Expert Service-Oriented Architecture in C# 2005

Second Edition

Jeffrey Hasan with Mauricio Duran

Expert Service-Oriented Architecture in C# 2005, Second Edition

Copyright © 2006 by Jeffrey Hasan, Mauricio Duran

All rights reserved. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, recording, or by any information storage or retrieval system, without the prior written permission of the copyright owner and the publisher.

ISBN-13 (pbk): 978-1-59059-701-9 ISBN-10 (pbk): 1-59059-701-X

Printed and bound in the United States of America 987654321

Trademarked names may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, we use the names only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

Lead Editor: Jonathan Hassell

Technical Reviewers: Mathew Upchurch, Omar Del Rio

Editorial Board: Steve Anglin, Dan Appleman, Ewan Buckingham, Gary Cornell, Jason Gilmore, Jonathan Hassell, James Huddleston, Chris Mills, Matthew Moodie, Dominic Shakeshaft,

Jim Sumser, Matt Wade

Project Manager: Richard Dal Porto Copy Edit Manager: Nicole LeClerc

Copy Editors: Jennifer Whipple, Ami Knox

Assistant Production Director: Kari Brooks-Copony

Production Editor: Ellie Fountain

Compositor: Dina Quan Proofreader: Liz Welch Indexer: Michael Brinkman

Artist: Kinetic Publishing Services, LLC

Cover Designer: Kurt Krames

Manufacturing Director: Tom Debolski

Distributed to the book trade worldwide by Springer-Verlag New York, Inc., 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax 201-348-4505, e-mail orders-ny@springer-sbm.com, or visit http://www.springeronline.com.

For information on translations, please contact Apress directly at 2560 Ninth Street, Suite 219, Berkeley, CA 94710. Phone 510-549-5930, fax 510-549-5939, e-mail info@apress.com, or visit http://www.apress.com.

The information in this book is distributed on an "as is" basis, without warranty. Although every precaution has been taken in the preparation of this work, neither the author(s) nor Apress shall have any liability to any person or entity with respect to any loss or damage caused or alleged to be caused directly or indirectly by the information contained in this work.

The source code for this book is available to readers at http://www.apress.com in the Source Code section.

Contents

About the Technic Acknowledgment	scal Reviewersts	xiii
Introduction		xvii
CHAPTER 1	Introducing Service-Oriented Architecture	1
	Overview of Service-Oriented Architecture	1
	What Are Web Services, Really?	
	Components of Web Service Architecture	6
	WS-I Basic Profile, WS- Specifications, and Web Services	
	Enhancements	
	Introducing the WS-I Basic Profile	
	Introducing the WS- Specifications	
	Introducing Web Services Enhancements	
	Sullillary	14
CHAPTER 2	The Web Services Description Language	15
	Elements of the WSDL Document	15
	The <types> Element</types>	
	The <message> Element</message>	18
	The <operation> Element</operation>	19
	The <porttype> Element</porttype>	21
	The <binding> Element</binding>	21
	The <port> Element</port>	
	The <service> Element</service>	
	The WSDL 1.1 Specification	
	Working with WSDL Documents	
	How to Generate a WSDL Document	
	What to Do with the WSDL Document	
	Summary	28

CHAPTER 3	Web Services	31
	How to Build a Message-Oriented Web Service Step 1: Design the Messages and the Data Types Step 2: Build the XSD Schema File for the Data Types Step 3: Create a Class File of Interface Definitions for the Messages and Data Types Optional Step 3A: Generate the WSDL Document Manually Step 4: Implement the Interface in the Web Service Code-Behind File Step 5: Generate a Proxy Class File for Clients Based on the WSDL Document Step 6: Implement a Web Service Client Using a Proxy Class File Next Steps Design and Build a Message-Oriented Web Service The Role of XML Messages and XSD Schemas The Role of the Interface Definition Class File	31 32 32 32 32 33 33 34 34
CHAPTER 4	Messages vs. Types Consume the Web Service Build the Web Service Consumer Summary Design Patterns for Building Service-Oriented Web Services	47 49 49 55
	How to Build Service-Oriented Web Services Step 1: Create a Dedicated Type Definition Assembly Step 2: Create a Dedicated Business Assembly Step 3: Create the Web Service Based on the Type Definition Assembly Step 4: Implement the Business Interface in the Web Service Step 5: Generate a Web Service Proxy Class File Based on the WSDL Document Step 6: Create a Web Service Client Design and Build a Service-Oriented Web Service Create the Definition Assembly (Step 1) Create the Business Assembly (Step 2) Create the Web Service (Steps 3–5) Create the Web Service Client (Step 6)	57 61 62 62 63 63 64 66 68

	Design and Build a Service Agent	75
	Implement the StockTrader SOA Application Using a	
	Service Agent	76
	The External Web Service (StockQuoteExternalService)	78
	The Service Agent (StockTraderServiceAgent)	78
	The Business Assembly (StockTraderBusiness)	80
	Summary	81
CHAPTER 5	Web Services Enhancements 3.0	83
	Overview of the WS- Specifications	83
	Business Significance of the WS- Specifications	
	Introducing the WS- Specifications	
	Interoperability	
	Composability	
	Security	
	Description and Discovery	
	Messaging and Delivery	
	Transactions	
	The WS- Specifications Covered in This Book	
	Introducing Web Services Enhancements 3.0	
	-	
	How the WSE Processing Infrastructure Works How WSE Works with ASP.NET	
	Install and Configure WSE 3.0	
	X.509 Certificate Support	
	X.509 Certificates Explained	
	Installing the X.509 Test Certificates	
	Set ASP.NET Permissions to Use the X.509 Certificates	
	Final Thoughts on WSE	
	Summary	106
CHAPTER 6	Secure Web Services with WS-Security	107
	The WS-Security Specification	107
	Secure Web Services in an SOA	111
	Implement WS-Security Using the WSE 3.0 Toolkit	112
	WSE 3.0 Security Policies	115
	Turnkey Security Assertions	117
	Securing the StockTrader Application Using WSE 3.0	
	Authorization	
	Summary	122

CHAPTER 7	Extended Web Services Security with WS-Security	
	and WS-Secure Conversation	133
	Authentication Models	133
	Direct Authentication	133
	Brokered Authentication	135
	Implementing Brokered Authentication	137
	Brokered Authentication Using Mutual Certificates	137
	Brokered Authentication Using Kerberos	146
	Prevent Replay Attacks Using Time Stamps, Digital Signatures, and	
	Message Correlation	
	Use Time Stamps for Message Verification	
	Use Username Token Nonce Values for Message Verification	160
	Use Message Correlation and Sequence Numbers for	
	Message Verification	
	Establish Trusted Communication with WS-Secure Conversation	
	Overview of Secure Conversation	
	How to Implement Secure Conversation Using WSE 3.0	
	Final Thoughts on Secure Conversation	
	Summary	167
CHAPTER 8	SOAP Messages: Addressing, Messaging,	
	and Routing	169
	Communication Models for Web Services	170
	Overview of WS-Addressing	
	Overview of the WS-Addressing Constructs	
	WSE 3.0 Implementation for WS-Addressing	
	Security Considerations for WS-Addressing	
	Overview of Messaging	
	Comparing Messaging with the HTTP and TCP Protocols	
	Representing SOAP Messages in the WSE 3.0 Messaging	
	Framework	179
	SOAP Senders and SOAP Receivers	
	Traditional XML Web Services vs. SOAP Messaging	
	over HTTP	187
	Properties of Message-Enabled Web Services	188

	Overview of Routing and Referral189
	Build a SOAP Router for the Load Balancing Routing Model 190
	Overview of the SOAPSender191
	Overview of the SOAPService192
	Overview of the SOAPRouter193
	Send a Stock Quote Request Using the SOAPSender
	Routing vs. WS-Referral
	Routing and Security196
	Routing vs. WS-Addressing
	Integrate Web Services and MSMQ197
	Use MSMQ for Reliable Messaging
	Create a Message Queue Trigger
	Create a Web Service That Uses MSMQ199
	Implement the Web Service Client
	Summary
	B IWOFOOL I' AL II W'I
CHAPTER 9	Beyond WSE 3.0: Looking Ahead to Windows
	Communication Foundation (WCF)
	Overview of WCF
	The WCF Service Model
	The WCF Connector211
	Hosting Environments211
	Messaging Services212
	System Services212
	Understanding WCF Web Services213
	What Is a WCF Web Service?213
	Understanding WCF Applications and Infrastructure
	The WCF Service Layer214
	Ports
	Typed Channels
	Service Manager
	Transports and Formatters
	How to Get Ready for WCF
	WSE 3.0 and WCF
	Summary

APPENDIX	References	225
	Service-Oriented Architecture (General)	225
	XML Schemas and SOAP	226
	WS- Specifications (General)	227
	Web Services Enhancements 2.0 and 3.0 (General)	
	WS-Security	228
	WS-Policy	230
	WS-Secure Conversation	230
	WS-Addressing	231
	WS-Messaging	231
	WS-Routing and WS-Referral	232
	WS-Reliable Messaging	232
	Windows Communication Foundation (Indigo)	
	Miscellaneous	233
INDEX		235