

Preface

When we “certify” something, we attest to that something being true or genuine, and we tend to think in terms of meeting a certain predefined standard. When we search for excellence, we give recognition to those who have attained higher levels of certification. We believe that certifications can prove something to us . . . something that might not be too easy for us to prove for ourselves.

And now, more than ever before, the industry of e-business is developing standards for the knowledge and practical skills that we as programmers are expected to possess in order to perform highly specialized jobs for which qualified candidates are in short supply.

Today’s marketplace has a critical need for technical professionals who can fulfill these newly emerging roles that are defined in terms of specific objectives along with standardized sets of skills.

So, if . . .

- You want to keep pace with the complex technologies and products in today’s constantly changing world . . .
- You want to gain proficiency in the latest IBM technology and solutions . . .
- You want to differentiate yourself, as being capable of delivering higher levels of service and technical expertise . . .

- You want to truly excel at your job, providing your employer confidence that your skills have been tested . . .

. . . then you are ready to move your career to a higher level. Start charting your course today!

IBM Certified Enterprise Developer - WebSphere Studio, Version 5.0

The book you now hold in your hands, *Developing J2EE Applications with IBM WebSphere Studio*, was written to fit into the Professional Certification Program from IBM. In particular, it has been designed to help you prepare for the role of IBM Certified Enterprise Developer - WebSphere Studio, Version 5.0. That credential speaks volumes about the person who holds it. It speaks of competency at performing certain required tasks, and it speaks of productivity gained by effectively leveraging the IBM WebSphere platform for e-business.

For WebSphere Studio Version 5.0, IBM defines three roles, increasing in sophistication from the entry-level Associate Developer, who is new to WebSphere and the use of IBM products for Web development, through the intermediate level Solution Developer, and progressing finally to the Enterprise Developer. The role this book addresses is the highest and most challenging of three roles: the Enterprise Developer, who designs, develops, and deploys distributed enterprise-level applications. The following table shows the three different roles and their associated IBM test numbers.

WebSphere Certification Roles and Associated Tests

Role	Head
IBM Certified Associate Developer - WebSphere Studio, Version 5.0	Developing with IBM WebSphere Studio, Version 5.0 (Test 285)
IBM Certified Solution Developer - WebSphere Studio, Version 5.0	Application Development with IBM WebSphere Studio, Version 5.0 (Test 286)
IBM Certified Enterprise Developer - WebSphere Studio, Version 5.0	Enterprise Application Development with IBM WebSphere Studio, Version 5.0 (Test 287)

Focusing now on the role of IBM Certified Enterprise Developer - WebSphere Studio Version 5.0, let's see how this book helps you prepare to demonstrate to the world that you have mastered the skills and knowledge necessary to accomplish the tasks required in the fulfillment of this role.

How does one qualify and prepare?

In order to qualify for the role of IBM Certified Enterprise Developer, you must pass four tests:

- Sun Certified Programmer for the Java 2 Platform 1.2 (Test 155)
- Object Oriented Analysis and Design with UML (Test 486)
- Enterprise Connectivity with J2EE V1.3 (Test 484)
- Enterprise Application Development with IBM WebSphere Studio, Version 5.0 (Test 287)

In preparing to take Test 287, IBM recommends you follow either the self-study or the tutor approach. This book is written primarily for those candidates who have chosen the self-study approach. If that is the path you have chosen to follow, then we strongly encourage you to test your skills and identify those areas where you may need improvement. IBM provides free of charge, over the Internet, a pre-assessment sample test for Test 287. Take advantage of the IBM Certification Exam (ICE) Tool, where sample questions are available. For more information, and to register to take the pre-test, go to the ICE home page at <http://certify.torolab.ibm.com>.

The best way to use this book will depend largely on your own individual needs and preferences. You may wish to read it sequentially starting with Chapter 1, or you may wish to review the chapter descriptions included here in the Preface and then focus on those chapters in which you are most interested. Another possible approach is to begin by looking at the certification objectives in order to select the chapters in which you are most interested. Yet another approach would be to look at the end-of-chapter materials, and decide from there which chapters you want to take on first.

Prerequisites

IBM recommends the prerequisites (i.e., knowledge and skills one needs to possess before beginning to prepare for this job role certification) listed in this section. Chances are, you already have some familiarity with the items on the list. But if you feel you lack sufficient knowledge regarding these items, you'll find the additional coverage in this book helpful. If you need more background than what is included, we recommend that you review the original specifications, which are generally available on the Web.

- Knowledge of the following Java APIs:
 - ◆ Servlet API 2.3
 - ◆ JSP 1.2
 - ◆ Java 2 SDK 1.3.X
 - ◆ JMS 1.0.2
 - ◆ JCA 1.0

- ◆ JTA 1.0
- ◆ JDBC 2.1
- ◆ EJB 2.0
- Plus knowledge of Web Services technologies:
 - ◆ SOAP
 - ◆ WSDL
 - ◆ UDDI
- Knowledge of object-oriented analysis and design:
 - ◆ UML
 - ◆ Design Patterns
- Experience working on actual object-oriented projects:
 - ◆ Participation in the analysis and design phases
 - ◆ Participation in building, deploying, and tuning J2EE-compliant enterprise applications that include EJBs and Web modules

Note: There is no substitute for actual project development experience. A candidate who lacks practical experience using Java on an object-oriented project, preferably a J2EE enterprise application, will be at a disadvantage as compared to the candidate who has learned certain valuable lessons from having applied this knowledge to work in the real world.

What is covered in this book?

The 15 chapters in this book have been specifically designed to address the objectives for Test 287. Here, at a high level, is what they cover.

Chapter 1, *Introduction to IBM WebSphere*, introduces the WebSphere platform as an enabling technology for enterprise computing (also known as e-business). It does so within the context of the Java 2 Enterprise Edition (J2EE) architecture, and it introduces several key members of the WebSphere product family.

Chapter 2, *Developing Enterprise Applications with WebSphere Studio*, introduces the reader to WebSphere Studio Application Developer, Version 5, and the role it plays in component-based development of J2EE enterprise applications. As we highlight the development of a simple J2EE application, we look at the most commonly used perspectives, and introduce the reader to the WebSphere Test Environment (WTE) and the Universal Test Client (UTC).

Chapter 3, *Servlets*, covers the design, development, and testing of servlets, filters, and listeners. It addresses issues regarding session management and options for maintaining conversational state with the user. It also introduces Model-View-Controller (MVC) and shows the part that servlets play. The latest additions to the Servlet Version 2.3 API, including filters and Web application lifecycle events and listeners, are included in this chapter as well.

Chapter 4, *JavaServer Pages (JSP)*, covers JSP syntax and then goes on to show how to design, develop, and test JSP pages using WebSphere Studio as well as the role of JSP pages in MVC. The design, development, and use of custom tag libraries are also covered.

Chapter 5, *Developing EJBs: Session Beans and the EJB Architecture*, introduces the EJB architecture and the role of Session beans as a façade. We show how Session beans are developed in WebSphere, and we explain their deployment descriptors. The proper use of EJBs in enterprise applications distinguishes the Enterprise Developer from the other development roles.

Chapter 6, *Developing Entity EJBs with WebSphere Studio*, explores both container-managed persistence (CMP) and bean-managed persistence (BMP) for Entity beans. We discuss WebSphere specifics for Entity beans and the use of EJB Query Language for finding CMP Entity beans. We will also cover relationships between Entity beans.

Chapter 7, *Message-Driven Beans*, presents a Java Message Service (JMS) primer, and then shows how Message-Driven beans are developed in WebSphere Studio.

Chapter 8, *Transactions*, covers the proper use of transactions, which is one of the most important and complex topics in J2EE. The chapter introduces basic concepts and then goes on to discuss the transactional support required by J2EE and EJBs in particular. The topics of concurrency and transactional isolation available in WebSphere are covered, followed by a section on best practices.

Chapter 9, *Security*, begins with a review of the basic concepts regarding security, followed by the J2EE requirements to support declarative and programmatic access to security services. In particular we will explore role-based security, which reduces the application developer's burden with regard to implementing security policies. We will then continue our discussion to show how to configure security for J2EE applications using WebSphere Studio.

Chapter 10, *JCA Tools and Supports*, provides a high-level overview of J2EE Connector Architecture and the characteristics of connection management, transaction management, security management, and the Common Client Interface.

Chapter 11, *Profiling Analysis Tools in WebSphere Studio*, shows you how to measure performance so that you can manage it. The profiling tools in WebSphere enable the Enterprise Developer to gather and analyze data regarding the runtime behavior of code

inside a Java Virtual Machine. The profiling perspective assists the developer in visualizing program execution. This chapter presents the goals of profiling and the profiling architecture upon which WebSphere relies.

Chapter 12, *Implementing Clients*, discusses how to implement clients in a distributed system. Behaving as J2EE components themselves, clients take advantage of a contract with their container that allows J2EE to offer a rich set of services, vastly simplifying the complexity of the client.

Chapter 13, *Packaging and Deployment*, covers areas of critical importance to the Enterprise Developer, who must first assemble a set of Web components, EJB components, and client components into a complete enterprise application, which is represented by an enterprise archive (EAR) file. Then the Enterprise Developer must deploy (i.e., install and configure) that enterprise application into an operational environment.

Chapter 14, *WebSphere Administration*, focuses on the aspects of the WebSphere Version 5 J2EE Server that influence the design of an enterprise application and its performance, particularly those aspects that are under the control of the developer. It is incumbent upon Enterprise Developers to understand the nature of the WebSphere Application Server Version 5, since that is the platform that will ultimately host their applications.

Chapter 15, *Remote Debugger and Java Component Test Tools in WebSphere Studio*, covers two very useful tools in WebSphere Studio Application Developer: (1) remote debugging and (2) the Component Testing Framework. The chapter first provides some background on the Remote Debugger and then outlines the steps required for remotely debugging applications that have already been deployed. The chapter then goes on to cover the Component Testing Framework and its associated perspective and concludes by outlining the procedures for creating, executing, and reviewing the results of Java Testcases.

Certification objectives

The following table lists, section by section, the individual certification objectives of Test 287, along with the chapter in this study guide in which they are addressed.

Test 287, Enterprise Application Development using WebSphere Studio Version 5.0

Section 1: Design, build and test reusable enterprise components (25%)	
1A: Design and develop Session EJBs	Chapter 5
1B: Design and develop Message-Driven EJBs	Chapter 7
1C: Design and develop Entity EJBs	Chapter 6
1D: Access container and server services from enterprise components	Chapters 5, 6, 7, 9, and 10
1E: Implement mechanisms for efficient inter-component calls	Chapters 5 and 6
1F: Test and debug enterprise components	Chapters 2 and 15
Section 2: Design, build and test Web components (19%)	
2A: Design, develop and test Java servlets, filters, and listeners	Chapter 3
2B: Design, develop, and test JSP pages	Chapter 4
2C: Manage end-user state and understand performance tradeoffs of using HTTP sessions	Chapters 3 and 14
2D: Design and develop custom tags	Chapter 4
Section 3: Develop clients that access the enterprise components (8%)	
3A: Implement Java clients calling EJBs	Chapter 12
3B: Implement Java clients calling Web Services	Chapter 12
3C: Implement mechanisms that support loose coupling between clients and components	Chapter 12
Section 4: Demonstrate understanding of database connectivity and messaging within IBM WebSphere Application Server (8%)	
4A: Create, configure, and tune connection pools	Chapter 14
4B: Interact with connection pools to obtain and release connections	Chapter 14
4C: Configure JMS connection factories and destinations	Chapter 7
Section 5: EJB transactions (10%)	
5A: Build EJBs that satisfy transactional requirements	Chapter 8
5B: Use JTA to control transaction demarcation	Chapter 8
5C: Manipulate transactional behavior of EJBs using deployment descriptors	Chapter 8

**Test 287, Enterprise Application Development using WebSphere Studio
Version 5.0 (Continued)**

Section 6: Assemble enterprise applications and deploy them in IBM WebSphere Application Server (15%)	
6A: Assemble Web components, EJB components, and client application components into enterprise applications	Chapter 13
6B: Deploy enterprise applications into servers	Chapters 9 and 13
6C: Configure resource and security-role references	Chapter 9 and 13
6D: Create and configure WebSphere test environment servers	Chapter 2
Section 7: Validate, tune, and troubleshoot an application within an IBM WebSphere Application Server environment (15%)	
7A: Use tracing and profiling tools to analyze and tune applications	Chapters 11 and 14
7B: Explain implications of resource management on application design and implementation	Chapters 11 and 14
7C: Identify misbehaving application components	Chapter 11, 14, and 15
7D: Describe the effects of a server failure on the application	Chapter 14
7E: Validate operational parameters of application server to support the enterprise application	Chapter 14

Contributors

You may have noticed that this book is written by multiple contributors. This was not by chance. We wanted to make sure that the book was written by a team of subject matter experts, each selected and assigned individual chapters according to their particular areas of expertise. For this reason we chose people from within IBM as well as consultants and IBM business partners. The resulting team combines the best mix of real-world project development, consulting experience, and classroom teaching experience. We include authors who have previously published articles, developers of Java and J2EE course materials, and presenters at technical conferences such as the WebSphere Technical Exchange.

Whether you are using this book to help you prepare for your certification or simply to gain knowledge of enterprise application development using WebSphere, we hope this book will be a valuable tool and a welcome addition to your bookshelf.