

Java™ Web Services



Java™ Web Services

by David A. Chappell and Tyler Jewell

Copyright © 2002 O'Reilly & Associates, Inc. All rights reserved.
Printed in the United States of America.

Published by O'Reilly & Associates, Inc., 1005 Gravenstein Highway North, Sebastopol, CA 95472.

O'Reilly & Associates books may be purchased for educational, business, or sales promotional use. Online editions are also available for most titles (*safari.oreilly.com*). For more information contact our corporate/institutional sales department: (800) 998-9938 or *corporate@oreilly.com*.

Editor: Mike Loukides

Production Editor: Ann Schirmer

Cover Designer: Emma Colby

Interior Designer: Melanie Wang

Printing History:

March 2002: First Edition.

Nutshell Handbook, the Nutshell Handbook logo, and the O'Reilly logo are registered trademarks of O'Reilly & Associates, Inc. Java™ and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc., in the United States and other countries. O'Reilly & Associates, Inc. is independent of Sun Microsystems. Many of the designations used by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and O'Reilly & Associates, Inc. was aware of a trademark claim, the designations have been printed in caps or initial caps. The association between the image of a European ibex and Java web services is a trademark of O'Reilly & Associates, Inc.

While every precaution has been taken in the preparation of this book, the publisher and author assume no responsibility for errors or omissions, or for damages resulting from the use of the information contained herein.

ISBN: 0-596-00269-6

Table of Contents

Preface	vii
1. Welcome to Web Services	1
What Are Web Services?	1
Web Services Adoption Factors	7
Web Services in a J2EE Environment	10
What This Book Discusses	11
2. Inside the Composite Computing Model	13
Service-Oriented Architecture	14
The P2P Model	23
3. SOAP: The Cornerstone of Interoperability	25
Simple	25
Object	26
Access	27
Protocol	27
Anatomy of a SOAP Message	28
Sending and Receiving SOAP Messages	32
The Apache SOAP Routing Service	45
SOAP with Attachments	49
4. SOAP-RPC, SOAP-Faults, and Misunderstandings	54
SOAP-RPC	54
Error Handling with SOAP Faults	63
SOAP Intermediaries and Actors	69

5. Web Services Description Language	72
Introduction to WSDL	73
Anatomy of a WSDL Document	74
Best Practices, Makes Perfect	96
Where Is All the Java?	96
6. UDDI: Universal Description, Discovery, and Integration	98
UDDI Overview	99
UDDI Specifications and Java-Based APIs	102
Programming UDDI	104
Using WSDL Definitions with UDDI	137
7. JAX-RPC and JAXM	140
Java API for XML Messaging (JAXM)	141
JAX-RPC	160
SOAPElement API	165
JAX-RPC Client Invocation Models	166
8. J2EE and Web Services	173
The SOAP-J2EE Way	173
The Java Web Service (JWS) Standard	188
9. Web Services Interoperability	191
The Concept of Interoperability	191
The Good, Bad, and Ugly of Interoperability	191
Potential Interoperability Issues	205
SOAPBuilders Interoperability	207
Other Interoperability Resources	230
Resources	233
10. Web Services Security	236
Incorporating Security Within XML	237
XML Digital Signatures	238
XML Encryption	243
SOAP Security Extensions	250
Further Reading	252
Appendix: Credits	253
Index	255

Welcome to Web Services

The promise of web services is to enable a distributed environment in which any number of applications, or application components, can interoperate seamlessly among and between organizations in a platform-neutral, language-neutral fashion. This interoperation brings heterogeneity to the world of distributed computing once and for all.

This book defines the fundamentals of a web service. It explores the core technologies that enable web services to interoperate with one another. In addition, it describes the distributed computing model that the core web service technologies enable and how it fits into the bigger picture of integration and deployment within the J2EE platform. It also discusses interoperability between the J2EE platform and other platforms such as .NET.

What Are Web Services?

A web service is a piece of business logic, located somewhere on the Internet, that is accessible through standard-based Internet protocols such as HTTP or SMTP. Using a web service could be as simple as logging into a site or as complex as facilitating a multi-organization business negotiation.

Given this definition, several technologies used in recent years could have been classified as web service technology, but were not. These technologies include win32 technologies, J2EE, CORBA, and CGI scripting. The major difference between these technologies and the new breed of technology that are labeled as web services is their standardization. This new breed of technology is based on standardized XML (as opposed to a proprietary binary standard) and supported globally by most major technology firms. XML provides a language-neutral way for representing data, and the global corporate support ensures that every major new software technology will have a web services strategy within the next couple years. When combined, the software integration and interoperability possibilities for software programs leveraging the web services model are staggering.

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.