
Object Storage Fact Book 5.0 Worksheets

Object-Relational Mapping

Joshua Duhl and Douglas K. Barry

Barry & Associates, Inc.

Unauthorized reproduction in any form, including photocopying, faxing, image scanning and storage in an information retrieval system is against the law without prior written permission of the copyright owner.

Copyright © 2001 Barry & Associates, Inc. All rights reserved.

Preface

This latest release of the *Object Storage Fact Book* has been expanded to provide more complete coverage of the products in the industry. Release 5.0 includes two volumes: *Object DBMSs*, and *Object-Relational Mapping*. This is the *Object-Relational Mapping* volume.

This volume has a number of sections, each of which includes an introduction explaining what is covered in that section. References to one of the standard textbooks in the field, *The Object Database Handbook*, by Douglas K. Barry, are included. This makes it easier to get an in-depth explanation of the concepts in each of the sections for those readers who need that information.

The tables are organized to correlate to *The Object Database Handbook* so that the user can easily read this book and obtain an in-depth understanding of the concepts of object technology.

Contents

Introduction	1
About Barry & Associates, Inc.	2
Using the <i>Object Storage Fact Book</i>	5
General Architecture	2
Client/Server Architecture	3
Platforms Supported.....	4
Networks Supported.....	5
Cache Location	6
Client Cache Implementation	7
Application Server Cache Implementation.....	8
Unit of Transfer between Database and Application Memory	9
Object Access.....	10
Lookahead/Prefetch	11
Lookahead/Prefetch Controls.....	12
Memory Utilization.....	13
Capacity and Scalability	14
Memory Footprint.....	15
Licensing, Metering, and Open Source.....	16
ODMG Compliance	17
Java Data Objects (JDO) Compliance	18
SQL-92 DDL and DML Compliance	19
SQL-92 Integrity and Query Expression Compliance	20
SQL:1999 DDL and DML Compliance.....	21
SQL:1999 Integrity and Query Expression Compliance	22
CORBA/XA Support	23
Java Support.....	24
Java Certification	25
Microsoft Support	26

Objects, Attributes, and Relationships	27
Objects or User-Defined Types	28
Types and Classes	29
Binding and Polymorphism	30
Inheritance and Delegation	31
Logical and Physical View	32
Persistence with Programming Languages	33
Object Identifiers	34
Object Identifier to Reference Conversion	35
Attributes and Relationships	36
Literal Attributes	37
Multimedia Attributes	38
Multimedia Data Manipulation	39
Collections and Aggregates	40
Composite or Complex Objects	41
Object Clustering	42
Integrity Constraints	43
Integrity Constraint Use	44
Instance Operations Extensibility	45
Class or Type Operations Extensibility	46
Procedures and Programming Language	47
Encapsulation	48
Method or Function Implementation	49
Method or Function Linking and Typing	50
Method or Function Execution Location	51
Object Language Integration	52
Application Server-Based Method or Function Language	53
Client-Based Database Method or Function Language	54
Class or Type Libraries	55
Object Language Class or Type Reuse by Inheritance	56
Object Language Class or Type Reuse by Changing Definition	57
Object Language Class or Type Reuse without Changing Definition	58
Object Language Class or Type Reuse using Processor	59
Object Language Class or Type Generation	60
Application Language Preprocessors	61
Procedural Languages	62
Higher-Level Language	63
Languages for Simultaneous Access	64

Languages for Simultaneous Method or Function Execution.....	65
Language Reference Safety	66
Language Type Safety	67
Code Management	68
Queries and Query Language.....	69
Query Language.....	70
Query Language Invocation.....	71
Query Language Invocation from Programming Language	72
Client-Side Programming Language Invocation	73
Application Server-Side Programming Language Invocation.....	74
Query Implementation	75
Data Updates and Queries.....	76
Query Processing Location.....	77
Query Scope.....	78
Client-Side Query Language Text Search	79
Application Server-Side Query Language Text Search.....	80
Query Optimization	81
Indexing	82
Access Methods	83
Concurrency and Recovery	84
Standard Concurrency Control	85
Advanced Concurrency Control	86
Custom Concurrency Control	87
Deadlocks.....	88
Instance Lock Modes	89
Class or Type Lock Modes	90
Lock Granularity.....	91
Reference Lock Granularity.....	92
Lock Setting, Releasing and Promotion.....	93
Change Notification or Triggers	94
Change Notification or Trigger Types Built-in	95
Change Notification or Trigger Execution Location	96
Change Notification or Trigger Implementation	97
Application Server-Based Change Notification or Trigger Language	98
Client-Based Database Change Notification or Trigger Language	99
Alerters or Named Events.....	100

Transaction Capability	101
Atomicity	102
Consistency	103
Isolation.....	104
Durability	105
Transaction Characteristics.....	106
Long Transactions.....	107
Shared Transactions	108
Multi-Threaded Transactions.....	109
Nested Short Transactions	110
Mapping Objects to External DBMSs.....	111
Mapping Direction: Database Table or Object Language Class or Type Generation	112
Mapping Generation	113
C++ Map Generation Processing.....	114
C# Map Generation Processing	115
Java Map Generation Processing.....	116
Perl Map Generation Processing.....	117
Python Map Generation Processing.....	118
Visual Basic Map Generation Processing.....	119
Smalltalk Map Generation Processing.....	120
SQL Generation and Support.....	121
Object Identifier Mapping.....	122
Literal Attribute Mappings	123
Multimedia Attribute Mappings	124
Table to Class Mappings.....	125
Class to Table Mappings.....	126
Collection to Table Mappings.....	127
Table to Collection Mappings.....	128
External DBMS Schema to Object Model Mapping Management	129
Schema Update Time.....	130
Schema Change Method	131
Multiple Mappings to a Schema	132
Multiple Schema	133
Versions of Schema	134
External DBMS Schema Change Isolation.....	135
External DBMS Schema Change Synchronization.....	136

Changes to Attributes or Data Members.....	137
Add a new attribute or data member to an existing class or type	137
Drop an existing attribute or data member from an existing class or type	138
Change the name of an attribute or data member of an existing class or type	139
Change the domain of an attribute or data member of an existing class or type	140
Change the default value of an existing attribute or data member	141
Add a shared value attribute or static member to an existing class	142
Change a shared value attribute or static member of existing class	143
Drop a shared value of an attribute or static member from an existing class	144
Changes to Database Methods or Functions.....	145
Add a new method or function to an existing class or type	145
Drop an existing method or function from an existing class or type	146
Change the name of a method or function for an existing class or type.....	147
Change the code of a method or function for an existing class or type	148
Change the inheritance of a method or function in an existing class or type	149
Changes to the Superclass/Subclass Supertype/Subtype Relationship.....	150
Add a new superclass or supertype to an existing class or type	150
Remove a superclass or supertype from another class or type	151
Change the order of the superclasses or supertypes of an existing class or type.....	152
Add a new class or type	153
Drop an existing class or type.....	154
Change the name of a class or type or an external DBMS table.....	155
Create a new class or type as a generalized superclass/supertype of existing classes/types	156
Partition a class or type into new classes or types	157
Coalesce existing classes or types into one new class or type	158
Changes to the Database Schema	159
Adding a table used by the application	159
Dropping a table used by the application.....	160
Adding a column used by the application.....	161
Dropping a column used by the application	162
External DBMS Schema Integration	163
External DBMS Schema Integration Conflict Resolution	164
Mapping Error Handling.....	165
Data Migration.....	166
External DBMS Location Independence	167

External DBMS Data Manipulation.....	168
Data Synchronization: Refresh Options.....	169
Refresh: Invocation Points.....	170
DBMS Simultaneously Open.....	171
External DBMS Queries.....	172
External DBMS Joins.....	173
External DBMS Updates.....	174
Querying Data in Multiple Databases.....	175
External DBMS Distributed Query Processing.....	176
External DBMS Distributed Transaction Management.....	177
External DBMS Concurrency Control.....	178
External DBMS Locking.....	179
External DBMS Two-Phase Commit Optimization.....	180
External DBMS Updates with Two-Phase Commit.....	181
External DBMS Security Implementation.....	182
External DBMS Product Support.....	183
_____ DBMS Access.....	184
_____ DBMS Access.....	185
_____ DBMS Access.....	186
_____ DBMS Access.....	187
_____ DBMS Access.....	188
_____ DBMS Access.....	189
_____ DBMS Access.....	190
_____ DBMS Access.....	191
_____ DBMS Access.....	192
_____ DBMS Access.....	193
_____ DBMS Access.....	194
_____ DBMS Access.....	195
External DBMS Release Support.....	196
External DBMS Access Method.....	197
Security Authorization.....	198
Security Granularity.....	199
United States DOD Certified Security Compliance.....	200
Security Implementation.....	201
Encoding of Schema and Method or Function Definitions.....	202
Private or Personal Database/Workspace Authorization.....	203
User or Role Authorization.....	204

Implicit Authorization.....	205
Positive and Negative Authorization	206
Strong and Weak Authorization.....	207
Day and Time Authorization	208
Web Capabilities	209
Storage of Web-Related Data	210
Server Pages.....	211
XML Capabilities.....	212
Web Load Balancing.....	213
Web Dispatcher Fail-Over Strategy.....	214
Application Server Support.....	215
Application Server Support.....	216
Application Server Support.....	217
Application Server Support.....	218
Application Server Support.....	219
Application Server Support.....	220
Application Server Support.....	221
Application Server Support.....	222
Application Server Support.....	223
Application Server Support.....	224
Application Server Support.....	225
Application Server Support.....	226
Application Server Support.....	227
Tools	228
Schema Browsing/Editing Tools	229
Data Browsing/Editing Tools	230
Query Tools	231
Report Writer	232
Multimedia Tools.....	233
DBA Tools	234
DBA Alerts	235
DBA Notification Method	236
Statistics	237
Tuning.....	238
CASE Tool Integration	239

Internationalization.....	240
Internationalization of Interactive Tools.....	241
Internationalization of Batch Tools	242
Internationalization of Error Messages.....	243
Internationalization of Object Names and Strings	244
References	245
Index	247

Introduction

The *Object Storage Fact Book* is the most comprehensive comparison of features for object storage. Aimed at development, production and maintenance concerns, the *Object Storage Fact Book* contains a superset of possible features for products that store objects. It provides data to sort through the complexities of the products so that feature strengths are matched to application needs; this is essential for making an informed product selection. The *Object Storage Fact Book* also accelerates the product selection process because the arduous and time-consuming task of gathering product data is completed for you.

About Barry & Associates, Inc.

The *Object Storage Fact Book* is published by Barry & Associates, Inc. The mission of Barry & Associates is to provide facts on object DBMS, object-relational mapping, and XML data server products. We do this through consulting, publishing and education. Founded by Doug Barry in 1992, the firm is particularly focused on strategic decision making about these kinds of products.

Facts about the Market and Industry

Barry & Associates is deeply familiar with products that store objects. Using the facts in this book and our breadth of experiences with applications requiring object storage, we help our clients with an unbiased perspective. Over the last eight years, Barry & Associates has worked with many clients who had many different applications. Over that time period, our clients have chosen a wide variety of products.

When you use Barry & Associates consulting services, you're getting an unbiased point of view. We have no "preferred" products and no financial stake in any of the companies. That means the focus will be on your application needs.

According to Doug Barry, "People often ask me which is the best product for storing objects. The answer is that it depends on your application needs. All of the products have strengths and weaknesses. The challenge is to help you find the product that has the strengths you need and the weaknesses that won't matter." This is accomplished with facts. Barry & Associates helps

clients determine the critical features needed for their application. This is then matched, in an iterative process, to products that have those features in their product.

Mentoring

It can be hard to get started in an application that uses a DBMS for storing objects. In situations like this, Barry & Associates can provide people to work as a mentor to the group. They can provide direction and information to such a group, giving them pointers to get started and assisting them along the way. Our goal is to help a group get started on their project and help them become specialists quickly. This arrangement can be short or long term.

Providing Answers

Sometimes people just need a chance to get unbiased answers about the many questions they have about this new technology. It may be that they are at the early stages of considering products or maybe they are not sure how to start.

In situations like these, Barry & Associates offers half to full day roundtable discussions for small groups. The purpose is to provide facts and information in response to specific questions. The structure of these sessions includes a short introductory outline of the basics concepts of products that store objects to create a common baseline for communication. The remaining time is an open question and answer session.

Product Selection

Through a two-day selection program, Barry & Associates has helped many organizations choose a product or narrow the universe of products down to a manageable list of two or three candidate products.

Barry & Associates has found that its selection model makes it possible to focus on key issues. We use our product and industry background with this selection model to focus your efforts on matching your application needs to product features instead of researching the products and the industry.

On the first day, the group will be guided through an analysis of application database needs and an initial determination of critical success factors is made. During the second day, the critical success factors are verified, an assessment of which products match the application needs is completed and a determination of any extraordinary requirements that require follow-up with vendors is made.

At the end of the second day, you'll have a strong grasp of your application database needs and the products that could meet those needs.

Implementation Stories

How exactly are these new products being used? Are companies using them in real, mission-critical applications? Are there limitations to the situations

Barry & Associates, Inc.

13504 4th Avenue South
Burnsville, MN 55337
USA

voice: +1-952-892-6113
fax: +1-952-892-5966
email: doug@barrilandassociates.com
web: <http://www.barrilandassociates.com>

in which they can be used? As in the introduction to any new technology, there are plenty of myths about products and lots of concern about jumping into the object or object-relational mapping world.

Using an implementation model, Barry & Associates has formally interviewed developers to learn about their experiences. Barry & Associates combines the interview data with its experiences to provide you with a balanced view of how these products are being used.

More Information

More information on the services that we offer can be obtained by contacting us at the address below or by checking our web page.

Using the *Object Storage Fact Book*

You can use the *Object Storage Fact Book* in many ways. Here is a standard process for using the book to select a product. A more complete selection model can be found in Chapter 7 of *The Object Database Handbook*. This model was originally developed for object DBMSs, but works equally well for object-relational mapping products. A summary of the model can also be found at <http://www.object-relational.com/select.html>.

1. Determine Critical Application Needs

It is important to first determine your application needs. Although this may appear easy on the surface, once you dig into the detail of the features found in this book you may find that your specific needs may be different than you originally anticipated.

2. Feature Understanding

The *Object Storage Fact Book* also can be used to provide background on possible product features that you may have not considered. It is important to have a full understanding of the possible features available before you determine features critical to your application needs.

3. Determine Your Critical Features

Once you have an understanding of application feature needs, you can use the *Object Storage Fact Book* to determine products that you should investigate further. One way to do this is to determine the features that products must have for consideration; these are your critical features.

4. Product Selection

Though the feature comparisons here are quite complete, it is important to discuss your application with vendor representatives before making a product selection. This will ensure that any product concerns that you have are properly covered.