

Table Of Contents

SECTION I: INTRODUCTION TO JAVA EE

1. INTRODUCTION TO JAVA	1
HISTORY OF JAVA	3
WHERE IS JAVA USED?	4
JAVA ARCHITECTURE AND ITS COMPONENTS	5
The Java Class File	6
Java Runtime Environment	8
The Java Virtual Machine	8
Component Of JVM	9
The Java API	10
JAVA PLATFORM	11
Java Platform, Micro Edition or Java ME	11
Java Platform, Standard Edition or Java SE	12
Java Platform, Enterprise Edition or Java EE	12
JAVA AVAILABILITY	12
2. UNDERSTANDING JAVA EE	15
WHAT IS AN ENTERPRISE APPLICATION?	15
Architecture Of An Enterprise Application	16
Challenges Of Enterprise Application Development	16
WHAT IS JAVA ENTERPRISE EDITION?	17
JAVA EE TECHNOLOGIES	18
Web Applications Technologies	18
Java Servlet	18
JavaServer Pages [JSP]	18
JavaServer Pages Standard Tag Library [JSTL]	18
JavaServer Faces [JSF]	18
Facelets	19
Enterprise Applications Technologies	19
Enterprise JavaBeans [EJB]	19
Java Persistence API [JPA]	19
Java Transaction API [JTA]	20
Java Message Service [JMS]	20
Java EE Connector Architecture	20
JavaMail	20
Web Services Technologies	20
SOAP and RESTful	20
Java API for XML Registries [JAXR]	21
Security Technologies	21
JACC	21
JASPIC	21

JAVA EE EVOLUTION.....	21
THE JOURNEY FROM 5 TO 6 AND THEN 6 TO 7	22
Java EE 5 To Java EE 6.....	22
Features Of Java EE 6.....	23
Extensibility.....	23
Profiles.....	23
Pruning The Outdated APIs.....	24
Servlet 3.0.....	25
Annotations.....	25
Web Fragments.....	26
Asynchronous Processing.....	26
Java Persistence API 2.0.....	26
JavaServer Faces 2.0.....	28
Enterprise JavaBeans 3.1.....	28
Removed Local Business Interface.....	29
Singleton Beans.....	29
EJB Components Packaged Directly In A WAR File.....	29
Embeddable API For Executing EJB In Java SE Environment.....	31
Asynchronous Session Bean.....	31
EJB Lite.....	31
JAX-RS 1.1.....	32
JCDI 1.0.....	32
Java EE 6 To Java EE 7.....	32
Features Of Java EE 7.....	33
Reduced Boilerplate Code.....	33
Annotated POJOs.....	34
Pruning Old Technologies.....	34
HTML 5.....	35
WebSocket 1.0.....	35
JavaScript Object Notation [JSON].....	36
Servlet 3.1.....	36
Non-blocking I/O.....	37
HTTP Protocol Upgrade Mechanism.....	38
Security Enhancements.....	38
JavaServer Pages 2.3.....	38
JavaServer Faces 2.2.....	38
Pass-through Elements.....	39
Enterprise JavaBeans 3.2.....	39
Java Persistent API [JPA] 2.1.....	40
Unsynchronization Of Persistence Contexts.....	40
Stored Procedures.....	41
Criteria Bulk Update/Delete.....	41
CDI Listeners In Entity Classes.....	42
Dynamically Defined Named Queries.....	42
Automatic Schema Generation.....	42

JOIN Using The ON Condition.....	45
Support For Downcast In JPQL.....	45
Support For Functions In JPQL.....	46
Converters.....	46
Java Transaction API [JTA] 1.2.....	47
@Transactional.....	47
@TransactionScoped.....	47
Context And Dependency Injection.....	47
Bean Validations 1.1.....	48
JAX-RS 2.0.....	49
Filters.....	49
Entity Interceptors.....	49
Java Message Service 2.0.....	49
Batch Applications.....	50
Web Profile.....	50
Concurrency Utilities.....	51
GLASSFISH SERVER 4.0 OPEN SOURCE EDITION.....	52
Administration.....	52
Developers.....	52
IT Operations.....	52
Features Of GlassFish Server 4.0 Open Source Edition.....	53
3. JAVA EE 7 ARCHITECTURE, SERVER AND CONTAINERS.....	55
TYPES OF SYSTEM ARCHITECTURE.....	56
Single Tier Architecture.....	56
Two Tier Architecture.....	57
Three Tier Architecture.....	58
Multi-Tier Architecture.....	59
Why Have So Many Layers?.....	61
Enterprise Architecture.....	61
The Client Tier.....	62
Web Client.....	63
Application Client.....	63
The Web Tier.....	63
The Business Tier.....	64
The Enterprise Information System [EIS] Tier.....	65
JAVA EE SERVER.....	66
JAVA EE CONTAINERS.....	66
Container Types.....	67
Enterprise JavaBeans [EJB] Container.....	68
Web Container.....	68
Application Client Container.....	69
Applet Container.....	69

4. SETTING UP THE DEVELOPMENT ENVIRONMENT	71
WHAT IS NETBEANS?.....	72
NetBeans Development Platform	72
INSTALLATION OF NETBEANS IDE	73
Installing Java Development Kit.....	73
Download NetBeans	73
INSTALLING NETBEANS IDE.....	74
SECTION II: JAVA SERVLETS	
5. INTRODUCTION TO JAVA SERVLETS	79
THE NEED FOR DYNAMIC CONTENT	79
Common Gateway Interface [CGI].....	80
Disadvantages In CGI.....	80
Alternatives To CGI.....	80
JAVA SERVLET TECHNOLOGY	81
Servlets And The Web Server.....	82
Servlet Clients.....	82
Servlet Container	82
WHY SERVLETS?	83
WHAT CAN SERVLETS DO?	83
Servlet - Request / Response Paradigm	84
Request / Response	84
What Do Servlets Look Like?.....	84
How Are Servlets Created?.....	85
6. SERVLET API AND LIFECYCLE.....	87
JAVA SERVLET API.....	88
javax.servlet Package.....	88
Servlet Interface	89
ServletContext Interface	90
ServletConfig Interface	92
ServletRequest And ServletResponse Interfaces	93
GenericServlet Class.....	95
ServletInputStream And ServletOutputStream Classes	95
RequestDispatcher Interface	96
Filter, FilterChain And FilterConfig Interfaces	97
ReadListener And WriteListener Interfaces.....	98
javax.servlet.http Package.....	98
HttpServlet Class	99
HttpServletRequest And HttpServletResponse Interfaces	100
HttpSession Interface.....	103
Cookie Class	104

Part Interface	105
WebConnection Interface	106
javax.servlet.annotation Package	106
@WebServlet Annotation	106
WebFilter Annotation	107
WebListener Annotation	107
WebInitParam Annotation	108
MultipartConfig Annotation	108
THE SERVLET SKELETON	109
THE SERVLET LIFE CYCLE	110
Initialization	111
Why Not Use A Constructor Instead Of init()?	111
init()	112
Runtime	112
Destruction	113
A SIMPLE WELCOME SERVLET	114
7. WORKING WITH SERVLETS.....	123
GETTING STARTED	123
What Is A Web Application?	124
Organization Of A Web Application	124
Web Resources.....	125
WEB-INF	125
Deployment Descriptor	126
Context Path.....	126
Creating A Web Application Using NetBeans.....	127
Creating index.jsp	131
Creating A Servlet.....	133
WelcomeServlet.java	133
About NetBean's Default Servlet Skeleton	136
Deployment Descriptor [web.xml].....	137
The <web-app> Element.....	138
The <servlet> Element	138
The <servlet-name> Element	139
The <servlet-class> Element	139
The <servlet-mapping> Element.....	139
The <servlet-name> Element	139
The <url-pattern> Element.....	139
The <servlet-config> Element	140
The <session-timeout> Element.....	140
The <welcome-file-list> Element	140
The <welcome-file> Element.....	140
Compiling And Building The Web Application	140
Running The Web Application	142
USING ANNOTATIONS INSTEAD OF DEPLOYMENT DESCRIPTOR.....	144
Running The Web Application	148

8. WORKING WITH DATABASES.....	149
WHAT IS JDBC?.....	150
JDBC Drivers.....	150
Types Of JDBC Drivers.....	151
JDBC Type 1 - JDBC-ODBC Driver.....	151
JDBC Type 2 - Java Native Interface Driver	151
JDBC Type 3 - Java Network Protocol Driver	152
JDBC Type 4 - Java Database Protocol Driver.....	152
Which Driver To Choose From?.....	152
Advantages Of JDBC.....	153
JDBC ARCHITECTURE	153
ACCESSING DATABASE	155
Configuring JDBC Driver.....	156
Creating A Database Connection.....	156
Executing Queries.....	157
Standard Statement	157
Prepared Statement	158
Callable Statement	158
Processing The Results	159
Closing The Database Connection.....	159
THE CUSTOMERS GUI EXAMPLE	160
Adding MySQL Connector/J JAR File.....	164
Creating A Servlet	165
Creating index.jsp	184
9. COOKIES.....	189
KINDS OF COOKIES	191
Permanent / Persistent Cookies.....	191
Session / Transient Cookies.....	191
WHERE COOKIES ARE USED?	192
Where Are Cookies Placed?	193
CREATING COOKIES USING SERVLET	193
Working With Cookies	193
Creating A Cookie Constructor	193
Setting A Cookie.....	195
Sending A Cookie To The Client.....	195
Retrieving Cookies	198
Expiration Of A Cookie.....	205
Destroying A Cookie	206
Assigning Values To Cookie	207
HttpOnly Cookies New From Servlet 3.0 Specification	214
DYNAMICALLY CHANGING THE COLORS OF A PAGE.....	215
10. SESSION	227
WHAT ARE SESSIONS?.....	228

LIFECYCLE OF HTTP SESSION	232
Session Management Rules	233
SESSION TRACKING WITH SERVLET API	233
Methods Of Session Tracking	234
Cookies	234
URL Rewriting.....	235
Hidden Form Fields	237
Secure Socket Layer [SSL]	239
Working With Session	239
Creating A Session.....	240
Destroying Session.....	244
Managing Sessions Lifetime	247
getAttribute().....	247
getAttributeNames().....	248
setAttribute().....	248
removeAttribute()	249
getId().....	249
isNew().....	250
getCreationTime().....	250
getLastAccessedTime().....	251
getMaxInactiveInterval()	251
setMaxInactiveInterval().....	252
A SHOPPING CART	255
11. FILTERS	277
IMPORTANCE OF FILTERS	279
IMPLEMENTING A FILTER INTERFACE.....	279
Filter Interface.....	280
init()	280
doFilter()	280
destroy()	281
FilterChain Interface	281
FilterConfig Interface.....	282
DEFINING FILTERS	282
Defining Filters In Deployment Descriptor	282
The <filter> Element.....	283
The <filter-mapping> Element.....	284
Defining Filters Using Annotations	297
CREATING A FILTER TO ADD URL AND TIME TO A DATABASE.....	301
12. REQUEST DISPATCHER	309
REQUESTDISPATCHER INTERFACE.....	310
Obtaining An Object Implementing RequestDispatcher.....	310
getRequestDispatcher().....	310
ServletContext.getRequestDispatcher()	311

ServletRequest.getRequestDispatcher().....	311
getNamedDispatcher()	312
METHODS OF REQUESTDISPATCHER	312
include().....	313
forward().....	313
REQUESTDISPATCHER APPLICATION	314
Creating Database Table.....	316
Creating The Web Application	317
Adding JAR File	317
Creating Servlets.....	317
HeaderServlet	317
LoginServlet	318
Cookie.....	319
Assigning Memory Variables To The VALUE Attribute	320
SetMeServlet.....	320
Checking The Username.....	322
Checking Whether Remember Me Is Selected	322
Forwarding The Request.....	322
CustomerServlet.....	323
Including Header.....	324
Creating index.jsp	324
Request Attributes.....	329
13. WORKING WITH FILES.....	331
UPLOADING FILES.....	331
@MultipartConfig	332
fileSizeThreshold.....	332
location	332
maxFileSize	332
maxRequestSize.....	332
CREATING AN UPLOAD FILE APPLICATION.....	333
Creating The Web Application	334
Creating Servlets.....	334
FileUploadServlet	334
Importing Interface/Classes	335
java.io.File Class.....	336
java.io.FileNotFoundException	336
java.io.FileOutputStream Class.....	336
java.io.InputStream Class	336
java.io.OutputStream Class.....	337
javax.servlet.annotation.MultipartConfig	337
javax.servlet.http.Part Interface	337
Annotations.....	337
Declaring Variables	337
final Keyword	338

ServletRequest.getPart()	338
Try Block	338
Catch Block.....	339
Finally Block.....	339
Retrieving File Name	339
SuccessfulUploadServlet	340
Creating index.jsp	341
DOWNLOADING FILES	345
Direct Link	345
Indirect Link	345
CREATING A DOWNLOAD FILE APPLICATION	346
Creating The Web Application	346
Creating Servlet	346
Importing Interface/Classes	347
javax.servlet.ServletContext Interface	347
javax.servlet.ServletOutputStream Class	348
doGet()	348
downloadFile().....	348
Creating index.jsp	351
14. WORKING WITH NON-BLOCKING I/O.....	355
CREATING A NON-BLOCKING READ APPLICATION	357
Creating The Web Application	357
Creating Java Class.....	357
ReadingListener	357
Importing Interfaces/Classes	359
javax.servlet.AsyncContext Interface	359
javax.servlet.ReadListener Interface	359
javax.servlet.ServletInputStream Class	360
Implementing ReadListener Interface	360
Declaring Input Stream And Asynchronous Context.....	360
ReadingListener Consturctor	360
onDataAvailable()	360
onAllDataRead()	361
onError()	361
Creating Servlets	362
ReadingNonBlockingServlet	362
@WebServlet	363
Using ReadListener Implementation With ServletInputStream.....	363
NonBlockingServlet.....	364
Importing Classes.....	365
java.io.BufferedReader Class.....	366
java.io.BufferedWriter Class.....	366
java.io.InputStream Class.....	366
java.io.InputStreamReader Class	366

java.io.OutputStreamWriter Class	366
java.net.HttpURLConnection Class	366
java.net.URL Class	367
Retrieving The File	367
Setting The Path And Making A Connection To ReadingNonBlockingServlet	367
Reading The File.....	368
Creating index.jsp	369

SECTION III: JAVASERVER PAGES

15. INTRODUCTION TO JAVASERVER PAGES..... 371

WHY USE JAVASERVER PAGES?	372
Nobody Can Borrow The Code	372
Faster Loading Of Pages.....	372
No Browser Compatibility Issues	373
JSP Support.....	373
Compilation	373
JSP Elements In HTML / XML Pages.....	373
DISADVANTAGES OF JSP	374
Attractive Java Code.....	374
Java Code Required	374
Simple Tasks Are Hard To Code	374
Difficult Looping In JSP.....	375
Occupies A Lot Of Space	375
JSP V/S SERVLETS.....	376
Why JSP If Java Already Has An API For Answering HTTP Requests?.....	376
LIFE CYCLE OF A JSP PAGE	376
HOW DOES A JSP FUNCTION?	377
HOW DOES JSP EXECUTE?	382
ABOUT JAVASERVER PAGES 2.3	383

16. GETTING STARTED WITH JAVASERVER PAGES..... 385

COMMENTS.....	385
JSP DOCUMENT	386
JSP ELEMENTS.....	388
Directives	389
The page Directive.....	390
The language Attribute	391
The import Attribute	391
The contentType Attribute.....	392
The pageEncoding Attribute.....	392
The session Attribute	393
The include Directive.....	393
The file Attribute	395

The taglib Directive	395
The uri Attribute	396
The prefix Attribute	396
Scripting Elements	397
Declarations	397
Scriptlets	399
Expressions	401
GUESTBOOK GUI EXAMPLE	402
Regular JSP	402
index.jsp	402
header.jsp	404
action.jsp	405
XML Based JSP	408
17. ACTION ELEMENTS	417
INCLUDING OTHER FILES	418
FORWARDING JSP PAGE TO ANOTHER PAGE	419
PASSING PARAMETERS FOR OTHER ACTIONS	421
LOADING A JAVABEAN	422
Adding A Bean To A JSP Page	423
Setting The Properties Of The Bean	425
Accessing The Properties Of The Beans	428
18. IMPLICIT OBJECTS, SCOPE AND EL EXPRESSIONS.....	429
IMPLICIT OBJECTS	429
Request.....	430
Response	431
Out	432
Session	433
Application.....	434
Config	435
PageContext.....	435
Page.....	436
Exception	437
SCOPE	437
Application Scope	438
Session Scope	438
Request Scope	439
Page Scope	439
CHARACTER QUOTING CONVENTIONS	439
UNIFIED EXPRESSION LANGUAGE [UNIFIED EL]	440
Unified EL Evaluation Syntax	442
Immediate Evaluation	442
Deferred Evaluation	443
Types Of Expressions	444
Value Expressions.....	444

Method Expressions.....	445
Using EL Expressions.....	445
Literals	446
Operators.....	448
Arithmetic Operators	448
Logical Operators	449
Relational Operators	449
Conditional Operators.....	450
The . [A Dot] Operator	450
The [] Operator	451
The empty Operator.....	452
Implicit Objects	453
EXPRESSION LANGUAGE 3.0.....	454
Lambda Expression.....	455
Collections	457
Sets.....	457
Lists	457
Maps	458
Collection Operations	458
Methods As Operators	459
Operator Notation	460
Restriction Operators	460
Projection Operators	461
Partitioning Operators.....	461
Concatenation Operators.....	462
Set Operators	462
Join Operators.....	463
Grouping Operators	464
Ordering Operators	464
Conversion Operators	465
Equality Operators	465
Element Operators	466
Qualifiers Operators.....	467
Aggregate Operators	468
Static Fields And Methods.....	468
Stand Alone EL API	469
Defining Bean.....	471
Declaring Variable.....	471
Evaluating Expression	471
ELManager	471
19. JAVASERVER PAGES STANDARD TAG LIBRARIES.....	473
WHAT IS WRONG IN USING JSP SCRIPTLET TAGS?.....	474
HOW JSTL FIXES JSP SCRIPTLET'S SHORTCOMINGS?	474
DISADVANTAGES OF JSTL	475

TAG LIBRARIES.....	475
The Core Tag Library	475
General-Purpose Actions	476
How Are Values Displayed.....	476
How Are Values Set.....	477
Exception Handling	477
Conditional Actions Or Flow Control Statements	478
Iterator Actions	479
The <c:forEach> Element	479
The <c:forEachTokens> Element	481
URL-Related Actions.....	481
Importing The Contents Of A URL Based Resources	481
URL Encoding And Rewriting.....	482
Sending An HTTP Redirect To A Client	483
Specifying The Request Parameters.....	484
The XML Tag Library	484
Core Actions	484
What is XPath?	484
Using The Select Attribute.....	485
How Are Resources Accessed	485
How Are XML Documents Parsed	486
Conditional Or Flow Control Statements.....	487
Transforming XML.....	487
The Internationalization And Formatting Tag Library.....	489
Locale Actions	489
Setting The Locale	489
Character Encoding For An HTTP Request.....	490
Messaging Actions.....	490
The <fmt:message> Element	490
Obtaining The Resource Bundle	491
Formatting The Dates And Numbers	492
Formatting Numbers	492
Parsing Numbers.....	493
Formatting The Date	494
Parsing The Date.....	495
Time Zones	496
The Database / SQL Tag Library	497
Datasources	497
Queries And Updates	498
The Database Transactions	502
Functions Tag Library.....	502

SECTION IV: JAVASERVER FACES

20. INTRODUCTION TO JAVASERVER FACES	507
WHY MODEL VIEW CONTROLLER?	507
WHAT IS JSF?	508
Server Side	508
User Interface	508
Component Framework	508
COMPONENTS OF JSF	509
JSF AS AN APPLICATION	510
What is Facelet?	511
JAVASERVER FACES APPLICATION COMPOSITION	511
JAVASERVER FACES APPLICATION LIFECYCLE	512
Restore View	514
Apply Request Values	514
Process Validations	515
Update Model Values	516
Invoke Application	516
Render Response	517
JAVASERVER FACES APPLICATION CONFIGURATION	517
The <faces-config> Element	518
The <navigation-rule> Element	518
The <from-view-id> Element	518
The <navigation-case> Element	519
The <from-outcome> Element	519
The <to-view-id> Element	519
The <managed-bean> Element	519
The <managed-bean-name> Element	520
The <managed-bean-class> Element	520
The <managed-bean-scope> Element	520
JAVASERVER FACES 2.2	520
HTML 5 Support	521
Faces Flows	521
Resource Library Contracts	522
Stateless Views	523
View Actions	523
Facelets	525
New Namespaces	525
21. GETTING STARTED WITH JAVASERVER FACES	527
CREATING A WEB APPLICATION	528
CREATING A LOGIN FORM	530
Facelets	531
Tag Library	532
Head And Body Elements	533

Form Element	533
Table Elements.....	534
Text Elements	534
CREATING FACELETS.....	535
CREATING A MANAGED BEAN.....	539
Imports.....	542
Annotations.....	542
JavaBean Properties.....	544
Actions.....	544
CREATING A JSF CONFIGURATION FILE	545
OVERVIEW OF DEPLOYMENT DESCRIPTOR [CREATED AUTOMATICALLY].....	549
BUILDING THE WEB APPLICATION	551
RUNNING THE APPLICATION.....	551
PROCESS FLOW	553
22. JAVASERVER FACES COMPONENTS	557
A TYPICAL JAVASERVER FACES PAGE	558
COMPONENTS	560
UI Components Classes	560
Behavioral Interfaces	561
Rendering Model	561
Render Kits	561
Component Tags.....	562
The <h:commandButton> Element.....	563
The <h:commandLink> Element.....	564
The <h:form> Element.....	564
The <graphicImage> Element.....	565
The <h:inputText> Element.....	565
The <h:inputTextarea> Element	566
The <h:inputSecret> Element	566
The <h:inputHidden> Element.....	567
The <h:outputText> Element.....	567
The <h:outputLabel> Element	568
The <h:outputLink> Element.....	568
The <h:outputFormat> Element.....	569
The <h:panelGrid> Element.....	570
The <h:panelGroup> Element.....	571
The <h:SelectBooleanCheckbox> Element	572
The <h:selectOneRadio> Element	573
The <h:selectOneListbox> Element.....	574
The <h:selectOneMenu> Element	574
The <h:selectManyCheckbox> Element	575
The <h:selectManyListbox> Element.....	576
The <h:selectManyMenu> Element.....	577

The <h:selectItem> Element	577
The <h:selectItems> Element	578
The <h:message> Element	578
The <h:messages> Element	579
The <h:dataTable> And <h:column> Elements	580
Bookmarkability	581
Registering Listener	582
The <f:valueChangeListener> Element	583
The <f:actionListener> Element	583
23. MANAGED BEANS	585
CREATING BEAN	586
REGISTERING BEAN	589
BINDING BEAN USING UNIFIED EL EXPRESSION	589
MANAGED BEAN PROPERTY INITIALIZATION	590
USING ANNOTATIONS	591
24. NAVIGATION RULES	593
APPLICATION CONFIGURATION RESOURCE FILE	594
CONFIGURING NAVIGATION RULE	595
The <navigation-rule> Element	596
The <from-view-id> Element	596
The <navigation-case> Element	596
The <from-action> Element	597
The <from-outcome> Element	597
The <to-view-id> Element	597
The <redirect/> Element	598
WAYS OF NAVIGATING BETWEEN PAGES	598
The Default Navigation Case	598
The Default Outcome Case	599
Using Wildcards Or Patterns	600
Using <from-action> Element	601
Global Outcome	602
Redirect Rendering	602
Navigation Cases Split Over Multiple Rules	603
Overlapping Navigation Cases	604
Conflict Of Navigation Cases	605
Implicit Navigation Rules	605
NAVIGATION PROCESS	606
TYPES OF NAVIGATION	608
Simple / Static Navigation	608
Complex / Dynamic Navigation	610
ACTIONS AND NAVIGATION	612
Implementing Application Actions	613

25. CONVERTERS AND VALIDATORS.....	615
CONVERTERS	616
DateTime Converter.....	618
Number Converter	621
VALIDATORS.....	623
Length Validator	624
Long Range Validator.....	625
Double Range Validator.....	626
CONVERSION AND VALIDATION PROCESS.....	627
THE REQUIRED AND THE IMMEDIATE ATTRIBUTES	628
The required Attribute.....	628
The immediate Attribute	628
CALCULATION OF LOAN PAYMENT EXAMPLE.....	629
Creating A Web Application.....	630
Creating A Calculation Of Loan Payment Form.....	630
Creating A Managed Bean	634
Creating A JSF Configuration File	637
Building The Web Application	639
Running The Application.....	639
26. ADDING HTML 5 FRIENDLY MARKUP.....	643
PASSTHROUGH ATTRIBUTES	644
Creating A Web Application.....	644
Creating A Book Details Form	645
Namespace To Process Passthrough Attributes	648
Resource Handling	648
Input Elements Of JSF	650
Creating JSF Page	650
Creating A Managed Bean	653
submitBookDetails()	655
startOverAction()	655
Creating A JSF Configuration File	656
Deployment Descriptor [Created Automatically]	657
CSS Resource	657
Building The Web Application	660
Running The Application.....	660
Using Passthrough Attribute UI Components.....	662
<f:passThroughAttribute>.....	663
<f:passThroughAttributes>	663
PASSTHROUGH ELEMENTS.....	664
Creating A Web Application.....	664
Creating The Book Details Form	665
Namespace To Process Passthrough Elements	667
Input Elements	667

Creating Facelet 668
 Creating A Managed Bean 669
 Creating A JSF Configuration File 670
 CSS Resource 670
 Building The Web Application 670
 Running The Application..... 670
27. FACES FLOW 671
 WHAT IS A FLOW? 671
 WHAT IS FACES FLOW? 672
 PACKAGING FLOWS 673
 JAR Files 673
 Directories..... 674
 CONFIGURING FLOW 675
 Configuration File..... 675
 Programmatically 676
 BOOKSHOP WEB APPLICATION 677
 Creating A Web Application 679
 Creating Welcome Page..... 679
 The prependId Attribute..... 680
 Creating Folders In web Directory..... 681
 Creating Customer Flow 681
 customer.xhtml 682
 EL Object #{flowScope} 683
 Moving To Next Flow 684
 customerA.xhtml..... 684
 Moving Between Pages Within Flows..... 686
 customerB.xhtml..... 686
 Moving To Next Flow 688
 Creating Book Flow..... 689
 book.xhtml 689
 Moving To Next Flow 691
 bookA.xhtml 691
 bookB.xhtml 693
 Moving To Next Flow 695
 Creating A Configuration File 695
 The <flow-definition> Element 697
 The <flow-return> Element 697
 The <from-outcome> Element..... 697
 The <inbound-parameter> Element 698
 The <flow-call> Element 698
 The <flow-reference> Element 698
 The <outbound-parameter> Element 698
 Creating Java Class To Configure A Flow 698
 Imports 700
 javax.enterprise.inject.Produces..... 700

javax.faces.flow.Flow	700
javax.faces.flow.builder.FlowBuilder	700
javax.faces.flow.builder.FlowBuilderParameter	700
javax.faces.flow.builder.FlowDefinition	700
Serializable	701
defineFlow()	701
Defining The Flow Identity	701
Defining The Return Node	701
Setting The Inbound Parameters	702
Defining How The Customer Flow Calls The Book Flow	702
Returning The Results	702
Creating Flow Scoped Managed Beans	702
CustomerBean.java	703
javax.faces.flow.FlowScoped	705
javax.inject.Named	705
getReturnValue()	705
BookBean.java	705
Deployment Descriptor [Created Automatically]	708
Creating Beans Configuration File	708
CSS Resource	710
Building The Web Application	711
Running The Application	711
28. RESOURCE LIBRARY CONTRACTS	717
WHAT ARE CONTRACTS?	717
LOGIN TEMPLATE CONTRACT	719
Creating A Web Application	719
Modifying The Default Facelet	720
Facelets Namespace	721
The <f:view> Element	721
The <ui:composition> Element	721
The <ui:define> Element	722
Creating Folders In /web Directory	722
Creating Simple Theme	723
template.xhtml	723
style.css	724
Creating Trendy Theme	726
template.xhtml	727
style.css	728
Creating Facelets For Login Application	730
index.xhtml	730
welcome.xhtml	732
error.xhtml	732
Creating A Configuration File	733

Creating Managed Beans	735
UserBean.java	735
MyThemes.java	736
Deployment Descriptor [Created Automatically]	737
Creating Beans Configuration File	737
Building The Web Application	738
Running The Application	738
29. AJAX	741
USING THE <f:ajax> ELEMENT	742
Creating A Web Application	744
Modifying The Default Facelet	744
Creating Facelets	746
welcome.xhtml	746
error.xhtml	747
Creating A Faces Configuration File	748
Creating Managed Beans	748
Deployment Descriptor [Created Automatically]	750
Creating Beans Configuration File	750
Building The Web Application	751
Running The Application	751
LIFECYCLE OF AJAX REQUEST	753
USING JAVASCRIPT RESOURCE LIBRARY	754
Creating A Web Application	755
Modifying The Default Facelet	756
Creating Facelets	758
welcome.xhtml	759
error.xhtml	760
Creating A Faces Configuration File	760
Creating Managed Beans	761
Deployment Descriptor [Created Automatically]	762
Creating Beans Configuration File	762
Building The Web Application	763
Running The Application	763
SECTION V: ENTERPRISE JAVABEANS	
30. INTRODUCTION TO ENTERPRISE JAVABEANS	765
ENTERPRISE BEAN ARCHITECTURE	766
Request And Response	766
Enterprise Bean Server	767
An Enterprise Bean [EJB]	768
EJB Evolution	768
Enterprise Bean Containers	770

Enterprise Bean Clients.....	771
BENEFITS OF ENTERPRISE BEAN.....	772
Complete Focus Only On Business Logic	772
Reusable Components.....	773
Portable	773
Fast Building Of Applications	773
One Business Logic Having Many Presentation Logics	774
Distributed Deployment.....	774
Application Interoperability.....	774
TYPES OF ENTERPRISE BEAN	774
Session Beans	775
Types of Session Beans.....	775
Stateless Session Bean	775
Stateful Session Bean.....	776
Singleton Session Bean.....	776
Message Driven Beans.....	776
ACCESSING ENTERPRISE BEANS	777
Enterprise Beans Clients	778
ENTERPRISE BEAN APPLICATION	778
Enterprise Bean Class	778
Business Interfaces.....	778
Helper Classes.....	778
PACKAGING ENTERPRISE BEANS.....	779
Packaging Enterprise Beans in EJB JAR Modules	779
Packaging Enterprise Beans in WAR Modules.....	780
31. GETTING STARTED WITH ENTERPRISE JAVABEANS.....	783
CREATING A WEB APPLICATION	784
CREATING AN ENTERPRISE BEAN.....	785
CREATING A WEB CLIENT [SERVLET]	788
CREATING A JSP FILE.....	791
BUILD THE WEB APPLICATION	793
RUNNING THE WEB APPLICATION	794
32. WORKING WITH SESSION BEANS.....	797
WHEN TO USE SESSION BEANS?.....	798
TYPES OF SESSION BEANS.....	799
Stateless Session Beans.....	799
Stateful Session Beans	800
Singleton Session Bean.....	801
REMOTE AND LOCAL INTERFACES.....	802
No-Interfaces View [Local Interface]	803
ACCESSING INTERFACES	803
Accessing No-Interface View	803
Client Access Using Dependency Injection	804

Client Access Using JNDI LookUp.....	804
Accessing Local Business Interface.....	804
Client Access Using Dependency Injection.....	804
Client Access Using JNDI LookUp.....	804
Accessing Remote Business Interface.....	804
Client Access Using Dependency Injection.....	805
Client Access Using JNDI LookUp.....	805
LIFECYCLE OF ENTERPRISE BEANS.....	805
Stateful Session Bean.....	805
Stateless Session Bean.....	806
Singleton Session Bean.....	806
PACKAGING ENTERPRISE BEANS.....	807
In EJB JAR Modules.....	807
In WAR Modules.....	808
THE SHOPPING CART [STATEFUL SESSION BEAN].....	809
Creating A Web Application.....	811
Creating A Stateful Session Bean.....	811
Lifecycle Callback Methods.....	818
Creating A Web Client Using JSP.....	818
JNDI Syntax.....	822
The java:module JNDI Namespace.....	823
The java:app JNDI Namespace.....	823
The java:global JNDI Namespace.....	823
Db Tables For The Enterprise Bean.....	826
Adding The Library File For JDBC.....	826
Building The Web Application.....	827
Running The Application.....	827
THE VISITOR STATISTICS [STATELESS SESSION BEAN].....	829
Creating A Web Application.....	830
Creating A Stateless Session Bean.....	831
Creating A Web Client Using JSP.....	835
Db Tables For The Enterprise Bean.....	837
Adding The Library File For JDBC.....	837
Building The Web Application.....	838
Running The Application.....	838
SERVLET HITS [SINGLETON SESSION BEANS].....	839
Creating A Web Application.....	840
Creating An Enterprise Bean.....	841
Creating A Web Client Using Servlet.....	842
Modifying The HTML Page.....	844
Building The Web Application.....	844
Running The Application.....	844
33. WORKING WITH MESSAGE DRIVEN BEANS.....	847
LIFECYCLE OF A MESSAGE DRIVEN BEAN.....	848
The onMessage() Method.....	849

USES OF MESSAGE DRIVEN BEANS	850
THE VISITOR STATISTICS EXAMPLE.....	850
Creating A Web Application.....	851
Creating An Enterprise Stateless Session Bean	852
Creating A Message Driven Bean.....	854
Creating A Web Client Using JSP	861
Db Tables For The Message Driven Bean	866
Adding The Library File For JDBC.....	867
Building The Web Application	867
Running The Application.....	868
34. INTERCEPTORS.....	871
Request And Interceptor	872
Defining An Interceptor.....	872
AroundInvoke Method.....	872
Applying Interceptor To Visitor Statistics Application	873
Creating A Java Class	873
Adding An Interceptor To An Enterprise Bean	875
Building The Web Application	876
Running The Application.....	876
35. CALENDAR BASED TIMER SERVICES	879
@SCHEDULE.....	880
Setting An Attribute Values.....	881
Using Wildcards.....	881
Specifying A List Of Values	881
Specifying A Range Of Values	881
Specifying Intervals	882
AUTOMATIC [SCHEDULED] NEWSLETTER DISPATCHER	883
Creating A Web Application.....	883
Creating An Enterprise Bean	884
Creating Database And Tables In MySQL	888
Adding The JDBC Driver For MySQL.....	889
Build The Web Application	889
Deploying The Web Application	889
Testing The Web Application	890
36. JAVA NAMING AND DIRECTORY INTERFACE.....	891
WHAT IS A NAMING SERVICE?	892
WHAT IS DIRECTORY SERVICE?	893
WHAT IS JAVA NAMING AND DIRECTORY INTERFACE?.....	894
Basic Lookup	895
JNDI Namespace In Java EE 7	896
The java:module JNDI Namespace.....	896
The java:app JNDI Namespace.....	897
The java:global JNDI Namespace.....	897

RESOURCES AND JNDI	898
Resource Injection	899
DATASOURCE RESOURCE DEFINITION IN JAVA EE 7	899

SECTION VI: JAVA PERSISTENCE API

37. PERSISTENCE, OBJECT/RELATIONAL MAPPING AND JPA	901
WHAT IS PERSISTENCE?.....	902
PERSISTENCE IN JAVA	903
Persistence Of Object Oriented Models.....	903
Why Object Oriented Models?	904
Why Relational Database?.....	904
CURRENT PERSISTENCE STANDARDS IN JAVA	904
Serialization	905
JDBC	905
EJB 2 Entity Beans	906
Java Data Objects.....	906
WHY ANOTHER PERSISTENCE STANDARDS?	907
OBJECT/RELATIONAL MAPPING.....	907
The Impedance Mismatch.....	907
How To Map One To The Other?.....	908
The Solution To The Impedance Mismatch.....	908
Why Object Relational Mapping?	910
Better System Architecture	910
Reduce Coding Time	910
Caching And Transactions.....	910
Where Does Java Persistence API Fit In?.....	911
Java Persistence API.....	911
Java Persistence API As A Specification.....	912
JPA 1.0 As A Part Of EJB 3	912
38. INTRODUCTION TO JAVA PERSISTENCE API.....	915
THE JAVA PERSISTENCE API.....	916
JPA, ORM, DATABASE AND THE APPLICATION	917
ARCHITECTURE OF JPA.....	919
Persistence	919
EntityManagerFactory	919
EntityManager	920
Entity	920
EntityTransaction.....	920
Query	920
Criteria	921
HOW JPA WORKS?	921
JPA 2.1	922
Stored Procedures	923

Unsynchronized Persistence Context	923
Schema Generation	924
Bulk Updates And Deletes Using Criteria	926
Functions in JPQL.....	927
Downcasting In JPQL	928
JOIN condition Using ON.....	929
Entity Listeners Using CDI.....	930
Dynamically Defined Named Queries	930
39. WRITING THE FIRST APPLICATION.....	933
APPLICATION REQUIREMENT SPECIFICATIONS.....	934
Where Does ORM/JPA Fit?.....	935
SOFTWARE REQUIREMENTS	936
Library Files.....	937
THE APPLICATION DEVELOPMENT APPROACH.....	937
CREATING DATABASE AND TABLES IN MYSQL	938
CREATING A WEB APPLICATION	938
ADDING THE REQUIRED LIBRARY FILES.....	939
CREATING A JAVABEAN CLASS.....	939
CREATING PERSISTENCE UNIT [PERSISTENCE.XML]	942
CREATING JSPS	949
Imports	953
Variable Declaration	954
Application Logic	954
Building An EntityManagerFactory	954
Obtaining A Session Object	954
Retrieving Captured Data	955
Populating The Entity Object With The Captured Data.....	955
Beginning A Transaction	955
Persisting Data.....	955
Committing A Transaction	956
Retrieving Data.....	956
Displaying Retrieved Data.....	957
THE GUESTBOOK APPLICATION STRUCTURE	958
RUNNING THE GUESTBOOK APPLICATION.....	958
40. CRITERIA API.....	961
IMPORTS	965
CRITERIA DECLARATIONS.....	966
RETRIEVING THE INSTANCE OF CRITERIABUILDER	966
CREATING A CRITERIAQUERY OBJECT	966
CREATING A TYPEDQUERY INSTANCE.....	966
EXECUTING THE QUERY.....	967

SECTION VII: HIBERNATE

41. INTRODUCTION TO HIBERNATE.....	969
WHAT IS HIBERNATE?.....	969
WHY HIBERNATE?.....	970
HIBERNATE, DATABASE AND THE APPLICATION.....	972
COMPONENTS OF HIBERNATE.....	973
Connection Management.....	973
Transaction Management.....	973
Object Relational Mapping.....	973
ARCHITECTURE OF HIBERNATE.....	974
Configuration Object.....	974
Session Factory.....	974
Session.....	975
Transaction.....	975
Query.....	975
Criteria.....	975
HOW HIBERNATE WORKS?.....	976
42. WRITING THE FIRST APPLICATION.....	977
APPLICATION REQUIREMENT SPECIFICATIONS.....	978
Where Does Hibernate Fit?.....	979
SOFTWARE REQUIREMENTS.....	980
Downloading Hibernate.....	981
THE APPLICATION DEVELOPMENT APPROACH.....	981
CREATING DATABASE AND TABLES IN MYSQL.....	982
CREATING A WEB APPLICATION.....	982
ADDING THE REQUIRED LIBRARY FILES.....	983
Hibernate Library Files.....	983
dom4j Library.....	983
JDBC Driver For MySQL.....	984
CREATING A JAVABEAN CLASS.....	985
CREATING HIBERNATE CONFIGURATION FILE.....	988
ADDING A MAPPING CLASS.....	993
CREATING JSPTS.....	993
Imports.....	997
Variable/Object Declaration.....	998
Application Logic.....	999
Creating A Configuration Instance And Building A Session Factory.....	999
Obtaining A Session Object.....	1000
Instantiating A Transaction.....	1000
Instantiating The JavaBean class [POJO].....	1000
Persisting Data.....	1000
Retrieving Data.....	1001
Displaying Retrieved Data.....	1002

RUNNING THE GUESTBOOK APPLICATION.....	1002
----------------------------------------	------

SECTION VIII: STRUTS

43. INTRODUCTION TO STRUTS	1005
STANDARD APPLICATION FLOW.....	1005
Framework.....	1006
Why Struts?.....	1006
MVC.....	1007
APPLICATION FLOW IN MVC.....	1008
WHAT IS STRUTS?.....	1009
WHAT IS STRUTS 2?.....	1009
WHY STRUTS 2?.....	1010
HISTORY OF STRUTS.....	1011
44. STRUTS FRAMEWORK CORE COMPONENTS	1013
StrutsPrepareAndExecuteFilter.....	1014
StrutsPrepareAndExecuteFilter In The Execution Flow.....	1014
ACTIONS.....	1015
Actions In The Execution Flow.....	1015
Role Of Action.....	1015
Performs As A Model.....	1015
Serves As A Data Carrier.....	1016
Helps Determine Results.....	1017
Single Or Multiple Results.....	1017
INTERCEPTORS.....	1018
Why Interceptors?.....	1019
Interceptor Configuration.....	1020
Interceptor Stack.....	1020
Interceptors In The Execution Flow.....	1021
VALUE STACK / OGNL.....	1021
Value Stack.....	1021
Value Stack In The Execution Flow.....	1021
Temporary Objects.....	1022
The Model Object.....	1022
The Action Object.....	1022
Named Objects.....	1022
Accessing Value Stack.....	1022
OGNL [Object-Graph Navigation Language].....	1023
OGNL Examples.....	1024
OGNL In The Execution Flow.....	1024
Role Of OGNL.....	1025
RESULTS AND RESULT TYPES [VIEW TECHNOLOGIES].....	1026
Results.....	1026

View Technologies	1026
Result Types	1027

45. GETTING STARTED WITH STRUTS 1029

APPLICATION REQUIREMENTS.....	1030
APPLICATION DEVELOPMENT	1031
Creating A Web Application	1032
Adding Struts 2 Libraries.....	1033
Creating Standard Deployment Descriptor [web.xml].....	1033
Adding Filter Element In Deployment Descriptor File [web.xml]	1034
Creating Struts Configuration File [struts.xml]	1035
Creating Database Table In MySQL.....	1038
Column Definition	1038
Adding MySQL Driver	1039
Working With Actions & Bean Classes.....	1039
A Bean Class.....	1039
Package	1041
Variables	1041
Setter/Getter Methods	1041
The Action Class.....	1042
Imports	1044
com.opensymphony.xwork2.ActionSupport.....	1044
java.sql Package.....	1045
java.text.DateFormat.....	1045
java.text.SimpleDateFormat.....	1045
java.util.ArrayList	1045
java.util.Date.....	1045
Extends	1046
Objects And Variables Declaration.....	1046
Diamond	1046
execute()	1047
Establishing A Connection With The MySQL Database Engine.....	1047
Adding The Captured Data To The Database Table	1047
Retrieving The Stored Data From The Database Table	1048
Adding The Retrieved Data To The ArrayList	1048
Returning Success.....	1048
Building Views	1048
Modifying The Default index.jsp.....	1053
Configuration - struts.xml.....	1054
GuestBook Action.....	1054
GuestBookSuccess Action.....	1055
Using Interceptors.....	1055
Imports	1056
com.opensymphony.xwork2.ActionInvocation	1057
com.opensymphony.xwork2.interceptor.Interceptor	1057

xxxviii Java EE 7 For Beginners

Implements.....	1057
Variables	1057
intercept().....	1057
init() And destroy()	1057
Declaring Interceptor	1058
Validations	1059
struts.xml Modifications	1063
Process Flow Diagram	1065
Running The GuestBook Web Application	1066

SECTION IX: ADVANCED TOPICS

46. WEB SERVICES	1071
SOAP	1072
BUILDING A WEB SERVICE USING JAX-WS	1072
What Is JAX-WS?.....	1072
BUILDING WEB SERVICE	1073
Creating MySQL DB Table	1074
Creating A Web Service	1075
Choosing A Container.....	1075
Creating A Web Application.....	1075
Creating A Web Service	1075
Designing The Web Service	1076
Adding An Operation To The Web Service.....	1076
Deploying And Testing The Web Service	1080
Consuming The Web Service	1082
Creating A Web Application.....	1082
Adding The Web Service To The Client Application	1083
Creating A Servlet.....	1084
Creating An HTML Form	1087
Building The Web Application	1087
Running The Application.....	1088
47. JAVAMAIL	1091
MAIL PROTOCOLS	1092
Simple Mail Transfer Protocol [SMTP].....	1092
Post Office Protocol [POP]	1092
Internet Message Access Protocol [IMAP]	1092
Multipurpose Internet Mail Extensions [MIME]	1093
Other Protocols	1093
COMPONENTS OF THE JAVAMAIL API.....	1093
THE JAVAMAIL API	1094
Session	1094
Message	1095

Address	1095
Authenticator	1097
Transport.....	1097
Store And Folder.....	1098
GETTING STARTED WITH THE JAVAMAIL API	1099
Creating A Web Application	1099
Creating An Enterprise Bean	1100
Creating The Mail Dispatcher Form Using JSP.....	1105
Creating A Servlet To Process The Mail	1106
Build The Web Application	1108
Running The Web Application	1108
ASYNCHRONOUS CALLS	1110
48. CONTEXT AND DEPENDENCY INJECTION (CDI)	1113
HISTORY	1113
CDI MANAGED BEANS	1114
DEPENDENCY INJECTION.....	1115
@Inject	1116
Constructor	1116
Instance Fields	1117
Setter Methods Of Properties.....	1117
@Named	1117
Why @Named?.....	1118
SCOPES.....	1118
@RequestScoped	1119
@SessionScoped.....	1119
@ApplicationScoped	1119
@Dependent	1119
@ConversationScoped.....	1119
CREATING A WEB APPLICATION	1120
CREATING A LOGIN FORM	1121
Using A CDI Managed Bean In A Facelet	1122
CREATING FACELETS.....	1123
CREATING A POJO	1125
Properties	1126
CREATING A CDI MANAGED BEAN	1126
Imports.....	1127
Annotations.....	1128
User POJO Properties	1128
Actions.....	1128
CREATING A JSF CONFIGURATION FILE	1129
DEPLOYMENT DESCRIPTOR [CREATED AUTOMATICALLY]	1129
CREATING BEANS CONFIGURATION FILE.....	1129
Building And Running The Web Application	1130

49. WEBSOCKET	1131
JAVA API FOR WEBSOCKET	1133
WEBSOCKET ENDPOINTS	1134
Programmatic Endpoints.....	1134
Annotated Endpoints.....	1135
CREATING A WEB APPLICATION	1137
ADDING MYSQL CONNECTOR/J JAR FILE	1138
CREATING A DATABASE.....	1138
CREATING A SERVER WEBSOCKET ENDPOINT	1139
Imports	1142
javax.websocket.OnClose	1142
javax.websocket.OnMessage	1142
javax.websocket.OnOpen.....	1142
javax.websocket.Session.....	1142
javax.websocket.server.ServerEndpoint	1142
@ServerEndpoint.....	1142
@OnMessage.....	1143
Sending Messages	1143
@OnOpen	1144
@OnClose.....	1144
CREATING AN HTML PAGE	1144
Connecting WebSocket Server Endpoint.....	1146
Events	1146
The onopen Event	1146
The onclose Event.....	1146
The onmessage Event.....	1146
The onerror Event	1146
Calling Functions	1146
Start Receiving Messages From Server	1147
BUILDING THE WEB APPLICATION	1147
RUNNING THE APPLICATION.....	1147
50. JAVASCRIPT OBJECT NOTATION (JSON).....	1151
JSON DATA STRUCTURE	1151
An Unordered Set	1152
An Ordered List	1152
JAVA API FOR JSON PROCESSING	1154
The Object Model API.....	1154
The Streaming Model API.....	1159
 SECTION X: ENTERPRISE APPLICATION DEVELOPMENT	
51. NEWS FORUM USING JAVASERVER PAGES	1165
ABOUT THE NEWS FORUM ENTERPRISE APPLICATION	1166

CREATING AN ENTERPRISE APPLICATION	1167
EJB MODULE.....	1169
Creating An Entity Class	1169
Persistence Unit	1174
Entity Class	1175
Creating Message-Driven Bean	1178
Creating Stateless Session Bean	1181
WEB MODULE.....	1185
Creating JSP Page.....	1185
Creating Singleton Session Bean	1187
Some Information About Event Listeners.....	1189
Creating Servlets.....	1191
BUILDING THE ENTERPRISE APPLICATION	1201
DEPLOYING THE ENTERPRISE APPLICATION.....	1202
RUNNING THE ENTERPRISE APPLICATION	1203
52. NEWS FORUM USING JAVASERVER FACES	1207
WEB MODULE.....	1209
Adding The JavaServer Faces Framework	1209
Creating Facelets.....	1211
Creating Singleton Session Bean	1216
Creating A CDI Managed Bean	1217
Creating CDI Configuration File	1222
Creating A JSF Configuration File	1222
Overview Of Deployment Descriptor [Created Automatically]	1225
BUILDING THE ENTERPRISE APPLICATION	1226