Data Warehousing & OLAP
- A Microsoft SQL Approach
Microsoft Solution to OLAP

ERD

Relational Tables

Items → Sales → Customers → Locations

Items → Sales → Customers → Locations

Complex SQL

Diagram showing the relationships between Items, Sales, Customers, and Locations, and the transformation of ERD to relational tables using complex SQL.
Microsoft Solution to OLAP

**ERD**

- Items
- Sales
- Customers
- Locations

**Star Schema**

- Fact Table

**Cube**

- Dimensions: Items, Sales, Locations, Times

**ETL**

- Data integration process

**Dimension Table**

- Sales
- Items
- Locations
- Time

**MDX**

- Query language for multidimensional data analysis
Microsoft Solution to OLAP

- *SQL on relational tables*
- *ETL for multidimensional model*
  - *Extract, transform, load*
- *MDX on multidimensional data*
  - *MDX: Multidimensional Data eXpression*
  - *Multidimensional data: cubes*
SQL Server 2000 Data Warehouse & OLAP Components

SQL Server Data Warehousing

Meta Data Services

Data sources

Intermediate Data Stores

Warehouse Servers

Business Intelligence

- SQL Server RDBMS
- SQL Server RDBMS and DTS
- SQL Server RDBMS and Analysis Services
- Analysis Services
- Analysis Services

- Excel, English Query and Third Party
- Third Party
- Third Party
- Data Mining Services

OLEDB/XML

OLEDB/XML

OLEDB/XML
SQL Server 2000 Data Warehouse & OLAP Components

- **DTS: Data Transformation Services**
  - Extract data from data sources
  - Transform, e.g. aggregate operations,
  - Load to warehouse server

- **Analysis services:**
  - Build dimensions & cubes …
  - Stored in ROLAP, MOLAP, HOLAP,…
  - Expose data to different applications
Building Data Warehouse

OLAP using SQL Server

1. Build relational tables (in a database)
2. Build fact table
3. Build dimension tables
4. Build multidimensional model
   - Cubes
5. Analyze
   - MDX
OLTP vs OLAP

- **OLTP**
  - To process transaction data efficiently,
  - Insert, delete, update
  - ER model
    - 11 Normalized tables

- **OLAP**
  - To query & analyze data efficiently
  - Dimension model
  - Fact & dimension tables
    - Additive numeric attributes
    - 4 tables
ER Model

Orders
- ORDER_ID
- CUST_ID
- DATE
- QUAN
- PRICE_EA

Items
- ITEM_ID
- ITEM_DESC
- COLOR_ID
- SIZE_ID
- MATL_ID

Colors
- COLOR_ID
- COLOR_DESC

Materials
- MATL_ID
- MATL_DESC

Dates
- DATE
- DATE_TYP_ID

Date Types
- DATE_TYP_ID
- DATE_TYP_DESC

Customers
- CUST_ID
- CUST_DESC
- CUSTYP_ID
- STATE_ID
- POST_ID

Cust Types
- CUSTYP_ID
- CUSTYP_DESC

States
- STATE_ID
- STATE_DESC

States
- STATE_ID
- STATE_DESC

Cities
- CITY_ID
- CITY_DESC

Sizes
- SIZE_ID
- SIZE_DESC
Dimension Model

- **Customers**
  - CUST_ID
  - CUST_DESC
  - CUSTYP_ID
  - CUSTYP_DESC
  - STATE_ID
  - STATE_DESC
  - POST_ID

- **Items**
  - ITEM_ID
  - ITEM_DESC
  - COLOR_ID
  - COLOR_DESC
  - SIZE_ID
  - SIZE_DESC
  - MATL_ID
  - MATL_DESC

- **Orders**
  - ORDER_ID
  - ITEM_ID
  - CUST_ID
  - DATE
  - QUAN
  - PRICE_EA

- **Time**
  - DATE
  - DATE_TYP_ID
  - DATE_TYP_DESC
Converting ER Model to Dimension Model

1. **Select subject (e.g. Orders) according to business needs & adding numeric additive attributes**
   - QUAN & PRICE_EA

2. **Build dimension tables by combining & de-normalizing descriptive attributes of related tables**

3. **Add primary keys of dimension tables to fact table**
SQL Server 2005 BI Architecture

Integration

Process Integration & Orchestration

ERP

CRM

LOB

Source Systems

Analysis

Data Marts

Enterprise Reporting

Data Warehouse

Data Analysis (OLAP, Data Mining)

Report

Client Portal

Familiar, Powerful BI Tools

Third Party Applications

Management

Business Insights

Interactive Reports

Performance Scorecard

Integrated Enterprise BI Platform

Business Analysis

Enterprise Reporting

Performance Management
SQL Server 2005 ProClarity Analytics

資料來源
SQL Server Analysis Services
OLAP Cubes/UDM
ProClarity Analytics Server

SQL Server 2005 商業智慧平台

使用者分析工具

MONITOR

ProClarity Dashboard
ProClarity for Sharepoint Portal Server

ProClarity for Business Scorecard Manager
ProClarity for Reporting Services

ANALYZE

Web Standard
Web Professional

PUBLISH

Web Professional
Desktop Professional
SQL Server 2005

- *Microsoft product demo*
- SSIS (SQL Server Integrated Service)
- Reporting functionality
- Data mining
Homework

- Compare the Analysis Services of SQL server 2005 and 2008
- Compare the Reporting Services of SQL server 2005 and 2008