

# How-to guides

## Interacting with BigQuery

### Introduction to interacting with BigQuery

An introduction to methods of interacting with BigQuery.

(/bigquery/docs/interacting-with-bigquery)

### BigQuery sandbox

Get started with BigQuery without creating a billing account for your project.

(/bigquery/docs/sandbox)

### Using the BigQuery web UI in the Cloud Console (beta)

BigQuery exposes a graphical web UI in the Cloud Console that you can use to load and export data, run queries, and perform other user and management tasks in your browser.

(/bigquery/docs/bigquery-web-ui)

### Using the classic BigQuery web UI

BigQuery exposes a graphical web UI that you can use to load and export data, run queries, and perform other user and management tasks in your browser.

(/bigquery/docs/bigquery-classic-ui)

### Using the bq command-line tool

The bq command-line tool is a python-based tool that accesses BigQuery from the command line.

(/bigquery/docs/bq-command-line-tool)

## Running and managing jobs

## Introduction to jobs

An introduction to BigQuery jobs.

(/bigquery/docs/jobs-overview)

## Running jobs programmatically

Run BigQuery jobs programmatically using the API and client libraries.

(/bigquery/docs/running-jobs)

## Managing jobs

Manage BigQuery jobs including listing jobs, canceling jobs, and rerunning jobs.

(/bigquery/docs/managing-jobs)

# Working with datasets

## Introduction to datasets

An introduction to BigQuery datasets.

(/bigquery/docs/datasets-intro)

## Dataset locations

An overview of locations for storing BigQuery data.

(/bigquery/docs/dataset-locations)

## Creating datasets

How to create datasets in BigQuery.

(/bigquery/docs/datasets)

## Copying datasets

How to copy datasets, including copying datasets across regions.

(/bigquery/docs/copying-datasets)

## Controlling access to datasets

How to control access to datasets in BigQuery.

(/bigquery/docs/dataset-access-controls)

## Listing datasets

How to list datasets in BigQuery projects.

(/bigquery/docs/listing-datasets)

## Getting information about datasets

How to get dataset information or metadata.

(/bigquery/docs/dataset-metadata)

## Updating datasets

How to update dataset properties including updating descriptions, default expiration times, and access controls.

(/bigquery/docs/updating-datasets)

## Managing datasets

Manage datasets including renaming datasets, deleting datasets, and copying datasets.

(/bigquery/docs/managing-datasets)

## Availability and durability

Understand availability and durability of your datasets if a disaster occurs.

(/bigquery/docs/availability)

## Working with table schemas

### Specifying a schema

How to create and use table schemas.

(/bigquery/docs/schemas)

### Specifying nested and repeated columns

How to specify nested and repeated columns in table schemas.

(/bigquery/docs/nested-repeated)

### Auto-detecting schemas

Use schema auto-detection when you load data or query external data.

(/bigquery/docs/schema-detect)

### Modifying table schemas

Modify table schema definitions including adding columns, renaming columns, deleting columns, and changing column names, data types, and modes.

(/bigquery/docs/managing-table-schemas)

## Working with tables

### Introduction to tables

An introduction to BigQuery tables.

(/bigquery/docs/tables-intro)

### Creating and using tables

Create and use tables including listing tables, getting information about tables, and controlling access to table data.

(/bigquery/docs/tables)

### **Managing tables**

Manage tables including updating table properties, renaming tables, deleting tables, and copying tables.

(/bigquery/docs/managing-tables)

### **Managing table data**

An overview of working with table data including querying tables, browsing table data, modifying table data, exporting data, and appending or overwriting data.

(/bigquery/docs/managing-table-data)

### **Exporting table data**

How to export table data to Cloud Storage.

(/bigquery/docs/exporting-data)

### **Updating table data using DML**

Perform bulk modifications to table data using the Data Manipulation Language in standard SQL.

(/bigquery/docs/updating-data)

## **Working with partitioned tables**

### **Introduction to partitioned tables**

An introduction to partitioned tables in BigQuery.

(/bigquery/docs/partitioned-tables)

## Creating ingestion-time partitioned tables

How to create and use ingestion-time partitioned tables including listing and getting information about ingestion-time partitioned tables.

(/bigquery/docs/creating-partitioned-tables)

## Creating date/timestamp partitioned tables

How to create and use partitioned tables including listing and getting information about date/timestamp partitioned tables.

(/bigquery/docs/creating-column-partitions)

## Creating integer range partitioned tables

How to create and use partitioned tables including listing and getting information about integer range partitioned tables.

(/bigquery/docs/creating-integer-range-partitions)

## Managing partitioned tables

How to manage partitioned tables including updating properties, copying partitions, and deleting partitions.

(/bigquery/docs/managing-partitioned-tables)

## Managing partitioned table data

How to manage partitioned table data including browsing data, modifying data, exporting data, and appending or overwriting data.

(/bigquery/docs/managing-partitioned-table-data)

## Querying partitioned tables

How to query partitioned tables.

(/bigquery/docs/querying-partitioned-tables)

## Updating partitioned table data using DML statements

How to use DML statements to insert, delete, or update data in partitioned tables.

(/bigquery/docs/using-dml-with-partitioned-tables)

## Working with clustered tables

### Introduction to clustered tables

An introduction to clustered tables in BigQuery.

(/bigquery/docs/clustered-tables)

### Creating and using clustered tables

How to create and use clustered tables including listing and getting information about clustered tables.

(/bigquery/docs/creating-clustered-tables)

### Querying clustered tables

How to query clustered tables.

(/bigquery/docs/querying-clustered-tables)

## Working with views

### Introduction to views

An introduction to BigQuery views.

(/bigquery/docs/views-intro)

### Creating views

How to create views.

(/bigquery/docs/views)

### **Controlling access to views**

How to control access to views.

(/bigquery/docs/view-access-controls)

### **Creating authorized views**

How to create a view that allows you to share query results with users and groups without giving them access to the underlying tables.

(/bigquery/docs/authorized-views)

### **Listing views**

How to list views.

(/bigquery/docs/listing-views)

### **Getting information about views**

How to get information or metadata about views.

(/bigquery/docs/view-metadata)

### **Updating views**

How to update view properties including descriptions, expiration times, and SQL queries.

(/bigquery/docs/updating-views)

### **Managing views**

Manage views including copying views, renaming views, and deleting views.

(/bigquery/docs/managing-views)



## Working with materialized views

### Introduction to materialized views

An introduction to BigQuery materialized views.

(/bigquery/docs/materialized-views-intro)

### Creating and using materialized views

Create and use materialized views.

(/bigquery/docs/materialized-views)

### Best practices for materialized views

Best practices for materialized views.

(/bigquery/docs/materialized-views-best-practices)

### Materialized views FAQ

Answers to frequently asked questions about materialized views.

(/bigquery/docs/materialized-views-faq)

## Using Reservations for workload management

### Introduction

An introduction to BigQuery Reservations.

(/bigquery/docs/reservations-intro)

### Concepts

Concepts related to Reservations.

(/bigquery/docs/reservations-concepts)

## Workload management

Using Reservations for workload management.

(/bigquery/docs/reservations-workload-management)

## Monitoring

How to monitor your Reservation usage and billing.

(/bigquery/docs/reservations-monitoring)

# Getting metadata using INFORMATION\_SCHEMA (beta)

## Introduction

An introduction to INFORMATION\_SCHEMA.

(/bigquery/docs/information-schema-intro)

## Getting dataset metadata

Using INFORMATION\_SCHEMA to retrieve metadata about datasets.

(/bigquery/docs/information-schema-datasets)

## Getting routine metadata

Using INFORMATION\_SCHEMA to retrieve metadata about routines.

(/bigquery/docs/information-schema-routines)

## Getting table metadata

Using INFORMATION\_SCHEMA to retrieve metadata about tables.

(/bigquery/docs/information-schema-tables)

### Getting view metadata

Using INFORMATION\_SCHEMA to retrieve metadata about views.

(/bigquery/docs/information-schema-views)

## Labeling BigQuery resources

### Introduction to labels

An introduction to labeling resources in BigQuery.

(/bigquery/docs/labels-intro)

### Adding labels

Add labels to group resources by purpose, environment, department, and so on.

(/bigquery/docs/adding-labels)

### Viewing labels

Viewing labels on BigQuery resources.

(/bigquery/docs/viewing-labels)

### Updating labels

Updating labels on BigQuery resources.

(/bigquery/docs/updating-labels)

### Filtering resources using labels

Filtering resources using labels.

(/bigquery/docs/filtering-labels)

## Deleting labels

Deleting labels on BigQuery resources.

(/bigquery/docs/deleting-labels)

# Loading data into BigQuery

## Introduction to loading data

Load your data into BigQuery from a variety of source formats, including CSV, JSON, Avro, Parquet, ORC and Datastore backups.

(/bigquery/docs/loading-data)

## Loading data from Cloud Storage

Load data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage)

## Loading Avro data from Cloud Storage

How to load Avro data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage-avro)

## Loading Parquet data from Cloud Storage

How to load Parquet data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage-parquet)

## Loading ORC data from Cloud Storage

How to load ORC data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage-orc)

### **Loading CSV data from Cloud Storage**

How to load CSV data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage-csv)

### **Loading JSON data from Cloud Storage**

How to load newline delimited JSON data from Cloud Storage.

(/bigquery/docs/loading-data-cloud-storage-json)

### **Loading Datastore exports from Cloud Storage**

How to load data from a Datastore export.

(/bigquery/docs/loading-data-cloud-datastore)

### **Loading Firestore exports from Cloud Storage**

How to load data from a Firestore export.

(/bigquery/docs/loading-data-cloud-firestore)

### **Loading data from a local data source**

How to load data from a local data source.

(/bigquery/docs/loading-data-local)

### **Streaming data into BigQuery**

Stream your data into BigQuery using the BigQuery API.

(/bigquery/streaming-data-into-bigquery)

## **Querying BigQuery data**

## Introduction to querying data

An introduction to running queries in BigQuery.

(/bigquery/docs/query-overview)

## Running interactive and batch queries

How to run interactive and batch queries.

(/bigquery/docs/running-queries)

## Performing a query dry run

How to perform a dry run for a query job to estimate the amount of data processed.

(/bigquery/docs/running-queries)

## Writing query results

Write and page through query results.

(/bigquery/docs/writing-results)

## Using cached results

How to use cached query results.

(/bigquery/docs/cached-results)

## Running parameterized queries

How to use parameterized queries.

(/bigquery/docs/parameterized-queries)

## Querying data using a wildcard table

Query several tables concisely using a wildcard table.

(/bigquery/docs/querying-wildcard-tables)

### **Saving and sharing queries**

Save and share queries.

(/bigquery/docs/saving-sharing-queries)

### **Scheduling queries**

Schedule recurring queries in BigQuery.

(/bigquery/docs/scheduling-queries)

### **Using the query plan explanation**

BigQuery provides diagnostic information about a completed query's execution plan.

(/bigquery/query-plan-explanation)

### **Using the BigQuery connector for Excel**

BigQuery offers a connector that allows you to query BigQuery data to from Excel.

(/bigquery/docs/bigquery-connector-for-excel)

## **Querying external data sources**

### **Introduction to external data sources**

Query data directly from external data sources such as Cloud Storage, Cloud Bigtable, and Drive.

(/bigquery/external-data-sources)

### **Creating a table definition file**

Create a table definition file for an external data source.

(/bigquery/external-table-definition)

### **Federated queries with Cloud SQL data**

Query data in BigQuery and Cloud SQL with a federated query.

(/bigquery/docs/cloud-sql-federated-queries)

### **Querying Cloud Bigtable data**

Use BigQuery to query data stored in Cloud Bigtable.

(/bigquery/external-data-bigtable)

### **Querying Cloud Storage data**

Use BigQuery to query data stored in Cloud Storage.

(/bigquery/external-data-cloud-storage)

### **Querying Drive data**

Use BigQuery to query data stored in Drive.

(/bigquery/external-data-drive)

## **Controlling BigQuery costs**

### **Introduction to controlling BigQuery costs**

An introduction to cost control measures for BigQuery.

(/bigquery/docs/controlling-costs)

### **Estimating storage and query costs**

How to estimate storage and query costs before loading and querying data.

(/bigquery/docs/estimate-costs)



### **Custom cost controls**

Manage costs by setting custom quotas on query processing.

(/bigquery/docs/custom-quotas)

### **Best practices for controlling costs**

Best practices for controlling costs in BigQuery.

(/bigquery/docs/best-practices-costs)

## **Securing BigQuery resources**

### **Predefined roles and permissions**

Information on BigQuery's predefined IAM roles and permissions.

(/bigquery/docs/access-control)

### **Primitive roles and permissions**

Information on primitive BigQuery roles and permissions that existed before IAM.

(/bigquery/docs/access-control-primitive-roles)

### **Access control examples**

Access control use cases in BigQuery.

(/bigquery/docs/access-control-examples)

### **Introduction to Column-level security (beta)**

Learn about BigQuery Column-level security.

(/bigquery/docs/column-level-security-intro)

### **Restricting access with Column-level security (beta)**

How to restrict access with BigQuery Column-level security.

(/bigquery/docs/column-level-security)

### **Encryption at rest**

Learn how BigQuery encrypts your data at rest.

(/bigquery/docs/encryption-at-rest)

### **Using Cloud Data Loss Prevention to scan BigQuery data**

Use Cloud Data Loss Prevention to identify and protect sensitive BigQuery data.

(/bigquery/docs/scan-with-dlp)

### **Protecting data with Cloud KMS keys**

Use customer-managed encryption keys (CMEK) for BigQuery.

(/bigquery/docs/customer-managed-encryption)

## **Monitoring and logging**

### **BigQuery monitoring using Cloud Monitoring**

Monitor BigQuery resources using Cloud Monitoring.

(/bigquery/docs/monitoring)

### **Auditing policy tags**

Audit activities related to policy tags.

(/bigquery/docs/auditing-policy-tags)

### **Audit logging reference**

Log BigQuery usage using audit logs.

(/bigquery/docs/reference/auditlogs)

## **BigQuery API basics**

### **Introduction to authentication**

Perform authentication in various application scenarios.

(/bigquery/docs/authentication)

### **Getting started with authentication**

Get started with application default credentials.

(/bigquery/docs/authentication/getting-started)

### **Authenticating with a service account key file**

Manually create and obtain service account credentials.

(/bigquery/docs/authentication/service-account-file)

### **Authenticating with a user account for installed applications**

Perform application authentication using user accounts.

(/bigquery/docs/authentication/end-user-installed)

### **Authorizing API requests**

Authorize API requests with access tokens.

(/bigquery/docs/authorization)

### **Batch requests**

Reduce the number of HTTP connections your client has to make by batching API calls.

(/bigquery/batch)

### **Paging through query results**

Page through query results using the BigQuery API.

(/bigquery/docs/paging-results)

### **API performance tips**

Techniques you can use to improve the performance of your application.

(/bigquery/docs/api-performance)

## **Best practices**

### **Controlling costs**

Best practices for controlling costs in BigQuery.

(/bigquery/docs/best-practices-costs)

### **Optimizing query performance**

Best practices for optimizing query performance in BigQuery.

(/bigquery/docs/best-practices-performance-overview)

### **Optimizing storage**

Best practices for optimizing BigQuery storage.

(/bigquery/docs/best-practices-storage)

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