## Contents

**Preface**

**Acknowledgments**

**About the Authors**

**Introduction**

### What's in the Book

- Organization of the Book
  - Part I
  - Part II

### 1 Introduction to SOA with Web Services

- The Service-Oriented Enterprise
- Service-Oriented Development
  - Service Abstraction
- Service-Oriented Architecture
## Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>What Are Services?</td>
<td>10</td>
</tr>
<tr>
<td>What Is Service-Oriented Architecture?</td>
<td>13</td>
</tr>
<tr>
<td>Challenges to Adoption</td>
<td>18</td>
</tr>
<tr>
<td>SOA and Web Services</td>
<td>20</td>
</tr>
<tr>
<td>Rapid Integration</td>
<td>23</td>
</tr>
<tr>
<td>Multi-Channel Access</td>
<td>26</td>
</tr>
<tr>
<td>Occasionally Connected Computing</td>
<td>28</td>
</tr>
<tr>
<td>Business Process Management</td>
<td>29</td>
</tr>
<tr>
<td>Extended Web Services Specifications</td>
<td>32</td>
</tr>
<tr>
<td>Standardization</td>
<td>32</td>
</tr>
<tr>
<td>Specification Composability</td>
<td>35</td>
</tr>
<tr>
<td>Metadata Management</td>
<td>38</td>
</tr>
<tr>
<td>Security</td>
<td>41</td>
</tr>
<tr>
<td>Reliability and Messaging</td>
<td>43</td>
</tr>
<tr>
<td>Transactions</td>
<td>44</td>
</tr>
<tr>
<td>Orchestration</td>
<td>46</td>
</tr>
<tr>
<td>Summary</td>
<td>48</td>
</tr>
</tbody>
</table>

### PART I  SOA AND BUSINESS PROCESS MANAGEMENT CONCEPTS 49

#### 2 Overview of Service-Oriented Architecture 51

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service-Oriented Business and Government</td>
<td>51</td>
</tr>
<tr>
<td>Service-Oriented Architecture Concepts</td>
<td>54</td>
</tr>
<tr>
<td>SOA Processes, Principles, and Tools</td>
<td>57</td>
</tr>
<tr>
<td>Services</td>
<td>58</td>
</tr>
<tr>
<td>Line of Business Services</td>
<td>61</td>
</tr>
<tr>
<td>Reusable Technical Services</td>
<td>63</td>
</tr>
<tr>
<td>Service Contracts</td>
<td>64</td>
</tr>
<tr>
<td>Web Services Platform</td>
<td>64</td>
</tr>
<tr>
<td>Service Requesters and Service Providers</td>
<td>68</td>
</tr>
</tbody>
</table>
Approved Products, Technologies, and Facilities 69

Service Governance, Processes, Guidelines, Principles, Methods, and Tools 70
  SOA Governance Policies and Processes 70
  SOA Principles and Guidelines 72

Key Service Characteristics 73
  Primary Characteristics 75
  Secondary Characteristics 78
  SOA Guidelines for Service Requesters 83
  SOA Guidelines for Legacy Systems and Legacy Services 85

Technical Benefits of a Service-Oriented Architecture 86
  Efficient Development 87
  More Reuse 88
  Simplified Maintenance 91
  Incremental Adoption 91
  Graceful Evolution 92

Service-Oriented Architecture—Business Benefits 93
  Increased Business Agility 94
  Better Business Alignment 96
  Improved Customer Satisfaction 98
  Reduced Vendor Lock-In and Reduced Switching Costs 99
  Reduced Integration Costs 100
  Improved ROI of Existing IT Assets 100

Summary 102

3 SOA and Web Services 103

The Web Services Platform 104
  Elements of the Web Services Platform 105
  Web Services Platform Principles 108

Service Contracts 109
  Service Contract Elements 109
  Documenting and Defining Service Contracts 111
  Service Contract Principles 112
  Service Contracts Focus on Service-Level Abstractions 112
4 SOA and Web Services for Integration

Overview of Integration

Common Business Drivers for Integration

Common Technical Challenges Faced During Integration

Requirements That the "Ideal" Integration Solution Must Satisfy

Integration Can Be Performed at Different Layers of the Technology Stack

Integration and Interoperability Using XML and Web Services

Two Approaches for Using XML and Web Services for Integration and Interoperability

Web Services Integration (WSI)

Service-Oriented Integration (SOI)

Applying SOA and Web Services for Integration—.NET and J2EE Interoperability

Applying SOA and Web Services for Integration—Service-Enabling Legacy Systems

Example #1—CICS and IMS

Example #2—CORBA

Applying SOA and Web Services for Integration—Enterprise Service Bus Pattern

Summary—SOA and Web Services for Integration

5 SOA and Multi-Channel Access

Business Benefits of SOA and Multi-Channel Access

Multi-Channel Access Reduces Staffing Costs

Multi-Channel Access Eliminates Obsolete and Expensive Infrastructure

Service-Oriented Architecture Reduces Costs and Improves Efficiency

A Service-Oriented Architecture for Multi-Channel Access

Architectural Challenges

Architecture for Multi-Channel Access

Client/Presentation Tier

Channel Access Tier
6 SOA and Business Process Management

Basic Business Process Management Concepts 221
   Business Process Management Systems 223
   Process Modeling 225
   Process Execution 226
   Process Monitoring 227
   Business Activity Monitoring 227

Example Business Process 229

Combining BPM, SOA, and Web Services 232
   Benefits of BPM, SOA, and Web Services 232
   Defining Atomic and Composite Services 236

Orchestration and Choreography Specifications 245
   Comparing Web Services Orchestration and Choreography 245
   WS-BPEL 248
   Choreography Description Language 259

Example of Web Services Composition 261
   Orchestration-Centric Approach 261
   Choreography-Centric Approach 263
   Comparing Orchestration-Centric and Choreography-Centric Approaches 265

Part I Summary: Benefits of Combining BPM, SOA, and Web Services 265
   Individual Features and Benefits of BPM, SOA, Web Services, and XML 265
   Complementary Features and Benefits of BPM, SOA, and Web Services 267
PART II EXTENDED WEB SERVICES SPECIFICATIONS 271

7 Metadata Management 273

The Simple Approach to Metadata Management 276
Using Plain SOAP and WSDL 278

Metadata Specifications 282
XML 283
WSDL 2.0 284
UDDI 286
Addressing 289

Policy 297
WS-Policy 299
Web Services Policy Language (WSPL) 305
WSDL 2.0 Features and Properties 307
Comparing the Policy Specifications 308

WS-MetadataExchange 309

Summary 312

8 Web Services Security 313

Overarching Concern 315
Core Concepts 316
Identity 319
Authentication 320
Digital Signature 321

Summary of Challenges, Threats, and Remedies 321
Message Interception 322
Person in the Middle Attacks 323
Spoofing 323
Replay Attacks 323
Denial-of-Service Attacks 323
Securing the Communications Layer 324
   IP Layer Security 325
   Transport-Level Security 325

Message-Level Security 327
   The WS-Security Framework 327
   WS-SecurityPolicy 332
   WS-Trust 333
   WS-SecureConversation 335
   WS-Federation 336
   Security Assertion Markup Language (SAML) 337
   XACML: Communicating Policy Information 341
   XML Key Management Specification (XKMS) 341

Data-Level Security 342
   XML Encryption 343
   XML Signature 344

Summary 346

Advanced Messaging 349

Reliable Messaging 349
   Overview 350
   Concepts and Technologies 352
   Benefits of Reliable Messaging 357
   Usage Scenarios for Reliable Messaging 358
   Web Services Reliable Messaging Specifications 362
   Comparing Web Services Reliable Messaging and
   Asynchronous Message Queuing 374

Notification 376
   WS-Eventing 378
   WS-Notification 379

Mobile Workers and Occasionally Connected Computing 379

Summary 381
## 10 Transaction Processing

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>384</td>
</tr>
<tr>
<td>The Transaction Paradigm</td>
<td>386</td>
</tr>
<tr>
<td>Impact of Web Services on Transactions</td>
<td>387</td>
</tr>
<tr>
<td>Protocols and Coordination</td>
<td>389</td>
</tr>
<tr>
<td>Activity</td>
<td>389</td>
</tr>
<tr>
<td>Context</td>
<td>390</td>
</tr>
<tr>
<td>Addressing</td>
<td>391</td>
</tr>
<tr>
<td>Policy</td>
<td>392</td>
</tr>
<tr>
<td>Coordination</td>
<td>392</td>
</tr>
<tr>
<td>Protocol Types</td>
<td>397</td>
</tr>
<tr>
<td>Transaction Specifications</td>
<td>401</td>
</tr>
<tr>
<td>The Web Services Coordinator</td>
<td>404</td>
</tr>
<tr>
<td>WS-AtomicTransaction</td>
<td>409</td>
</tr>
<tr>
<td>WS-BusinessActivity</td>
<td>411</td>
</tr>
<tr>
<td>WS-Context</td>
<td>412</td>
</tr>
<tr>
<td>WS-Coordination Framework</td>
<td>414</td>
</tr>
<tr>
<td>WS-Transaction Management</td>
<td>416</td>
</tr>
<tr>
<td>Summary</td>
<td>420</td>
</tr>
</tbody>
</table>

## Bibliography

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books</td>
<td>421</td>
</tr>
<tr>
<td>Technology References</td>
<td>422</td>
</tr>
<tr>
<td>Articles</td>
<td>424</td>
</tr>
<tr>
<td>Specifications</td>
<td>425</td>
</tr>
<tr>
<td>General</td>
<td>425</td>
</tr>
<tr>
<td>Metadata</td>
<td>426</td>
</tr>
<tr>
<td>Security</td>
<td>427</td>
</tr>
<tr>
<td>Reliability</td>
<td>428</td>
</tr>
<tr>
<td>Notification</td>
<td>428</td>
</tr>
</tbody>
</table>
Contents

Transactions 428
Orchestration 428
Orchestration Historical References 429
Other Resources 430

Index 431