About Apache Iceberg

1. Iceberg is an open table format designed to handle huge datasets

2. It provides a table structure that brings the benefits of traditional databases, such as SQL, ACID compliance, and partitioning, to your data files

3. It supports features like
    a. Schema Evolution - Allows schema updates without costly data rewrites or migrations
    b. Partition - Divides data into smaller subsets, allowing you to access only the data needed for a query instead of reading the entire dataset
    c. Time travel - Allows access to an older version of data by fetching a snapshot from a specific period in the past
    d. Snapshots - Represent the state of a table at a specific point in time

4. Apache Iceberg doesn't store data in tables. Instead, it organizes data files to show them as a single table

5. Architecture Details

    Data Layer - Actual data files reside here
    Above the data layer is the **metadata layer**.

    i. **Manifest File** -
        1. Manifest files will store information on what files are present in the data layer. Manifest files track metadata at the **file level.**
        2. They store partition information, statistics like row count, column count, snapshot details, max, min and file format for each data file.
        3. Helps in query optimization by reducing the need to scan irrelevant files

    ii. Going forward, I will ingest more parquet files, leading to the creation of more manifest files

    iii. Since I have multiple manifest files, I will need another layer, the **manifest list**, on top of them.

    iv. **Manifest List** -
        1. Using the manifest list, we can connect multiple manifest files in one collection.
        2. Now, manifest files represent the data. If I want a description of the table schema, other info about the table.
        3. Improve query performance by narrowing down which files should be read

    v. **Metadata file** - The Metadata file will not represent the table. It will point to the manifest list, which further points to manifest files, which point to data files. The metadata file can contain multiple snapshots. It stores the table's schema, location, partition information, snapshot timestamps, and other information

    Catalog - Master directory system for all your Iceberg tables. The catalog layer contains a reference or pointer to the table's current metadata file. Whenever you change data, a new metadata file is written, and the pointer now points to the most recent metadata file in the log.

6. Iceberg Architecture