**Assignment 2: Forms of Hierarchies in Data Warehouse Dimensions**

In a Data Warehouse (DWH), **hierarchies** define relationships within dimensions, enabling different levels of data aggregation and drill-down analysis.

**1. Simple Hierarchy**

* **Definition**: A **single path** exists from the lowest level to the top level.
* **Structure**: Each level aggregates data from the level below it.
* **Example**:
  + **Product Hierarchy**: Item → Product Group → Product Category
  + **Location Hierarchy**: Shop → City → State

**2. Parallel Hierarchy**

* **Definition**: A dimension can have **multiple independent hierarchies**.
* **Structure**: No hierarchical relationship between the parallel branches.
* **Example**:
  + **Time Dimension**:
    - Year → Quarter → Month → Day
    - Year → Week

**3. Schema-Based Representation of Hierarchies**

Three different schema approaches are used to represent hierarchies in a DWH:

**a) Horizontal Representation**

* Stores each level of the hierarchy in **separate columns** in a denormalized table.
* **Pros**: Faster queries (no joins).
* **Cons**: Schema changes are difficult (e.g., adding new levels).

**b) Vertical (Recursive) Representation**

* Uses a **Parent\_ID** column to reference the next higher level.
* **Pros**: Easier to modify hierarchies.
* **Cons**: Requires **self-joins** for queries.

**c) Combined Representation**

* Stores both **horizontal and vertical** structures in a flexible schema.
* Includes a **Level column** to indicate classification depth.
* **Pros**: Supports multiple hierarchy types dynamically.

**Conclusion**

Data Warehouse hierarchies play a crucial role in organizing dimensions for analysis. Depending on the use case, different hierarchy types (simple, parallel) and schema representations (horizontal, vertical, combined) are chosen to optimize query performance and flexibility.

Let me know if you need more details! 🚀