Slowly Changing Dimensions (SCD) is a concept used in data warehousing to manage and handle changes to dimension data over time. In a data warehouse, dimensions represent the characteristics or attributes that describe the facts (measures) in a business process. SCD deals with the challenge of maintaining historical and current versions of dimension data, allowing analysis and reporting of data as it appeared at different points in time.

There are several types of Slowly Changing Dimensions, commonly referred to as SCD types. The three most used types are SCD Type 1, SCD Type 2, and SCD Type 3. There is also an additional type called SCD Type 4, which is less common but can be useful in specific scenarios.

SCD Type 1:

In SCD Type 1, no historical data is preserved, and the dimension is updated in place. This means that when a change occurs, the existing data is overwritten with the new data, effectively losing the previous values. SCD Type 1 is suitable when historical data is not important or when the dimension data does not change frequently. An example of SCD Type 1 is a customer's address, where only the current address is relevant, and there is no need to maintain a history of previous addresses.

SCD Type 2:

SCD Type 2 maintains a full history of dimension changes by creating new records for each change. It introduces a surrogate key to uniquely identify each version of the dimension. New records are inserted for each change, with the original data remaining unchanged. This allows for accurate analysis and reporting based on historical data. An example of SCD Type 2 is an employee dimension, where changes like promotions, department transfers, or salary updates are tracked by creating new records for each change, maintaining a history of the employee's attributes.

SCD Type 3:

SCD Type 3 maintains limited history by adding columns to the existing dimension table to track a few specific changes. Typically, it includes additional columns to hold previous and current versions of certain attributes. This approach sacrifices the ability to capture a complete history but allows for limited tracking of changes. An example of SCD Type 3 is a product dimension with columns like "Current Price" and "Previous Price," which capture the latest and previous prices for the products.

SCD Type 4:

SCD Type 4, also known as a separate history table, involves creating a separate table to store the history of dimension changes. The original dimension table remains unchanged, and a separate history table captures the changes, including start and end dates for each version. This approach helps keep the main dimension table compact and easily queryable. An example of SCD Type 4 is maintaining the price history of a product in a separate table, linked to the product dimension, which allows for efficient retrieval of historical prices without bloating the main dimension table.