Dimensional Modelling

Important Concepts

DIMENSIONAL MODELING

A data modeling technique optimized for data warehousing and decision support systems, focusing on ease of querying.

Using star and snowflake schemas to organize data in a data warehouse.

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STAR SCHEMA

A type of database schema that consists of one or more fact tables referencing any number of dimension tables.

A sales database where a fact table contains sales data, and dimension tables include information about products, customers, and time.

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SNOWFLAKE SCHEMA

A more complex version of the star schema where dimension tables are normalized into multiple related tables.

A sales database where dimension tables such as products and customers are further split into related tables like product categories and customer demographics.

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FACT TABLE

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Central table in a star schema that contains quantitative data for analysis.

A sales fact table that includes measures like sales revenue, quantity sold, and discount applied.

DIMENSION TABLE

Tables that contain descriptive attributes (dimensions) related to the facts.

A product dimension table that includes product names, categories, and descriptions.

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GRAIN

The level of detail or granularity of the data stored in a fact table.

Daily sales data versus monthly sales data in a fact table.

SURROGATE KEY

A unique identifier for each row in a dimension table, not derived from application data.

An auto-incremented integer used as the primary key in a customer dimension table.

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SLOWLY CHANGING DIMENSIONS (SCD)

Techniques for managing and tracking changes in dimension table attributes over time.

Type 1 SCD updates data directly, Type 2 SCD adds new rows, and Type 3 SCD adds new columns to track changes.

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TYPE 1 SCD

Overwrites old data with new data in a dimension table.

Updating a customer's address directly in the customer dimension table.

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TYPE 2 SCD

Creates a new record with a new surrogate key when a change occurs in the dimension data.

Adding a new row for a customer who has moved to a new address, retaining the history of the old address.

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TYPE 3 SCD

Adds new columns to a dimension table to track changes over time.

Adding columns for "previous address" and "current address" in a customer dimension table.

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CONFORMED DIMENSIONS

Dimensions that are shared across multiple fact tables and/or data marts.

A date dimension table used across sales, inventory, and finance data marts.

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JUNK DIMENSION

Combines low-cardinality flags and indicators into a single dimension table.

Combining boolean flags like "is_promotional" and "is_returned" into a single junk dimension table.

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ROLE-PLAYING DIMENSIONS

A single physical dimension table used in different contexts within the schema.

A date dimension table used for "order date," "ship date," and "delivery date" in a sales schema.

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FACTLESS FACT TABLE

A fact table that captures events or conditions with no associated numeric facts.

A table capturing student attendance records without any numerical measures.

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AGGREGATE FACT TABLE

A summarized fact table that improves query performance by reducing the amount of data processed.

A monthly sales summary table that aggregates daily sales data.

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BRIDGE TABLE

A table used to handle many-to-many relationships between fact and dimension tables.

A table linking customers to multiple sales regions they belong to.

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DEGENERATE DIMENSION

A dimension attribute stored in the fact table itself.

An order number stored directly in the sales fact table without a separate dimension table.

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ETL (EXTRACT, TRANSFORM, LOAD)

The process of extracting data from source systems, transforming it, and loading it into a data warehouse.

Extracting sales data from transactional databases, transforming it to match the warehouse schema, and loading it into the data warehouse.

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BUS ARCHITECTURE

A framework for organizing data marts and warehouses using conformed dimensions and facts.

Ensuring that all data marts use the same date dimension table to provide a consistent view of time across the organization.

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DATA MART

A subset of the data warehouse focused on a specific business area or department.

A sales data mart that contains sales-related data for analysis by the sales department.

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GRAIN DECLARATION

The process of defining the granularity of the fact table during design.

Deciding that the grain of the sales fact table will be at the daily transaction level.

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DIMENSIONAL HIERARCHY

A structure that organizes dimension attributes into levels of granularity.

A time hierarchy with levels for year, quarter, month, and day.

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MULTIVALUED DIMENSIONS

Dimensions where attributes can have multiple values for a single entity.

A customer dimension where a customer can have multiple phone numbers or email addresses.

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OUTRIGGER DIMENSION

A dimension table that is linked to another dimension table rather than directly to a fact table.

A product subcategory table linked to a product category table, which in turn is linked to the fact table.

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MINI-DIMENSION

A dimension table that captures rapidly changing attributes, separated from the main dimension table.

A mini-dimension for tracking changes in customer preferences separate from the main customer dimension table.

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DATA STEWARDSHIP

The management and oversight of an organization's data assets to ensure data quality and governance.

Implementing policies and procedures for data entry, validation, and maintenance to ensure accurate and reliable data in the data warehouse.

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SURROGATE KEY PIPELINE

The process of assigning surrogate keys to records as they are loaded into the data warehouse.

Generating unique integer surrogate keys for customer records during the ETL process.

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SLOWLY CHANGING MEASURE

Measures in a fact table that change over time and need to be tracked historically.

Tracking historical changes in product prices in the sales fact table.

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FACT TABLE GRAIN

The level of detail or granularity of the data stored in a fact table.

Storing sales data at the transaction level versus the daily summary level.

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SNAPSHOT FACT TABLE

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Captures the state of a process at a specific point in time.

A table capturing the month-end inventory levels for each product.

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ACCUMULATING SNAPSHOT FACT TABLE

Tracks the progress of a process over time, updating records as milestones are reached.

A table tracking the stages of an order from placement to shipment and delivery, with updates to the same record as the order progresses.

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SEMI-ADDITIVE MEASURES

Measures that can be summed across some dimensions but not others.

Bank account balances that can be summed across time but not across accounts.

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NON-ADDITIVE MEASURES

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Measures that cannot be summed across any dimension.

Ratios or percentages, such as profit margins, that cannot be summed meaningfully.

ETL STAGING AREA

A temporary storage area used during the ETL process to hold data before it is transformed and loaded.

Using a staging database to store raw sales data extracted from transactional systems before transforming and loading it into the data warehouse.

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DATA QUALITY

Ensuring the accuracy, completeness, and reliability of data in the data warehouse.

Implementing data validation checks during the ETL process to ensure accurate and consistent data.

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DATA LINEAGE

Tracking the origin and transformations of data as it moves through the data warehouse.

Maintaining metadata that documents the source systems, transformations, and loading processes for each data element in the warehouse.

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BUSINESS PROCESS

A series of activities or tasks that produce a specific outcome, often used as the basis for defining fact tables.

The order fulfillment process, which includes order placement, processing, shipment, and delivery.

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DRILL-DOWN ANALYSIS

The ability to navigate from summarized data to more detailed data.

Analyzing sales data by drilling down from monthly sales totals to daily sales transactions.

DERIVED TABLE

A table created as the result of a query, often used to simplify complex joins and calculations.

Creating a derived table to calculate the average order value for each customer segment.

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FACT TABLE AGGREGATION

The process of summarizing detailed data in a fact table to improve query performance.

Aggregating daily sales data into monthly sales summaries to speed up reporting queries.

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PERFORMANCE TUNING

Techniques used to optimize the performance of the data warehouse and its queries.

Indexing key columns in fact and dimension tables to improve query performance.

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DATA WAREHOUSE ARCHITECTURE

The overall structure and organization of the data warehouse, including schemas, ETL processes, and data storage.

Implementing a three-tier architecture with staging, integration, and presentation layers.

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DIMENSIONAL INTEGRITY

Ensuring consistency and accuracy of dimensions across the data warehouse.

Implementing referential integrity constraints to ensure dimension keys in fact tables match primary keys in dimension tables.

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LATE ARRIVING DATA

Data that arrives after the initial load of a fact table and needs to be integrated into the existing data.

Handling late arriving sales transactions that need to be added to a fact table after the end of the reporting period.

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DATA WAREHOUSE LIFECYCLE

The stages of development and maintenance of a data warehouse, from initial planning to ongoing management.

Following a lifecycle approach that includes requirements gathering, design, implementation, testing, and maintenance phases.

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OLAP (ONLINE ANALYTICAL PROCESSING)

A category of software tools that provide analysis of data stored in a database, often used in data warehousing.

Using OLAP tools to perform multidimensional analysis of sales data, such as slicing, dicing, and pivoting.

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KIMBALL METHODOLOGY

An approach to data warehousing that emphasizes the use of dimensional modeling and incremental development.

Implementing a data warehouse using the Kimball Methodology, starting with a data mart and gradually integrating additional data sources.

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CORPORATE INFORMATION FACTORY (CIF)

A framework for enterprise data warehousing that integrates data from various sources into a central repository.

Using CIF to integrate data from sales, finance, and HR systems into a centralized data warehouse for enterprise-wide reporting and analysis.

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DATA VAULT MODELING

A database modeling methodology designed to provide long-term historical storage of data from multiple systems.

Implementing a data vault model to store historical sales data from multiple transactional systems in a central repository.

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