

Contents

Preface	ix
Acknowledgments	xxi

Part I: Introducing XML 1

Chapter 1: XML Concepts 3

What Is XML?	3
Extensibility	5
Structure	5
Validity	6
What Is XML Not?	6
XML Standards and the World Wide Web Consortium	7
XML Elements and Attributes	7
Elements	7
Attributes	8
Text	8
Empty elements	8
XML Document Structure	9
Data Source Encoding	9
Element and Attribute Structure	10
XML Document Syntax	12
XML Namespaces	13
When to use namespaces	14
XML Data Validation	14
Validating XML documents with DTDs	16
Validating XML documents with Schemas	18
Special Characters and Entity References	22
Using entity references as variables	23
Reserved character references	24
XML 1.1	24
XML 1.1 new features	25
Summary	27

Chapter 2: XML Documents 29

An Example XML Document	29
XML Document Structure and Syntax	32
Empty elements	36
XML housekeeping	36
Entity references and special characters	37

International XML with xml:lang	37
Keeping Your Space with xml:space	39
XML Namespaces	40
When to use namespaces	44
Element Name Tips	45
Summary	46
Chapter 3: XML Data Format and Validation	47
XML Parsers for Data Validation	49
Document Type Definitions	49
Applying DTDs	51
DTD structure	53
W3C XML Schemas	62
W3C Schema data types	62
W3C Schema elements	65
W3C Schema element and data type restrictions	67
Namespaces and W3C Schemas	68
An example W3C Schema document	68
Applying Schemas	71
Schema structure and syntax	72
Summary	76
Chapter 4: XML Parsing Concepts	79
Document Object Model (DOM)	80
What is DOM?	80
About DOM 1, DOM 2, and DOM 3	82
Simple API for XML (SAX)	83
What is SAX?	83
SAX 1 and SAX 2	83
About XML Parsers	86
Apache's Xerces	87
IBM's XML4J	87
Sun's JAXP	87
Microsoft's XML parser (MSXML)	88
DOM or SAX: Which Parser to Use?	88
Summary	90
Chapter 5: Parsing XML with DOM	91
Understanding the DOM	92
The W3C DOM 1 Recommendation	92
The W3C DOM 2 Recommendation	93
The W3C DOM 3 Recommendation	93
Microsoft MSXML DOM enhancements	95
DOM Interfaces and Nodes	95
Understanding DOM nodes	98
W3C DOM nodeTypes, constants, nodeName, and nodeValue	100

The MSXML DOM nodeTypeString property	100
DOM node properties	101
W3C DOM node methods	104
Other DOM node properties and methods	105
Summary	121
Chapter 6: Parsing XML with SAX	123
Understanding SAX	124
Where SAX comes from	124
SAX 1 and SAX 2	125
Microsoft MSXML SAX extensions	125
Interfaces for SAX and MSXML	126
SAX core interfaces	127
SAX extension interfaces	128
MSXML SAX extension interfaces	129
SAX Methods and Properties	130
SAX interfaces	130
SAX helper classes	143
SAX extension interfaces	160
SAX extension helper classes	163
MSXML Extension Interfaces	167
Summary	171
Chapter 7: XSLT Concepts	173
Introducing the XSL Transformation Recommendation	173
How an XSL Transformation Works	175
XSL stylesheets	175
XSL for attributes and elements	175
XSLT Elements	179
XSL and XPath	183
XSLT Extensions with EXSLT.org	189
Summary	190
Chapter 8: XSL Transformations	191
To Begin...	191
XML to XML	194
XML to text	209
XML to HTML	212
Summary	216
Chapter 9: XSL Formatting Objects	217
Understanding XSL Formatting Objects	217
Understanding FOP Servers	219
Converting XML to PDF	219
Summary	232

Part II: Microsoft Office and XML**233****Chapter 10: Microsoft XML Core Services 235**

Getting Started	235
System requirements and installation	236
Core files and versions	238
Parsing and Features Overview	241
Parsing	241
Fundamental classes	242
Other objects	246
New objects	247
Summary	249

Chapter 11: Working with the MSXML DOM 251

Introduction	252
DOM members	252
Building XML-Based Applications	263
Summary	269

Chapter 12: Generating XML from MS Access Data 271

Introduction	272
Exporting and Importing Data	272
Exporting	272
Importing	284
Summary	289

**Chapter 13: Creating an Excel Spreadsheet
from an XML Data Source 291**

Introduction	292
Importing XML	292
Exporting XML	304
Summary	307

Part III: XML Web Applications Using J2EE**309****Chapter 14: XML Tools for J2EE: IBM, Apache,
Sun, and Others 311**

IBM Tools	312
WebSphere Studio Application Developer and Workbench	312
IBM AlphaWorks	313
Eclipse Tools	315

Sun Tools	316
Sun ONE	317
The Java Web Services Developer Pack	317
Apache Tools	318
XML Parsing Code: XML4J, Xerces, and JAXP: What Is What?	320
Summary	321
Chapter 15: Xerces	323
Downloading and Installing Xerces	324
Parsing XML Documents in J2EE	325
Parsing XML documents with DOM	325
Parsing XML documents with SAX	334
Summary	340
Chapter 16: Xalan	341
Downloading and Installing Xalan	342
Transforming XML Documents in J2EE	343
Using Xalan to transform XML documents	343
Sending transformation output to the screen and using an XML stylesheet reference	349
Passing transformation output to DOM and SAX	351
Summary	359
Chapter 17: XML APIs from Sun	361
About the Java Community Process	362
Introduction to the Sun Java Web Services Developer Pack	363
JAXP (Java API for XML Processing)	363
JAXB (Java Architecture for XML Binding)	363
JAXM (Java API for XML Messaging)	364
JSTL (Java Server Pages Standard Tag Library)	364
JAX-RPC (Java API for XML-Based RPC)	364
JAXR (Java API for XML Registries)	364
Java WSDP Registry Server	364
SAAJ (SOAP with Attachments API for Java)	364
Developing with JAXP (Java API for XML Processing)	365
Swapping processors and parsers with JAXP	367
Working with JAXP and Xalan JAXP examples	370
Developing with JAXB (Java Architecture for XML Binding)	371
Developing with JSTL (JavaServer Pages Standard Tag Library)	389
Downloading and installing the JSTL	397
Working with the JSTL XML Processing Library	400
Summary	428

Part IV: Relational Data and XML**429****Chapter 18: Accessing and Formatting****XML from SQL Server Data 431**

The XML Programming Bible Example Tables	432
Installing and Configuring SQLXML	435
Viewing XML Results in Query Analyzer	435
Accessing SQL Server Using HTTP	436
Retrieving XML Data Using FOR XML	444
Using RAW mode	444
Using AUTO mode	445
Using Explicit mode	446
Updating SQL Server Data with XML	451
Updating relational data using OPENXML	451
Creating an annotated W3C schema for SQL Server data	460
Using schemas to specify SQL Server table relationships	466
Using XML Bulk Load	467
Updategrams	469
Summary	471

Chapter 19: Accessing and Formatting XML from Oracle Data . . . 473

The XML Programming Bible Example Tables	474
Installing and Configuring the Oracle Database and the Oracle XDK . . .	477
About Oracle XML DB	477
About the Oracle XDK	477
Developing Oracle XML Solutions with XML DB	478
Working with XML DB	478
Working with multiple data rows using XML DB	485
Working with the XMLTYPE data type	487
Creating relational data from XML documents	489
Formatting XML documents with XMLFormat	497
XML resources for PL/SQL developers	499
A DBMS_XMLGEN example	501
Working with the Oracle XDK	504
Oracle and Java integration: JDBC and SQLJ	505
Summary	508

Chapter 20: Accessing and Formatting XML from DB2 509

Installing DB2 and the DB2 XML Extender	509
The XML Programming Bible Example Tables	510
DB2 XML Functions	513
Adding an XML document declaration	519
Grouping and ordering XML with XMLAGG()	520

Developing XML Solutions with the DB2 XML Extender	521
Binding and enabling databases for XML Extender	521
Working with Document Access Definitions (DAD)	523
Working with XML columns	523
XML column mapping example	524
XML collection SQL mapping DAD example	529
XML Collection RDB Node example	531
Checking your RDB Node DAD with the DAD Checker	535
Adding DADS and DTDs to the database	536
Summary	537

Chapter 21: Building XML-Based Web Applications with JDBC . . . 539

About Java Database Connectivity (JDBC)	539
Introduction to the Sample Java Application – XMLPBXMLApp.java . . .	542
How the application works	542
About the example SQL Server database	543
Creating the Java Application User Interface	543
Defining public variables and the application window	544
Setting objects in the Window and implementing	
ActionListeners	545
Defining the action for the source list	547
Defining the action for the quote list	547
Retrieving a list of authors from the Authors table via JDBC	548
Retrieving a list of quotes from a selected author	550
Generating Custom XML Output	551
XML Servlets	558
Example: A Three-Tier System Combining Java Applications,	
Servlets, and SQL Server	559
Prerequisites for Servlet Development	560
Introducing the XML example servlets and client application	560
Running the Web Example Application	561
Under the Hood of the Web Application Servlets	564
The XMLPBWebServletGetAuthorList Servlet	564
The XMLPBWebServletAppGetSingleAuthorList Servlet	566
The XMLPBWebServletBuildElementXML Servlet	569
The XMLPBWebServletBuildAttributeXML Servlet	572
A Multi-Tier Java Application	575
Installing the XMLPBServletApp Java Application	575
Under the Hood of the Multi-Tier Application Servlets	576
The XMLPBAppServletGetAuthorList Servlet	576
The XMLPBAppServletGetSingleAuthorList Servlet	578
The XMLPBAppServletBuildElementXML Servlet	580
The XMLPBAppServletBuildAttributeXML Servlet	583
Under the Hood of the XML Quote Generator — Servlet	
Edition Application	586
Summary	590

Chapter 22: Transforming Relational XML Output into Other Formats 591

Transformation Functions in Oracle, DB2, and MS SQL Server	592
MS SQL Server and XSL	592
Oracle and XSL	596
DB2 and XSL	601
Transforming JDBC Result Sets to HTML	606
Building Data Islands with the Microsoft XML Core Services (MSXML)	611
Introduction to XML data islands	611
The Microsoft XML Core Services (MSXML)	612
The Data Islands Example Page	612
Creating a data island using JavaScript and MSXML	614
Transforming an XML document to an XML data island	616
Parsing data island data into a table	618
Linking XSL with HTML page design elements	619
Sorting data islands using JavaScript and XSL	619
Summary	621

Part V: Introducing Web Services 623

Chapter 23: Web Service Concepts 625

Introduction to Web Services	625
Web Service Building Blocks	626
SOAP (Simple Object Access Protocol)	627
WSDL (Web Services Description Language)	628
UDDI (Universal Description, Discovery and Integration)	628
Web Services Architecture	629
Basic Web service architecture	629
Extended Web service architectures	629
Web Service Models	631
The call and response model	631
The brokered calls model	632
The chained model	633
Serving Web Services	633
Consuming Web Services	634
Summary	634

Chapter 24: SOAP 635

Introduction	635
SOAP format	636
A SOAP request	637

The HTTP header	637
The SOAP request envelope	639
A SOAP response	642
Summary	643
Chapter 25: WSDL	645
WSDL Format	645
Using WSDL	649
Definitions	649
Parts, types, and messages	649
Operations and portTypes	649
Bindings	650
Services and ports	650
Updating WSDL	651
Editing WSDL	652
Summary	653
Chapter 26: UDDI	655
UDDI Structure	655
Finding Web services with UDDI	656
UDDI APIs	661
The Microsoft UDDI SDK	663
Summary	664
Chapter 27: Microsoft Web Services	665
The Microsoft SOAP Toolkit	666
What's in the SDK	666
Overview of the MS SOAP component library	667
Server-Side Programming with MS SOAP	668
Client-Side Programming with MS SOAP	675
Office XP Web Services Toolkit	676
Utilities in the MS SOAP Toolkit	680
Summary	682
Chapter 28: J2EE Web Services	683
Web Services: .NET or J2EE?	683
Yeah, blah, blah, blah, Brian: Which one do I pick?	684
Don't overlook smart clients!	684
About portals	685
J2EE Web Service Architecture	687
Software Support for J2EE Web Services	690
Apache Offerings	691
Apache AXIS	691
Web Services Invocation Framework (WSIF)	691
Web Services Inspection Language (WSIL)	691

XML security	692
Jakarta Tomcat	692
IBM Offerings	692
WebSphere Application Server	692
WebSphere Portal Server	692
IBM AlphaWorks	693
Eclipse Tools for J2EE Web Service Developers	693
BEA Offerings	694
Sun Offerings	694
Sun ONE Application Server	694
The Sun Java Web Services Developer Pack	694
Summary	695

Part VI: Microsoft.NET and Web Services

697

Chapter 29: Creating and Deploying .NET Web Services 699

Introduction	700
Brief overview of .NET	700
Web Services Class and Attributes	703
Visual Studio .NET and Language Support	705
XML Support for Web Services	707
Summary	709

Chapter 30: Accessing .NET Web Services 711

Web Services Security	711
Deploying .NET Web Services	715
Upgrading Existing Applications	716
Summary	717

Chapter 31: Building a .NET Web Services Client 719

Introduction	719
Browser-Based Client	721
Windows-Based Client (PocketPC)	730
Summary	734

Part VII: Web Services and J2EE

735

Chapter 32: Web Service Tools for J2EE: IBM, Apache, Sun, and Others 737

Tools for Building J2EE Web Services	738
Apache Offerings	738
Web Services Invocation Framework (WSIF)	739
Web Services Inspection Language (WSIL)	739

XML Security	740
Jakarta Tomcat	740
IBM Offerings	740
WebSphere Studio Application Developer and Workbench	740
IBM AlphaWorks	741
Eclipse Tools	742
Sun Offerings	743
Sun ONE Studio	743
The Sun Java Web Services Developer Pack	743
JAXP (Java API for XML Processing)	744
JAXB (Java Architecture for XML Binding)	744
JAXM (Java API for XML Messaging)	744
JSTL (Java Server Pages Standard Tag Library)	744
JAX-RPC (Java API for XML-Based RPC)	745
Java WSDP Registry Server	745
SAAJ (SOAP with Attachments API for Java)	745
And Others	746
Summary	746

Chapter 33: Web Services with the Sun Java Web Services

Developer Pack 747

JWSDP Overview	748
The API Puzzle	748
Java API for XML Messaging (JAXM)	749
The JAXM provider model	750
JAXM clients	751
SOAP messages and SAAJ	751
Connections	752
JAXM package structure	753
Profiles	754
JAXM versus JMS	754
Building a client	755
Handling a SOAPFault	759
The Provider Admin Tool	759
Java API for XML-Based RPC (JAX-RPC)	759
WSDL at work	761
Developing clients	762
Developing services (endpoints)	765
Mapping data types	766
Message handlers	767
Using wscompile and wsdeploy	767
Java API for XML Registries (JAXR)	767
Capability profiles	768
JAXR architecture	768
A few registry scenarios	769
Summary	772

Chapter 34: Apache Axis 773

The Axis Evolution	773
Performance enhancements	774
Flexibility and extensibility	774
Supporting the SOAP specification	775
Improved interoperability	775
Transport independence	775
JAX-RPC and SAAJ compliance	775
WSDL support	775
Architecture Overview	776
Message handlers and message chains	777
Subsystem overview	778
Type mappings	780
Installing and Running Axis	781
Axis distribution files	781
Copying WEBAPPS and LIB files	782
Starting the server	782
Building and Consuming a Simple Web Service	784
Setting up your environment	785
Creating a service	785
Building the client	786
Deployment	788
Dynamic deployment (JWS)	788
WSDD deployment	789
WSDL Tools	794
WSDL2Java	794
Java2WSDL	797
Monitor SOAP Message with TCPMON	798
TCPMON setup	798
Monitoring messages	798
Summary	800

Chapter 35: Accessing Web Services from Java Applications 801

When NOT to Use J2EE Web Services	802
Example: A Three-Tier System Combining Java Applications, Web Services, and Relational Data	802
Separating the user interface from the data access processes	803
Prerequisites for Developing J2EE Web Services	803
Downloading and installing AXIS	803
Deploying Web service class, WSDL, and WSDD files	804
Running Web services on a J2EE application server	804
Running the Web services without a J2EE server	804
Installing the WSDL files	806
Developing Web Services	807
Inside the XMLPBWSServletGetAuthorList Web service	807
The XMLPBWSServletGetSingleAuthorList Web service	813

The XMLPBWSServletBuildElementXML Web service	815
The XMLPBWSServletBuildAttributeXML Web service	818
Inside the XMLPBWSApp J2EE Client Application	820
How the application works	821
Creating the Java Application User Interface	822
Defining public variables and the application window	822
Setting objects in the window and implementing ActionListeners	823
Defining the action for the Author list	825
Defining the action for the Quote list	826
Retrieving a list of authors by calling a Web service	827
Retrieving a list of quotes from a selected author	828
Generating Custom XML Output	829
Summary	832

Part VIII: Advanced Web Services

833

Chapter 36: Accessing Relational Data via Web Services 835

MS SQL Server and Web services	835
Installing and configuring SQLXML	836
Configuring IIS Virtual Directory Management Web Services	836
Handling Microsoft Web service data in other platforms	839
Oracle and Web services	842
DB2 and Web services	843
Example: A Multi-Tier Web Service Using J2EE and DB2	844
Prerequisites for Developing J2EE and DB2 Web Services	845
Downloading and installing the DB2 JDBC driver	845
Downloading and installing WOF	846
Deploying Web service class, WSDL, and WSDD files	847
Running Web services on a J2EE application server	848
Running the Web services without a J2EE server	848
Installing the WSDL files	850
Developing Web Services	850
Inside the XMLPBWSMTServletGetAuthorList Web service	850
The XMLPBWSMTServletGetSingleAuthorList Web service	856
The XMLPBMTWSServletDB2Format Web service	858
Inside the XMLPBWSMTApp J2EE Client Application	859
How the application works	860
Creating the Java Application User Interface	860
Defining public variables and the application window	860
Setting objects in the window and implementing ActionListeners	862
Defining the action for the author list	864
Defining the action for the quote list	864

Retrieving a list of authors by calling a Web service	865
Retrieving a list of quotes from a selected author	866
Generating DB2 XML Output	867
Summary	869
Chapter 37: Authentication and Security for Web Services	871
Secure, Reliable Web Service Requirements	872
Current Web Service Standards for Security and Authentication	873
Transport-Layer Security	873
Public key infrastructure (PKI)	874
Kerberos	874
W3C Recommendations	874
OASIS Security and Authentication Specifications	875
WS-Security	875
WS-Policy framework	876
Web Services Policy Assertions Language (WS-PolicyAssertions)	876
Web Services Policy Attachment (WS-PolicyAttachment)	877
Web Services Security Policy Language (WS-SecurityPolicy)	877
WS-Trust	877
WS-SecureConversation	877
Secure Assertion Markup Language (SAML)	878
XML Access Control Markup Language (XACML)	878
Web Service Security and Authentication in Java	878
Java community process initiatives for Web service security	879
Apache XML Security	879
IBM XML Security Suite	879
Web Service Security and Authentication in Microsoft .NET	880
Web Service Transactions: BPEL4WS and WSCI	880
Web Services Choreography Interface (WSCI)	881
BPEL4WS	881
BPEL4WS, BPML, and WSCI working together	882
Tools for transactional Web services	882
Summary	883
Index	885