option("usePlainNumberFormat","true")\
        .option("startColumn", 0)\
        .option("endColumn", 99)\
        .option("timestampFormat", "MM-dd-yyyy HH:mm:ss")\
        .option("maxRowsInMemory", 20)\
        .option("excerptSize", 10)\
        .option("header", "true")\
        .format("excel")\
        .load("/home/ritorta/HomeWork/W7/Task_2/W7T2.xlsx").limit(1000)\
        .withColumn("interest", sum1(col("Payment of interest")).over(w))\
        .withColumn("debt", sum1(col("Payment of the principal debt")).over(w))

df300 = spark.read.format("com.crealytics.spark.excel")\
        .option("dataAddress", "'300'!A1:F38")\
        .option("useHeader", "false")\
        .option("treatEmptyValuesAsNulls", "false")\
        .option("inferSchema", "true").option("addColorColumns", "true")\
        .option("usePlainNumberFormat","true")\
        .option("startColumn", 0)\
        .option("endColumn", 99)\
        .option("timestampFormat", "MM-dd-yyyy HH:mm:ss")\
        .option("maxRowsInMemory", 20)\
        .option("excerptSize", 10)\
        .option("header", "true")\
        .format("excel")\
        .load("/home/ritorta/HomeWork/W7/Task_2/W7T2.xlsx").limit(1000)\
        .withColumn("interest", sum1(col("Payment of interest")).over(w))\
        .withColumn("debt", sum1(col("Payment of the principal debt")).over(w))

df_combined = dfG.union(df120).union(df150).union(df250).union(df300)

df_combined.write.format("jdbc").option("url","jdbc:mysql://localhost:33061/spark
?user=root&password=1")\
        .option("driver", "com.mysql.cj.jdbc.Driver").option("dbtable",
"AiR_W7T2")\
        .mode("append").save()
```

```
"""df_pandas = df_combined.toPandas()"""

df_pandas1 = dfG.toPandas()
df_pandas2 = df120.toPandas()
df_pandas3 = df150.toPandas()
df_pandas4 = df250.toPandas()
df_pandas5 = df300.toPandas()

ax = plt.gca()
ax.ticklabel_format(style='plain')

df_pandas1.plot(kind='line', x='number', y='debt', color='green', ax=ax,
label='Debt Genetal')
df_pandas1.plot(kind='line', x='number', y='interest', color='red', ax=ax,
label='Interest General')
df_pandas2.plot(kind='line', x='number', y='debt', color='grey', ax=ax,
label='Debt 120')
df_pandas2.plot(kind='line', x='number', y='interest', color='orange', ax=ax,
label='Interest 120')
df_pandas3.plot(kind='line', x='number', y='debt', color='purple', ax=ax,
label='Debt 150')
df_pandas3.plot(kind='line', x='number', y='interest', color='yellow', ax=ax,
label='Interest 150')
df_pandas4.plot(kind='line', x='number', y='debt', color='blue', ax=ax,
label='Debt 250')
df_pandas4.plot(kind='line', x='number', y='interest', color='brown', ax=ax,
label='Interest 250')
df_pandas5.plot(kind='line', x='number', y='debt', color='black', ax=ax,
label='Debt 300')
df_pandas5.plot(kind='line', x='number', y='interest', color='pink', ax=ax,
label='Interest 300')

plt.title('Loan Payments Over Time')
plt.grid ( True )
ax.set(xlabel=None)

plt.savefig("/home/ritorta/HomeWork/W7/Task_2/Loan_Payments_Over_Time.jpeg")
plt.show()
spark.stop()
t1=time.time()
print('finished',time.strftime('%H:%M:%S',time.gmtime(round(t1-t0))))
```




3. Зарегистрируйтесь в OpenWeatherApi (https://openweathermap.org/api)

3.1 Создайте ETL, который получает температуру в заданной вами локации, и дальше делает ветвление:

- В случае, если температура больше 15 градусов цельсия — идёт на ветку, в которой есть оператор, выводящий на экран «тепло»;

- В случае, если температура ниже 15 градусов, идёт на ветку с оператором, который выводит в консоль «холодно».

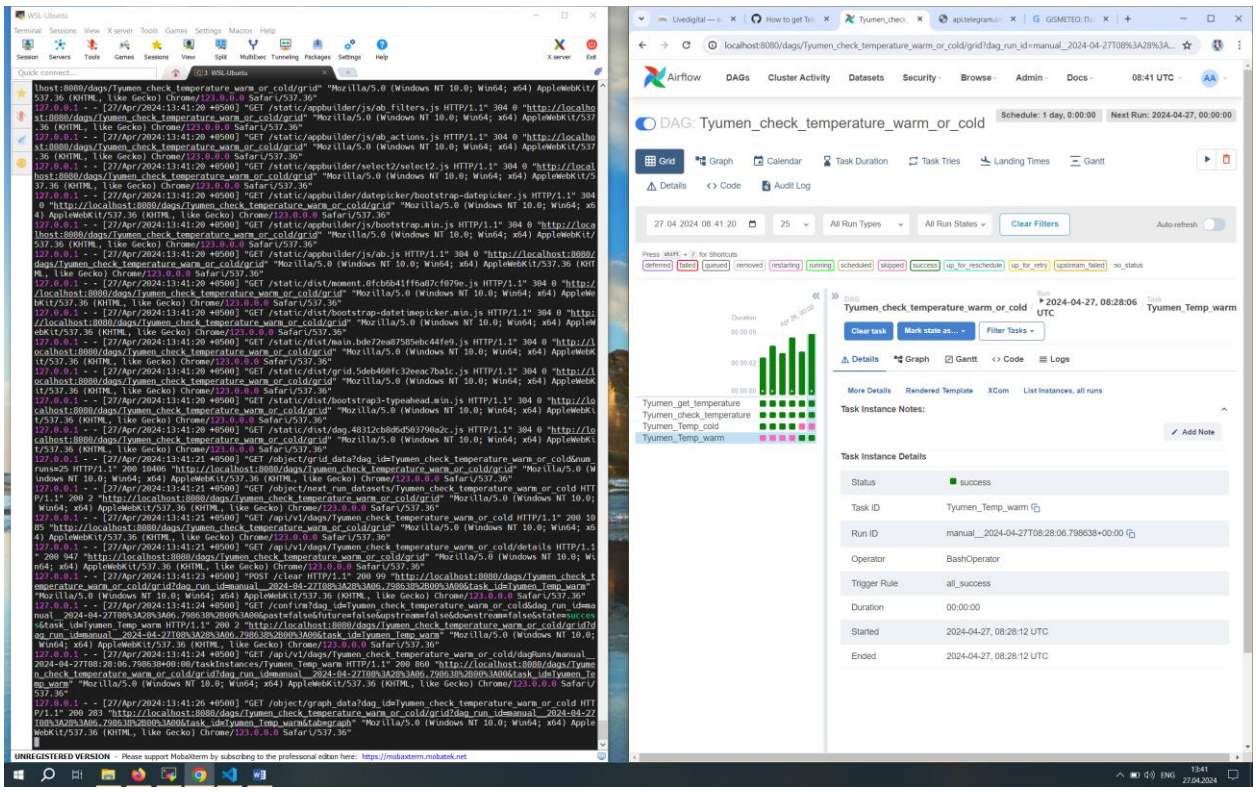
- Оператор ветвления должен выводить в консоль полученную от API температуру.

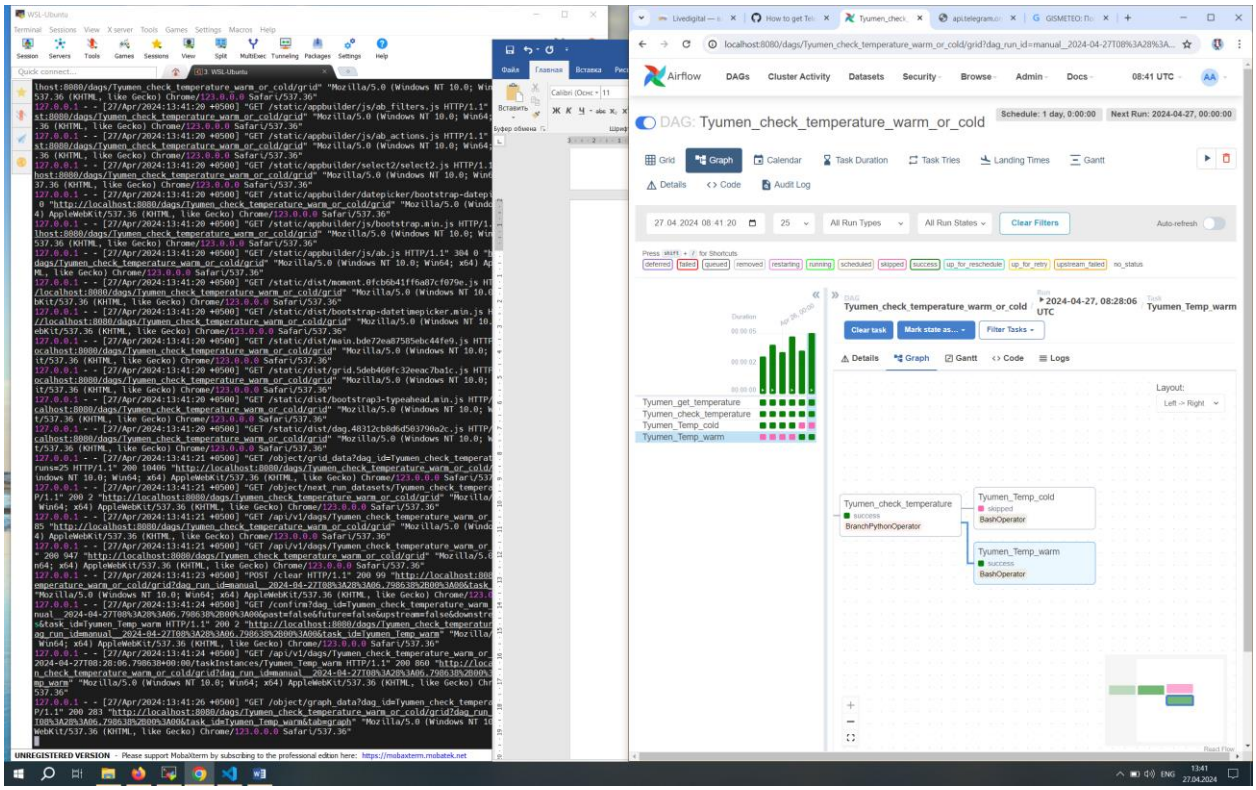
- Приложите скриншот графа и логов работы оператора ветвленния.

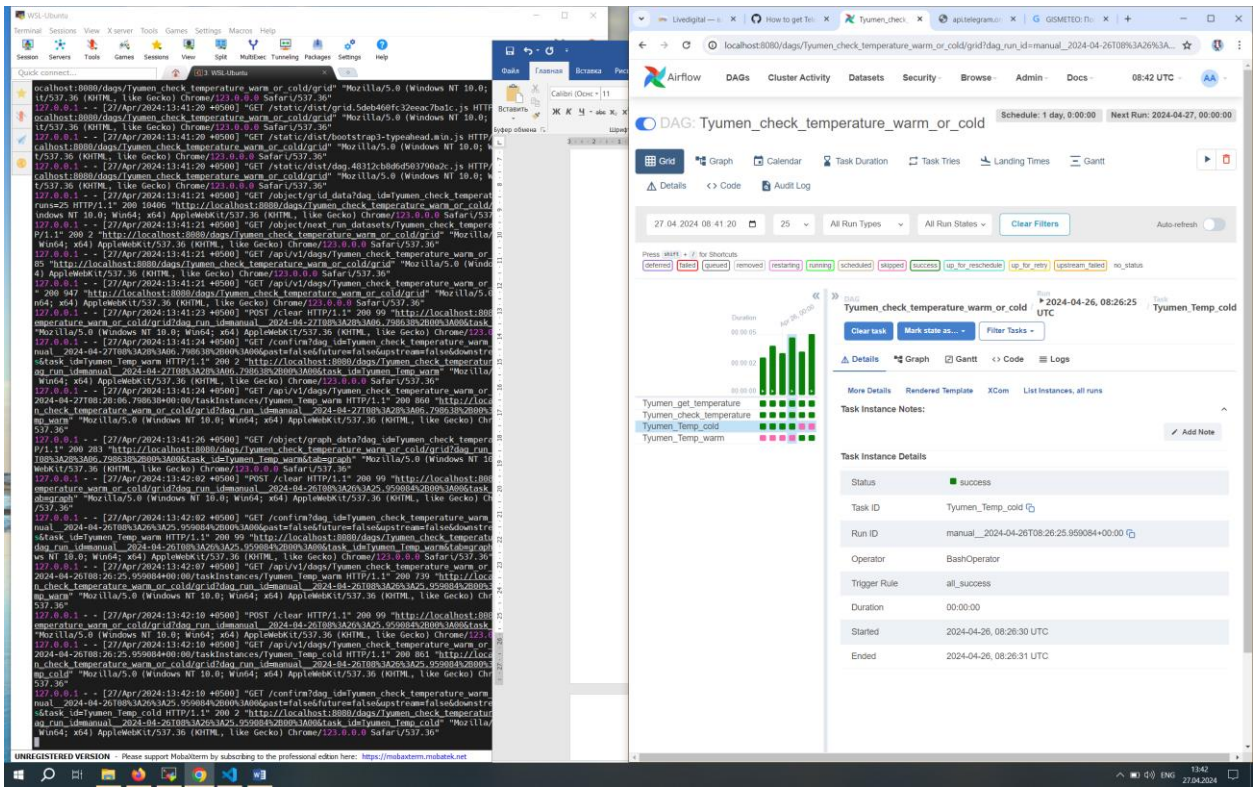
```
from datetime import datetime
from airflow import DAG
from airflow.operators.bash import BashOperator
from airflow.operators.python import PythonOperator, BranchPythonOperator
from datetime import datetime, timedelta
from airflow.operators.python import PythonOperator
from datetime import datetime
import pendulum
import requests


default_args = {
'owner': 'Ritorta',
'depends_on_past': False,
'start_date': pendulum.datetime(year=2024, month=4,
day=25).in_timezone('Europe/Moscow'),
```

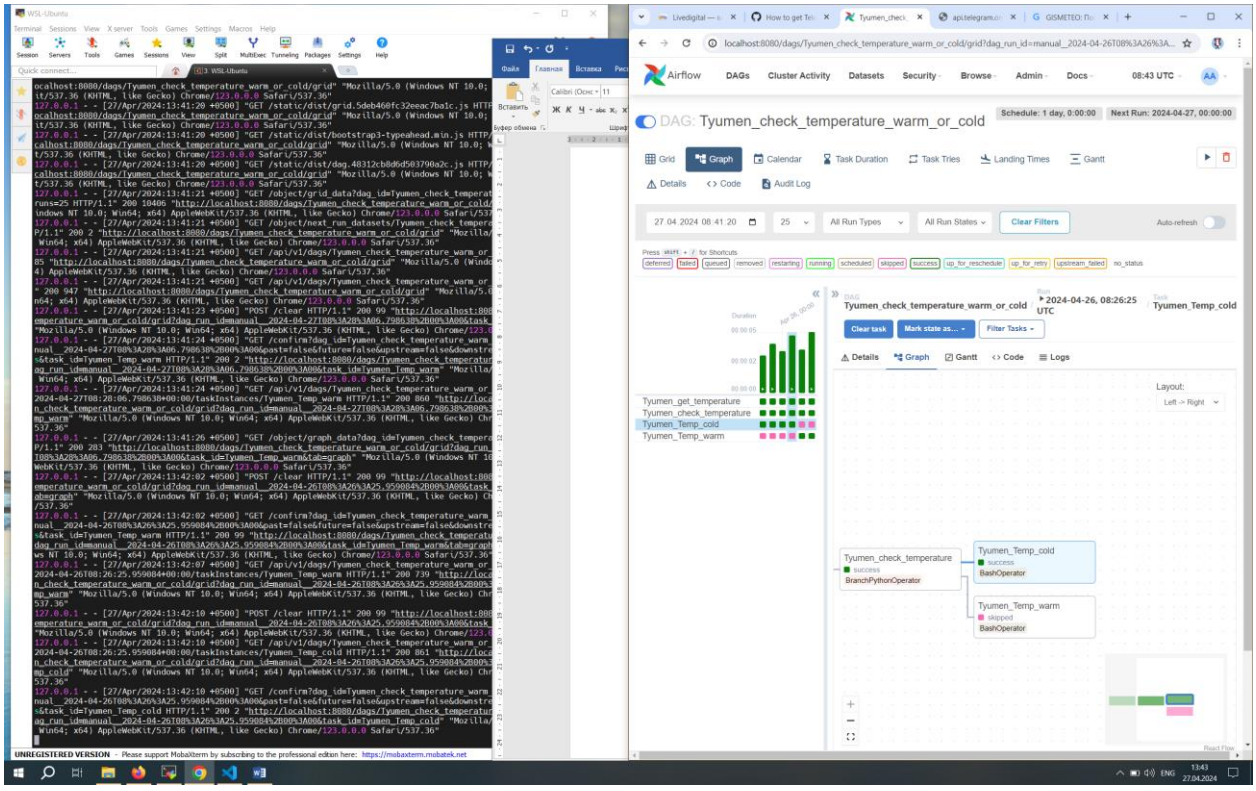
```
'email': ['meddesu@yandex.ru'],
'email_on_failure': False,
'email_on_retry': False,
'retries': 0,
'retry_delay': timedelta(minutes=5)
}

#DAG1
dag1 = DAG('Work_7_Task_1',
default_args=default_args,
description="Home_Work_7_1",
catchup=False,
schedule_interval='0 6 * * *')

AiR_Home_7_1  = BashOperator(
task_id='Run_Work_7_1',
bash_command='export SPARK_HOME=/home/spark && export
PATH=$PATH:$SPARK_HOME/bin:$SPARK_HOME/sbin && python3
/home/ritorta/HomeWork/W7/Task_1/W7T1.py',
dag=dag1)

AiR_Home_7_1

#DAG2
dag2 = DAG('Work_7_Task_2',
default_args=default_args,
description="Home_Work_7_2",
catchup=False,
schedule_interval='0 6 * * *')

AiR_Home_7_2  = BashOperator(
task_id='Run_Work_7_2',
bash_command='export SPARK_HOME=/home/spark && export
PATH=$PATH:$SPARK_HOME/bin:$SPARK_HOME/sbin && python3
/home/ritorta/HomeWork/W7/Task_2/AiR_W7T2.py',
dag=dag2)

AiR_Home_7_2

#DAG3
def openwear_get_temp(**kwargs):

    ti = kwargs['ti']
    city = "Tyumen"
    api_key = "bc6d51747326a116e97fbc66146b6deb"
    url =
f"https://api.openweathermap.org/data/2.5/weather?q={city}&appid={api_key}"
    payload = {}
    headers = {}
    response = requests.request("GET", url, headers=headers, data=payload)
    return round(float(response.json()['main']['temp'])-273.15, 2)
```

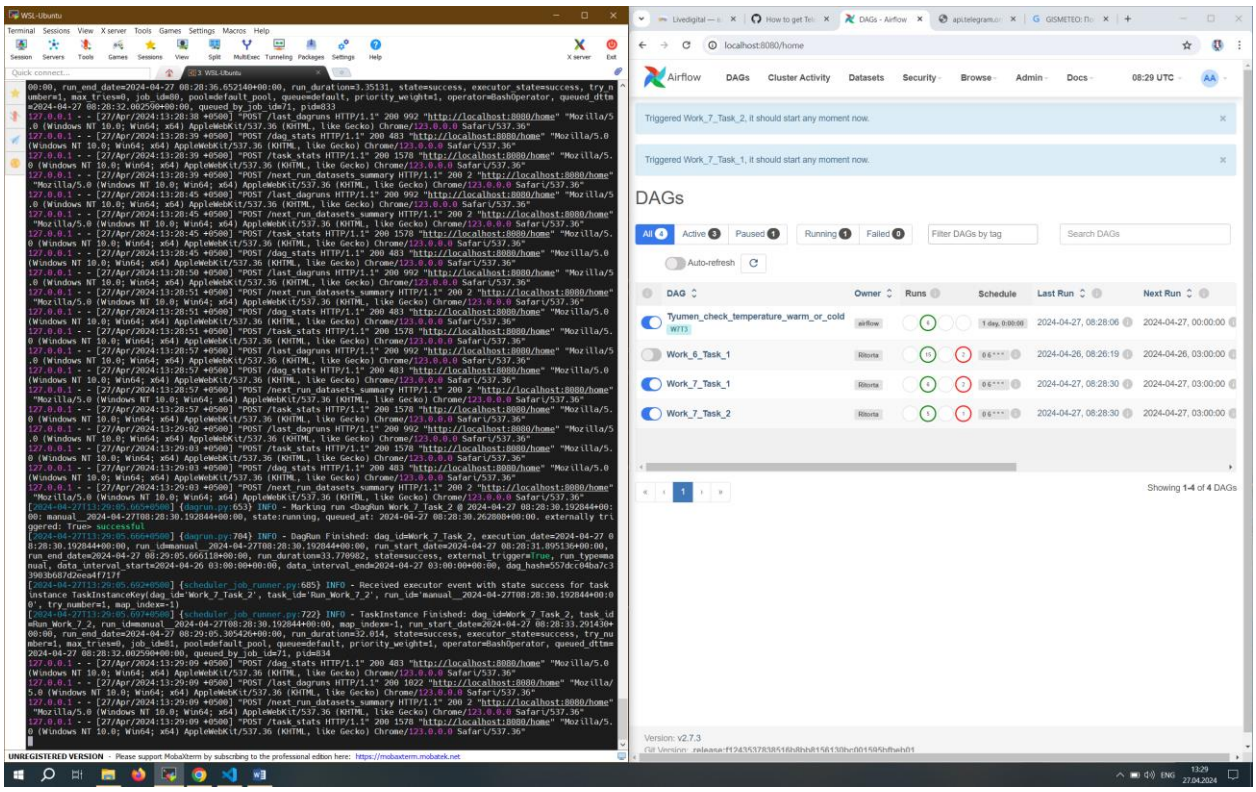
```python
def openwear_check_temp(ti):
    temp = int(ti.xcom_pull(task_ids='Tyumen_get_temperature'))
    print(f'Temperature now is {temp}')
    if temp >= 15:
        return 'Tyumen_Temp_warm'
    else:
        return 'Tyumen_Temp_cold'

with DAG(
        'Tyumen_check_temperature_warm_or_cold',
        start_date=datetime(2024, 4, 25),
        catchup=False,
        tags=['W7T3'],
) as dag:
    Tyumen_get_temperature = PythonOperator(
        task_id='Tyumen_get_temperature',
        python_callable=openwear_get_temp,
    )

    Tyumen_check_temperature = BranchPythonOperator(
        task_id='Tyumen_check_temperature',
        python_callable=openwear_check_temp,
    )

    Tyumen_Temp_warm = BashOperator(
        task_id='Tyumen_Temp_warm',
        bash_command='echo "It is warm"',
    )

    Tyumen_Temp_cold = BashOperator(
        task_id='Tyumen_Temp_cold',
        bash_command='echo "It is cold"',
    )

Tyumen_get_temperature >> Tyumen_check_temperature >> [Tyumen_Temp_warm,
Tyumen_Temp_cold]
```






DAG: Tyumen_check_temperature_warm_or_cold
Schedule: 1 day, 0:00:00
Next Run: 2024-04-27, 00:00:00
Grid
Graph
Calendar
Task Duration
Task Tries
Landing Times
Gantt
Details
Code
Audit Log
Clear Filters
Tyumen_get_temperature
Tyumen_check_temperature
Tyumen_Temp_cold
Tyumen_Temp_warm
Clear task
Mark state as...
Filter Tasks
Logs
More Details
Rendered Template
XCom
List Instances, all runs
Task Instance Notes:
Add Note
Task Instance Details
Status
success
Task ID
Tyumen_Temp_cold
Run ID
manual__2024-04-26T08:26:25.959084+00:00
Operator
BashOperator
Trigger Rule
all_success
Duration
00:00:00
Started
2024-04-26, 08:26:30 UTC
Ended
2024-04-26, 08:26:31 UTC


DAG: Tyumen_check_temperature_warm_or_cold
Schedule: 1 day, 0:00:00
Next Run: 2024-04-27, 00:00:00
Grid
Graph
Calendar
Task Duration
Task Tries
Landing Times
Gantt
Details
Code
Audit Log
Clear Filters
Tyumen_get_temperature
Tyumen_check_temperature
Tyumen_Temp_cold
Tyumen_Temp_warm
Clear task
Mark state as...
Filter Tasks
Logs
Layout:
Left -> Right
Tyumen_check_temperature
BranchPythonOperator
Tyumen_Temp_cold
BashOperator
Tyumen_Temp_warm
BashOperator


WSL-Ubuntu
Airflow
DAGs
Cluster Activity
Datasets
Security
Browse
Admin
Docs
08:29 UTC
Triggered Work_7_Task_2, it should start any moment now.
Triggered Work_7_Task_1, it should start any moment now.
DAGs
All 4
Active 3
Paused 1
Running 1
Failed 0
Filter DAGs by tag
Search DAGs
Auto-refresh
DAG
Owner
Runs
Schedule
Last Run
Next Run
Tyumen_check_temperature_warm_or_cold
WT13
airflow
1 day, 0:00:00
2024-04-27, 08:28:06
2024-04-27, 00:00:00
Work_6_Task_1
Rikorta
2024-04-26, 08:26:19
2024-04-26, 03:00:00
Work_7_Task_1
Rikorta
2024-04-27, 08:28:30
2024-04-27, 03:00:00
Work_7_Task_2
Rikorta
2024-04-27, 08:28:30
2024-04-27, 03:00:00
Showing 1-4 of 4 DAGs
Version: v2.7.3
UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net
ENG
13:29
27.04.2024