



Capstone Courseware, LLC

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163. Enterprise JavaBeans

Version 3.0.1

This course gives the experienced Java developer a thorough grounding in Enterprise JavaBeans -- the Java EE standard for scalable, secure, and transactional business components. EJB 3.0 has reinvigorated this area of Java enterprise development, with dramatic improvements in ease of use and smooth integration with servlet-based or JSF web applications. This course treats the 3.0 specification, with a few notes on 2.1 compatibility but an emphasis on doing things the 3.0 way.

Students get an overview of the EJB rationale and architecture, and then dive right into creating session beans and entities. The new dependency-injection features of EJB3 cause perhaps the most confusion, so we work through a chapter devoted explicitly to DI and JNDI, and basically how components find each other to make an application. We study entities and the Java Persistence API in depth, and get a look at message-driven beans as well. The latter phase of the course covers advanced topics including transactions, security, and interceptors.

A bridge module is also available that illustrates how JavaServer Faces (JSF) web applications can work with EJBs and Java Persistence API entities; this brief presentation can easily be added to the end of the class and works especially well to cap off a week of training using this course and one of our JSF courses.

This course is also available in a variant that focuses on EJB3 as supported by Oracle® WebLogic: see Course 163-WL, "EJB on the WebLogic Server."

Prerequisites

- Solid Java programming skills and understanding of OO Java and Java-5 language features is essential. Course 103 is excellent preparation for this course.
- Experience with developing Java web applications is very helpful for this



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course, but not strictly required.

- Some knowledge of XML will be useful for writing the occasional deployment descriptor, but is not required. Course 501 is recommended for those who would like to get more familiar with XML before pursuing this course.





Learning Objectives

- Understand the role of EJB in the broader Java EE platform.
- Describe the features that are implemented by an EJB container on behalf of application components.
- Build stateless session beans as part of a service layer or SOA.
- Build JPA entities to represent persistent data records within the Java application.
- Develop systems of entities to manage complex data models including 1:1, 1:N, and N:N associations.
- Manage transactional behavior of the application through declarative and programmatic techniques.
- Invoke EJB sessions from Java web applications.
- Use dependency injection and JNDI names to assemble complex web/EJB systems with minimal fuss and maximal flexibility.
- Implement message-driven beans to process queued messages asynchronously.
- Declare and/or program transaction boundaries, persistence contexts, and exception handling to properly control persistence logic.
- Apply role-based authorization policies to EJBs.
- Build interceptors to perform generic processing before, after, or around EJB business-method invocations.
- Use EJB timers to defer processing or establish regularly scheduled tasks.

Timeline: 5 days.

IDE Support: Eclipse Europa

In addition to the primary lab files, an optional overlay is available that adds support for Eclipse Europa. Students can code and compile from within the IDE; final build and deploy is done from DOS using Ant, and applications are tested using a local web browser. See also our orientation to Using Capstone's Eclipse Overlays, and please be advised that this is an optional feature; it is not a separate version of the course, and the course itself does not contain explicit Eclipse-specific lab





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instructions.





Chapter 1. Overview

- Enterprise Applications
- Containers and Objects
- Three Containers
- Remote Connectivity
- Scalability and Availability
- Security
- Transaction Control

Chapter 2. Architecture

- What is an EJB?
- Types of Beans
- Inversion of Control
- The Bean-Type Annotations
- Dependency Injection
- The @EJB Annotation
- Development Cycle and Roles

Chapter 3. Session Beans

- Interface/Implementation Split
- Stateful vs. Stateless
- The @Stateless Annotation
- Lifecycle and State Transitions
- Session Context
- The @Stateful Annotation
- State Transitions
- Singletons and Pools

Chapter 4. Entities

- The Java Persistence API
- Persistence Annotations
- Configuration by Exception
- ORM Annotations
- The EntityManager
- Acquiring and Using the EntityManager
- persistence.xml
- @Enumerated and @Temporal Types

Chapter 5. Associations





Associations, Cardinality, and Ownership
Annotations
Unidirectional vs. Bidirectional
The @Embedded Annotation

Chapter 6. Java Persistence Query Language

OO Query Languages
The FROM Clause and Directionality
The WHERE Clause
The SELECT Clause
Joins
Aggregates and Grouping
Ordering

Chapter 7. Dependency Injection

Interdependent Systems
The Factory Pattern
The Service Locator Pattern
Dependency Injection
Injection by Magic?
Injection by Type
Injection by Name
The Component Environment
Deployment Descriptors
Impact on Stateful Session Beans
JNDI
Connecting to a Remote Bean
Using mappedName
Who Can Declare Dependencies

Chapter 8. Message-Driven Beans

Asynchronous Messaging
The Java Message Service
Message-Driven Beans
Message Types
Injecting JMS Queues

Chapter 9. Transactions

ACID Transactions





- The EntityTransaction Interface
- EJB Transaction Attributes
- Persistence Contexts
- Extended Persistence Contexts
- Isolation Levels
- Application-Managed Persistence
- The SessionSynchronization Interface
- Impact on JMS and MDBs

Chapter 10. Exception Handling

- Java Exceptions
- Remote Exceptions
- EJB Exception Handling
- System Exceptions
- Application Exceptions
- Transaction Control

Chapter 11. Security

- Authentication and Authorization
- Declarative Authorization
- Abstract Roles
- Concrete Realms
- Programmatic Authorization
- Run-As Identity

Chapter 12. Interceptors

- EJB and AOP
- The Intercepting Filter Pattern
- EJB Interceptors
- Annotating Interceptor Classes
- The InvocationContext Interface
- Binding Interceptors to Targets
- Shared Lifecycle and Context
- Interceptors and MDBs

Chapter 13. Timers

- The EJB Timer Service
- The TimerService Interface
- The Timer Interface





Timeout Methods
Timer Handles
Transactions and Timers

Appendix A. Learning Resources

Appendix B. Quick Reference: Java EE Annotations

System Requirements

Hardware Requirements (Minimum)

1 GHz, 512 meg RAM, 1 gig disk space.

Hardware Requirements (Recommended)

2 GHz, 1 gig RAM, 1 gig disk space.

Operating System

Tested on Windows XP Professional. Course software should be viable on all systems which support the Java EE 5.0 SDK.

Network and Security

Limited privileges required -- please see our standard security requirements at <http://capcourse.com/Guides/Security.html>.

Software Requirements

All free downloadable tools.

