Prerequisites
Students should have some experience with relational databases, data warehouses, and star schemas.

Who Should Attend
This course is targeted at business power users, analysts, and software developers, data modelers, data base analysts, and any other technical or business person who needs to understand how to design, build, and use OLAP cubes for use with multidimensional information systems.

Course Description

Course Topics
- Chapter 1: The Functional Requirements of OLAP Systems
- Chapter 2: The Limitations of Spreadsheets and SQL
- Chapter 3: Thinking Clearly in N Dimensions
- Chapter 4: Introduction to the LC Model
- Chapter 5: The Internal Structure of a Dimension
- Chapter 6: Hypercubes or Semantic Spaces
- Chapter 7: Multidimensional Formulas
- Chapter 8: Links
- Chapter 9: Analytic Visualization
- Chapter 10: Physical Design of Applications
- Chapter 11: Practical Steps for Designing and Implementing OLAP Models
- Chapter 12: Introduction to the Foodcakes Application Example
- Chapter 13: Purchasing and Currency Exchange
- Chapter 14: Materials Inventory Analysis
- Chapter 15: FCI’s Sales and Marketing
- Chapter 16: FCI’s Activity-Based Management
- Chapter 17: A Computational Example
- Chapter 18: Multidimensional Guidelines
- Chapter 19: Product Language Comparisons
- Chapter 20: DSS Fusion
Chapter 1: The Functional Requirements of OLAP Systems
   The Different Meanings of OLAP
   Where OLAP Is Useful
   The Distinction between Transaction and Decision Support Processing
   The Functional Requirements for OLAP
      User Challenges
      The Goal-Challenge Matrix
      Core Logical Requirements
      Core Physical Requirements

Chapter 2: The Limitations of Spreadsheets and SQL
   The Evolution of OLAP Functionality in Spreadsheets and SQL Databases
   Proving the Point: Some Examples

Chapter 3: Thinking Clearly in N Dimensions
   Lower-Dimensional Data Sets
   Beyond 3 Dimensions
   Multidimensional Type Structures (MTSs)
   Representing Hypercubes on a Computer Screen
   Analytical Views

Chapter 4: Introduction to the LC Model
   Disarray in the OLAP Space
      Terms Frequently Used to Refer to the Same Thing
      Open Issues
      Critique of Implicit Issue-Specific Approaches to OLAP Modeling
   Attributes of an Ideal Model
      Theoretic Groundedness
      Completeness
      Efficiency
      Analytical Awareness
   Overview of the Located Content (LC) Model
      A Functional Approach
      Super Symmetry
      Type Structures
      Schemas and Models
Chapter 5: The Internal Structure of a Dimension

Nonhierarchical Structuring
  Method of Definition
  Cardinality
  Ordering
  Metrics

Dimensional Hierarchies
  Overview
  Hierarchies in General
  Ragged Hierarchies

Referencing Syntax

Leveled or Symmetric Hierarchies

Leveled Dimensions with Nominally Ordered Instances

Leveled Dimensions with Ordinally Ordered Instances

Leveled Dimensions with Cardinaly Ordered Instances: Time and Space

Constant Scaling Factors

Multiple Hierarchies per Type

Pseudolevels
  Ordering
  Dummy Members

Mixed Hierarchies

Chapter 6: Hypercubes or Semantic Spaces

Meaning and Sparsity
  Types of Sparsity
  Defining Application Ranges

Meaning and Comparability
  When a New Dimension Needs a New Cube
  A Single Domain Schema
  Multidomain Schemas
  Not Applicable Versus Nonvarying
  Joining Cubes with Nonconformant Dimensions

Chapter 7: Multidimensional Formulas

Formulas in a Multidimensional Context
  Formula Hierarchies or Dependency Trees
  Cell- and Axis-Based Formulas
  Precedences

Multidimensional Formulas
  Anatomy of a Multidimensional Aggregation Formula
  Formula Types
  Formula Complexities
Chapter 8: Links
Types of Links
Structure Tables and Links
Data Tables and Content Links
  Row-Member Links
  Column-Member Links
  Cell Links
  Table-Member Links
Preaggregation

Chapter 9: Analytic Visualization
What Is Data Visualization?
The Semantics of Visualization
  Graphic Versus Tabular-Numeric Representation
  Picking the Appropriate Visualization Forms
Using Data Visualization for Decision Making
  Business Pattern Analysis
Visualizing Multidimensional Business Data
  Subsetting
  Repeating or Tiled Patterns
Examples of More Complex Data Visualization Metaphors
  Product Sales Analysis
  Credit Car Application Analysis
  Web Site Traffic Analysis

Chapter 10: Physical Design of Applications
Data Distribution
  Within Machines
  Within an Application
  Across Machines
  Across Applications (ROLAP and HOLAP)
  Across Partitions
Calculation Distributions
  Temporal
  Across Applications and Utilities
Common Configurations
  Departmental: Relational Data Mart with a Multidimensional Client
  Departmental: Multidimensional Server and Client
  Enterprise: Relational Warehouse, Multidimensional Midtier Server, and Multidimensional Client
  Enterprise: Relational Warehouse, Multidimensional Midtier Server, Web Server, and Multidimensional Thin Client
Chapter 11: Practical Steps for Designing and Implementing OLAP Models

User Requirements
- Understand the Current Situation
- Useful Questions to Ask
- Questions about the Actual Situation
- Questions about the Problems
- Information about Constraints
- Requirements Documentation

Solution Design
- Logical Model Definition
- Cubes and Dimensions
- Links
- Dimension Hierarchies
- Dimension Members
- The Decision Context
- Formulas
- Deciding When and Where to Compute

More Complex Aggregations and Analysis
- Nonleaf Input Data
- Nominal Versus Ordinal Versus Carinal Analysis
- Sparsity
- Auditing

Chapter 12: Introduction to the Foodcakes Application Example

Preface to the Second Edition
Introduction to the Foodcakes International Application

Chapter 13: Purchasing and Currency Exchange

Background Issues
- Data Sources

Purchases Cube
- Locator Dimensions
- Input Contents
- Basic Derivations

Exchange Rate Cube
- The Dimensions

Combined Purchasing and Exchange Rates
Chapter 14: Materials Inventory Analysis
The Inventory Throughput Cube
- Data Sources
- Dimensions
- Input Contents
- Viewing Basic Aggregations
- More Analytical Derivations
- Systematic Age Tracking
- Auditing
- Derived Variables
- Costing
  - Site by Time-Level Costing

Chapter 15: FCI’s Sales and Marketing
- Cube Dimensions
- Cube Input Variables
  - Number of Packages Sold: Qty_Sold (pkg)
  - Return to Qty_Sold (pkg)
  - List Price per Package ($/pkg)
- Analyzing Sales
- Marketing
- Value States

Chapter 16: FCI’s Activity-Based Management
- Jane’s Presentation
- The Approach
- Business Process and Asset Dimensions
- Calculating Total Cost of Goods Sold
  - Tracking Batch Ids at the Point of Sale
- Calculating Total Costs
  - Introduction
  - The Enterprise Asset Utilization and Cost Cube
- Legal Issues: A Reader Exercise
Chapter 17: A Computational Example

How to Work through the Exercise

FCI Dimension Definitions

Global Business Rules

FCI Schemas

Business Process Schemas
  - Sales and Marketing
  - Transportation from Product Inventory to Stores
  - Product Inventory
  - Transportation from Production to Product Inventory
  - Production
  - Materials Inventory
  - Materials Shipping
  - Currency Exchange
  - Purchasing

Cube Views
  - Sales and Marketing
  - Transportation from Product Inventory to Stores
  - Product Inventory
  - Transportation from Production to Product Inventory
  - Production
  - Materials Inventory
  - Materials Shipping
  - Currency Exchange
  - Purchasing

Costs Summary

FCI Cost-Revenue Analysis Calculation Steps by Schema
  - Sales and Marketing
  - Transportation from Product Inventory to Stores
  - Product Inventory
  - Transportation from Production to Product Inventory
  - Production
  - Materials Inventory
  - Materials Shipping
  - Currency Exchange
  - Purchasing
Chapter 18: Multidimensional Guidelines

Outline
Core Logical Features
  Structure
  Operations
  Representations
Noncore Logical
  Knowledge-Domain
  Process-Oriented Domains
Physical Features
  Storage and Access
  Computations
  Multitier Distribution
  Optimizations and Efficiencies
  Platform Issues
  Multiuser Security

Chapter 19: Product Language Comparisons

Kickoff Example
Sample Schemata
Referencing Examples
  Referencing a Specific Member
  Referencing a Parent Member
  Referencing a Set of Children
  Previous and Next Members (Lag and Lead)
  Referring to Ancestors
  Descendants
Treatment of Missing and Inapplicable Cells (Instances)
Handling Calculation Precedence
Basic Formulas
Application Ranges in Joined Cubes
Chapter 20: DSS Fusion

Overview of a Unified Architecture
The Decision Function Dimension
The Media Dimension
Internal and External Representation Dimensions
Source versus Derived Expressions
The DEER Cycle
Levels of Abstraction Dimension
Data versus Knowledge Dimension
Concluding Remarks on a Unified Decision Support Framework

Smaller, Multifunction Tasks
Integrating OLAP and Data Mining or Statistics
Business-Driven Analytical Segmentation
MD Visualization
MD Arrays for Test Retrieval
MD Arrays for Data Mining

A Single More Fully Integrated Example