



Table of Contents

Introduction	xvii
Chapter 1: Java EE 5: An Overview.....	1
Evolution of Java	2
Starting with Java	3
Enterprise Architecture Types	5
Single-Tier Architecture	5
2-Tier Architecture	6
3-Tier Architecture	7
The n-Tier Architecture	8
Goals of Enterprise Applications.....	9
Features of Java EE 5.....	11
Exploring the Java EE 5 Platform	13
The Runtime Infrastructure	13
Java EE 5 APIs.....	13
Architecture of Java EE 5	16
Describing Java EE Containers	17
Container Types	17
Java EE 5 Container Architecture	18
Developing Java EE 5 Applications	20
Exploring Probable Java EE Application Architectures	20
Application Development and Deployment Roles.....	21
Exploring the Application Development Process.....	22
Compatible Products for the Java EE Platform.....	24
Java Database Connectivity	25
Servlets.....	25
JavaServer Pages	26
Java Server Faces	26
JavaMail	26
Enterprise JavaBeans	26
Summary	27
Quick Revise	27
Chapter 2: Web Applications and Java EE 5.....	29
Exploring the HTTP Protocol.....	30
How Does HTTP Work?	30
Describing HTTP Requests.....	31

Table of Contents

HTTP Responses	34
Introducing Web Applications	35
Components of a Web Application	36
Structure /Modules of Web Applications	39
Describing Web Containers.....	40
Types of Web Containers.....	40
Building Web Applications	41
Applications with Basic HTML pages	41
Applications with Basic JSP Pages and Servlets	41
Applications with Modular Components	42
EJB-Centric Applications	43
Summary	46
Quick Revise	46
Chapter 3: Java Database Programming.....	47
Introduction to JDBC.....	48
Components of JDBC.....	48
JDBC Specification	49
JDBC Architecture.....	49
JDBC Drivers.....	50
Describing the Type-1 Driver	50
Describing the Type-2 Driver (Java to native API).....	51
Describing the Type-3 Driver (Java to Network Protocol/ All Java Driver).....	53
Describing the Type-4 Driver (Java to Database protocol).....	54
Features of JDBC	54
New Features in JDBC 4.0.....	56
Describing the JDBC API's	57
The java.sql Package	58
The javax.sql Package.....	61
Describing the Major Classes and Interfaces.....	62
Understanding the DriverManager Class	62
Understanding the Driver Interface.....	63
Understanding Connection Interface.....	64
Understanding the Statement Interface.....	66
Implementing JDBC Processes with java.sql Package	70
Basic JDBC Steps	70
Creating a Simple JDBC Application	73
Working with the PreparedStatement Interface	76
Working with the CallableStatement Interface	82
Working with ResultSets	90
Working with Batch Updates.....	100
Describing SQL 99 Data Types	105
Implementing JDBC Processes with the javax.sql Package	121
Using DataSource to Make a Connection.....	122
Describing Connection Pooling	122
Using RowSet Objects.....	126
Working with Transactions	140

Describing ACID Properties	140
Types of Transactions	141
Performing Transaction Management	141
Summary	145
Quick Revise	145
Chapter 4: Understanding Servlet Programming	147
What's New in Servlet 2.5?	148
Features of Java Servlets	149
Servlet - A Request and Response Model	149
Servlet and Environment State	150
Security Features	151
HTML-Aware Servlets	152
HTTP-Specific Servlets	153
Performance Features	153
3-Tier Applications	154
Web Publishing System	155
Servlet API	156
The javax.servlet Package	156
The javax.servlet.http Package	159
Servlet Life-Cycle	160
The init() Method	161
The service() Method	161
The destroy() Method	162
Servlet Configuration	163
Servlet Configuration in web.xml	163
Working with ServletConfig and ServletContext	164
Creating a Sample Servlet	165
Directory Structure	166
Configuring the Servlet	166
Packaging, Deploying and Running the Web Application	167
Working with HttpServletRequest and HttpServletResponse	169
HttpServletRequest	169
HttpServletResponse	178
Request Delegation and Request Scope	184
Servlet Collaboration	187
Collaboration through the System Properties List	187
Collaboration through a Shared Object	188
Collaboration through Inheritance	195
Summary	197
Quick Revise	197
Chapter 5: Handling Sessions in Servlets	199
What is a Session?	200
Introducing Session Tracking	200
Session Tracking Mechanisms	201
Cookies	201
Hidden Form Fields	205

Table of Contents

URL Rewriting.....	205
Session using Secure Socket Layer (SSL).....	207
Session Tracking and Java Servlet API.....	208
History of Session Tracking.....	208
Session Creation and Tracking	208
Login Application using Session Tracking	217
Directory Structure of Login Application	217
Building the Front-End	218
Creating and Managing Session	218
Configuring the Login Application.....	221
Running the Login Application	222
Summary	223
Quick Revise	223
Chapter 6: Event Handling in Servlets	225
What are Events?.....	226
What is Event Handling?.....	226
Types of Servlet Events.....	227
Servlet Context Level Events.....	227
Servlet Session Level Events	236
Online Store Application	243
Creating CartContextListener for an Online Store.....	247
Building Front-end of Online Store.....	249
Summary	255
Quick Revise	255
Chapter 7: Understanding Java Server Pages	257
Overview of JSP Technology.....	258
Architecture of JSP page	258
JSP Model I architecture.....	258
JSP Model II architecture	259
Understanding the JSP Page Lifecycle.....	259
Page Translation.....	260
Page Compilation.....	260
Loading & Initialization Stage	260
Request Handling Stage.....	260
Destroying Stage	261
JSP Elements	262
Directives.....	262
Scripting Elements	266
Actions elements	267
Implicit Objects.....	282
Comments	283
The JSP Expression Language.....	284
Syntax of Expressions in JSP Pages – <code>\${}</code> vs. <code>#{}</code>	285
Accessing Variables	286
EL Operators.....	287
Functions	289

Implicit Objects Available in the EL.....	290
Disabling Scripting Elements.....	291
Invalid EL Expressions and Deactivating EL Evaluation.....	291
Warnings, Errors.....	292
Resolution of Variables and Their Properties.....	292
Automatic Type Conversion.....	292
Default Values.....	292
Handling Errors.....	293
Debugging with JspDebug.....	294
Performance.....	294
Buffering.....	294
Precompiling.....	295
Using JSP Best Practices.....	296
Elimination of Scriptlets.....	296
Use the MVC Pattern and Frameworks.....	296
Place Business Logic in JavaBeans.....	296
Use Existing Custom Tag Libraries.....	297
Use Custom Actions.....	297
Use of Template.....	297
Use the Correct Inclusion Mechanism.....	297
Use Common Configuration Settings.....	298
Be User-Friendly and Use JSP Exception Mechanism.....	298
Be Page Designer-Friendly, and Use JSP Comments.....	298
Take Advantage of Validation.....	298
Make Your Pages Readable.....	299
Summary.....	299
Quick Revise.....	299
Chapter 8: Implementing JSP Tag Extensions.....	301
Overview of Tag Extensions.....	302
Elements of Tag Extensions.....	303
The TLD File.....	303
The taglib Directive.....	303
The Tag Handler.....	304
Tag Extension API.....	304
The Tag Interface.....	304
JspTag Interface.....	306
IterationTag Interface.....	306
TagSupport Class.....	306
BodyTag Interface.....	307
BodyContent Class.....	308
BodyTagSupport Class.....	308
DynamicAttributes Interface.....	309
SimpleTag Interface.....	310
SimpleTagSupport Class.....	310
TagAdapter Class	311
TagLibraryInfo Class.....	312

Table of Contents

TagInfo Class	313
TagFileInfo Class	314
TagAttributeInfo Class	315
TagExtraInfo Class	315
PageData Class	316
VariableInfo Class	316
TagData Class	317
TagLibraryValidator Class	318
ValidationMessage Class	319
Classic Tag Handlers	319
Life-Cycle of Classic Tag Handlers	319
Implementing Classic Tags	320
Simple Tag Handlers	324
Life Cycle of Simple Tag Handlers	324
Implementing Simple Tag Handler	324
JSP Fragments	327
Creation of a JSP Fragment	327
Invocation of a JSP Fragment	327
JspFragment Class	328
Understanding Tag Files	328
Handling Dynamic Attributes in Tag Files	329
Exporting Variables from a Tag File to a JSP Page	329
Using Attributes to Provide Names for Variables	329
Invoking JSP Fragments from Tag Files	330
Summary	330
Quick Revise	331
Chapter 9: Implementing JavaServer Pages Standard Tag Library	333
Introducing JSTL	334
Features of JSTL	334
Tag Libraries in JSTL	334
Working with the Core Tag Library	335
Tags in the Core Tag Library	335
Implementing the Core Tag Library	338
Working with the XML Tag Library	342
Tags of the XML Tag Library	342
Implementing the XML Tag Library	349
Working with the Internationalization Tag Library	351
Tags of the Internationalization Tag Library	351
Implementing Internationalization Tag Library	359
Working with the SQL Tag Library	366
Tags of the SQL Tag Library	366
Implementing the SQL Tag Library	372
Working with the Functions Tag Library	374
Functions Available in the Functions Tag Library	374
Implementing the JSTL Functions	375

Summary	377
Quick Revise	377
Chapter 10: Implementing Filters	379
Why Filters?	380
When to Use Filters?	380
How do Filters Work?	381
Filter API	381
The Filter Interface	381
The FilterConfig Interface	382
The FilterChain Interface	383
Setting up the Development Environment	383
Creating and Configuring Filters	384
Writing a Generic Filter	384
Configuring Filters	386
Creating a Filter Application	387
Writing Your First Filter	387
Creating Home Page	388
Creating a Servlet to Test the Filter	389
Configuring the Filter	390
Build Simple Filter Using Initializing Parameter	391
Creating the MsgFilter Filter	391
Creating a JSP Page to Test the Filter	392
Configuring the Filter	392
Testing Your Filter	393
Manipulating Responses	393
Creating the FilterServletOutputStream class	394
Creating the GenericResponseWrapper class	395
Creating the Filter	398
Creating the Servlet to Test the Filter	399
Configuring the Filter	399
Testing the Filter	400
Threading Issues with Filters	400
Summary	401
Quick Revise	401
Chapter 11: Working with JavaServer Faces	403
Overview of JSF	404
Features of JSF	405
JSF Architecture	405
Elements of JavaServer Faces	407
UI Component	407
Renderer	408
Validators	409
Backing Beans	409
Converters	410
Events and Listeners	410
Message	413

Table of Contents

Navigation.....	413
JSF Request Processing Life-cycle	414
The Restore View Phase.....	415
The Apply Request Values Phase.....	415
The Process Validations Phase.....	416
The Update Model Values Phase.....	416
The Invoke Application Phase.....	416
The Render Response Phase.....	416
JSF Tag Libraries	417
JSF HTML Tags.....	417
JSF Core Tags.....	436
JSF Standard UI Components	447
Command Components.....	449
Data Component	449
Form Component	449
Image Component.....	450
Input Component.....	450
Message and Messages Component	450
Output Component.....	450
Parameter Component	450
Checkbox Component	450
SelectItem and SelectItems Component	450
SelectMany and SelectOne Component	450
ViewRoot Component.....	451
Working with Backing Beans.....	451
Using Backing Bean Method as Event Handler	453
Using Backing Bean Method as Validator	454
Managing Backing Beans.....	454
JSF Input Validation	455
Using Validator Method	456
Using Validators.....	456
JSF Type Conversion	458
Standard JSF Converters.....	458
Creating Custom Converters	459
Handling Page Navigation in JSF.....	459
Internationalization Support in JSF.....	461
Configuring Supported Locales.....	461
Creating Resource Bundles.....	461
Accessing Localized Messages from Resource Bundle.....	462
Configuring JSF Applications	464
Setting web.xml	464
Setting faces-config.xml	465
Developing a JSF Application.....	467
Setting Development Environment.....	467
Creating JSF Pages	468
Creating Backing Bean – Employee	478
String getEmployees()	481

String addNew()	481
String update()	481
String deleteEmployee()	481
String getDetail()	481
void getEmployee(ActionEvent)	481
Managing Employee Bean	482
Creating the EmployeeDB Class	482
Creating the EmailValidator Class	485
Configuring a JSF Application	486
Enabling JSF Servlet in web.xml	486
Defining Navigation rules in faces-config.xml	487
Supporting Internationalization	488
Running the KogentPro Application	489
Displaying all Employees	490
Getting Employee Detail	491
Adding New Employee	491
Editing Employee Detail	492
Deleting Employee	493
Summary	493
Quick Revise	493
Chapter 12: Understanding JavaMail	495
Introducing JavaMail	496
Mail Protocols	497
JavaMail Architecture	498
JavaMail API	499
The Session class	500
The Authenticator class	502
The Message class	502
The MimeMessage class	502
The Part interface	504
The MultiPart class	506
The BodyPart class	507
The MimeBodyPart class	507
The PreencodedMimeBodyPart class	507
The MimeUtility class	507
The InternetHeader class	508
The ParameterList class	508
The QuotaAwareStore interface	509
The Resource class	509
The Quota class	509
The SharedFileInputStream class	510
The SharedByteArrayInputStream class	510
The ByteArrayDataSource class	511
The Flags.Flag class	511
The Address class	512
The Store class	512

Table of Contents

The Folder class	514
The Transport class	519
Working with JavaMail	520
Sending Mail	520
Reading Mail	522
Summary	523
Quick Revise	523
Chapter 13: Understanding EJB 3.0	525
EJB 3.0 Fundamentals	526
Why EJB 3.0?	526
EJB 3.0 – Architecture and Concepts	527
Features of EJB 3.0	530
Classifying EJBs	533
Understanding Session Bean	533
Conversational State	534
State Management of a Bean	534
Stateless Session Beans	534
Stateful Session Beans	535
Stateless versus Stateful Session Beans	537
Implementing Session Beans	537
Business Interface	537
Bean Class	537
Developing a Stateless Session Bean	538
Running the Application	543
Developing a Stateful Session Bean	544
Understanding Message-Driven Bean	548
Characteristics of Message-Driven Bean	548
Structure of Message-Driven Bean	548
Life-cycle of Message-Driven Bean	548
Implementing Message-Driven Bean	550
Implementation of MessageDrivenBean and MessageListener	550
Implementation of Business Logic inside the onMessage()	551
A Sample MDB Application	551
Packaging, Deploying, and Running the Application	555
Managing Transactions in Java EE Application	560
Transaction Properties	561
Transaction Model	562
Distributed Transactions	564
Implementing Transaction Management in EJB 3.0	566
Bean-Managed Transactions	566
Container-Managed Transactions	568
Understanding EJB 3.0 Timer Services	569
Different Types of Timers	570
Strengths and Limitations of EJB Timer Services	570
Timer Service API	570
The TimerService Interface	571

The Timer Interface.....	572
The TimedObject Interface	573
The TimerHandle Interface	574
Implementing EJB 3.0 Timer Service	574
Creating Timer Objects	575
Canceling a Timer Object.....	576
Expiration of Timer Object	576
Understanding EJB 3.0 Interceptors.....	576
Specifying Interceptors.....	577
Life-cycle of Interceptors.....	578
Interceptor class.....	578
Applying Interceptors through XML.....	579
Disabling Interceptors	579
Using Annotations for Interceptors	580
Programming by using the Business Methods	580
Programming by using the Life-cycle Call Back Methods	580
Specifying Default Interceptor Methods.....	582
Life-cycle Call Back Methods in an Interceptor Class.....	582
@PreDestroy Annotation	583
@PostConstruct Annotation	583
@PostActivate Annotation.....	583
@PrePassivate Annotation.....	583
Life-cycle Call-back Interceptor Methods in a MDB	584
Life-cycle Callback Interceptor Methods in a session bean	586
Summary	587
Quick Revise	588
Chapter 14: Implementing Entities and Java Persistence API	589
Understanding Object-Relational Mapping (ORM).....	590
Understanding Java Persistence API	590
Entity Manager API.....	590
Introducing Entities	591
Specifying the @ENTITY.....	597
Specifying the @Table.....	598
Specifying the @Columns	598
Specifying the @Enumerated	599
Specifying the @Lob.....	599
Specifying the @Temporal.....	599
Entity and Session Beans	600
When To Use Entity Bean	600
Entity class.....	601
Life Cycle of Entity	601
Entity Listeners and Callbacks.....	602
Packaging a Persistence Unit	603
Obtaining an Entity Manager.....	605
Interacting with an Entity Manager	606
Entity Relationship Types.....	607

Table of Contents

One-to-One	608
One-to-Many	613
Many-to-One	618
Many-to-Many	622
Mapping Collection-Based Relationships	627
Entity Inheritance	628
Single table per class hierarchy	631
Separate table per subclass	634
Single table per concrete entity class	635
Understanding Java Persistence Query Language (JPQL)	635
JPQL Functions	636
JPQL statements	638
SELECT clause	639
From clause	640
WHERE clause	640
ORDER BY clause	641
CONDITIONAL EXPRESSION	641
Query API	644
Creating Sample Application	649
Directory Structure	649
Creating Web Module	650
Configuring Connection Pool and JDBC Resource	658
Summary	661
Quick Revise	661
Chapter 15: Packaging and Deploying on the Java Application Server	663
Need of Packaging and Deploying	664
What Can Be Packaged?	664
Java EE Runtime Containers	665
Packaging and Deploying Java EE 5 Applications	665
Using the NetBeans IDE	665
Using the asant Utility	667
Using the Admin Console	670
Using the Development Directory	673
Summary	674
Quick Revise	674
Appendix A: RMI-IIOP	675
Appendix B: Understanding Directory Services and JNDI	713
Appendix C: Installing Java EE 5 SDK Update 3	731
Glossary	739
Index	749
What's on the CD-ROM	755