

Table Of Contents

SECTION I: INTRODUCTION

1. PERSISTENCE AND OBJECT/RELATIONAL MAPPING	1
WHAT IS PERSISTENCE	2
PERSISTENCE IN JAVA	2
Object Persistence.....	2
Why Object Oriented Models	3
Why Relational Database.....	3
OBJECT/RELATIONAL MAPPING.....	4
The Impedance Mismatch.....	4
How To Map One To The Other.....	5
The Solution To The Impedance Mismatch.....	5
Why Object Relational Mapping	7
Better System Architecture	7
Reduce Coding Time	7
Caching And Transactions.....	7
Hibernate As The ORM Of Choice	8
A Quick Overview	8
2. INTRODUCTION TO HIBERNATE.....	11
WHAT IS HIBERNATE.....	12
WHY HIBERNATE	13
HIBERNATE, DATABASE AND THE APPLICATION	14
COMPONENTS OF HIBERNATE	15
Connection Management	15
Transaction Management.....	15
Object Relational Mapping.....	16
ARCHITECTURE OF HIBERNATE.....	16
Configuration Object	16
Session Factory	17
Session	17
Transaction	17
Query	17
Criteria	18
HOW HIBERNATE WORKS	18

SECTION II: GETTING STARTED

3. WRITING THE FIRST APPLICATION.....	19
APPLICATION REQUIREMENT SPECIFICATIONS.....	20
Where Does Hibernate Fit	21

SOFTWARE REQUIREMENTS	23
Downloading Hibernate	23
Library Files.....	23
THE APPLICATION DEVELOPMENT APPROACH.....	24
CREATING DATABASE AND TABLES IN MySQL	25
CREATING A WEB APPLICATION	26
ADDING THE REQUIRED LIBRARY FILES.....	28
Hibernate Library Files	29
JDBC Driver For MySQL.....	32
CREATING A JavaBean CLASS	33
Guestbook.java [Code Spec].....	35
CREATING HIBERNATE CONFIGURATION FILE	38
CREATING HIBERNATE MAPPING FILE	42
ADDING A MAPPING RESOURCE.....	47
CREATING JSPs.....	48
GuestBookEntry.jsp [Code Spec]	51
GuestBookView.jsp [Code Spec].....	53
Imports	56
Variable Declaration	57
Application Logic	57
Creating A Configuration Instance And Building A Session Factory.....	57
Obtaining A Session Object.....	58
Instantiating A Transaction.....	58
Instantiating The JavaBean class [POJO]	58
Persisting Data	58
Retrieving Data	59
Displaying Retrieved Data	60
EDITING THE WEB.XML FILE	61
RUNNING THE GUESTBOOK APPLICATION.....	61
4. USING HIBERNATE TOOLS/PLUGINS WITH NETBEANS.....	67
BUILDING THE GUESTBOOK APPLICATION.....	68
Preparing The Database	68
Creating The GuestBook Database	68
Creating The GuestBook Table.....	69
Creating A Web Application.....	69
Creating A Database Connection	70
The Hibernate Configuration File	73
The Hibernate And MySQL Library Files	74
Generating POJOs And Mapping Documents [Reverse Engineering].....	75
The Mapping Document [Guestbook.hbm.xml]	80
The Modified Hibernate Configuration File [hibernate.cfg.xml].....	80
The POJO [Guestbook.java]	81
Adding Web Pages [JSP].....	82
GuestBookEntry.jsp [Code Spec]	85

GuestBookView.jsp [Code Spec]	86
Editing web.xml.....	89
Running The Web Application	90
THE HQL EDITOR	90
CODE COMPLETION	92
The Hibernate Configuration File	93
The Hibernate Mapping Document.....	94
HIBERNATE ANNOTATIONS SUPPORT	94
RE-FACTORING SUPPORT	97

SECTION III: UNDERSTANDING CONFIGURATION AND MAPPING

5. CONFIGURING HIBERNATE	101
KINDS OF CONFIGURATIONS.....	101
Configuring Using The hibernate.cfg.xml File	102
Configuring Using The hibernate.properties File	104
Configuring Programmatically	105
Creating An Instance Of Configuration	105
Specifying The Mapping Documents And The Associated POJOs	106
Adding Mapping Documents	106
Adding The POJO Class	106
Setting The Properties.....	106
Obtaining A SessionFactory	107
UNDERSTANDING THE CONFIGURATION PROPERTIES	107
Configuration Properties.....	107
Connection Properties	108
JDBC Properties	109
JNDI Properties	110
Cache Properties	110
Transaction Properties	111
Miscellaneous Properties	111
DIALECTS	113
GUEST BOOK APPLICATION	114
Using An XML Based Configuration File.....	114
Configuration Using A Properties File	118
Programmatic Configuration	121
6. GETTING STARTED WITH MAPPING.....	123
HIBERNATE TERMINOLOGY.....	126
Entities	126
Values	127
Components	128

MAPPING DOCUMENT	129
Elements Of Mapping Document.....	130
DOCTYPE	130
<hibernate-mapping> Element.....	130
The schema Attribute	130
The catalog Attribute	131
The default-cascade Attribute	131
The default-access Attribute	131
The default-lazy Attribute	132
The auto-import Attribute	132
The package Attribute.....	132
<class> Element.....	133
The name Attribute	134
The table Attribute	134
The rowid Attribute.....	134
The discriminator-value Attribute.....	134
The node Attribute	134
The mutable Attribute	135
The schema Attribute	135
The catalog Attribute	135
The proxy Attribute.....	135
The dynamic-update Attribute	136
The check Attribute.....	136
The dynamic-insert Attribute	136
The batch-size Attribute.....	137
The select-before-update Attribute	137
The polymorphism Attribute.....	137
The lazy Attribute	137
The where Attribute	138
The persister Attribute	138
The optimistic-lock Attribute.....	138
The entity-name Attribute.....	138
The subselect Attribute	138
The abstract Attribute.....	138
<property> Element	138
The name Attribute	140
The column Attribute	140
The type Attribute	140
The update Attribute	141
The insert Attribute.....	141
The formula Attribute	142
The access Attribute.....	143
The lazy Attribute	143
The unique Attribute	143
The not-null Attribute	144

The optimistic-lock Attribute.....	144
The index Attribute.....	144
The node Attribute.....	144
The length Attribute.....	144
The precision Attribute.....	144
The scale Attribute.....	144
The unique-key Attribute.....	145
<component> Element.....	145
The name Attribute.....	145
The class Attribute.....	145
The update Attribute.....	145
The insert Attribute.....	145
The access Attribute.....	146
The lazy Attribute.....	146
The unique Attribute.....	146
The optimistic-lock Attribute.....	146
The node Attribute.....	146
<discriminator> Element.....	146
The column Attribute.....	149
The type Attribute.....	149
The force Attribute.....	149
The insert Attribute.....	150
The formula Attribute.....	150
7. THE DATABASE IDENTITY.....	151
<id> ELEMENT.....	151
The name Attribute.....	153
The type Attribute.....	153
The column Attribute.....	153
The unsaved-value Attribute.....	154
The access Attribute.....	154
The node Attribute.....	154
The length Attribute.....	154
<generator> ELEMENT.....	154
The increment Class.....	155
The identity Class.....	156
The sequence Class.....	156
The hilo Class.....	157
The seqhilo Class.....	157
The uuid Class.....	158
The guid Class.....	158
The native Class.....	158
The assigned Class.....	159
The select Class.....	159
The foreign Class.....	159

The sequence-identity Class.....	159
The SequenceStyleGenerator Class	160
sequence_name	160
initial_value	160
increment_size	160
force_table_use	160
value_column.....	161
optimizer	161
none.....	161
hilo	161
pooled.....	161
The TableGenerator Class.....	161
table_name	162
value_column_name	162
segment_column_name.....	162
segment_value.....	162
segment_value_length.....	162
initial_value	162
increment_size	162
optimizer	163
<composite-id> ELEMENT.....	163
The name Attribute	165
The class Attribute	165
The unsaved-value Attribute.....	165
The mapped Attribute	165
The access Attribute.....	165
8. ASSOCIATIONS	167
KIND OF RELATIONSHIPS	167
ONE-TO-ONE	168
ONE-TO-MANY / MANY-TO-ONE.....	169
MANY-TO-MANY	170
<one-to-one> ELEMENT - RELATIONSHIP MAPPING	172
The name Attribute	172
The class Attribute	172
The cascade Attribute	172
The check Attribute.....	173
The constrained Attribute.....	173
The fetch Attribute.....	173
The embed-xml Attribute.....	173
The foreign-key Attribute	173
The property-ref Attribute.....	173
The access Attribute.....	174
The lazy Attribute	174
The formula Attribute	174

The entity-name Attribute.....	174
The node Attribute	174
The outer-join Attribute	174
<many-to-one> ELEMENT - RELATIONSHIP MAPPING	176
The name Attribute	176
The column Attribute.....	177
The class Attribute	177
The cascade Attribute	177
The index Attribute.....	177
The fetch Attribute.....	177
The update Attribute	177
The insert Attribute.....	177
The embed-xml Attribute.....	178
The property-ref Attribute.....	178
The access Attribute.....	178
The unique Attribute.....	179
The not-null Attribute	179
The optimistic-lock Attribute.....	179
The lazy Attribute	179
The entity-name Attribute.....	179
The formula Attribute	180
The foreign-key Attribute	180
The node Attribute.....	180
The not-found Attribute.....	180
The outer-join Attribute.....	180
The unique-key Attribute.....	180
<many-to-many> ELEMENT - RELATIONSHIP MAPPING	182
The column Attribute.....	182
The class Attribute	182
The fetch Attribute.....	182
The embed-xml Attribute.....	183
The property-ref Attribute.....	183
The unique Attribute.....	183
The lazy Attribute	183
The entity-name Attribute.....	183
The formula Attribute	183
The foreign-key Attribute	184
The node Attribute.....	184
The not-found Attribute.....	184
The outer-join Attribute.....	184
The where Attribute.....	184
The order-by Attribute.....	184
9. COLLECTIONS	187
<set> ELEMENT	188
<bag> ELEMENT.....	190

<list> ELEMENT.....	192
<map> ELEMENT.....	194
ATTRIBUTES OF THE COLLECTION ELEMENTS	196
The name Attribute	196
The schema Attribute.....	196
The catalog Attribute	196
The cascade Attribute	197
The check Attribute.....	197
The table Attribute	197
The where Attribute	197
The embed-xml Attribute.....	197
The batch-size Attribute.....	197
The collection-type Attribute	198
The access Attribute.....	198
The fetch Attribute	198
The sort Attribute	198
The lazy Attribute	198
The mutable Attribute	198
The node Attribute	199
The optimistic-lock Attribute.....	199
The persister Attribute	199
The outer-join Attribute	199
The subselect Attribute	199
The inverse Attribute	200
The order-by Attribute	200
<key> ELEMENT.....	200
The column Attribute	200
The on-delete Attribute	200
The property-ref Attribute.....	201
The not-null Attribute	201
The update Attribute	201
The unique Attribute	201
AUTHOR DETAILS USING ASSOCIATIONS [MAPPING DOCUMENTS]	202
CREATING DATABASE AND TABLES IN MySQL	204
CREATING A WEB APPLICATION	205
CREATING A JavaBean CLASS	205
Contactdetails [Contactdetails.java].....	205
Books [Books.java].....	207
Authors [Authors.java].....	209
CREATING HIBERNATE MAPPING FILE	212
Contactdetails [Contactdetails.hbm.xml]	212
Books [Books.hbm.xml]	213
Authors [Authors.hbm.xml].....	214
CREATING HIBERNATE CONFIGURATION FILE	216

CREATING JSPs.....	216
Entry.jsp [Code Spec]	216
View.jsp [Code Spec]	222
Variable Declaration	227
Application Logic	228
Creating A Configuration Instance And Building A Session Factory	228
Obtaining A Session Object.....	228
Instantiating A Transaction.....	228
Querying The Authors Class For View.....	228
Saving Captured Data	229
Retrieving And Setting Author Details	229
Retrieving And Setting Contact Details.....	229
Retrieving And Setting Book Details.....	229
Persisting Retrieved Data.....	230
Deleting Data	230
Displaying Retrieved Data.....	230
EDITING THE WEB.XML FILE.....	231
10. CONCURRENCY CONTROL USING VERSIONING	233
<version> ELEMENT.....	233
How Versioning Takes Place.....	234
The column Attribute.....	235
The name Attribute	235
The type Attribute.....	235
The access Attribute.....	235
The unsaved-value Attribute.....	236
The generated Attribute	236
The insert Attribute.....	236
<timestamp> ELEMENT.....	237
The column Attribute.....	237
The name Attribute	238
The access Attribute.....	238
The source Attribute	238
The unsaved-value Attribute.....	239
The generated Attribute	239
11. ANNOTATIONS.....	241
WHY ANNOTATIONS	242
Disadvantages Of Using Annotations	242
Java 5 Is A Compulsion	242
Migration Issues.....	242
Changes Require Rebuilding The Application	243
What To Use When.....	243
CONFIGURING HIBERNATE ANNOTATIONS	246
Downloading Hibernate Annotations.....	246

Adding Hibernate Annotations Library Files.....	246
Adding Library Files Using NetBeans IDE	246
Creating An Instance Of Annotation Configuration	247
Mapping The JavaBean Class Location.....	248
Hibernate Configuration File	248
AnnotationConfiguration Object.....	248
Obtaining A SessionFactory	248
EJB 3 ANNOTATIONS.....	249
@Entity	249
@Table.....	251
Unique Constraints.....	251
@Id	253
Field Access.....	253
Property Access	253
@GeneratedValue.....	254
@SequenceGenerator.....	255
@TableGenerator.....	256
@Column	258
@Version	259
@IdClass, @Embedded, @Embeddable And @EmbeddedId.....	260
Component Property As @Id And Component class @Embeddable	261
Component Property As @EmbeddedId.....	263
Class As @IdClass And Property @Id	265
@OneToOne.....	267
@ManyToOne	270
@ManyToMany.....	274
GUEST BOOK APPLICATION.....	276
AUTHOR DETAILS USING ASSOCIATIONS [ANNOTATIONS]	282
Contactdetails [Contactdetails.java].....	283
Books [Books.java].....	285
Authors [Authors.java].....	287
Hibernate Configuration File [hibernate.cfg.xml].....	290
View.jsp	291

SECTION IV: WORKING WITH HIBERNATE

12. SESSION.....	293
KIND OF OBJECTS	295
Transient Object.....	295
Persistent Object	296
Detached Object.....	296
CORE METHODS OF SESSION	296
Persisting Objects Using Save	296
Persisting Objects Using SaveOrUpdate.....	298

Retrieving Objects Using Load.....	299
Retrieving Objects Using Get	300
Refreshing Objects Using Refresh.....	301
Updating Objects	301
The update() Method	302
Deleting Persistent Objects.....	303
13. TRANSACTIONS.....	305
TRANSACTIONS IN GENERAL.....	305
TRANSACTIONS IN HIBERNATE.....	306
Transaction Interface Implementations.....	306
TRANSACTION INTERFACE METHODS.....	307
begin().....	307
setTimeout(int seconds).....	309
14. IMPLEMENTING CONNECTION POOLING.....	311
HOW DOES CONNECTION POOLING WORK.....	312
HIBERNATE'S CONNECTION POOLING SYSTEM - C3P0.....	313
CONNECTION POOLING IN GUESTBOOK	313
CONNECTION POOLING USING JNDI.....	314
 SECTION V: THE HIBERNATE QUERY LANGUAGE	
15. THE BASICS OF HIBERNATE QUERY LANGUAGE [HQL]	323
WHY HIBERNATE QUERY LANGUAGE	324
THE ELEMENTS OF HQL	326
Clauses.....	326
The FROM Clause	326
Assigning Alias.....	327
Multiple Objects	327
The SELECT Clause.....	328
SQL Aggregate Functions.....	328
The DISTINCT Keyword	328
Encapsulating Results In Collections.....	329
Custom Type.....	329
The WHERE Clause	330
Multiple Conditions	331
Using BETWEEN And LIKE Operators	331
Comparing NULL Values.....	331
Using IN Operator	331
Using Unique Identifier	331
Using Composite Unique Identifiers.....	332
The ORDER BY Clause	332

The GROUP BY Clause	333
The HAVING Clause.....	334
Sub-Queries	334
Invoking SQL Functions.....	335
The HQL UPDATE	336
The HQL DELETE.....	337
The HQL INSERT	337
16. JOINS IN HQL	339
IMPLICIT AND EXPLICIT JOINS.....	341
TYPES OF JOINS.....	343
INNER JOIN.....	343
LEFT OUTER JOIN.....	344
RIGHT OUTER JOIN	344
FULL JOIN.....	345
FETCHING ASSOCIATIONS	345
17. THE QUERY INTERFACE	347
IMPORTING QUERY INTERFACE	348
FORMING AN HQL QUERY	348
CREATING A NEW INSTANCE OF QUERY INTERFACE	349
EXECUTING QUERIES	349
The list() method.....	349
The uniqueResult() method.....	350
The iterate() method.....	350
BINDING QUERY PARAMETERS	351
JDBC Style Positional Parameter.....	352
Named List Parameters	353
COMMENTING THE SQL	354
18. THE CRITERIA API	357
CORE CLASSES OF CRITERIA	358
Criteria Class.....	358
Criterion Class	359
Restrictions Class.....	359
Projection Class	360
Order Class	360
CREATING AN INSTANCE OF CRITERIA	361
PROJECTIONS	361
Aggregation	363
Joins	364
RESTRICTIONS	365
Disjunction.....	368
Conjunction.....	368
ORDER.....	369

RESTRICTIONS ON ASSOCIATIONS	370
USING AN ALIAS	371
QUERY BY EXAMPLE [QBE]	372
THE GUESTBOOK APPLICATION.....	374
The Criteria API	374
The Query By Example API.....	375
19. PAGINATION	383
METHODS OF PAGINATION.....	385
The setFirstResult() Method	385
The setMaxResults() Method.....	385
BUILDING WEB APPLICATION WITH PAGINATION SUPPORT	386
Running The GuestBook Application.....	392
20. NAMED QUERIES	397
DEFINING THE QUERY IN THE MAPPING DOCUMENT	398
Using The <query> Element.....	398
Using The <sql-query> Element.....	399
INVOKING THE QUERY IN THE APPLICATION CODE SPEC	400
GUESTBOOK USING NAMED QUERIES	401
NAMED QUERIES USING ANNOTATIONS	402
21. NATIVE SQL QUERIES.....	405
SCALAR QUERIES.....	406
ENTITY QUERIES	408
JOIN QUERIES	410
ALIASES AND PROPERTY	411
22. FILTERS	413
HOW FILTERS WORK	414
DEFINING FILTERS	414
FILTER INTERFACE.....	416
The getFilterDefinition() Method	416
The getName() Method.....	416
The setParameter() Method.....	416
The setParameterList() Method	417
The validate() Method	417
ENABLING OR DISABLING FILTERS	417
IMPLEMENTING FILTERS IN GUESTBOOK.....	418
Defining And Attaching Filter	418
Enabling Filter	421

SECTION VI: APPLICATION DEVELOPMENT WITH HIBERNATE

23. CUSTOMER DATABASE USING JSP.....	425
DATABASE TABLES	426
Entity Relationship Diagram.....	426
Table Specifications.....	427
CITY	427
STATE	427
COUNTRY	427
CUSTOMER.....	427
EMAIL.....	428
DATA ENTRY FORM	428
BUILDING THE APPLICATION USING NETBEANS	430
Creating Web Application	430
Adding The Library Files To The Project.....	433
Downloading The Required Library Files	433
Hibernate.....	433
MySQL JDBC Driver	434
Display Tag.....	434
iText	434
Common Library Files Required By The Display Tag	434
A Dedicated Library Directory	435
Copying Library Files To The Dedicated Directory	435
The Hibernate Configuration	437
The Hibernate Utility Class [com.development.utils].....	437
The Base Hibernate DAO Interface [com.development.utils]	441
The Base Hibernate DAO [com.development.utils]	441
Obtaining Session Object.....	442
Managing Transactions	443
POJOs, Mapping Documents And DAOs.....	444
City [com.development.hibernate.city].....	445
POJO	445
Mapping Document.....	446
DAO	447
State [com.development.hibernate.city].....	448
POJO	448
Mapping Document.....	450
DAO	451
Country [com.development.hibernate.city].....	453
POJO	453
Mapping Document.....	454
DAO	455
Creating POJO And Mapping Documents Automatically	457
Customer [com.development.hibernate.customer].....	460
POJO	460

Mapping Document	463
DAO.....	464
Email [com.development.hibernate.customer]	467
POJO.....	467
Mapping Document	468
DAO.....	469
Creating POJO And Mapping Documents Automatically	470
Cascade All.....	471
Servlets	472
GetStateList [com.development.servlet].....	472
GetCityList [com.development.servlet].....	474
JSP	476
Customer.jsp [jsp/customer]	476
footer.jsp [jsp/].....	484
JavaScript.....	484
Customer.js [javaScript\customer]	484
jquery2 [javaScript\ajax].....	486
CSS	487
Images.....	487
Index Page	488
Display Tag Properties.....	488
Editing web.xml.....	488
RUNNING THE APPLICATION	490
Edit.....	492
Delete.....	492
Export	492
24. USING JAVA PERSISTENCE API WITH HIBERNATE.....	493
WHAT IS JPA	494
Why JPA.....	495
JPA's Requirements	495
THE CUSTOMER DATABASE APPLICATION	496
EntityManager And Transaction Instances [BaseDAO.java].....	497
Removing The HibernateUtil Helper Class	499
Instance Methods In DAO Classes	500
CityDAO.java [com.development.hibernate.city]	500
CountryDAO.java [com.development.hibernate.city]	501
StateDAO.java [com.development.hibernate.city]	502
CustomerDAO.java [com.development.hibernate.customer]	503
EmailDAO.java [com.development.hibernate.customer]	505
Adding Persistence Unit [persistence.xml]	505
Modifying Hibernate Configuration File [hibernate.cfg.xml].....	507
Adding The Hibernate EntityManager Library Files	508
Downloading The Required Library Files	508
Hibernate EntityManager.....	508
Copying Library Files To The Dedicated Directory	508

25. CUSTOMER DATABASE USING STRUTS²	509
DATABASE TABLES	510
Entity Relationship Diagram.....	510
BUILDING THE APPLICATION.....	511
Creating Web Application	511
Adding The Library Files To The Project.....	513
Downloading The Required Library Files	514
Struts 2	514
A Dedicated Library Directory	514
Copying Library Files To The Dedicated Directory	514
The Hibernate Configuration	516
The Hibernate Utility Class [com.development.utils].....	516
The Base Hibernate DAO Interface [com.development.utils]	516
The Base Hibernate DAO [com.development.utils]	516
The Development Support [com.development.utils]	517
POJOs, Mapping Documents And DAOs.....	518
Action Classes.....	519
AjaxAction	519
CustomerIndexAction	522
CustomerAction	524
JSP	530
Customer.jsp [jsp/customer]	530
footer.jsp [jsp/].....	535
ajax.jsp [jsp/ajax]	536
JavaScript.....	536
customer [javaScript\customer].....	536
jquery2 [javaScript\ajax].....	538
CSS	538
Images.....	539
Index Page.....	539
Display Tag Properties.....	540
Struts ² XML Configuration Files	541
Editing web.xml.....	544
RUNNING THE APPLICATION.....	545
PROCESS FLOW	546
26. SWITCHING THE DATABASE [MYSQL TO ORACLE].....	551
INSTALLING ORACLE DATABASE 10g	552
CREATING USER / SCHEMA WITH APPROPRIATE PRIVILEGES	552
CREATING IDENTICAL TABLE STRUCTURE.....	556
Country	556
State	556
City	556
Customers	556

City 557
 Importing Oracle Dump File..... 557
 ADDING ORACLE'S JDBC DRIVER [ojdbc14.jar] 563
 MODIFYING HIBERNATE'S CONFIGURATION FILE [hibernate.cfg.xml] 565
 MODIFYING HIBERNATE'S MAPPING DOCUMENTS 566

SECTION VII: APENDIX

A. INSTALLING THE NETBEANS IDE..... 569
 WHAT IS NETBEANS?..... 569
 The NetBeans Development Platform 570
 INSTALLATION OF NETBEANS IDE 570
 Installing Java Development Kit..... 570
 Download NetBeans 571
 Kinds Of Installers 571
 Java SE..... 571
 Java 572
 Ruby..... 572
 C/C++ 572
 PHP 572
 All 572
 Installation Of NetBeans IDE On Windows 573

