Resource Optimization: Performance

Performance

The queries provided in this guide are intended to help you setup and run queries pertaining to identifying areas where poor performance might be causing excess consumption, driven by a variety of factors.

What You'll Learn

- how to identify areas in which performance can be improved
- how to analyze workloads with poor performance causing excess consumption
- how to identify warehouses that would benefit from scaling up or out

What You'll Need

- A Snowflake Account
- Access to view [Account Usage Data Share]

Related Materials

- Resource Optimization: Setup & Configuration
- Resource Optimization: Usage Monitoring
- Resource Optimization: Billing Metrics

Query Tiers

Each query within the Resource Optimization Snowflake Quickstarts will have a tier designation just to the right of its name as "(T*)". The following tier descriptions should help to better understand those designations.

Tier 1 Queries

At its core, Tier 1 queries are essential to Resource Optimization at Snowflake and should be used by each customer to help with their consumption monitoring - regardless of size, industry, location, etc.

Tier 2 Queries

Tier 2 queries, while still playing a vital role in the process, offer an extra level of depth around Resource Optimization and while they may not be essential to all customers and their workloads, it can offer further explanation as to any additional areas in which over-consumption may be identified.

Tier 3 Queries

Finally, Tier 3 queries are designed to be used by customers that are looking to leave no stone unturned when it comes to optimizing their consumption of Snowflake. While these queries are still very helpful in this process, they are not as critical as the queries in Tier 1 & 2.

Data Ingest with Snowpipe and "Copy" (T1)

TIER 1

Description:

This query returns an aggregated daily summary of all loads for each table in Snowflake showing average file size, total rows, total volume and the ingest method (copy or snowpipe)

How to Interpret Results:

With this high-level information you can determine if file sizes are too small or too big for optimal ingest. If you can map the volume to credit consumption you can determine which tables are consuming more credits per TB loaded.

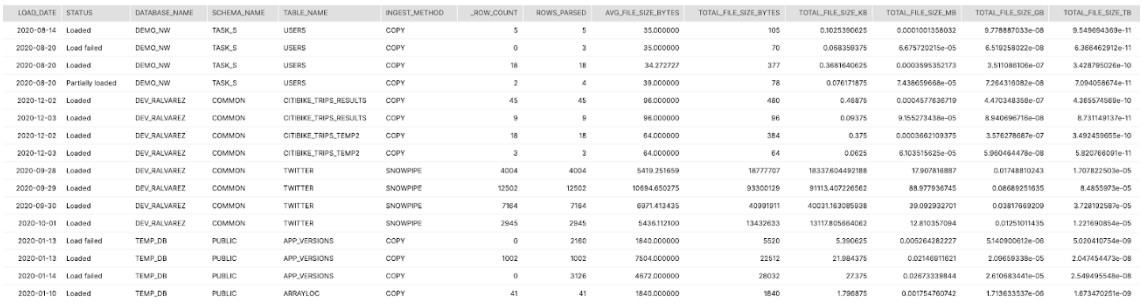
Primary Schema:

Account_Usage

SQL

```
SELECT
  TO_DATE(LAST_LOAD_TIME) as LOAD_DATE
  ,STATUS
  ,TABLE_CATALOG_NAME as DATABASE_NAME
  ,TABLE_SCHEMA_NAME as SCHEMA_NAME
  ,TABLE_NAME
  ,CASE WHEN PIPE_NAME IS NULL THEN 'COPY' ELSE 'SNOWPIPE' END AS INGEST_METHOD
  ,SUM(ROW_COUNT) as ROW_COUNT
  ,SUM(ROW_PARSED) as ROWS_PARSED
  ,AVG(FILE_SIZE) as AVG_FILE_SIZE_BYTES
  ,SUM(FILE_SIZE) as TOTAL_FILE_SIZE_BYTES
  ,SUM(FILE_SIZE)/POWER(1024,1) as TOTAL_FILE_SIZE_KB
  ,SUM(FILE_SIZE)/POWER(1024,2) as TOTAL_FILE_SIZE_MB
  ,SUM(FILE_SIZE)/POWER(1024,3) as TOTAL_FILE_SIZE_GB
  ,SUM(FILE_SIZE)/POWER(1024,4) as TOTAL_FILE_SIZE_TB
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."COPY_HISTORY"
GROUP BY 1,2,3,4,5,6
ORDER BY 3,4,5,1,2
;
```

Screenshot



LOAD_DATE	STATUS	DATABASE_NAME	SCHEMA_NAME	TABLE_NAME	INGEST_METHOD	ROW_COUNT	ROWS_PARSED	AVG_FILE_SIZE_BYTES	TOTAL_FILE_SIZE_BYTES	TOTAL_FILE_SIZE_KB	TOTAL_FILE_SIZE_MB	TOTAL_FILE_SIZE_GB	TOTAL_FILE_SIZE_TB
2020-08-14	Loaded	DEMO_NW	TASK_S	USERS	COPY	5	5	35.000000	105	0.10253906	0.0001001358032	9.778887033e-08	9.549694369e-11
2020-08-20	Load failed	DEMO_NW	TASK_S	USERS	COPY	0	3	35.000000	70	0.068359375	6.675722215e-05	6.519258022e-08	6.366462912e-11
2020-08-20	Loaded	DEMO_NW	TASK_S	USERS	COPY	18	18	34.272727	377	0.3681640625	0.0003595352173	3.511086106e-07	3.428795026e-10
2020-08-20	Partially loaded	DEMO_NW	TASK_S	USERS	COPY	2	4	39.000000	78	0.07617187	7.438659668e-05	7.264316082e-08	7.094058674e-11
2020-12-02	Loaded	DEV_RALVAREZ	COMMON	CITIBIKE_TRIPS_RESULTS	COPY	45	45	96.000000	480	0.46875	0.0004577636719	4.470348358e-07	4.365574569e-10
2020-12-03	Loaded	DEV_RALVAREZ	COMMON	CITIBIKE_TRIPS_RESULTS	COPY	9	9	96.000000	96	0.09375	9.155273438e-05	8.940696716e-08	8.731149137e-11
2020-12-02	Loaded	DEV_RALVAREZ	COMMON	CITIBIKE_TRIPS_TEMP2	COPY	18	18	64.000000	384	0.375	0.0003662109375	3.576278687e-07	3.492459655e-10
2020-12-03	Loaded	DEV_RALVAREZ	COMMON	CITIBIKE_TRIPS_TEMP2	COPY	3	3	64.000000	64	0.0625	6.103515625e-05	5.960464478e-08	5.820766091e-11
2020-09-28	Loaded	DEV_RALVAREZ	COMMON	TWITTER	SNOWPIPE	4004	4004	5419.251659	18777707	18337.604492188	17.907816887	0.01748810243	1.707822503e-05
2020-09-29	Loaded	DEV_RALVAREZ	COMMON	TWITTER	SNOWPIPE	12502	12502	10694.650275	93300129	91113.407226562	88.977836745	0.08689251635	8.4855973e-05
2020-09-30	Loaded	DEV_RALVAREZ	COMMON	TWITTER	SNOWPIPE	7164	7164	6971.412435	40991911	40031.163085938	39.092932701	0.03817699209	3.728192587e-05
2020-10-01	Loaded	DEV_RALVAREZ	COMMON	TWITTER	SNOWPIPE	2945	2945	5436.112100	13432633	13117.805664062	12.810357094	0.01251011435	1.221690854e-05
2020-01-13	Load failed	TEMP_DB	PUBLIC	APP_VERSIONS	COPY	0	2160	1840.000000	5520	5.390625	0.005264282227	5.140900612e-06	5.020410754e-09
2020-01-13	Loaded	TEMP_DB	PUBLIC	APP_VERSIONS	COPY	1002	1002	7504.000000	22512	21.984375	0.02146911621	2.09659338e-05	2.047494473e-08
2020-01-14	Load failed	TEMP_DB	PUBLIC	APP_VERSIONS	COPY	0	3126	4672.000000	28032	27.375	0.02673339844	2.610683441e-05	2.548695548e-08
2020-01-10	Loaded	TEMP_DB	PUBLIC	ARRAYLOC	COPY	41	41	1840.000000	1840	1.796875	0.001754760742	1.713633537e-06	1.673470251e-09

Scale Up vs. Out (Size vs. Multi-cluster) (T2)

TIER 2

Description:

Two separate queries that list out the warehouses and times that could benefit from either a MCW setting OR scaling up to a larger size

How to Interpret Results:

Use this list to determine reconfiguration of a warehouse and the times or users that are causing contention on the warehouse

Primary Schema:

Account_Usage

SQL

```
--LIST OF WAREHOUSES AND DAYS WHERE MCW COULD HAVE HELPED
SELECT TO_DATE(START_TIME) as DATE
,WAREHOUSE_NAME
,SUM(AVG_RUNNING) AS SUM_RUNNING
,SUM(AVG_QUEUED_LOAD) AS SUM_QUEUED
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."WAREHOUSE_LOAD_HISTORY"
WHERE TO_DATE(START_TIME) >= DATEADD(month,-1,CURRENT_TIMESTAMP())
GROUP BY 1,2
HAVING SUM(AVG_QUEUED_LOAD) >0
;

--LIST OF WAREHOUSES AND QUERIES WHERE A LARGER WAREHOUSE WOULD HAVE HELPED WITH
REMOTE SPILLING
SELECT QUERY_ID
,USER_NAME
,WAREHOUSE_NAME
,WAREHOUSE_SIZE
,BYTES_SCANNED
,BYTES_SPILLED_TO_REMOTE_STORAGE
,BYTES_SPILLED_TO_REMOTE_STORAGE / BYTES_SCANNED AS SPILLING_READ_RATIO
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."QUERY_HISTORY"
WHERE BYTES_SPILLED_TO_REMOTE_STORAGE > BYTES_SCANNED * 5  -- Each byte read was
spilled 5x on average
ORDER BY SPILLING_READ_RATIO DESC
;
```

Screenshot

DATE	WAREHOUSE_NAME	SUM_RUNNING	SUM_QUEUED
2020-10-10	SGURSOY_MCW_CLUSTER	23.134146666	71.554796667
2020-10-06	DGARDNER_MCW_CLUSTER	30.532923333	108.237089999
2020-10-27	AP_WAREHOUSE	4.105586666	0.328790000
2020-10-06	VLAD	12.718840002	4.664140001

Warehouse Cache Usage (T3)

TIER 3

Description:

Aggregate across all queries broken out by warehouses showing the percentage of data scanned from the warehouse cache.

How to Interpret Results:

Look for warehouses that are used from querying/reporting and have a low percentage. This indicates that the warehouse is suspending too quickly

Primary Schema:

Account_Usage

SQL

```
SELECT WAREHOUSE_NAME
,COUNT(*) AS QUERY_COUNT
,SUM(BYTES_SCANNED) AS BYTES_SCANNED
,SUM(BYTES_SCANNED*PERCENTAGE_SCANNED_FROM_CACHE) AS BYTES_SCANNED_FROM_CACHE
,SUM(BYTES_SCANNED*PERCENTAGE_SCANNED_FROM_CACHE) / SUM(BYTES_SCANNED) AS
PERCENT_SCANNED_FROM_CACHE
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."QUERY_HISTORY"
WHERE START_TIME >= dateadd(month,-1,current_timestamp())
AND BYTES_SCANNED > 0
GROUP BY 1
ORDER BY 5
;
```

Screenshot

WAREHOUSE_NAME	QUERY_COUNT	BYTES_SCANNED	BYTES_SCANNED_FROM_CACHE	PERCENT_SCANNED_FROM_CACHE
ADMIN_WH	2	3656736768	0	0
MRAINEY_WH	8	4075008	0	0
DEMO_WH	1	237568	0	0
SKUMAR_WH	2	115639296	1536	1.328268204e-05
SCWH	3	4732139520	2174976	0.0004596178939
REF_ER_WH	25	676613120	1774080	0.00262200059
MPROCTOR_XS_WH	8	10470936656	83157504	0.007941744538
ADHOC	60	5188376544	79983072	0.01541581867
MHENSON_WH	221	353100925440	6399581184	0.01812394339

Heavy Scanners (T3)

TIER 3

Description:

Ordered list of users that run queries that scan a lot of data.

How to Interpret Results:

This is a potential opportunity to train the user or enable clustering.

Primary Schema:

Account_Usage

SQL

```
select
  User_name
, warehouse_name
, avg(case when partitions_total > 0 then partitions_scanned / partitions_total else 0
end) avg_pct_scanned
from   snowflake.account_usage.query_history
where  start_time::date > dateadd('days', -45, current_date)
group by 1, 2
order by 3 desc
;
```

Full Table Scans by User (T3)

TIER 3

Description:

These queries are the list of users that run the most queries with near full table scans and then the list of the queries themselves.

How to Interpret Results:

This is a potential opportunity to train the user or enable clustering.

Primary Schema:

Account_Usage

SQL

```
--who are the users with the most (near) full table scans
SELECT USER_NAME
,COUNT(*) as COUNT_OF_QUERIES
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."QUERY_HISTORY"
WHERE START_TIME >= dateadd(month,-1,current_timestamp())
AND PARTITIONS_SCANNED > (PARTITIONS_TOTAL*0.95)
AND QUERY_TYPE NOT LIKE 'CREATE%'
group by 1
order by 2 desc;

-- This gives all queries in the last month with nearly a full table scan :) > 95%,
ordered by the worst offending
SELECT *
FROM "SNOWFLAKE"."ACCOUNT_USAGE"."QUERY_HISTORY"
WHERE START_TIME >= dateadd(month,-1,current_timestamp())
AND PARTITIONS_SCANNED > (PARTITIONS_TOTAL*0.95)
AND QUERY_TYPE NOT LIKE 'CREATE%'
ORDER BY PARTITIONS_SCANNED DESC
LIMIT 50  -- Configurable threshold that defines "TOP N=50"
;
```

Top 10 Spillers Remote (T3)

TIER 3

Description:

Identifies the top 10 worst offending queries in terms of bytes spilled to remote storage.

How to Interpret Results:

These queries should most likely be run on larger warehouses that have more local storage and memory.

Primary Schema:

Account_Usage

SQL

```
select query_id, substr(query_text, 1, 50) partial_query_text, user_name,
warehouse_name, warehouse_size,
       BYTES_SPILLED_TO_REMOTE_STORAGE, start_time, end_time, total_elapsed_time/1000
total_elapsed_time
from   snowflake.account_usage.query_history
where  BYTES_SPILLED_TO_REMOTE_STORAGE > 0
and start_time::date > dateadd('days', -45, current_date)
order  by BYTES_SPILLED_TO_REMOTE_STORAGE desc
limit 10
;
```

AutoClustering History & 7-Day Average (T3)

TIER 3

Description:

Average daily credits consumed by Auto-Clustering grouped by week over the last year.

How to Interpret Results:

Look for anomalies in the daily average over the course of the year. Opportunity to investigate the spikes or changes in consumption.

Primary Schema:

Account_Usage

SQL

```
WITH CREDITS_BY_DAY AS (
SELECT TO_DATE(START_TIME) as DATE
,SUM(CREDITS_USED) as CREDITS_USED


FROM "SNOWFLAKE"."ACCOUNT_USAGE"."AUTOMATIC_CLUSTERING_HISTORY"

WHERE START_TIME >= dateadd(year,-1,current_timestamp())
GROUP BY 1
ORDER BY 2 DESC
  )

SELECT DATE_TRUNC('week',DATE)
```

```
,AVG(CREDITS_USED) as AVG_DAILY_CREDITS
FROM CREDITS_BY_DAY
GROUP BY 1
ORDER BY 1
;
```

Materialized Views History & 7-Day Average (T3)

TIER 3

Description:

Average daily credits consumed by Materialized Views grouped by week over the last year.

How to Interpret Results:

Look for anomalies in the daily average over the course of the year. Opportunity to investigate the spikes or changes in consumption.

Primary Schema:

Account_Usage

SQL

```
WITH CREDITS_BY_DAY AS (
SELECT TO_DATE(START_TIME) as DATE
,SUM(CREDITS_USED) as CREDITS_USED


FROM "SNOWFLAKE"."ACCOUNT_USAGE"."MATERIALIZED_VIEW_REFRESH_HISTORY"

WHERE START_TIME >= dateadd(year,-1,current_timestamp())
GROUP BY 1
ORDER BY 2 DESC
  )

SELECT DATE_TRUNC('week',DATE)
,AVG(CREDITS_USED) as AVG_DAILY_CREDITS
FROM CREDITS_BY_DAY
GROUP BY 1
ORDER BY 1
;
```

Search Optimization History & 7-Day Average (T3)

TIER 3

Description:

Average daily credits consumed by Search Optimization grouped by week over the last year.

How to Interpret Results:

Look for anomalies in the daily average over the course of the year. Opportunity to investigate the spikes or changes in consumption.

Primary Schema:

Account_Usage

SQL

```
WITH CREDITS_BY_DAY AS (
SELECT TO_DATE(START_TIME) as DATE
,SUM(CREDITS_USED) as CREDITS_USED


FROM "SNOWFLAKE"."ACCOUNT_USAGE"."SEARCH_OPTIMIZATION_HISTORY"

WHERE START_TIME >= dateadd(year,-1,current_timestamp())
GROUP BY 1
ORDER BY 2 DESC
  )

SELECT DATE_TRUNC('week',DATE)
,AVG(CREDITS_USED) as AVG_DAILY_CREDITS
FROM CREDITS_BY_DAY
GROUP BY 1
ORDER BY 1
;
```

Snowpipe History & 7-Day Average (T3)

TIER 3

Description:

Average daily credits consumed by Snowpipe grouped by week over the last year.

How to Interpret Results:

Look for anomalies in the daily average over the course of the year. Opportunity to investigate the spikes or changes in consumption.

Primary Schema:

Account_Usage

SQL

```
WITH CREDITS_BY_DAY AS (
SELECT TO_DATE(START_TIME) as DATE
,SUM(CREDITS_USED) as CREDITS_USED


FROM "SNOWFLAKE"."ACCOUNT_USAGE"."PIPE_USAGE_HISTORY"

WHERE START_TIME >= dateadd(year,-1,current_timestamp())
GROUP BY 1
ORDER BY 2 DESC
  )
```

```
SELECT DATE_TRUNC('week',DATE)
,AVG(CREDITS_USED) as AVG_DAILY_CREDITS
FROM CREDITS_BY_DAY
GROUP BY 1
ORDER BY 1
;
```

Replication History & 7-Day Average (T3)

TIER 3

Description:

Average daily credits consumed by Replication grouped by week over the last year.

How to Interpret Results:

Look for anomalies in the daily average over the course of the year. Opportunity to investigate the spikes or changes in consumption.

Primary Schema:

Account_Usage

SQL

```
WITH CREDITS_BY_DAY AS (
SELECT TO_DATE(START_TIME) as DATE
,SUM(CREDITS_USED) as CREDITS_USED


FROM "SNOWFLAKE"."ACCOUNT_USAGE"."REPLICATION_USAGE_HISTORY"

WHERE START_TIME >= dateadd(year,-1,current_timestamp())
GROUP BY 1
ORDER BY 2 DESC
  )

SELECT DATE_TRUNC('week',DATE)
,AVG(CREDITS_USED) as AVG_DAILY_CREDITS
FROM CREDITS_BY_DAY
GROUP BY 1
ORDER BY 1
;
```