

## Chapter 5

# Advanced Data Modeling

### Chapter Focus

- The first part of the chapter covers the Extended Entity Relationship Model.
  - a. the use of entity super types and subtypes is presented.
  - b. specialization hierarchy example in Figure 5.2 is used to illustrate the main constructs.
  - c. the benefits of attribute inheritance and relationship inheritance are presented.
  - d. Remember that an entity supertype and an entity subtype are related in a 1:1 relationship.
  - e. Emphasis is put on the use of the subtype discriminator and the concept of overlapping and disjoint constraints in relation to entity subtypes is presented.
  - f. The completeness constraint indicates whether all entity supertypes must have at least one subtype.
  - g. the specialization and generalization hierarchies are explored.
  - h. Finally, the use of entity clusters as an alternative method to simplify crowded data models are explained.
- The second part of the chapter covers the importance of proper primary key selection.
  - a. It starts by clearly stating the function of a PK -- identification -- and how that function differs from the descriptive nature of the other attributes in an entity. The use of PKs to uniquely identify each entity instance is emphasized.
  - b. natural keys, primary keys, and surrogate keys are presented again.
  - c. the primary key guidelines that specify the PK characteristics. PKs must be unique, non-intelligent, they do not change over time, they are ideally composed of a single attribute, they are numeric, and they are security compliant.
  - d. Finally, a contrast between the use of surrogate and composite primary keys presented. Remember, composite primary keys are useful in composite entities where each primary key combination is allowed only once in the M:N relationship.
- The third part of the chapter covers four special design cases:
  - a. Implementing 1:1 relationships.
  - b. Maintaining the history of time-variant data.
  - c. Fan traps.
  - d. Redundant relationships.

# Chapter Data Modeling

**Markus Ehrenmueller-Jensen**



## Chapter Data Modeling:

*Data Modeling with Microsoft Power BI* Markus Ehrenmueller-Jensen, 2024-06-10 Data modeling is the single most overlooked feature in Power BI Desktop yet it's what sets Power BI apart from other tools on the market This practical book serves as your fast forward button for data modeling with Power BI Analysis Services tabular and SQL databases It serves as a starting point for data modeling as well as a handy refresher Author Markus Ehrenmueller Jensen founder of Savory Data shows you the basic concepts of Power BI's semantic model with hands on examples in DAX Power Query and T SQL If you're looking to build a data warehouse layer chapters with T SQL examples will get you started You'll begin with simple steps and gradually solve more complex problems This book shows you how to Normalize and denormalize with DAX Power Query and T SQL Apply best practices for calculations flags and indicators time and date role playing dimensions and slowly changing dimensions Solve challenges such as binning budget localized models composite models and key value with DAX Power Query and T SQL Discover and tackle performance issues by applying solutions in DAX Power Query and T SQL Work with tables relations set operations normal forms dimensional modeling and ETL

**Data Modeling Fundamentals** Paulraj Ponniah, 2007-06-30 The purpose of this book is to provide a practical approach for IT professionals to acquire the necessary knowledge and expertise in data modeling to function effectively It begins with an overview of basic data modeling concepts introduces the methods and techniques provides a comprehensive case study to present the details of the data model components covers the implementation of the data model with emphasis on quality components and concludes with a presentation of a realistic approach to data modeling It clearly describes how a generic data model is created to represent truly the enterprise information requirements

**Hands-On Big Data Modeling** James Lee, Tao Wei, Suresh Kumar Mukhiya, 2018-11-30 Solve all big data problems by learning how to create efficient data models Key Features Create effective models that get the most out of big data Apply your knowledge to datasets from Twitter and weather data to learn big data Tackle different data modeling challenges with expert techniques presented in this book Book Description Modeling and managing data is a central focus of all big data projects In fact a database is considered to be effective only if you have a logical and sophisticated data model This book will help you develop practical skills in modeling your own big data projects and improve the performance of analytical queries for your specific business requirements To start with you'll get a quick introduction to big data and understand the different data modeling and data management platforms for big data Then you'll work with structured and semi structured data with the help of real life examples Once you've got to grips with the basics you'll use the SQL Developer Data Modeler to create your own data models containing different file types such as CSV XML and JSON You'll also learn to create graph data models and explore data modeling with streaming data using real world datasets By the end of this book you'll be able to design and develop efficient data models for varying data sizes easily and efficiently What you will learn Get insights into big data and discover various data models Explore conceptual logical and big

data models Understand how to model data containing different file types Run through data modeling with examples of Twitter Bitcoin IMDB and weather data modeling Create data models such as Graph Data and Vector Space Model structured and unstructured data using Python and R Who this book is for This book is great for programmers geologists biologists and every professional who deals with spatial data If you want to learn how to handle GIS GPS and remote sensing data then this book is for you Basic knowledge of R and QGIS would be helpful Expert Data Modeling with Power BI Soheil Bakhshi, 2023-04-28 Take your Power BI reports to the next level by learning various data modeling techniques and leveraging the latest features of Power BI effectively Get With Your Book PDF Copy AI Assistant and Next Gen Reader Free Key Features Get an understanding of data modeling techniques using Power BI with this up to date guide Learn how to define the relationships between data sets to extract valuable insights Explore best practices for data preparation and modeling and build optimal data models to solve a wide variety of real world business challenges Book Description This book is a comprehensive guide to understanding the ins and outs of data modeling and how to create full fledged data models using Power BI confidently In this new fully updated edition you ll learn how to connect data from multiple sources understand data define and manage relationships between data and shape data models to gain deep and detailed insights about your organization As you advance through the chapters the book will demonstrate how to prepare efficient data models in the Power Query Editor and use simpler DAX code with new data modeling features You ll explore how to use the various data modeling and navigation techniques and perform custom calculations using the modeling features with the help of real world examples Finally you ll learn how to use some new and advanced modeling features to enhance your data models to carry out a wide variety of complex tasks Additionally you ll learn valuable best practices and explore common data modeling complications and the solutions to supercharge the process of creating a data model in Power BI and build better performing data models By the end of this Power BI book you ll have gained the skills you need to structure data coming from multiple sources in different ways to create optimized data models that support high performing reports and data analytics What you will learn Implement virtual tables and time intelligence functionalities in DAX to build a powerful model Identify Dimension and Fact tables and implement them in Power Query Editor Deal with advanced data preparation scenarios while building Star Schema Discover different hierarchies and their common pitfalls Understand complex data models and how to decrease the level of model complexity with different approaches Learn advanced data modeling techniques such as calculation groups aggregations incremental refresh RLS OLS and more Get well versed with datamarts and dataflows in PowerBI Who this book is for This MS Power BI book is for BI users data analysts and analysis developers who want to become well versed with data modeling techniques to make the most of Power BI Basic working knowledge of Power BI and the Star Schema functionality are required to help you to understand the concepts covered in this book **Database Modeling Step by Step** Gavin Powell, 2020-01-06 With the aim of simplifying relational database modeling Database Modeling Step by Step

presents the standard approach to database normalization and then adds its own approach which is a more simplistic intuitive way to building relational database models Going from basics to contemporary topics the book opens with relational data modeling and ends with BigData database modeling following a road map of the evolution in relational modeling and including brief introductions to data warehousing and BigData modeling A break down of the elements of a model explains what makes up a relational data model This is followed by a comparison between standard normalization and a more simplistic intuitive approach to data modeling that a beginner can follow and understand A brief chapter explains how to use the database programming language SQL Structured Query Language which reads from and writes to a relational database SQL is fundamental to data modeling because it helps in understanding how the model is used In addition to the relational model the last three chapters cover important modern world topics including denormalization that leads into data warehouses and BigData database modeling The book explains how there is not much to logical data modeling in BigData databases because as they are often schema less which means that BigData databases do not have schemas embedded into the database itself they have no metadata and thus not much of a logical data model Online bonus chapters include a case study that covers relational data modeling and are available at the author s web site [www.oracletroubleshooter.com/datamodeling.html](http://www.oracletroubleshooter.com/datamodeling.html)

**Beginning Relational Data Modeling** Sharon Lee Allen,Evan Terry,2006-11-03 Data storage design and awareness of how data needs to be utilized within an organization is of prime importance in ensuring that company data systems work efficiently If you need to know how to capture the information needs of a business system in a relational database model but don t know where to start then this is the book for you **Beginning Relational Data Modeling** Second Edition will lead you step by step through the process of developing an effective logical data model for your relational database No previous data modeling experience is even required The authors infuse the book with concise straightforward wisdom to explain a usually complex jargon filled discipline And examples are based on their extensive experience modeling for real business systems Data Modeling Essentials Graeme C. Simsion,1994 **Data Modeling Essentials** is a

comprehensive guide to data modeling for commercial information systems Data modeling is presented as a design activity which offers opportunities for creativity and innovation **MySQL Workbench: Data Modeling & Development** Michael McLaughlin,2013-04-30 **MySQL Workbench Data Modeling and Development** helps developers learn how to effectively use this powerful product for database modeling reverse engineering and interaction with the database without writing SQL statements MySQL Workbench is a graphical user interface that developers can use to create and maintain MySQL databases without coding The book covers the interface and explains how to accomplish each step by illustrating best practices visually

*Data Modeling Essentials* Graeme C. Simsion,Graham C. Witt,2001 This essential guide focuses on data quality and why the data model is so important plus includes essential material on developing a real model and covers organization of the modeling task and managing compromises **Data Modeling Essentials** Graeme Simsion,Graham Witt,2004-12-03 Data

Modeling Essentials Third Edition covers the basics of data modeling while focusing on developing a facility in techniques rather than a simple familiarization with the rules In order to enable students to apply the basics of data modeling to real models the book addresses the realities of developing systems in real world situations by assessing the merits of a variety of possible solutions as well as using language and diagramming methods that represent industry practice This revised edition has been given significantly expanded coverage and reorganized for greater reader comprehension even as it retains its distinctive hallmarks of readability and usefulness Beginning with the basics the book provides a thorough grounding in theory before guiding the reader through the various stages of applied data modeling and database design Later chapters address advanced subjects including business rules data warehousing enterprise wide modeling and data management It includes an entirely new section discussing the development of logical and physical modeling along with new material describing a powerful technique for model verification It also provides an excellent resource for additional lectures and exercises This text is the ideal reference for data modelers data architects database designers DBAs and systems analysts as well as undergraduate and graduate level students looking for a real world perspective Thorough coverage of the fundamentals and relevant theory Recognition and support for the creative side of the process Expanded coverage of applied data modeling includes new chapters on logical and physical database design New material describing a powerful technique for model verification Unique coverage of the practical and human aspects of modeling such as working with business specialists managing change and resolving conflict

**Data Model Patterns** David C. Hay, 2013-07-18 This is the digital version of the printed book Copyright 1996 Learning the basics of a modeling technique is not the same as learning how to use and apply it To develop a data model of an organization is to gain insights into its nature that do not come easily Indeed analysts are often expected to understand subtleties of an organization s structure that may have evaded people who have worked there for years Here s help for those analysts who have learned the basics of data modeling or entity relationship modeling but who need to obtain the insights required to prepare a good model of a real business Structures common to many types of business are analyzed in areas such as accounting material requirements planning process manufacturing contracts laboratories and documents In each chapter high level data models are drawn from the following business areas The Enterprise and Its World The Things of the Enterprise Procedures and Activities Contracts Accounting The Laboratory Material Requirements Planning Process Manufacturing Documents Lower Level Conventions

Mastering Data Modeling John Carlis, 2000-11-10 Data modeling is one of the most critical phases in the database application development process but also the phase most likely to fail A master data modeler must come into any organization understand its data requirements and skillfully model the data for applications that most effectively serve organizational needs Mastering Data Modeling is a complete guide to becoming a successful data modeler Featuring a requirements driven approach this book clearly explains fundamental concepts introduces a user oriented data modeling notation and describes a rigorous step by step process for

collecting modeling and documenting the kinds of data that users need Assuming no prior knowledge Mastering Data Modeling sets forth several fundamental problems of data modeling such as reconciling the software developer s demand for rigor with the users equally valid need to speak their own sometimes vague natural language In addition it describes the good habits that help you respond to these fundamental problems With these good habits in mind the book describes the Logical Data Structure LDS notation and the process of controlled evolution by which you can create low cost user approved data models that resist premature obsolescence Also included is an encyclopedic analysis of all data shapes that you will encounter Most notably the book describes The Flow a loosely scripted process by which you and the users gradually but continuously improve an LDS until it faithfully represents the information needs Essential implementation and technology issues are also covered You will learn about such vital topics as The fundamental problems of data modeling The good habits that help a data modeler be effective and economical LDS notation which encourages these good habits How to read an LDS aloud in declarative English sentences How to write a well formed syntactically correct LDS How to get users to name the parts of an LDS with words from their own business vocabulary How to visualize data for an LDS A catalog of LDS shapes that recur throughout all data models The Flow the template for your conversations with users How to document an LDS for users data modelers and technologists How to map an LDS to a relational schema How LDS differs from other notations and why Story interludes appear throughout the book illustrating real world successes of the LDS notation and controlled evolution process Numerous exercises help you master critical skills In addition two detailed annotated sample conversations with users show you the process of controlled evolution in action

**Fundamentals of Database Systems** Ramez Elmasri, Sham Navathe, 2007 This edition combines clear explanations of database theory and design with up to date coverage of models and real systems It features excellent examples and access to Addison Wesley s database Web site that includes further teaching tutorials and many useful student resources [Data Modeling Essentials](#) Mr. Rohit Manglik, 2024-07-20 EduGorilla Publication is a trusted name in the education sector committed to empowering learners with high quality study materials and resources Specializing in competitive exams and academic support EduGorilla provides comprehensive and well structured content tailored to meet the needs of students across various streams and levels **A Complete System for Estimating the Quantities and Costs of Frame and Brick Houses** Alfred J. Donley, 1926

**Database Processing** David M. Kroenke, 2004 This book provides a solid modern foundation in the fundamentals of database processing This new edition proves to be the most comprehensive revision of the book yet with expanded and updated treatment of cutting edge technologies like XML and ADO NET Midwest **Data Modeling with Microsoft Excel** Bernard Obeng Boateng, 2023-11-30 Save time analyzing volumes of data using a structured method to extract model and create insights from your data Key Features Acquire expertise in using Excel s Data Model and Power Pivot to connect and analyze multiple sources of data Create key performance indicators for decision making using DAX and Cube functions Apply

your knowledge of Data Model to build an interactive dashboard that delivers key insights to your users Purchase of the print or Kindle book includes a free PDF eBook Book Description Microsoft Excel's BI solutions have evolved offering users more flexibility and control over analyzing data directly in Excel Features like PivotTables Data Model Power Query and Power Pivot empower Excel users to efficiently get transform model aggregate and visualize data Data Modeling with Microsoft Excel offers a practical way to demystify the use and application of these tools using real world examples and simple illustrations This book will introduce you to the world of data modeling in Excel as well as definitions and best practices in data structuring for both normalized and denormalized data The next set of chapters will take you through the useful features of Data Model and Power Pivot helping you get to grips with the types of schemas snowflake and star and create relationships within multiple tables You'll also understand how to create powerful and flexible measures using DAX and Cube functions By the end of this book you'll be able to apply the acquired knowledge in real world scenarios and build an interactive dashboard that will help you make important decisions What you will learn Implement the concept of data modeling within and beyond Excel Get transform model aggregate and visualize data with Power Query Understand best practices for data structuring in MS Excel Build powerful measures using DAX from the Data Model Generate flexible calculations using Cube functions Design engaging dashboards for your users Who this book is for This book is for Excel users looking for hands on and effective methods to manage and analyze large volumes of data within Microsoft Excel using Power Pivot Whether you're new or already familiar with Excel's data analytics tools this book will give you further insights on how you can apply Power Pivot Data Model DAX measures and Cube functions to save time on routine data management tasks An understanding of Excel's features like tables PivotTable and some basic aggregating functions will be helpful but not necessary to make the most of this book

**Systems Analysis and Design** Alan Dennis, Barbara Haley Wixom, 2000 Wanted Intelligent Motivated Individuals for High Paying Systems Analyst and Design Positions This practical no nonsense textbook provides you with the rich foundation you need to enter the exciting field of systems analysis and design and helps you gain the core skills that will ensure a successful and rewarding career Each chapter in the text describes one part of the SAD process provides clear explanations on how to do it gives a detailed example and then includes exercises that allow you to practice what you've learned The focus is on the specific tasks that analysts need to accomplish over the course of a project and the deliverables that will be produced from the tasks As you complete the book tasks are checked off and deliverables completed and filed in a Project Binder Along the way you are reminded of your progress using roadmaps that indicate where the current task fits into the larger context of SAD The result is that you come to understand how to use this process in a real situation and acquire key skills that you'll use throughout your career Other Features of the Text A running case integrated throughout gives you the chance to apply each new skill they learn Object oriented techniques currently used in practice are introduced Stories feedback and advice from a diverse group of IS professionals and consultants provide real world insight



Topics are presented in the order in which an analyst encounters them in a typical project Each chapter has several mini cases that give an example of a real life situation to illustrate key concepts in action

**Handbook of Research on Innovations in Database Technologies and Applications** Viviana E. Ferragagine,Jorge H. Doorn,Laura C.

Rivero,2009-01-01 This book provides a wide compendium of references to topics in the field of the databases systems and applications Provided by publisher **Data Management** Richard T. Watson,1999 Using organisational memory as a motivating feature this book teaches the critical value of data to an organisation and how to manage it effectively The text concentrates on how databases are used and designed as well as other management technologies

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