LAB 4
NET-CENTRIC

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Part A)

Weather Data Producer

```
PS C:\Users\MEGA> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> mvn exec:java "-Dexec.mainClass=com.example.weather.WeatherStation"
[INFO] Scanning for projects...
[INFO]
[INFO] -----------------< com.example.weather:WeatherProject >-----------------
[INFO] Building WeatherStationLab 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- exec:3.1.0:java (default-cli) @ WeatherProject ---
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
{"station_id":1,"s_no":2,"weather":{"temperature":45,"humidity":69,"wind_speed":27},"status_timestamp":1766932860,"batte
ry_status":"low"}
{"station_id":1,"s_no":3,"weather":{"temperature":53,"humidity":59,"wind_speed":23},"status_timestamp":1766932861,"batte
ry_status":"medium"}
{"station_id":1,"s_no":4,"weather":{"temperature":109,"humidity":59,"wind_speed":54},"status_timestamp":1766932862,"batt
ery_status":"medium"}
{"station_id":1,"s_no":5,"weather":{"temperature":51,"humidity":56,"wind_speed":44},"status_timestamp":1766932863,"batte
ry_status":"medium"}
{"station_id":1,"s_no":6,"weather":{"temperature":89,"humidity":11,"wind_speed":5},"status_timestamp":1766932864,"batter
y_status":"medium"}
{"station_id":1,"s_no":7,"weather":{"temperature":31,"humidity":96,"wind_speed":10},"status_timestamp":1766932865,"batte
ry_status":"medium"}
```

Part B)

Weather Reading topic

Consumer

```
PS C:\Users\MEGA> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> docker exec -it kafka /usr/bin/kafka-console-consumer --bootstrap-server loc
alhost:9092 --topic weather_readings --from-beginning
{"station_id":1,"s_no":1,"weather":{"temperature":93,"humidity":90,"wind_speed":33},"status_timestamp":1766930047,"batte
ry_status":"high"}
{"station_id":1,"s_no":2,"weather":{"temperature":65,"humidity":25,"wind_speed":36},"status_timestamp":1766930049,"batte
ry_status":"high"}
{"station_id":1,"s_no":3,"weather":{"temperature":108,"humidity":42,"wind_speed":45},"status_timestamp":1766930050,"batt
ery_status":"low"}
{"station_id":1,"s_no":4,"weather":{"temperature":96,"humidity":54,"wind_speed":33},"status_timestamp":1766930051,"batte
ry_status":"medium"}
{"station_id":1,"s_no":5,"weather":{"temperature":80,"humidity":86,"wind_speed":10},"status_timestamp":1766930052,"batte
ry_status":"high"}
{"station_id":1,"s_no":6,"weather":{"temperature":102,"humidity":15,"wind_speed":33},"status_timestamp":1766930053,"batt
ery_status":"high"}
{"station_id":1,"s_no":7,"weather":{"temperature":75,"humidity":84,"wind_speed":17},"status_timestamp":1766930054,"batte
ry_status":"high"}
{"station_id":1,"s_no":8,"weather":{"temperature":83,"humidity":97,"wind_speed":18},"status_timestamp":1766930055,"batte
ry_status":"high"}
{"station_id":1,"s_no":9,"weather":{"temperature":103,"humidity":31,"wind_speed":14},"status_timestamp":1766930056,"batt
ery_status":"high"}
{"station_id":1,"s_no":10,"weather":{"temperature":99,"humidity":36,"wind_speed":0},"status_timestamp":1766930057,"batte
ry_status":"medium"}
{"station_id":1,"s_no":12,"weather":{"temperature":37,"humidity":74,"wind_speed":8},"status_timestamp":1766930059,"batte
ry_status":"medium"}
```

Part C)

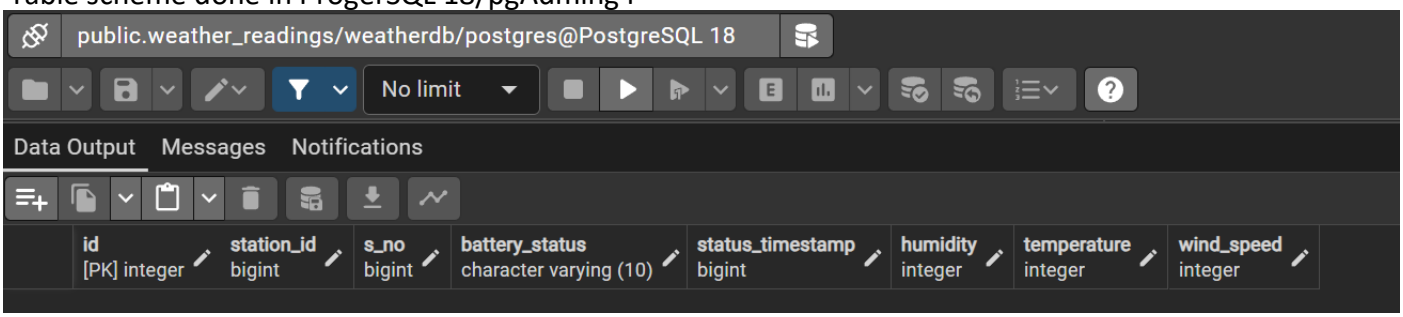
```
PS C:\Users\MEGA> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> mvn exec:java "-Dexec.mainClass=com.example.weather.RainingProcessor"
[INFO] Scanning for projects...
[INFO]
[INFO] -----------------< com.example.weather:WeatherProject >-----------------
[INFO] Building WeatherStationLab 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- exec:3.1.0:java (default-cli) @ WeatherProject ---
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
Raining Trigger Processor started...
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517857}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517878}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517879}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517880}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517882}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517883}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517883}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517885}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517886}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517886}
? Rain Alert Generated: {"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766934517887}
```

Rain Alerts topic

```
PS C:\Users\MEGA\WeatherLab\WeatherProject> docker exec -it kafka /usr/bin/kafka-console-consumer --bootstrap-server loc
alhost:9092 --topic rain_alerts --from-beginning
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265783}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265825}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265835}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265837}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265837}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265841}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265841}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265841}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265845}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265845}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265848}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265848}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265848}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265848}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265856}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265858}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265858}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265858}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265858}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265863}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265863}
{"station_id":1,"alert_type":"RAIN","message":"Humidity exceeded 70%","timestamp":1766930265863}
```

Part D)

Table scheme done in ProgerSQL 18/pgAdming4




```
weatherdb=# \dt
               List of tables
 Schema |       Name       | Type  |  Owner
--------+------------------+-------+----------
 public | weather_readings | table | postgres
(1 row)


weatherdb=# \d weather_readings
                                    Table "public.weather_readings"
      Column      |          Type          | Collation | Nullable |                    Default
------------------+------------------------+-----------+----------+-----------------------------------------------
 id               | integer                |           | not null | nextval('weather_readings_id_seq'::regclass)
 station_id       | bigint                 |           |          |
 s_no             | bigint                 |           |          |
 battery_status   | character varying(10)  |           |          |
 status_timestamp | bigint                 |           |          |
 humidity         | integer                |           |          |
 temperature      | integer                |           |          |
 wind_speed       | integer                |           |          |
Indexes:
    "weather_readings_pkey" PRIMARY KEY, btree (id)
```

Central station

The Kafka consumer

```
PS C:\Users\MEGA> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> mvn exec:java "-Dexec.mainClass=com.example.weather.KafkaConsumerApp"
[INFO] Scanning for projects...
[INFO]
[INFO] -----------------< com.example.weather:WeatherProject >-----------------
[INFO] Building WeatherStationLab 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- exec:3.1.0:java (default-cli) @ WeatherProject ---
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
Central Station Consumer started...
```

After inserting

```
PS C:\Users\MEGA> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> cd C:\Users\MEGA\WeatherLab\WeatherProject
PS C:\Users\MEGA\WeatherLab\WeatherProject> mvn exec:java "-Dexec.mainClass=com.example.weather.KafkaConsumerApp"
[INFO] Scanning for projects...
[INFO]
[INFO] -----------------< com.example.weather:WeatherProject >-----------------
[INFO] Building WeatherStationLab 1.0-SNAPSHOT
[INFO]   from pom.xml
[INFO] --------------------------------[ jar ]---------------------------------
[INFO]
[INFO] --- exec:3.1.0:java (default-cli) @ WeatherProject ---
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
Central Station Consumer started...
Inserted batch of 5000 records
```

```
tery_status":"high"}
{"station_id":1,"s_no":5272,"weather":{"temperature":93,"humidity":25,"wind_speed":1},"status_timestamp":1766941936,"bat
tery_status":"low"}
{"station_id":1,"s_no":5273,"weather":{"temperature":89,"humidity":59,"wind_speed":52},"status_timestamp":1766941937,"ba
ttery_status":"high"}
{"station_id":1,"s_no":5274,"weather":{"temperature":110,"humidity":2,"wind_speed":49},"status_timestamp":1766941938,"ba
ttery_status":"low"}
{"station_id":1,"s_no":5275,"weather":{"temperature":67,"humidity":13,"wind_speed":48},"status_timestamp":1766941939,"ba
ttery_status":"medium"}
{"station_id":1,"s_no":5276,"weather":{"temperature":38,"humidity":92,"wind_speed":26},"status_timestamp":1766941940,"ba
ttery_status":"low"}
{"station_id":1,"s_no":5277,"weather":{"temperature":118,"humidity":57,"wind_speed":46},"status_timestamp":1766941941,"b
attery_status":"medium"}
{"station_id":1,"s_no":5278,"weather":{"temperature":44,"humidity":83,"wind_speed":20},"status_timestamp":1766941942,"ba
ttery_status":"medium"}
{"station_id":1,"s_no":5279,"weather":{"temperature":68,"humidity":64,"wind_speed":21},"status_timestamp":1766941943,"ba
ttery_status":"low"}
{"station_id":1,"s_no":5280,"weather":{"temperature":99,"humidity":25,"wind_speed":3},"status_timestamp":1766941944,"bat
tery_status":"high"}
{"station_id":1,"s_no":5281,"weather":{"temperature":69,"humidity":18,"wind_speed":8},"status_timestamp":1766941945,"bat
tery_status":"high"}
{"station_id":1,"s_no":5282,"weather":{"temperature":47,"humidity":21,"wind_speed":29},"status_timestamp":1766941946,"ba
ttery_status":"high"}
{"station_id":1,"s_no":5283,"weather":{"temperature":85,"humidity":39,"wind_speed":2},"status_timestamp":1766941947,"bat
tery_status":"medium"}
{"station_id":1,"s_no":5284,"weather":{"temperature":99,"humidity":36,"wind_speed":46},"status_timestamp":1766941948,"ba
ttery_status":"high"}
{"station_id":1,"s_no":5285,"weather":{"temperature":88,"humidity":9,"wind_speed":30},"status_timestamp":1766941949,"bat
tery_status":"high"}
```


Screenshot of database

	id [PK] integer	station_id bigint	s_no bigint	battery_status character varying (10)	status_timestamp bigint	humidity integer	temperature integer	wind_speed integer
404	404	1	449	medium	1766930502	89	67	48
405	405	1	450	low	1766930503	58	63	29
406	406	1	451	low	1766930504	91	72	1
407	407	1	453	low	1766930506	39	115	40
408	408	1	454	low	1766930507	38	119	48
409	409	1	455	low	1766930508	63	46	16
410	410	1	456	high	1766930509	35	97	17
411	411	1	457	medium	1766930510	81	119	7
412	412	1	458	low	1766930511	16	54	53
413	413	1	459	medium	1766930512	62	30	54
414	414	1	460	low	1766930513	34	52	46
415	415	1	461	high	1766930514	58	60	21
416	416	1	462	high	1766930515	97	77	52
417	417	1	463	low	1766930516	6	81	2
418	418	1	464	low	1766930517	37	61	12
419	419	1	465	medium	1766930518	21	74	49

Total rows: 5000 | Query complete 00:00:00.426 | CRLF | Ln 1, Col 38

E)

Query | Query History

```sql
SELECT
    station_id,
    battery_status,
    COUNT(*) AS status_count,
    ROUND(
        COUNT(*) * 100.0 /
        SUM(COUNT(*)) OVER (PARTITION BY station_id),
        2
    ) AS percentage
FROM weather_readings
GROUP BY station_id, battery_status
ORDER BY station_id, battery_status;
```

Data Output | Messages | Notifications

Showing rov

	station_id bigint	battery_status character varying (10)	status_count bigint	percentage numeric
1	1	high	1497	29.94
2	1	low	1494	29.88
3	1	medium	2009	40.18

Query | Query History

```sql
SELECT station_id,
       MAX(s_no) AS expected,
       COUNT(*) AS received,
       (MAX(s_no) - COUNT(*)) AS dropped
FROM weather_readings
GROUP BY station_id;
```

Data Output | Messages | Notifications

Showing rows: 1 to 1

	station_id bigint	expected_messages bigint	received_messages bigint	dropped_messages bigint
1	1	4671	5000	-329

F)

```
jom@DESKTOP-E5SMOBF: /m

jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Desktop/lab4/weather-lab/k8s$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
central-station-86b958dc8c-v2q9g    1/1     Running   0          3m36s
postgres-58545fd654-2lz2b           1/1     Running   0          12m
weather-station-6b985b87cd-2hcb4    1/1     Running   0          3m36s
weather-station-6b985b87cd-84kvr    1/1     Running   0          3m34s
weather-station-6b985b87cd-89jcb    1/1     Running   0          3m34s
weather-station-6b985b87cd-8b8zr    1/1     Running   0          3m35s
weather-station-6b985b87cd-kdwbb    1/1     Running   0          3m35s
weather-station-6b985b87cd-q4n8j    1/1     Running   0          3m35s
weather-station-6b985b87cd-rfj6t    1/1     Running   0          3m36s
weather-station-6b985b87cd-shgz5    1/1     Running   0          3m34s
weather-station-6b985b87cd-skpgb    1/1     Running   0          3m35s
weather-station-6b985b87cd-xl9x9    1/1     Running   0          3m38s
jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Desktop/lab4/weather-lab/k8s$ kubectl logs deployment/weather-station
Found 10 pods, using pod/weather-station-6b985b87cd-xl9x9
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
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Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
Weather Station alive
```

```
jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Desktop/lab4/weather-lab/k8s$ kubectl logs deployment/central-station
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
Central Station alive
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Central Station alive
Central Station alive
Central Station alive
```

```
jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Downloads/WeatherLab (2)/WeatherLab/WeatherProject$ cd k8s
jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Downloads/WeatherLab (2)/WeatherLab/WeatherProject/k8s$ kubectl get pods
NAME                               READY   STATUS    RESTARTS   AGE
central-station-86b958dc8c-tx9qq   1/1     Running   0          6m
postgres-58545fd654-srxd9          1/1     Running   0          6m2s
weather-station-6b985b87cd-2qfh8   1/1     Running   0          6m
weather-station-6b985b87cd-8hsm5   1/1     Running   0          6m1s
weather-station-6b985b87cd-b44bb   1/1     Running   0          6m
weather-station-6b985b87cd-b7886   1/1     Running   0          6m
weather-station-6b985b87cd-cm8rc   1/1     Running   0          6m
weather-station-6b985b87cd-dc27k   1/1     Running   0          6m1s
weather-station-6b985b87cd-flkfn   1/1     Running   0          6m
weather-station-6b985b87cd-fvx7z   1/1     Running   0          6m
weather-station-6b985b87cd-nxv87   1/1     Running   0          6m
weather-station-6b985b87cd-zdq5t   1/1     Running   0          6m1s
jom@DESKTOP-E5SMOBF:/mnt/c/Users/Jom/Downloads/WeatherLab (2)/WeatherLab/WeatherProject/k8s$ kubectl exec -it postgres-5
8545fd654-srxd9 -- psql -U postgres weather
psql (15.15 (Debian 15.15-1.pgdg13+1))
Type "help" for help.

weather=#
```