Data Modeling

I INTRODUCTION TO DATA MODELING

Data Modeling: An Overview

- Data Model Defined
- What Is a Data Model?
- Why Data Modeling?
- Who Performs Data Modeling?
- Conceptual Data Modeling
- Data Model Components
- Data Modeling Steps
- Data Model Quality
- Significance of Data Model Quality
- Data Model Characteristics
- Ensuring Data Model Quality
- Data System Development
- Data System Development Life Cycle
- Roles and Responsibilities
- Modeling the Information Requirements
- Applying Agile Modeling Principles
- Data Modeling Approaches and Trends
- Data Modeling Approaches
- Modeling for Data Warehouse

Methods, Techniques, and Symbols

- Data Modeling Approaches
- Semantic Modeling
- Relational Modeling
- Entity-Relationship Modeling
- Methods and Techniques

II DATA MODELING FUNDAMENTALS

Anatomy of a Data Model

- Data Model Composition
- Models at Different Levels
- Conceptual Model: Review Procedure
- Conceptual Model: Identifying Components
- Creation of Models
- Entity Types
- Specialization Generalization
- Relationships
- Attributes
- Identifiers
- Review of the Model Diagram
- Logical Model: Overview
- Model Components
- Transformation Steps
- Relational Model
- Physical Model: Overview
- Model Components
- Transformation Steps

Entities in Detail

- Entity Types or Object Sets
- Comprehensive Definition
- Identifying Entity Types
- Generalization and Specialization
- Why Generalize or Specialize?
- Supertypes and Subtypes
- Generalization Hierarchy
- Recursive Structures
- Conceptual and Physical
- Modeling Time Dimension
- Categorization
- Entity Validation Checklist
- Completeness
- Correctness

Attributes and Identifiers in Detail

- Attributes
- Properties or Characteristics
- Attributes as Data
- Attribute Values
- Names and Descriptions
- Attribute Domains
- Definition of a Domain
- Domain Information
- Attribute Values and Domains
- Value Set
- Range
- Type
- Null Values
- Types of Attributes
- Single-Valued and Multivalued Attributes
- Simple and Composite Attributes
- Attributes with Stored and Derived Values
- Identifiers or Keys
- Need for Identifiers
- Definitions of Keys

Relationships in Detail

- Relationships
- Associations
- Relationship: Two-Sided
- Relationship Sets
- Double Relationships
- Relationship Attributes
- Degree of Relationships
- Unary Relationship
- Binary Relationship
- Ternary Relationship
- Quaternary Relationship
- Structural Constraints
- Cardinality Constraint
- Participation Constraint

- Dependencies
- Entity Existence
- Relationship Types
- Identifying Relationship
- Nonidentifying Relationship
- Maximum and Minimum Cardinalities
- Mandatory Conditions: Both Ends
- Optional Condition: One End
- Optional Condition: Other End
- Optional Conditions: Both Ends
- Special Cases
- Gerund
- Aggregation
- Access Pathways
- Design Issues
- Relationship or Entity Type?
- Ternary Relationship or Aggregation?
- Binary or N-ary Relationship?
- One-to-One Relationships
- One-to-Many Relationships
- Circular Structures
- Redundant Relationships
- Multiple Relationships
- Relationship Validation Checklist
- Completeness
- Correctness

Data Normalization

- Informal Design
- Forming Relations from Requirements
- Potential Problems
- Update Anomaly
- Deletion Anomaly
- Addition Anomaly
- Normalization Methodology
- Strengths of the Method
- Application of the Method
- Normalization Steps
- Fundamental Normal Forms
- First Normal Form
- Second Normal Form
- Third Normal Form
- Boyce-Codd Normal Form
- Higher Normal Forms
- Fourth Normal Form
- Fifth Normal Form
- Domain-Key Normal Form
- Normalization Summary
- Review of the Steps
- Normalization as Verification

Modeling for Data warehouse

- Decision-Support Systems
- Need for Strategic Information
- History of Decision-Support Systems
- Operational Versus Informational Systems
- System Types and Modeling Methods
- Data Warehouse
- Data Warehouse Defined
- Major Components
- Data Warehousing Applications
- Modeling: Special Requirements
- Dimensional Modeling
- Dimensional Modeling Basics
- STAR Schema
- Snowflake Schema
- Families of STARS
- Transition to Logical Model
- OLAP Systems
- Features and Functions of OLAP
- Dimensional Analysis
- Hypercubes
- OLAP Implementation Approaches
- Data Modeling for OLAP
- Data Mining Systems
- Basic Concepts
- Data Mining Techniques
- Data Preparation and Modeling
- Data Preprocessing
- Data Modeling