



Data Modeling: Beginning and Advanced HDT825 Five Days

Prerequisites

Students should have experience designing databases.

Who Should Attend

This course is targeted at database designers, data modelers, database analysts, and anyone else who needs to design databases.

Course Description

This course provides students with the beginning and advanced skills necessary to design complete databases. It is based on the Graeme Simsion and Graham Witt book [Data Modeling Essentials, 3rd Edition](#) published on November 18, 2004 by Morgan Kaufmann, ISBN: 0126445516.

Course Topics

- What Is Data Modeling?
- Basics of Sound Structure
- The Entity-Relationship Approach
- Subtypes and Supertypes
- Attributes and Columns
- Primary Keys and Identity
- Extensions & Alternatives
- Organizing the Data Modeling Task
- The Business Requirements
- Conceptual Data Modeling
- Logical Database Design
- Physical Database Design
- Advanced Normalization
- Modeling Business Rules
- Time-Dependent Data
- Modeling for Data Warehouses and Data Marts
- Enterprise Data Models and Data Management



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Chapter 1 - What Is Data Modeling?

- Introduction
- A Data-Centered Perspective
- A Simple Example
- Design, Choice, and Creativity
- Why Is the Data Model Important?
- What Makes a Good Data Model?
- Performance
- Database Design Stages and Deliverables
- Where Do Data Models Fit In?
- Who Should Be Involved in Data Modeling?
- Is Data Modeling Still Relevant?
- Alternative Approaches to Data Modeling
- Terminology
- Where to from Here?—An Overview of Part 1

Chapter 2 - Basics of Sound Structure

- Introduction
- An Informal Example of Normalization
- Relational Notation
- A More Complex Example
- Determining Columns
- Repeating Groups and First Normal Form
- Second and Third Normal Forms
- Definitions and a Few Refinements
- Choice, Creativity, and Normalization
- Terminology 60

Chapter 3 - The Entity-Relationship Approach

- Introduction
- A Diagrammatic Representation
- The Top-Down Approach: Entity-Relationship Modeling
- Entity Classes
- Relationships
- Attributes
- Myths and Folklore
- Creativity and E-R Modeling



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Chapter 4 - Subtypes and Supertypes

- Introduction
- Different Levels of Generalization
- Rules Versus Stability
- Using Subtypes and Supertypes
- Subtypes and Supertypes as Entity Classes
- Diagramming Conventions
- Definitions
- Attributes of Supertypes and Subtypes
- Non-Overlapping and Exhaustive
- Overlapping Subtypes and Roles
- Hierarchy of Subtypes
- Benefits of Using Subtypes and Supertypes
- When Do We Stop Supertyping and Subtyping?
- Generalization of Relationships
- Theoretical Background

Chapter 5 - Attributes and Columns

- Introduction
- Attribute Definition
- Attribute Disaggregation: One Fact Per Attribute
- Types of Attributes
- Attribute Names
- Attribute Generalization

Chapter 6 - Primary Keys and Identity

- Basic Requirements and Trade-Offs
- Basic Technical Criteria
- Surrogate Keys
- Structured Keys
- Multiple Candidate Keys
- Guidelines for Choosing Keys
- Partially-Null Keys

Chapter 7 - Extensions & Alternatives

- Introduction
- Extensions to the Basic E-R Approach
- The Chen E-R Approach
- Using UML Object Class Diagrams



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Chapter 8 - Organizing the Data Modeling Task

- Data Modeling in the Real World
- Key Issues in Project Organization
- Roles and Responsibilities
- Partitioning Large Projects
- Maintaining the Model
- Packaging It Up

Chapter 9 - The Business Requirements

- Purpose of the Requirements Phase
- The Business Case
- Interviews and Workshops
- Riding the Trucks
- Existing Systems and Reverse Engineering
- Process Models
- Object Class Hierarchies

Chapter 10 - Conceptual Data Modeling

- Designing Real Models
- Learning from Designers in Other Disciplines
- Starting the Modeling
- Patterns and Generic Models
- Bottom-Up Modeling
- Top-Down Modeling
- When the Problem is Too Complex
- Hierarchies, Networks, and Chains
- One-to-One Relationships
- Developing Entity Class Definitions
- Handling Exceptions
- The Right Attitude
- Evaluating the Model
- Direct Review of Data Model Diagrams
- Comparison with the Process Model
- Testing the Model with Sample Data
- Prototypes
- The Assertions Approach



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Chapter 11 - Logical Database Design

- Introduction
- Overview of the Transformations Required
- Table Specification
- Basic Column Definition
- Primary Key Specification
- Foreign Key Specification
- Table and Column Names
- Logical Data Model Notations

Chapter 12 - Physical Database Design

- Introduction
- Inputs to Database Design
- Options Available to the Database Designer
- Design Decisions Which Do Not Affect Program Logic
- Crafting Queries to Run Faster
- Logical Schema Decisions
- Views

Chapter 13 - Advanced Normalization

- Introduction
- Introduction to the Higher Normal Forms
- Boyce-Codd Normal Form
- Fourth Normal Form (4NF) and Fifth Normal Form (5NF)
- Beyond 5NF: Splitting Tables Based on Candidate Keys
- Other Normalization Issues
- Advanced Normalization in Perspective

Chapter 14 - Modeling Business Rules

- Introduction
- Types of Business Rules
- Discovery and Verification of Business Rules
- Documentation of Business Rules
- Implementing Business Rules
- Rules on Recursive Relationships



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Chapter 15 - Time-Dependent Data

- The Problem
- When Do We Add the Time Dimension?
- Audit Trails and Snapshots
- Sequences and Versions
- Handling Deletions
- Archiving
- Modeling Time-Dependent Relationships
- Date Tables
- Temporal Business Rules
- Changes to the Data Structure
- Putting it into Practice

Chapter 16 - Modeling for Data Warehouses and Data Marts

- Introduction
- Characteristics of Data Warehouses and Data Marts
- Quality Criteria for Warehouse and Mart Models
- The Basic Design Principle
- Modeling for the Data Warehouse
- Modeling for the Data Mart

Chapter 17 - Enterprise Data Models and Data Management

- Introduction
- Data Management
- Classification of Existing Data
- A Target for Planning
- A Context for Specifying New Databases
- Guidance for Database Design
- Input to Business Planning
- Specification of an Enterprise Database
- Characteristics of Enterprise Data Models
- Developing an Enterprise Data Model
- Choice, Creativity, and Enterprise Data Models