Cost optimization best practices for BigQuery

Google Cost Optimization team

Google Cloud

Google BigQuery: A primer

Google Cloud

Google BigQuery

Google Cloud Platform's **enterprise data warehouse** for analytics

Exabyte-scale data warehousing

Encrypted, durable, **secure**, And highly available

Fully managed and **serverless** for maximum agility and scale

Unique

Real-time insights from streaming data

Unique

Built-in **ML and Geospatial** for predictive insights

Unique

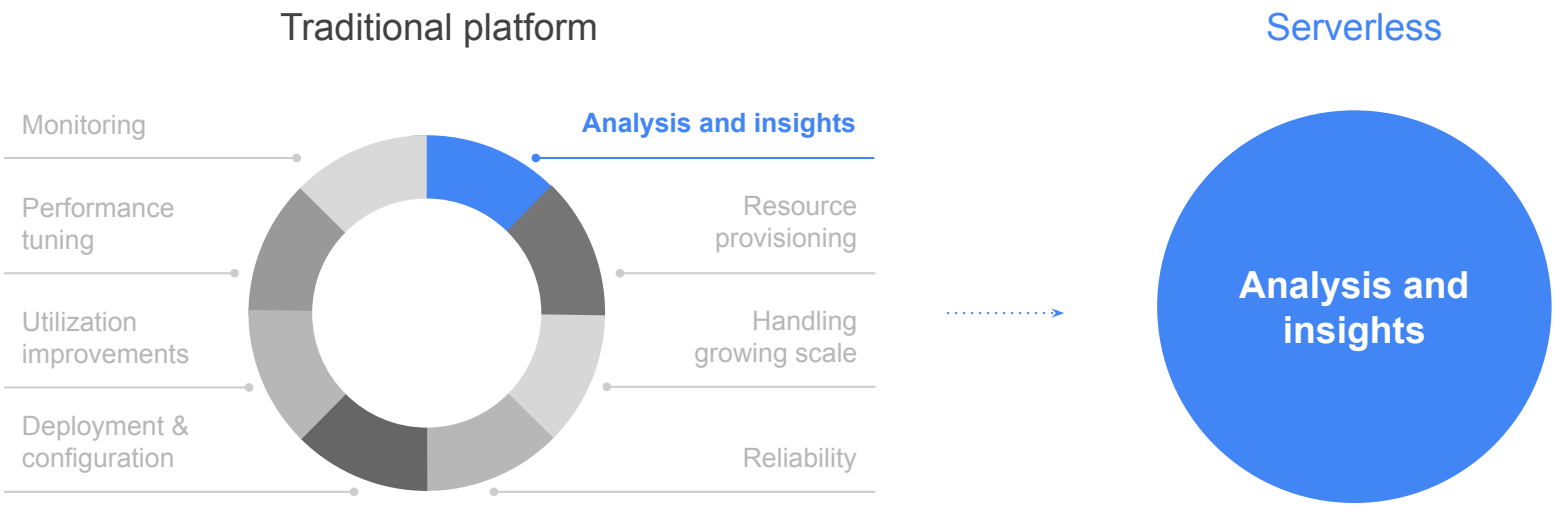
High-speed, in-memory **BI Engine** for faster reporting and analysis

Unique

Google Cloud

Serverless data analytics

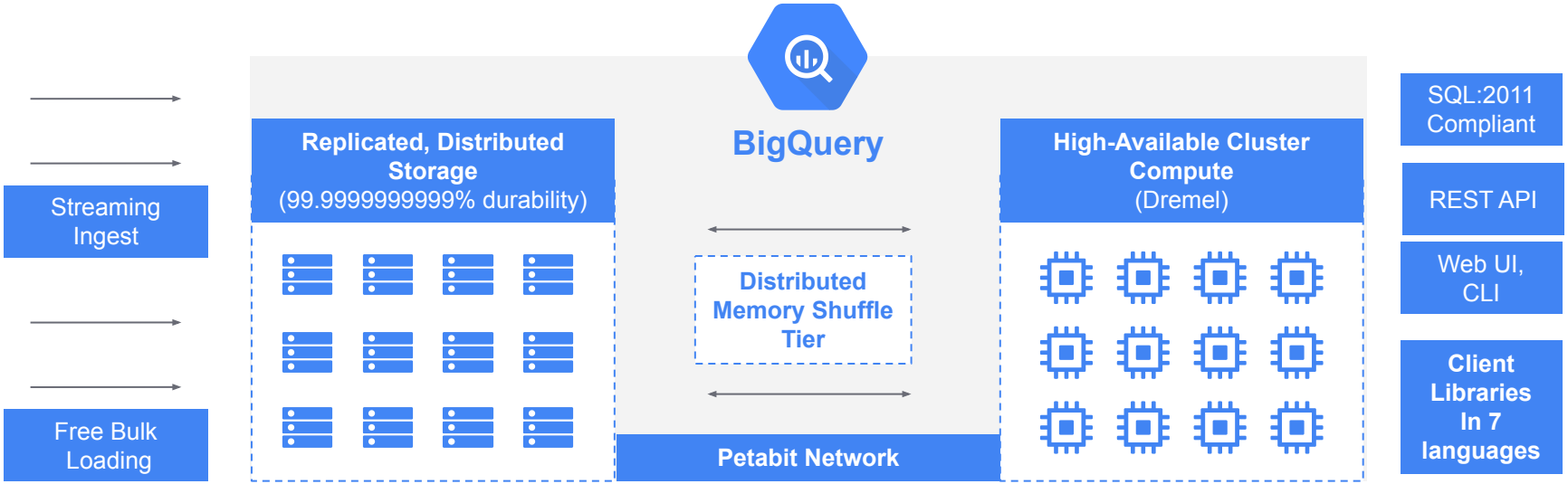
From infrastructure to platform for insights



Google Cloud

BigQuery | Architectural Advantage

Decoupled storage and compute for maximum flexibility

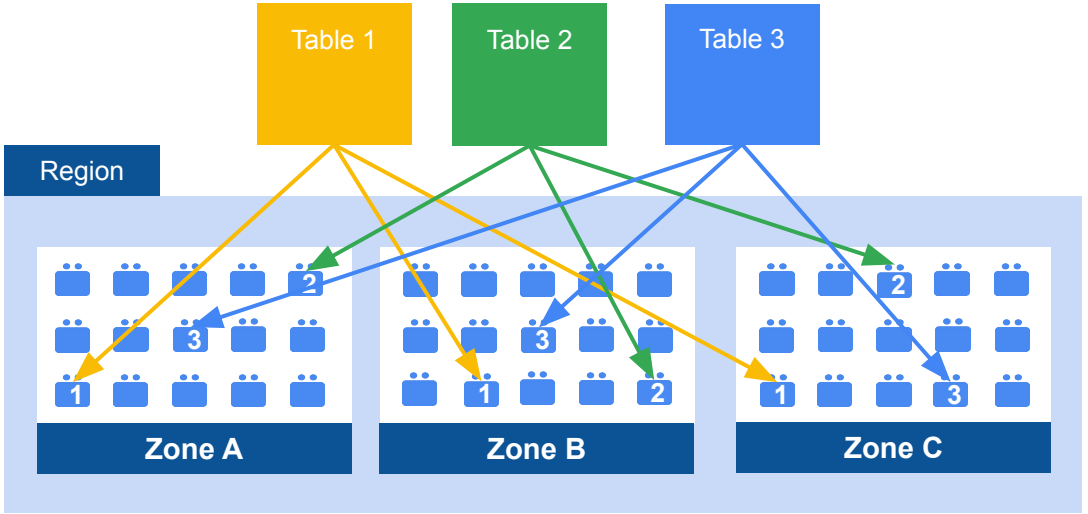


Google Cloud

BigQuery | Managed storage

Durable and persistent storage with automatic backup

- Tables are stored in optimized columnar format
- Each table is compressed and encrypted on disk
- Storage is durable & each table is replicated across datacenters

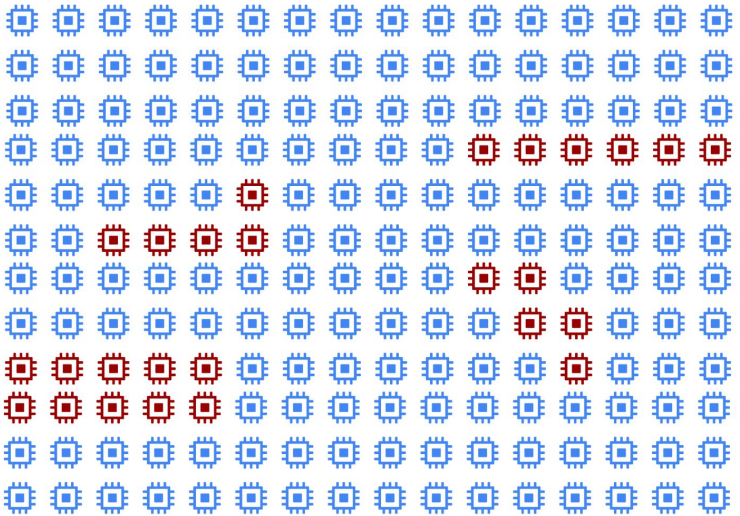


Google Cloud

BigQuery | Large stateless compute

Modern architecture for scalability and performance

- Superlinear horizontal scalability
- Immune to node/rack downtime
- Seamless maintenance
- Pipelined execution, dynamic work repartitioning, speculative execution



Google Cloud

BigQuery Pricing

Query processing

The cost to process queries in BigQuery

- **Ondemand pricing:** You are charged for the number of bytes processed by each query
- **Flat-rate pricing:** you purchase slots, which are virtual CPUs - a dedicated processing capacity that you can use to run queries.

Storage

The cost to store data that you load into BigQuery.

Cost optimization techniques

Query processing

- Ondemand pricing
  - Query the data you need
  - Query cost controls
  - Partition and Cluster your tables (includes zero maintenance auto-reclustering)
- Flat-rate pricing

Storage

- Data Retention
- Long term storage
- Avoid duplicate storage - use federated data access model
- Streaming Insert
- Backup and recovery

Demo

Getting Started with BigQuery

Optimize querying

Google Cloud

BigQuery OnDemand

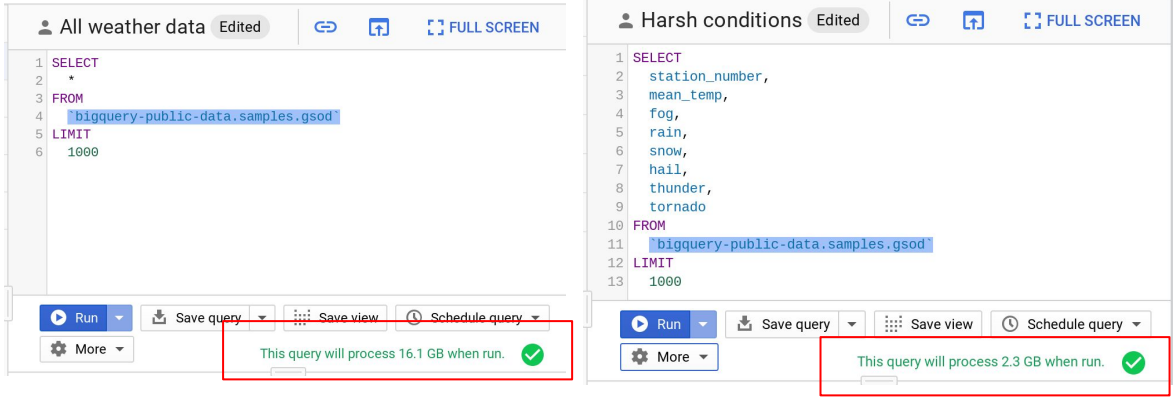
On-demand query pricing is as follows:

US (multi-region) ▼ | Monthly

Operation	Pricing	Details
Queries (on-demand)	$5.00 per TB	The first 1 TB per month is free.

Query the data you need

- Avoid SELECT *
- Use preview option to explore your data - its free!
- Filter your query as early and as often as possible to improve performance and reduce cost.
- Check how much your query is going to be charged
- Avoid SQL anti-patterns



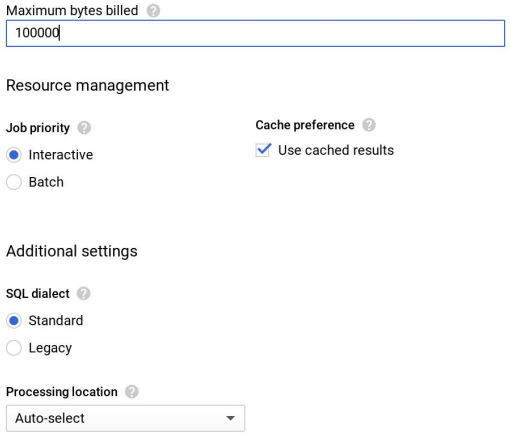
Google Cloud

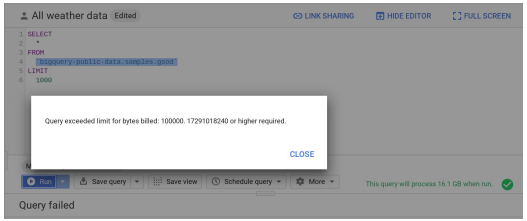
Optimize querying

1. **Query required data**
2. Enforce cost control
3. Partition and cluster
4. Flat-rate pricing

Avoid human errors

- Enforce MAX limits on bytes processed at query, user and project level.
- Cancelling a query may cost $
- Use caching intelligently





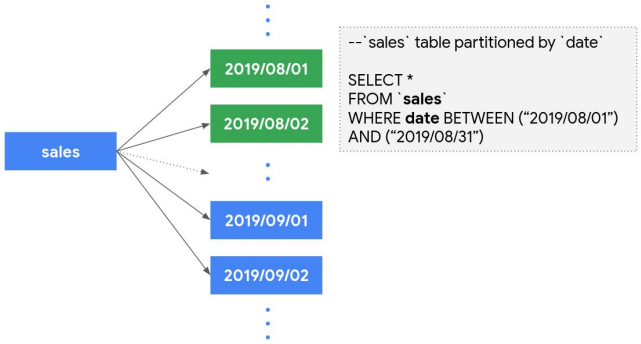
Google Cloud

Optimize querying

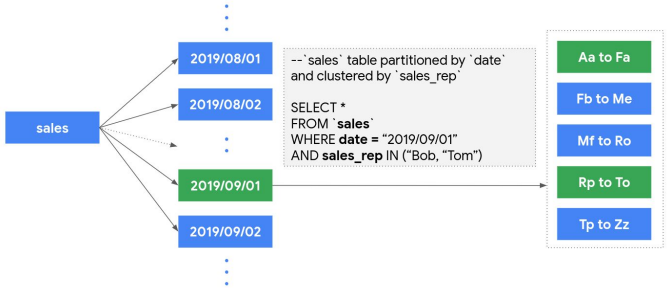
1. Query required data
2. **Enforce cost control**
3. Partition and cluster
4. Flat-rate pricing

Partition & cluster your data

- Partition your table to reduce the data sweeped
  - Enable required partition filter
- Cluster to further prune your data blocks



Partitioning



Clustering

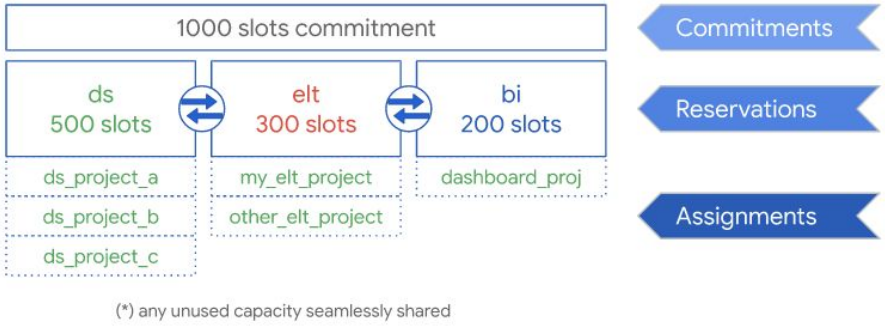
Optimize querying

1. Query required data
2. Enforce cost control
3. **Partition and cluster**
4. Flat-rate pricing

Google Cloud

Flat-rate & Reservations

- Think about flat-rate once your BigQuery processing cost > $XXK
  - Familiarize with BigQuery cost using our pricing calculator
- How many slots you should buy? - Visualize slot utilization in Stackdriver



Google Cloud

Optimize querying

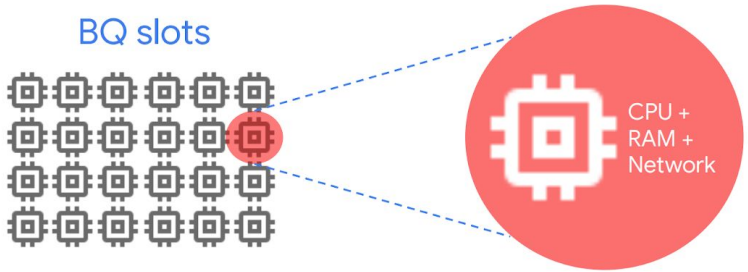
1. Query required data
2. Enforce cost control
3. Partition and cluster
4. **Flat-rate pricing**

Let’s double click into flat-rate

Google Cloud

What are BigQuery Slots?

1. A slot is a CPU
2. When you provision slots you purchase processing capacity. More slots gives you faster queries and/or more concurrency.
3. You can buy slots for seconds (Flex Slots), months, or a year



Query Pricing Options

Ad Hoc

- Perpetual Free Tier
- Pay-as-you-go (On Demand)

Scheduled (NEW 100 Slot Minimum!)

- Flex Slots
  - 60 Second Minimum
- Flat Rate
  - Monthly
  - Annual (15% Discount)

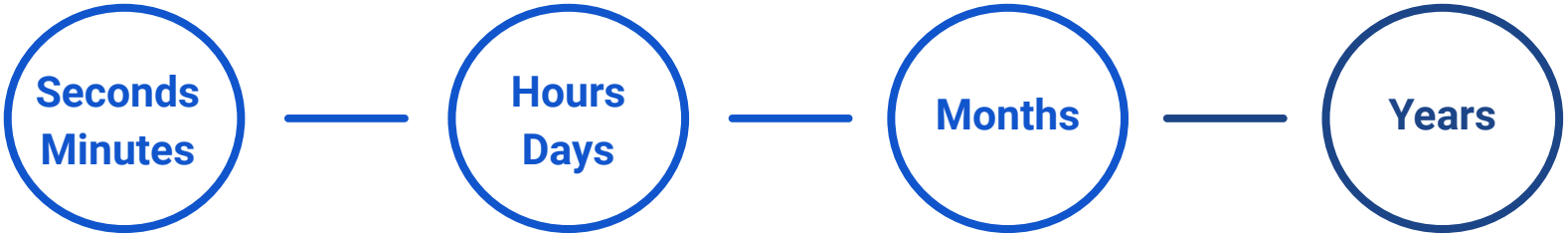
Efficient

Manage Slots with Reservations API!

Predictable

Google Cloud

BigQuery Commitment Types and Use Cases



Flex Slots

Rapidly respond to business demands and Evaluate performance.

Flex Slots

Plan for business-critical calendar events.

Monthly Commitments

Ideal balance between flexibility and cost.

Annual Commitments

The most cost-effective option for steady-state workloads.

Google Cloud

BigQuery Compute Pricing Scheme

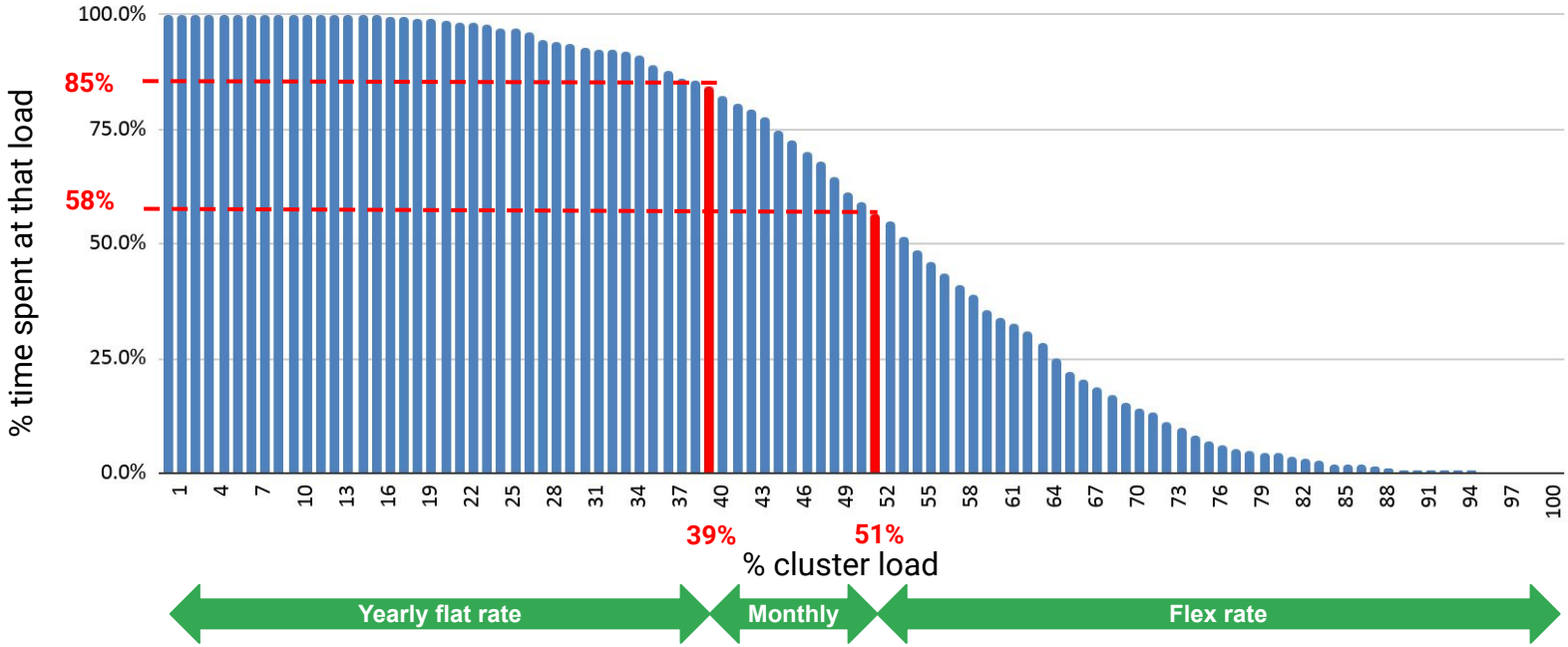
On demand	Pay-as-you-go
2000 slots per project (burstable)	$5 per processed TB

AND/OR

Commitment	Flex rate	Monthly flat-rate commitment	Yearly flat-rate commitment
Min 100 slots per month	$ 2920 ($4/hr) (1 min then by the second)	$ 2,000	$ 1,700

- A slot busy for more than 85% (1700/2000) of the year will be the most cost-efficient in **Yearly flat rate**
- A slot busy for less than 58% (1700/2920) of the year will be the most cost-efficient in **Flex rate**
- A slot busy for between 58% and 85% of the year will be the most cost-efficient in **Monthly flat rate**

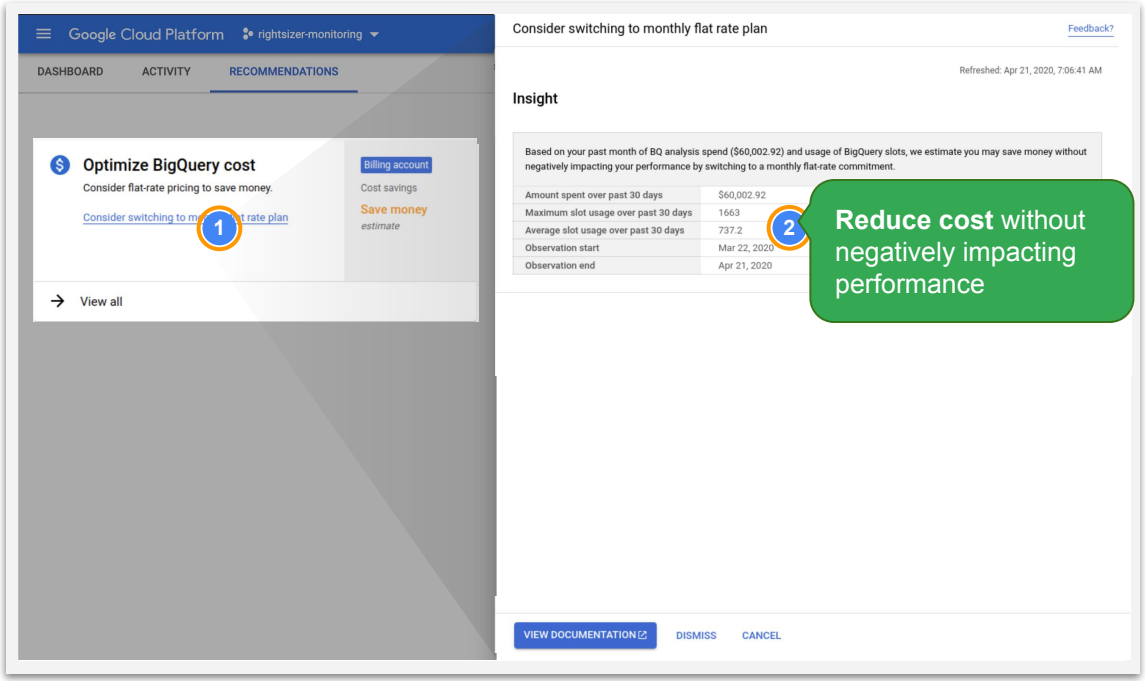
Cumulated workload distribution over time



Suboptimal BigQuery pricing configuration

BigQuery Slot Recommender
ALPHA

- Choose optimal BigQuery billing model based on usage
- Save with monthly & annual slot commitments
- Reserve capacity upfront and run unlimited queries

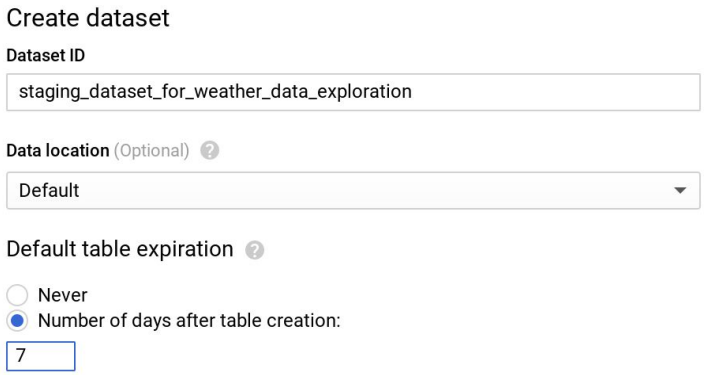


Related session: **DA300** - Awesome New Features to Help You Manage BigQuery

Optimizing Storage

Google Cloud

How long are you keeping your data?



Dataset level

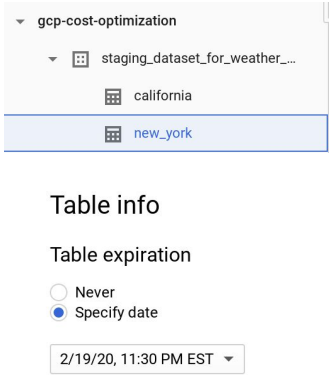


Table level

Similar to dataset-level and table-level, you can also set up expiration at partition-level.
Do checkout our public documentation for default behaviors.

Google Cloud

Be wary how you edit your data?

- If your table or partition has not been edited for 90 days, the the storage price drops by 50%.
- Watchout for any actions that edits your table: Loading into BQ, DML operations, streaming inserts, ..
- For long term archives with access frequency at most once a year - leverage Coldline or archival class in GCS.

The first 10 GB of storage per month is free.

US (multi-region)		Monthly
Operation	Pricing	Details
Active storage	$0.020 per GB	The first 10 GB is free each month.
Long-term storage	$0.010 per GB	The first 10 GB is free each month.

Google Cloud

Avoid duplicate copies of data

Leverage BigQuery's federated data access model for your data stored on:

- Cloud Drive
- Cloud BigTable
- Cloud Storage
- Cloud SQL (new!)

Use cases:

- Infrequently changing data set
- Querying is less performant - **gotcha!**

Google Cloud

Table Snapshots

- **Table snapshots** - Immutable versions of base tables; they only allow read operations. You must restore the table snapshot to a normal table to perform any mutations to the metadata or data. Useful for logical backups.
- **CLI / API and SQL commands** for creating snapshots at the table. Can be created at any point within 7 day time travel window.
- **Independent of base table** - Table snapshot permissions are independent of the base table. They have their own retention period, description, and labels that are independent of the base tables (even if the base table is deleted).
- **Low Cost** - You do not incur additional storage cost for table snapshots until the base table is modified or deleted (charged for unique bytes).

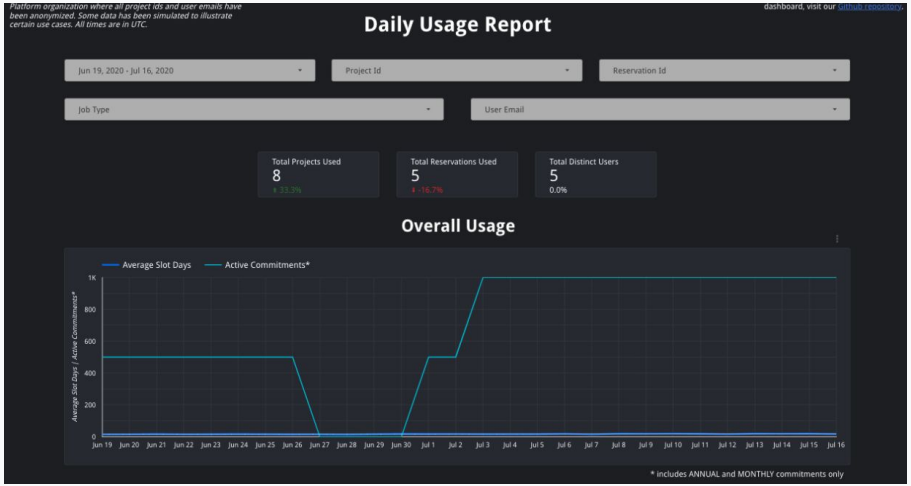
Visualize cost

- Create your own dashboard (step by step)
- Analyze spending trend & query trend over time
- Breakdown cost per project and per user
- Be proactive about tracking your expensive queries and optimize them

Google Cloud

BigQuery System Tables Reports

- Leverage INFORMATION_SCHEMA metadata tables to understand slot utilization across projects, jobs, and reservations
- Create your own dashboard for sample visualizations and reports
- Github repository includes sample SQL queries to use as-is or modify

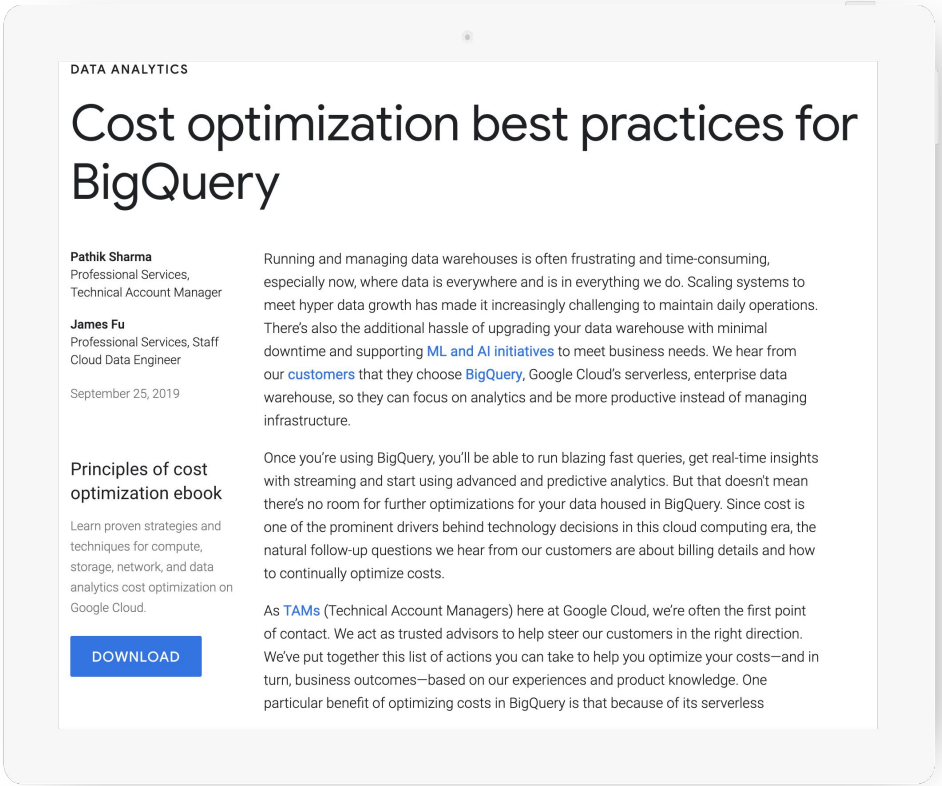


Google Cloud

Blogpost

For more details

bit.ly/gcp-co-bq



DATA ANALYTICS

Cost optimization best practices for BigQuery

Pathik Sharma
Professional Services, Technical Account Manager

James Fu
Professional Services, Staff Cloud Data Engineer

September 25, 2019

Running and managing data warehouses is often frustrating and time-consuming, especially now, where data is everywhere and is in everything we do. Scaling systems to meet hyper data growth has made it increasingly challenging to maintain daily operations. There's also the additional hassle of upgrading your data warehouse with minimal downtime and supporting ML and AI initiatives to meet business needs. We hear from our customers that they choose BigQuery, Google Cloud's serverless, enterprise data warehouse, so they can focus on analytics and be more productive instead of managing infrastructure.

Principles of cost optimization ebook

Learn proven strategies and techniques for compute, storage, network, and data analytics cost optimization on Google Cloud.

DOWNLOAD

Once you're using BigQuery, you'll be able to run blazing fast queries, get real-time insights with streaming and start using advanced and predictive analytics. But that doesn't mean there's no room for further optimizations for your data housed in BigQuery. Since cost is one of the prominent drivers behind technology decisions in this cloud computing era, the natural follow-up questions we hear from our customers are about billing details and how to continually optimize costs.

As TAMs (Technical Account Managers) here at Google Cloud, we're often the first point of contact. We act as trusted advisors to help steer our customers in the right direction. We've put together this list of actions you can take to help you optimize your costs—and in turn, business outcomes—based on our experiences and product knowledge. One particular benefit of optimizing costs in BigQuery is that because of its serverless

Thank you!

Q & A

Google Cloud