
Object Storage Fact Book 5.0 Worksheets

Object DBMSs

Douglas K. Barry and Joshua Duhl

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 DBMSs* 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>	2
General Architecture	2
Client/Server Architecture	3
Platforms Supported.....	4
Small Footprint Platforms Supported	5
Networks Supported.....	6
Cache Location	7
Client/Application Cache Implementation	8
Server Cache Implementation.....	9
Unit of Transfer between Database and Application Memory	11
Object Access.....	12
Lookahead/Prefetch	13
Lookahead/Prefetch Controls.....	14
Memory Utilization.....	15
Storage Implementation	16
Partitioning.....	17
Defragmentation and Compaction	18
Continuous Operation	19
Capacity and Scalability	20
Memory Footprint.....	21
Licensing, Metering, and Open Source.....	22
ODMG Compliance	23
Java Data Objects (JDO) Compliance	24
Java Data Mappings, Wrapper Classes	25
Java Data Mappings, Primitives	26
SQL-92 DDL and DML Compliance	27

SQL-92 Integrity and Query Expression Compliance	28
SQL:1999 DDL and DML Compliance.....	29
SQL:1999 Integrity and Query Expression Compliance	30
CORBA/XA Support	31
Java Support.....	32
Java Certification	33
Microsoft Support	34
Objects, Attributes, and Relationships	35
Objects or User-Defined Types	36
Persistence with Programming Languages	37
Object Identifiers	38
Object Identifier to Reference Conversion	39
Attributes and Relationships	40
Literal Attributes	41
Multimedia Attributes	42
Multimedia Data Manipulation.....	43
Collections and Aggregates	44
Composite or Complex Objects	45
Object Clustering	46
Integrity Constraints.....	47
Integrity Constraint Use.....	48
Instance Operations Extensibility	49
Class or Type Operations Extensibility	50
Plug-Ins.....	51
Categories of Plug-Ins.....	52
Plug-Ins and Queries.....	53
Plug-Ins and Backup	54
Plug-Ins and Recovery	55
Plug-Ins and Transactions.....	56
Plug-Ins and Replication.....	57
Procedures and Programming Language	58
Types and Classes	59
Binding and Polymorphism	60
Inheritance and Delegation	61
Logical and Physical View	62
Encapsulation	63
Method or Function Implementation	64

Method or Function Linking and Typing.....	65
Method or Function Execution Location	66
Object Language Integration.....	67
Server-Based Method or Function Language	68
Client-Based Database Method or Function Language	69
Class or Type Libraries.....	70
Object Language Class or Type Reuse by Inheritance	71
Object Language Class or Type Reuse by Changing Definition	72
Object Language Class or Type Reuse without Changing Definition.....	73
Object Language Class or Type Reuse using Processor.....	74
Object Language Class or Type Generation	75
Application Language Preprocessors.....	76
Procedural Languages.....	77
Higher-Level Language	78
Languages for Simultaneous Access	79
Languages for Simultaneous Method or Function Execution.....	80
Language Reference Safety	81
Language Type Safety	82
Code Management	83
Data Schema and Schema Evolution	84
Schema Update Time.....	85
Schema Change Method	86
Changes to Attributes or Data Members.....	87
Add a new attribute or data member to an existing class or type	87
Drop an existing attribute or data member from an existing class or type	88
Change the name of an attribute or data member of an existing class or type	89
Change the domain of an attribute or data member of an existing class or type	90
Change the default value of an existing attribute or data member	91
Add a shared value attribute or static member to an existing class	92
Change a shared value attribute or static member of existing class	93
Drop a shared value of an attribute or static member from an existing class	94
Changes to Database Methods or Functions.....	95
Add a new method or function to an existing class or type	95
Drop an existing method or function from an existing class or type	96
Change the name of a method or function for an existing class or type.....	97
Change the code of a method or function for an existing class or type	98
Change the inheritance of a method or function in an existing class or type	99

Changes to the Superclass/Subclass Supertype/Subtype Relationship.....	100
Add a new superclass or supertype to an existing class or type	100
Remove a superclass or supertype from another class or type	101
Change the order of the superclasses or supertypes of an existing class or type.....	102
Add a new class or type	103
Drop an existing class or type.....	104
Change the name of a class or type.....	105
Create a new class or type as a generalized superclass/supertype of existing classes/types	106
Partition a class or type into new classes or types	107
Coalesce existing classes or types into one new class or type.....	108
Multiple Schema	109
Versions of Schema	110
Queries and Query Language	111
Query Language.....	112
Query Language Invocation.....	113
Query Language Invocation from Programming Language	114
Client-Side Programming Language Invocation	115
Server-Side Programming Language Invocation.....	116
Query Implementation	117
Data Updates and Queries.....	118
Query Processing Location.....	119
Query Scope.....	120
Client-Side Query Language Text Search	121
Server-Side Query Language Text Search.....	122
Query Optimization	123
Indexing	124
Access Methods	125
Concurrency and Recovery	126
Standard Concurrency Control	127
Advanced Concurrency Control	128
Custom Concurrency Control	129
Deadlocks.....	130
Instance Lock Modes	131
Class or Type Lock Modes	132
Lock Granularity.....	133
Reference Lock Granularity.....	134
Lock Setting, Releasing and Promotion.....	135

Change Notification or Triggers	136
Change Notification or Trigger Types Built-in	137
Change Notification or Trigger Execution Location	138
Change Notification or Trigger Implementation	139
Server-Based Change Notification or Trigger Language	140
Client-Based Database Change Notification or Trigger Language	141
Alerters or Named Events	142
Checkin/Checkout of Objects	143
Audit Trail.....	144
Replication Independence.....	145
Replication Type.....	146
Replication Granularity.....	147
Unit of Transfer for Replication	148
Replication Conflict Unit.....	149
Replication Conflict Resolution.....	150
Replication Conflict API.....	151
Replication Guarantees	152
Database Fail-Over Strategy	153
Disk Media Protection	154
Backup Facilities.....	155
Transaction Capability	156
Atomicity	157
Consistency	158
Isolation.....	159
Durability	160
Transaction Characteristics.....	161
Long Transactions.....	162
Shared Transactions	163
Multi-Threaded Transactions.....	164
Nested Short Transactions	165
Version Capability.....	166
Version Implementation.....	167
Version Binding	168
Version Configurations.....	170
Version Configuration Streams.....	172
Version Granularity	173
Version Merging.....	174

Version Extensibility	175
Version Queries	176
Distributed and Multi-Database Systems.....	177
Location Independence	178
Local Autonomy at Each Site	179
No Reliance on a Central Site.....	180
Fragmentation Independence	181
Detachable Databases	182
Detachable Database Synchronization.....	183
Private Workspaces or Databases	184
Private Objects in Shared Workspace or Database.....	185
Distributed Query Processing	186
Distributed Transaction Management.....	187
Two-Phase Commit Optimization	188
Server or Peer Hardware Heterogeneity	189
Network Heterogeneity.....	190
Wide Area Network Support	191
Security Authorization	192
Security Granularity.....	193
United States DOD Certified Security Compliance.....	194
Security Implementation.....	195
Encoding of Schema and Method or Function Definitions	196
Private or Personal Database/Workspace Authorization	197
User or Role Authorization.....	198
Implicit Authorization.....	199
Positive and Negative Authorization	200
Strong and Weak Authorization.....	201
Day and Time Authorization	202
Web Capabilities	203
Storage of Web-Related Data	204
HTML Processing.....	205
HTML Characteristics	206
HTML Interface	207
Server Pages.....	208
XML Capabilities.....	209
Web Sessions	210
Web Load Balancing.....	211

Web Dispatcher Fail-Over Strategy.....	212
Personalization.....	213
Application Server Support.....	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
Tools.....	224
Schema Browsing/Editing Tools.....	225
Data Browsing/Editing Tools.....	226
Query Tools.....	227
Version Browsing/Editing Tools.....	228
Screen Development Tools.....	229
Report Writer.....	230
Multimedia Tools.....	231
DBA Tools.....	232
DBA Alerts.....	233
DBA Notification Method.....	234
Statistics.....	235
Tuning.....	236
CASE Tool Integration.....	237
4GL.....	238
Internationalization.....	239
Internationalization of Interactive Tools.....	240
Internationalization of Batch Tools.....	241
Internationalization of Error Messages.....	242
Internationalization of Object Names and Strings.....	243
Mapping Objects to External DBMSs.....	244
Mapping Direction: Database Table or Object Language Class or Type Generation.....	245
Mapping Generation.....	246
C++ Map Generation Processing.....	247
C# Map Generation Processing.....	248

Java Map Generation Processing	249
Perl Map Generation Processing.....	250
Python Map Generation Processing.....	251
Visual Basic Map Generation Processing.....	252
Smalltalk Map Generation Processing.....	253
SQL Generation and Support.....	254
Object Identifier Mapping.....	255
Literal Attribute Mappings	256
Multimedia Attribute Mappings	257
Table to Class Mappings.....	258
Class to Table Mappings.....	259
Collection to Table Mappings.....	260
Table to Collection Mappings.....	261
External DBMS Schema to Object Model Mapping Management	262
Schema Update Time.....	263
Schema Change Method	264
Multiple Mappings to a Schema	265
Multiple Schema	266
Versions of Schema	267
External DBMS Schema Change Isolation.....	268
External DBMS Schema Change Synchronization.....	269
Changes to Attributes or Data Members.....	270
Add a new attribute or data member to an existing class or type	270
Drop an existing attribute or data member from an existing class or type	271
Change the name of an attribute or data member of an existing class or type	272
Change the domain of an attribute or data member of an existing class or type	273
Change the default value of an existing attribute or data member	274
Add a shared value attribute or static member to an existing class	275
Change a shared value attribute or static member of existing class	276
Drop a shared value of an attribute or static member from an existing class	277
Changes to Database Methods or Functions.....	278
Add a new method or function to an existing class or type.....	278
Drop an existing method or function from an existing class or type.....	279
Change the name of a method or function for an existing class or type.....	280
Change the code of a method or function for an existing class or type.....	281
Change the inheritance of a method or function in an existing class or type	282

Changes to the Superclass/Subclass Supertype/Subtype Relationship.....	283
Add a new superclass or supertype to an existing class or type	283
Remove a superclass or supertype from another class or type	284
Change the order of the superclasses or supertypes of an existing class or type.....	285
Add a new class or type	286
Drop an existing class or type.....	287
Change the name of a class or type or an external DBMS table.....	288
Create a new class or type as a generalized superclass/supertype of existing classes/types	289
Partition a class or type into new classes or types	290
Coalesce existing classes or types into one new class or type.....	291
Changes to the Database Schema	292
Adding a table used by the application.....	292
Dropping a table used by the application.....	293
Adding a column used by the application.....	294
Dropping a column used by the application	295
External DBMS Schema Integration	296
External DBMS Schema Integration Conflict Resolution	297
Mapping Error Handling.....	298
Data Migration	299
External DBMS Location Independence	300
External DBMS Data Manipulation.....	301
Data Synchronization: Refresh Options.....	302
Refresh: Invocation Points.....	303
DBMS Simultaneously Open.....	304
External DBMS Queries	305
External DBMS Joins	306
External DBMS Updates.....	307
Querying Data in Multiple Databases.....	308
External DBMS Distributed Query Processing	309
External DBMS Distributed Transaction Management.....	310
External DBMS Concurrency Control.....	311
External DBMS Locking	312
External DBMS Two-Phase Commit Optimization	313
External DBMS Updates with Two-Phase Commit	314
External DBMS Security Implementation	315

External DBMS Product Support.....	316
_____ DBMS Access.....	317
_____ DBMS Access.....	318
_____ DBMS Access.....	319
_____ DBMS Access.....	320
_____ DBMS Access.....	321
_____ DBMS Access.....	322
_____ DBMS Access.....	323
_____ DBMS Access.....	324
_____ DBMS Access.....	325
External DBMS Access Method.....	326
References	327
Index	329

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 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, www.barryandassociates.com.

Barry & Associates, Inc.

13504 4th Avenue South
Burnsville, MN 55337
USA

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

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.odbmsfacts.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.