eLearningCurve

Data Modeling

Fundamentals

Dave Wells

Module 0: About the Course (2 min)

Module 1: Introductions to Data Modeling (37 min)

- What is Data Modeling?
  - What is a Model?
  - What is a Data Model?
  - What is Data Modeling?
  - What is Data Modeling? – Database Design
  - What is Data Modeling? – Understand existing Data
- Why Data Modeling is Needed?
  - Mapping Data and Real World Things
  - Data Modeling as a Design Process
  - Data Models as a Learning Process
  - Data Modeling & Data Standards
  - Data Modeling & Implementation
  - Data Modeling Use Cases
- Levels of data Modeling
  - Levels of Data Model Abstraction
  - Contextual Data Model
  - Conceptual Data Model
  - Logical Data Model
  - Logical Data Model
  - Physical Data Model
  - Technical Specification
- Kinds of Data Models
  - Relational & Multi-Dimensional Data Modeling
  - Graph Modeling
  - Document Modeling
- Module Summary

Module 2: Entity-Relationship Modeling (59 min)

- Entity-Relationship Modeling Basis
  - What is an E-R Model?
  - What is an E-R Model? – Example
  - Entities
  - Entity Representation
  - Relationships
  - Relationship Cardinality
  - Cardinality as Business Rules
  - Attributes
  - Exercise: Reading an Entity-Relationship Model
  - Exercise Solution: Reading an Entity-Relationship Model

- Conceptual Modeling
  - The Primary Entities
  - The Major Relationships
  - The Essential Attributes
- Logical Modeling
  - The Entities
  - The Relationships
  - The Attributes
  - The Attributes – A Discovery Process
  - Normalization
  - Normalization – 1st Normal Form: Remove Repeating Groups
  - Normalization – 1st Normal Form: Remove Non-Key Dependency
  - Normalization – 2nd Normal Form: Remove Partial-Key Dependency
  - Normalization – 3rd Normal Form: Remove Transient Attribute Dependency
  - Normalization Step-by-Step
  - Abstraction – Abstracting Attributes
  - Abstraction – Abstracting Entities Part 1
  - Abstraction – Abstracting Entities Part 2
  - Abstraction – State Transition: A complementary Model
  - Data Naming
- Physical Modeling
  - From Logical to Physical
  - From Entity Types to Tables
  - Resolve Many-to-Many Relationships
  - Model Foreign Key Relationships
  - Columns & Data Element Names
  - Data Types
  - Column Constraints
  - SQL Data Types & Constraints
- Module Summary

Module 3: Multi-Dimensional Data Modeling (51 min)

- Multi-Dimensional Modeling Basics
  - What is Multi-Dimensional Data?
  - Conceptual Model Components
  - Logical Model Components
  - Relational with Additional Constraints
  - Physical Model Components (Star Schema)
- Conceptual Modeling
  - Business Questions
  - Measurement Subjects
  - Measurement Categories
  - Subject-to-Category Mapping
  - Subject & Category Refinement – Checking the Attributes
  - Subject & Category Refinement – Similar Subjects?

- o Subject & Category Refinement – Category Conflicts?
  - o The Conceptual Model
  - o Evolving Conceptual Model
- Logical Modeling
  - o Scope of the Logical Model
  - o The Meter
  - o The Measures
  - o The Dimensions
  - o Dimension Hierarchy
  - o Dimension Attributes
  - o Granularity
- Physical Modeling
  - o From Logical Model to Star Schema
  - o Dimension Tables
  - o Dimension Table Keys
  - o The fact Table
  - o The Fact Table Key
- Dimension Design Techniques
  - o Junk Dimensions
  - o Degenerate Dimensions
  - o Slowly changing Dimensions
  - o Slowly changing Dimensions – Type 1
  - o Slowly changing Dimensions – Type 2
  - o Slowly changing Dimensions – Type 3
- Module Summary

Module 4: NoSQL Data Modeling (69 min)

- NoSQL Modeling Basics
  - o The Essence of Every Data Model
  - o Common NoSQL Data Stores
  - o Why Model NoSQL Data?
  - o Modeling NoSQL Data – Why, What, How?
  - o Schema-on-Read vs. Schema-on-Write
- Key-Value Data Modeling
  - o Key-Value Data Store Concepts
  - o Finding Things
  - o Modeling Things
  - o Modeling Identities
  - o Modeling Properties
  - o Modeling Associations
  - o Key-Value Modeling Process
- Document Store Data Modeling
  - o Document Store Concepts
  - o Document Example
  - o Document Structure
  - o Conceptual Modeling – Things: Document Collection

- o Conceptual Modeling – Things: Sub-Document
- o Conceptual Modeling – Associations: Hierarchy
- o Document Conceptual Model
- o From Conceptual to Logical Model
- o Modeling Identities
- o Modeling Properties
- o Document Modeling Process
- Graph Data Modeling
  - o Graph Concepts
  - o Two Kinds of Graphs
  - o Graphs as Triplets
  - o Graph Data Concepts
  - o Graphing Modeling vs. E-R Modeling
  - o Modeling Things
  - o Modeling Identities
  - o Modeling Associations
  - o Modeling Properties of Things
  - o Modeling Properties of Associations
  - o Graph Modeling Process
- Module Summary

Module 5: Semantic Data Modeling (64 min)

- Semantic Modeling Basics
  - o The Roles of Semantics in Data Management
  - o Data Semantics Defined
  - o Semantics and Data Interoperability
  - o Semantics and Data Integration
  - o Ontology and Taxonomy
  - o Ontology, Taxonomy, and Graphs
  - o Graph Terminology
  - o Semantic Data Modeling Process
  - o Terminology Analysis
  - o Semantic Modeling Results
- Modeling Ontology
  - o Scope of Modeling
  - o Project Scope
  - o Inputs to Modeling
  - o Entity Analysis
  - o Relationship Analysis
  - o Definitions and Annotations
  - o Definitions and Annotations – Nodes
  - o Definitions and Annotations – Edges
  - o Definitions and Annotations Lead to Learning New Things
  - o Ontology as a Knowledge Graph
  - o Properties Analysis
  - o More Definitions and Annotations

- o Ontology as a Property Graph
- Modeling Taxonomies
  - o Extending Ontology with Taxonomy
  - o Taxonomy – Where and Why?
  - o Entity Taxonomy – Classification of Things
  - o Entity Taxonomy – Subclasses and Properties Analysis
  - o Entity Taxonomy – More Properties Analysis
  - o Entity Taxonomy – Subclasses and Relationships Analysis
  - o Properties Taxonomy – Classifying Attribute Values
  - o Putting the Pieces Together
- The Enterprise Semantic Model
  - o Managed Scope & Iterative Modeling
  - o You Have a Semantic Model - What Next?
  - o Applied Data Semantics: APIs, Data Services, and Data Products
- Module Summary