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Pro WCF

Practical Microsoft SOA Implementation

Creating the next generation of secure, reliable, and interoperable services

Chris Peiris and Dennis Mulder

Foreword by Thom Robbins,
Director of .NET Platform Marketing, Microsoft Corporation

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To my wife, Kushanthi, and my son, Keshera—you give me a reason to wake up every day and tackle the world head-on. Thank you also to my father, Christopher; mum, Shantha; and my brother, Gayan. It is your blessings and inspirations that get me through the hard times. Last but not least, a big thanks to Mr. Pinto and Mrs. Alwis who played a big part in my secondary education. You gave me wings to fly. I wouldn't have made it this far without your help.
—Chris Peiris

To my wife, Janneke—without your patience I wouldn't have been able to get my first book out of the door. I know that it wasn't easy to go through the past year with Anouk's birth and Amber's "childhood puberty" (she's a three year old). To my parents and my sister—thanks a lot for the heads-up and the interest you expressed in my writing.
—Dennis Mulder

I can safely say that I would've never been able to navigate through the past 16 years without my wife, Donna. She has been there for me countless times and is always someone who provides me with comfort, understanding, and lots of reality. And to my two little girls, Christine and Lauren, who to me represent what life is all about. I love them all dearly and couldn't make it through many days without knowing that I'll see their smiling faces and have enjoyable conversations that makes me feel like a kid again.
—Shawn Cicoria

To my wife, Meenakshi, without her support, patience, endless review sessions, ideas, and desire for perfection, this book would not have been possible. She provides the rational balance to my mad world.
—Amit Bahree

To my grandfather, Late Mahesh Chandra Pathak, for his blessings and moral values. To my parents, Pankaj and Bina Pathak, for being the best parents, and to my lovely sister, Tanwi, for her immense support and for teaching me to do what I believe in. I also appreciate the help, support, and encouragement from my mentor Mr. J.P. Kukreti and my dear friends (Amit Rawat, Piyush Suyal, Vikal Devlal, Harsh Nigam, and Shweta Bashani).
—Nishith Pathak

Contents at a Glance

PART 4 Appendixes

Contents

PART 3 Advanced Topics in WCF

PART 4 Appendixes

Foreword

Modern distributed systems are based on the principles of Service-Oriented Architecture (SOA). This type of application architecture is based on loosely coupled and interoperable services. The global acceptance of web services has changed how these application components are defined and built. They're fueled by vendor agreements on standards and proven interoperability. This combination has helped set web services apart from other integration technologies. Windows Communication Foundation (WCF) is Microsoft's unified framework for building reliable, secure, transacted, and interoperable distributed applications. WCF represents a new step in distributed programming for developers using the .NET Framework. If you are planning or currently building systems using any of today's .NET distributed technologies, you should be paying close attention to WCF and the material in this book. It's only a matter of time before all .NET-targeted code related to communications will be written using WCF.

WCF is designed to offer a manageable approach to distributed computing, broad interoperability, and direct support for service orientation. As the name suggests, WCF provides the .NET Framework with a foundation for writing code to communicate across components, applications, and systems. WCF was completely designed with service orientation in mind. It is primarily implemented as a set of classes on top of the .NET Framework common language runtime (CLR). Because it was designed to extend the .NET Framework, WCF enables developers who are building object-oriented applications today to take their existing skills and start developing service-oriented applications.

SOA is an architectural pattern that has many different styles. To support this, WCF provides a layered architecture. At the bottom layer, WCF exposes a channel architecture that provides asynchronous, untyped messages. Built on top of this are protocol facilities for secure, reliable, transacted data exchange and a broad choice of transport and encoding options. While WCF introduces a new development environment for distributed application, it is designed to interoperate with non-WCF-based applications. WCF interoperability has two important aspects: interoperability with other platforms and interoperability with the Microsoft technologies that preceded WCF.

The typed programming model or service model exposed by WCF is designed to ease the development of distributed applications and provide developers with experience in an ASP.NET web service. .NET Remoting and Enterprise Services offer a familiar development experience with WCF. The service model features a straightforward mapping of web service concepts to the types of the .NET Framework CLR. This includes a flexible and extensible mapping of messages to service implementations found in the .NET languages. WCF also provides serialization facilities that enable loose coupling and versioning. At the same time, this provides integration and interoperability with existing .NET technologies such as MSMQ, COM+, and others. The result of this technology unification is greater flexibility and significantly reduced development complexity.

To allow more than just basic communication, WCF implements web service technologies defined by the WS-* specifications. These specifications address several areas, including basic messaging, security, reliability, and transactions, as well as working with a service's metadata.

Support for the WS-* protocols means that web services can easily take advantage of interoperable security, reliability, and transaction support required by businesses today. Developers can now focus on business logic and leave the underlying plumbing to WCF. WCF also provides opportunities for new messaging scenarios with support for additional transports such as TCP and Named Pipes and new channels such as the peer channel. More flexibility is also available around hosting web services. Windows Forms applications, ASP.NET applications, console applications, Windows services, and COM+ services can all easily host web service endpoints on any protocol. WCF also has many options for digitally signing and encrypting messages including support for Kerberos and X.509.

Building distributed systems using SOA is not a new concept. However, WCF represents a new paradigm in how these applications are developed using the .NET Framework 3.0. Each author has practical real-world experience in building and architecting distributed systems for a variety of customers. They also bring a wealth of knowledge and experience in their understanding of WCF and the .NET Framework. In this book they come together to present practical answers in building a good architecture, the options you have for communication, the various security concerns, and so much more.

This book doesn't merely offer genuine insight into solving real enterprise problems using WCF. It also provides extensive examples to make it easier to put these into practice. This book is definitely a great resource for application developers and architects new to SOA or just new to the core concepts of WCF. It is great to see a resource that both answers common questions and provides guidance that gets right to the point from experienced architects and developers. I hope you enjoy reading this book as much as I did and keep it close as you start building your own WCF applications.

Thom Robbins
Director, .NET Platform Marketing
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About the Authors

CHRIS PEIRIS (MVP, MIT, BComp, BBus–Accounting) currently works for Avanade Australia as a solutions architect. Chris is an avid publisher and a thought leader in the application integration space. He is a frequent speaker at professional developer conferences on Microsoft technologies. In fact, he has been awarded the title Microsoft Most Valuable Professional (MVP) for his contributions to .NET technologies by Microsoft. Chris has been designing and architecting Microsoft IT solutions since 1995. He is an expert in developing scalable, high-performance integration solutions for financial institutions, G2G, B2B, and media groups. Chris has written many articles, reviews, and columns for various online publications including 15Seconds, Wrox (Apress), and Developer Exchange (DevX). He has also coauthored several books on web services, UDDI, C#, IIS, Java, and security topics. These include *C# Web Services*, *C# for Java Programmers*, *MCSA/MCSE Managing and Maintaining a Windows Server 2003 Environment*, and *Managing and Maintaining a Windows Server 2003 Environment for an MCSA Certified on Windows 2000*. Chris's current passions include WCF, IBM Message Broker, and EAI. He lives with his family in Conder, Australian Capital Territory, in Australia. He can be reached at `http://www.chrispeiris.com`.

DENNIS MULDER (MCSD, MCDBA) is senior principal consultant and solution manager with Avanade Netherlands and started his career in 1997. Since the beginning, he has dedicated himself to Microsoft technology. When the first betas of Microsoft .NET were released, he knew he made a good choice. As an early adopter of Microsoft technology, he has kept pace in the certification challenges and succeeded in getting several of his certifications in beta stage. Although Dennis has a broad range of experience on the Microsoft platform, in particular in web and database technology, his current focus is on service orientation, enterprise integration, and software factories. As a consultant he is working with enterprise customers to solve their challenges by leveraging the power of the Microsoft platform, usually in the role of architect and/or team lead. Dennis frequently publishes articles in *Microsoft .NET Magazine* (Dutch) and other (online) places. He is also an Ineta speaker and frequently speaks at Dutch Microsoft conferences and user groups. You can reach Dennis through his blog at `http://www.dennismulder.net`.

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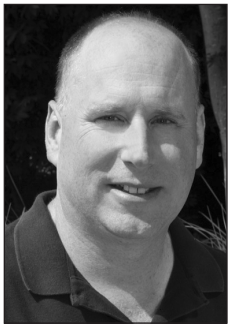
DENNIS MULDER



SHAWN CICORIA

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Chris Peiris
Canberra, Australia
November 2006

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Dennis Mulder
Almere, The Netherlands
November 2006

Introduction

This book explains the Windows Communication Foundation (WCF) from the Service-Oriented Architecture (SOA) perspective. It explains WCF as an evolution of the SOA concept, not as a "message bus" concept built on the next generation of Microsoft products. The book attempts to answer the following main questions:

- What is SOA?
- Why is WCF so important? What does it solve?
- How does WCF implement SOA principles?
- How does interoperability work between WCF and other SOA implementations?

We will provide answers to these questions by concentrating on the following important features of WCF:

- The WCF programming model
- The unified programming model
- The hosting options available for WCF web services
- How to make WCF web services secure
- How to manage these WCF services (and the tools available to manage them)
- How queue management and reliable messaging work in WCF
- How to implement transaction support in WCF
- How a WCF service interacts with COM+ components and how COM+ interacts with WCF service
- How to use data binding with WCF services
- Whether you can interop a WCF service with other (non-Microsoft) SOA offerings

We will also address the business drivers that dictate the need for these WCF feature. In addition, we'll explore the industry best practices in the process of addressing all these features.

Who This Book Is For

This book is targeted toward novice and intermediate readers who are curious about WCF. In this book, we'll do the following:

- Explain the business motives and pain points of the current SOA offerings.
- Explain how you can address these pain points by using WCF.
- Show practical implementations of these scenarios using code examples.

How This Book Is Structured

This book is divided into three parts, with a total of 13 chapters. The following sections describe each part. The book also has three appendixes, where you'll find a description of the sample application (QuickReturns Ltd), a history of Microsoft web service implementations, and WCF installation information.

Part 1: "Introducing Windows Communication Foundation"

This part of the book introduces web service standards and the fundamental components of SOA. We will also discuss how these principles are illustrated in WCF. Once you understand some of these concepts, including the business and technological factors, you can appreciate the simplicity and flexibility of WCF. Chapter 1 will cover the service standards. Then we will introduce WCF in Chapter 2. This is followed by a discussion of the WCF programming model in Chapter 3.

Part 2: "Programming with WCF"

In this part, we'll discuss the WCF technical features in detail. We'll concentrate on the programming aspects of WCF with the assistance of a fictitious QuickReturns Ltd. stock market application in Chapter 4. We'll initially guide you through installing WCF components. Then we'll walk you through creating services and hosting these services with WCF in Chapter 5. We will discuss all the hosting options available in WCF in detail. Finally, in Chapter 6, we'll cover the management options available to manage WCF services to obtain the best return on investment for your application.

Part 3: "Advanced Topics in WCF"

Real-world SOA applications will have many demanding features to implement. These complex real-world web service implementations will address security issues (both client and service), reliable messaging, transactions, COM+ integration, data integration issues, and peer-to-peer communications. An enterprise can achieve the eventual "value proposition" by utilizing these advanced features of WCF. In Chapters 7 through 12, you will concentrate on these topics. In addition, you'll investigate the WCF interoperability options available to seamlessly communicate with non-Microsoft platforms in Chapter 13.

Prerequisites

To get the most out of this book, you should install WCF/the .NET 3.0 Framework. You can download this for free from `http://wcf.netfx3.com/`. We also recommend using Microsoft Visual Studio as the development environment to experiment with the code samples, which you can find in the Source Code/Download section of the Apress website (`http://www.apress.com`).

Contacting the Authors

Most of the authors of this book have dedicated websites or blogs. Therefore, please refer to the "About the Authors" section to find individual contact information.