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# SLOWLY CHANGING DIMENSIONS

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## 1. What is the concept of slowly changing dimensions (SCD)?

Slowly changing dimensions (SCD) are in which values of attributes are changed over time. It stores both historical as well as current data over time in a data warehouse. It is considered to be one of the most critical ETL tasks in tracking the history of dimension records.

## 2. Why SCD?

Data in the warehouse is designed to analyze the historical data hence we need some approach to handle changes in dimension.

### Example

For example, an organization may use its Product dimension table to store product descriptions. The description lists the ingredients of the product. If there is a change to the ingredient list, the description in the OLTP is updated to reflect this change. When the changed record (the slowly changing dimension) is extracted into the data warehouse, the data warehouse updates the appropriate record with the new data. How that change is reflected in the data warehouse depends on how slowly changing dimensions has been implemented in the warehouse.

## 3. What are its types?

SCD Types	Brief
Type 0	Passive method
Type 1	Overwrite old value
Type 2	Add new row
Type 3	Add new column
Type 4	Use Historical table
Type 6	Combine SCD type 1+2+3

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Fig 3.1

## 4. Explain with examples (Scd1, Scd2, Scd3, Scd4).

### 4.1 Type 0 SCD

Attributes of dimension which never change their value.

#### **Example**

- Date of birth of any employee
- Employee joining date.

These are the attributes which never change.

### 4.2 Type 1 SCD (Overwriting)

A type 1 slowly changing dimension overwrites the existing data warehouse value with the new value coming from the OLTP system.

Although the type I does not maintain history, it is the simplest and fastest way to load dimension data. Type I is used when the old value of the changed dimension is not deemed important for tracking or is a historically insignificant attribute.

#### **Example**

A company that manufactures cardboard boxes might have a Product dimension table that tracks the product ID, product name, and product description. Similar columns would be present in the *warehouse* Product dimension, with the addition of a surrogate ID (primary key) to track each unique record.

If one of the product descriptions were to change from *glued box* to *pasted box* in the OLTP system, it would trigger a slowly changing dimension event in the warehouse Product dimension.

### Type 1 Slowly Changing Dimension

Product Dim (Source)			Product Dim (Target)			
Product Name	Product ID	Product Descr	Product Name	SID	Source Product ID	Product Descr
10 inch box	010	10 inch <del>glued</del> <b>pasted</b> box	10 inch box	0001	010	10 inch <b>pasted</b> box
12 inch box	012	12 inch glued box	12 inch box	0002	012	12 inch glued box

Fig 4.2

### 4.3 Type 2 SCD (Creating another dimension record)

A type 2 slowly changing dimension enables you to track the history of updates to your dimension records. When a changed record enters the warehouse, it creates a new record to store the changed data and leaves the old record intact. A Type 2 SCD retains the full history of values.

Each change to a dimension generates a new dimension record, This is done by a combination of:

- Effective dating both the new and old record (the old record is assigned a non-active effective date and the new record is assigned an active effective date).
- Assigning the new record a new (and unique) surrogate key.

#### Example

Using the same cardboard manufacturing company as an example from the previous section, and assuming one of the product descriptions changed from *glued box* to *pasted box* in the OLTP system, type 2 slowly changing dimension would be used to retain the former description while incorporating the new. Instead of overwriting the existing value in the product description column, a new record is added, and a new surrogate ID (primary key) is assigned to the record. The original record with the description *glued box* remains.

### Type 2 Slowly Changing Dimension

Product Dim (Source)			Product Dim (Target)					
Product Name	Product ID	Product Descr	SID	Source Product ID	Product Name	Product Descr	EFF_START_DT	EFF_END_DT
12 inch box	012	12 inch glued box	0001	012	12 inch box	12 inch glued box	Jan-01-1753	Dec-31-9999
10 inch box	010	10 inch glued box	0002	010	10 inch box	10 inch glued box	Jan-01-1753	May-12-06
		10 inch pasted box	0003	010	10 inch box	10 inch pasted box	May-12-06	Dec-31-9999

Fig 4.3

#### 4.4 Type 3 SCD (Creating new column)

A type 3 slowly changing dimension creates a new current value column in the existing record but retains the original column as well. The new current value column holds the new dimension data coming from the OLTP system. New column is added rather than row.

Example			
Employee ID	Employee Name	Current Location	Previous Location
100	ABC	USA	India

Fig 4.1

#### 4.5 Type 4 SCD (Creating separate table)

Update the record like type 1 SCD and separate historical table is maintained to track the history of changes.



Fig 4.5

#### 4.6 Type 6 SCD (type 2 + type 3)

Type 6 Slowly Changing Dimensions in Data Warehouse is a combination of Type 2 and Type 3 SCDs.