

# EPAM's Snowflake Hands-on Lab

## Lab Overview

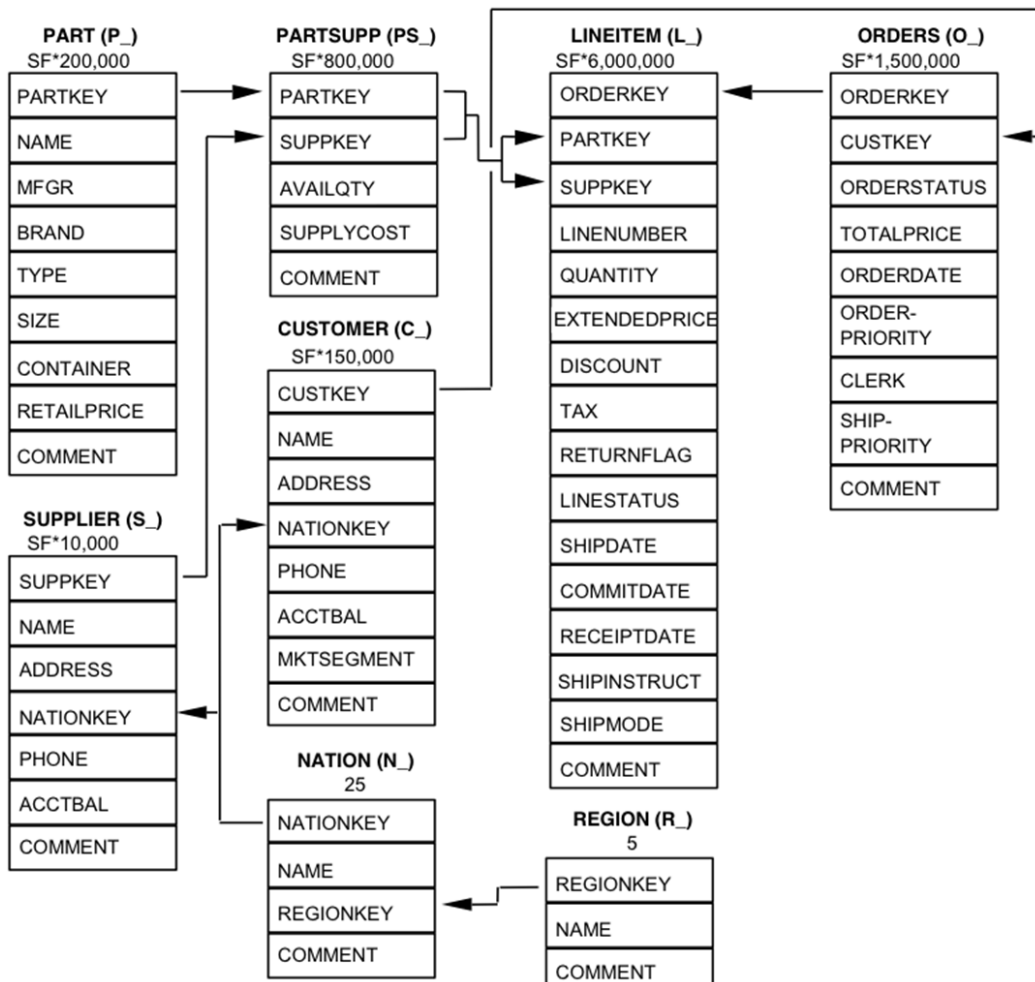
For those who begin to study Snowflake from scratch, it is recommended to start with “[Hands-On Lab Guide for Snowflake Free Trial](#)” that describes how to work with the main database features in the form of step-by-step guide.

This Lab (prepared by your EPAM colleagues) offers a high-level description of the practical task for self-directed learning.

The target group for the Lab are DWBI engineers with experience in building Data Warehouses using other databases (Oracle, MS SQL, Teradata, etc.).

## Lab Data Set

Data set from [TPC-H benchmark](#) is proposed for the Lab. TPC-H allows you to generate data for 8 tables. The data volume (in gigabytes) is defined by scale factor (SF). For the Lab purpose, you can [download](#) prepared in advance data set (2 GB of raw data, SF=2):



| Table      | Number of rows |
|------------|----------------|
| H_LINEITEM | 11 996 782     |
| H_ORDER    | 3 000 000      |
| H_PARTSUPP | 1 600 000      |
| H_PART     | 400 000        |
| H_CUSTOMER | 300 000        |
| H_SUPPLIER | 20 000         |
| H_NATION   | 25             |
| H_REGION   | 5              |

In the shared folder, you can also find DDL script for the tables: *tpch\_ddl.sql*.

## Lab Description

Hands-on-lab is considered as completed if you score  $\geq 60$  points.

(Tasks 1, 8 – 5 points each, Tasks 2, 4, 5, 6 – 10 points each, Task 3 – 30 points, Task 7 – 20 points).

### 1. Database creation

First, you need to create a separate database EPAM\_LAB in Snowflake.

The screenshot shows the Snowflake console interface. At the top, there's a navigation bar with icons for Databases, Shares, Data Marketplace, Warehouses, Worksheets, and History. Below this, the 'Databases' section is active, showing a list of databases. The list includes columns for Database, Origin, Creation Time, Owner, and Comment. The 'EPAM\_LAB' database is highlighted in blue, indicating it is the current selection. Other databases listed include 'SOCIAL\_MEDIA\_FLOODGATES', 'LIBRARY\_CARD\_CATALOG', 'USDA\_NUTRIENT\_STDREF', 'SNOWFLAKE\_SAMPLE\_DATA', 'DEMO\_DB', and 'UTIL\_DB'.

| Database                | Origin            | Creation Time       | Owner        | Comment  |
|-------------------------|-------------------|---------------------|--------------|--|
| EPAM_LAB                |                   | 8/4/2021, 3:52 PM   | SYSADMIN     |  |
| SOCIAL_MEDIA_FLOODGATES |                   | 7/28/2021, 2:49 PM  | SYSADMIN     | There's so much data from social media - flood warning |
| LIBRARY_CARD_CATALOG    |                   | 7/28/2021, 10:45 AM | SYSADMIN     | Essentials Lesson 9                                    |
| USDA_NUTRIENT_STDREF    |                   | 7/27/2021, 2:30 PM  | SYSADMIN     | Snowflake Lab  |
| SNOWFLAKE_SAMPLE_DATA   | SFC_SAMPLES.SA... | 7/27/2021, 10:29 AM | ACCOUNTADMIN | TPC-H, OpenWeatherMap, etc                             |
| DEMO_DB                 |                   | 7/27/2021, 10:29 AM | SYSADMIN     | demo database  |
| UTIL_DB                 |                   | 7/27/2021, 10:29 AM | SYSADMIN     | utility database                                       |

### 2. Data loading

In this step, you need to load Lab data set to internal (Snowflake) or external stage. If you have an existing account in AWS/GCP/Azure cloud, external stage would be preferable. Please note that you may need some data preparation steps before loading.

← → ↻ wpa11502.snowflakecomputing.com/console#/data/tables?databaseName=EPAM\_LAB

Enjoy your free trial! Visit our [documentation](#) to learn more about using Snowflake or [contact our support](#)

**Databases** > EPAM\_LAB

Tables Views Schemas Stages File Formats Sequences Pipes

+ Create... + Create Like... Clone... Load Data... Drop... Transfer Ownership

| Table Name  | Schema   | Creation Time ▼        | Owner    | Rows  | Size    |
|-------------|----------|------------------------|----------|-------|---------|
| ORDERS_WF   | CORE_DWH | 8/9/2021, 12:16:24 ... | SYSADMIN | 3M    | 65.9MB  |
| NATION_WF   | CORE_DWH | 8/9/2021, 12:16:23 ... | SYSADMIN | 25    | 2.5KB   |
| REGION_WF   | CORE_DWH | 8/9/2021, 12:16:23 ... | SYSADMIN | 5     | 1.5KB   |
| CUSTOMER_WF | CORE_DWH | 8/9/2021, 12:14:30 ... | SYSADMIN | 300K  | 9.9MB   |
| PARTSUPP    | TPCH     | 8/4/2021, 5:14:41 PM   | SYSADMIN | 1.6M  | 32.6MB  |
| ORDERS      | TPCH     | 8/4/2021, 5:10:13 PM   | SYSADMIN | 3M    | 85.0MB  |
| LINEITEM    | TPCH     | 8/4/2021, 4:58:02 P... | SYSADMIN | 12.0M | 348.0MB |
| CUSTOMER    | TPCH     | 8/4/2021, 4:37:40 P... | SYSADMIN | 300K  | 14.0MB  |
| PART        | TPCH     | 8/4/2021, 3:53:15 PM   | SYSADMIN | 400K  | 9.0MB   |
| NATION      | TPCH     | 8/4/2021, 3:53:14 PM   | SYSADMIN | 25    | 2.5KB   |
| REGION      | TPCH     | 8/4/2021, 3:53:14 PM   | SYSADMIN | 5     | 1.5KB   |

The data load was done using SnowSQL, in the following file you will find the code for loading through the internal stage.



Data Load Point 2.txt

### 3. ELT Data Workflow

Create two schemas in the DB you created before:

- CORE\_DWH
- DATA\_MART

← → ↻ wpa11502.snowflakecomputing.com/console#/data/schemas?databaseName=EPAM\_LAB

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**Databases** Shares Data Marketplace Warehouses Worksheets History

Databases > EPAM\_LAB

Tables Views **Schemas** Stages File Formats Sequences Pipes

+ Create... Clone... Alter... Drop... Transfer Ownership

| Schema             | Creation Time ▼       | Owner    | Managed Access | Comment                         |
|--------------------|-----------------------|----------|----------------|---------------------------------|
| INFORMATION_SCHEMA | 12:10:05 PM           |          |                | Views describing the content... |
| DATA_MART          | 8/9/2021, 3:47:42 PM  | SYSADMIN |                |                                 |
| CORE_DWH           | 8/9/2021, 10:18:00 AM | SYSADMIN |                |                                 |
| TPCH               | 8/4/2021, 3:53:06 PM  | SYSADMIN |                |                                 |
| PUBLIC             | 8/4/2021, 3:52:33 PM  | SYSADMIN |                |                                 |

Develop the following automated data workflow:

Stage -> CORE\_DWH -> DATA\_MART

Data in CORE\_DWH should be modeled according to 3NF (as is - no transformation). Star Schema is a target data model for DATA\_MART (data should be transformed accordingly).

The following Snowflake features should be used:

- Orchestration Tasks
- Stored Procedures
- Tables Streams

The dataflow was created, I was able to create a simple stored procedure due to the fact that my knowledge in JavaScript is fairly limited. Here you can see the code used:



Data Load - WF.txt

And here's the final Star Schema created, the image is taken from the Power BI service:



## 5. Snowflake SQL

From the shared folder you can also [download](#) the file with 22 TPC-H benchmarking queries (tpch\_benchmark\_queries.sql). Please note that the queries were modified to execute in AWS RedShift database, so some of them may require modifications for Snowflake. Use the queries to test how Snowflake works:

- Create several warehouses of different sizes and compare their performance;
- Test how Snowflake leverages different types of caches;
- Rewrite a couple of queries to execute on Star Schema data model and compare performance (3NF vs Star Schema);
- Execute queries using SnowSQL (CLI Client).

Data load code using SnowSQL.



Data Load Point 2.txt

Screen shot of the SnowSQL client connected

```
Command Prompt - snowsql -a WPA11502 -u julianadiaz

--disable-request-pooling    if there is no activity from the user..
                             Disable request pooling. This can help speed
                             up connection failover
--token TEXT                 The token to be used with oauth
                             authentication method
-?, --help                  Show this message and exit.

C:\Users\Juliana_Diaz>snowsql -a WPA wpa11502 -u julianadiaz
Got unexpected extra argument (wpa11502)
Try "snowsql --help" for more information.

C:\Users\Juliana_Diaz>snowsql -a WPA11502 -u julianadiaz
Failed to initialize log. No logging is enabled: [Errno 13] Permission denied: 'C:\\Users\\snowsql_rt.log'
Password:
250001 (08001): Failed to connect to DB: WPA11502.snowflakecomputing.com:443. Incorrect username or password was specified.
If the error message is unclear, enable logging using -o log_level=DEBUG and see the log to find out the cause. Contact support for further help.
Goodbye!

C:\Users\Juliana_Diaz>snowsql -a WPA11502 -u julianadiaz
Failed to initialize log. No logging is enabled: [Errno 13] Permission denied: 'C:\\Users\\snowsql_rt.log'
Password:
* SnowSQL * v1.2.9
Type SQL statements or !help
julianadiaz#COMPUTE_WH@no database).(no schema)>use DATABASE
                                     EPAM_LAB;

+-----+
| status |
+-----+
| Statement executed successfully. |
+-----+
1 Row(s) produced. Time Elapsed: 0.247s
julianadiaz#COMPUTE_WH@EPAM_LAB.PUBLIC>
```

Queries:

```
julianadiaz@COMPUTE_WH@EPAM_LAB.TPCH>Select * from nation;
```

| N_NATIONKEY | N_NAME         | N_REGIONKEY | N_COMMENT  |
|-------------|----------------|-------------|--|
| 0           | ALGERIA        | 0           | packages sleep .   |
| 1           | ARGENTINA      | 1           | quickly final instructions wake alongside of .                           |
| 2           | BRAZIL         | 1           | carefully ironic ideas after affix quickly above .                       |
| 3           | CANADA         | 1           | packages cajole carefully furiously even pinto beans .                   |
| 4           | EGYPT          | 4           | blithely ironic pinto beans along haggle carefully ruthlessly special Ti |
| 5           | ETHIOPIA       | 0           | regular, ironic deposits across wake after .                             |
| 6           | FRANCE         | 3           | quickly even platelets among sleep about .                               |
| 7           | GERMANY        | 3           | packages about use blithely furiously regular ideas .                    |
| 8           | INDIA          | 2           | blithely express pinto beans along use blithely packages .               |
| 9           | INDONESIA      | 2           | final, ironic deposits poach ruthlessly across :                         |
| 10          | IRAN           | 4           | express, silent deposits cajole carefully ironic pinto beans .           |
| 11          | IRAQ           | 4           | blithely final theodolites haggle carefully against .                    |
| 12          | JAPAN          | 2           | quickly express platelets integrate quickly .                            |
| 13          | JORDAN         | 4           | packages sleep about .   |
| 14          | KENYA          | 0           | regular, bold deposits sleep .   |
| 15          | MOROCCO        | 0           | fluffily bold dolphins haggle carefully quickly regular instructions .   |
| 16          | MOZAMBIQUE     | 0           | silent accounts use blithely according to .                              |
| 17          | PERU           | 1           | quickly bold instructions sleep alongside of .                           |
| 18          | CHINA          | 2           | blithely furious theodolites cajole quickly bold instructions .          |
| 19          | ROMANIA        | 3           | evenly bold pains sleep special, ironic deposits .                       |
| 20          | SAUDI ARABIA   | 4           | even accounts could cajole .   |
| 21          | VIETNAM        | 2           | blithely even instructions use blithely .                                |
| 22          | RUSSIA         | 3           | blithely silent pinto beans nag blithely .                               |
| 23          | UNITED KINGDOM | 3           | blithely regular theodolites mold slowly :                               |
| 24          | UNITED STATES  | 1           | regular accounts was quickly even, express deposits .                    |

```
julianadiaz@COMPUTE_WH@EPAM_LAB.TPCH> SELECT * FROM ORDERS LIMIT 4;
```

| O_ORDERKEY | O_CUSTKEY | O_ORDERSTATUS | O_ORDERPRIORITY | O_CLERK         | O_SHIPPRIORITY | O_COMMENT   | O_TOTALPRICE | O_ORDERDATE |
|------------|-----------|---------------|-----------------|-----------------|----------------|---|--------------|-------------|
| 8236871    | 143534    | F             | 3-MEDIUM        | Clerk#000001814 | 0              | carefully ironic foxes haggle carefully after .   | 40297.3235   | 1995-05-1   |
| 8236903    | 81907     | P             | 3-MEDIUM        | Clerk#000000951 | 0              | pending requests above cajole furiously bold pint | 164358.9028  | 1995-05-1   |
| 8236930    | 217568    | P             | 4-NOT SPECIFIED | Clerk#000000399 | 0              | carefully brave ideas sleep .                     | 290492.3663  | 1995-05-1   |
| 8236997    | 284752    | P             | 4-NOT SPECIFIED | Clerk#000001273 | 0              | quickly final dependencies wake bold accounts .   | 90221.7012   | 1995-05-2   |

4 Row(s) produced. Time Elapsed: 2.475s

```
julianadiaz@COMPUTE_WH@EPAM_LAB.TPCH>SELECT SUM (O_TOTALPRICE) AS PRICEPERPRIORITY,
O_ORDERPRIORITY
FROM ORDERS
GROUP BY O_ORDERPRIORITY;
```

| PRICEPERPRIORITY | O_ORDERPRIORITY |
|------------------|-----------------|
| 90825667127.2229 | 3-MEDIUM        |
| 90713197066.928  | 1-URGENT        |
| 90526540370.2413 | 2-HIGH          |
| 90640568676.5932 | 5-LOW           |
| 90683397435.5099 | 4-NOT SPECIFIED |

5 Row(s) produced. Time Elapsed: 1.690s

```
julianadiaz@COMPUTE_WH@EPAM_LAB.TPCH>
```

## 6. Other Snowflake features

Learn and test other interesting Snowflake features:

- Object Cloning;

```
164 CREATE TABLE lineitem_dm CLONE "EPAM_LAB"."CORE_DWH"."LINEITEM_WF";
165 |
166 ALTER TABLE "EPAM_LAB"."DATA_MART"."LINEITEM_DM"
167 ADD L_EXTENDEDPRICE1 FLOAT8,
168     L_DISCOUNT1 FLOAT8,
169     L_TAX1 FLOAT8,
170     L_SHIPDATE1 DATE,
171     L_COMMITDATE1 DATE,
172     L_RECEIPTDATE1 DATE,
173     L_PARTSUPPKEY VARCHAR,
174     L_LINEITEMUID VARCHAR;
```

- Time Travel;

```
select * from "EPAM_LAB"."DATA_MART"."PARTSUPP_DM" at(offset => -60*5);
select * from "EPAM_LAB"."DATA_MART"."PARTSUPP_DM" at(timestamp => 'Mon, 16 August 2021 16:20:00 -0500'::timestamp_tz);
```

ts Data Preview Open History

Query ID SQL 4.58s 1,600,000 rows

result... Download Copy Columns

| Row | PS_PARTKEY | PS_SUPPKEY | PS_AVAILQTY | PS_COMMENT                 | PS_SUPPLYCOST | PS_PARTSUPPKEY |
|-----|------------|------------|-------------|----------------------------|---------------|----------------|
| 1   | 191111     | 6139       | 506         | quickly final instructi... | 51.49         | 191111-6139    |
| 2   | 191113     | 11114      | 1473        | packages are about .       | 148.16        | 191113-11114   |

- Data Sharing - share your DATA\_MART schema with a colleague who helps you with this Lab.

## 7. Snowpipe

Automated incremental data loading using Snowpipe. Split lineitem & order files into several parts and simulate their sequential loading to stage buckets.

```
12 //STAGE CREATION
13
14 CREATE OR REPLACE STAGE Snowpipe_Epam
15 url='s3://snowpipe-epamlab'
16 credentials=(aws_key_id='AKIASDGNXNS2OH2BXMKP' aws_secret_key='pVzjY6LhzW5Xw8D38R1sx4pKEbQzYaZvK8aQW/P')
17 file_format=DSV;
18
19 SHOW STAGES;
20
21 //PIPE CREATION
22 CREATE OR REPLACE PIPE epam_lab_pipe auto_ingest=true AS
23 COPY INTO snowpipe.nation
24 FROM @Snowpipe_Epam
25 file_format=DSV;
26
27 SHOW PIPES;
28
29 list @snowpipe_Epam;
30
31 alter pipe epam_lab_pipe refresh;
32
33 SELECT COUNT (*) FROM nation;
```

results Data Preview Open History

Query ID SQL 44ms 1 rows

filter result... Download Copy Columns

| Row | COUNT (*) |
|-----|-----------|
| 1   | 25        |

## 8. Additional tasks

Connect your Snowflake account with partner applications available for a free trial (e.g. Fivetran, Periscope Data, Matillion in Partner Connect menu). Explore how selected tools work.

My account is currently connected to SnapLogic, in the following JSON snap we can see the table Region loaded through Snaps:



**Snowflake - Bulk Load output0**

| Preview Type | Indent Level | Expand Level |
|--------------|--------------|--------------|
| JSON         | 2            | 1+           |

```

{
  "table": "'PUBLIC'.",
  "input_records": 0,
  "results": {
    "file": "s3://snowpipe-epamlab/h_region.csv",
    "status": "LOAD_SKIPPED",
    "rows_parsed": "0",
    "rows_loaded": "0",
    "error_limit": null,
    "errors_seen": "1",
    "first_error": "File was loaded before.",
    "first_error_line": null,
    "first_error_character": null,
    "first_error_column_name": null
  }
}
  
```