

Training: Capstone Courseware
161 The Java Persistence API

TRAINING GOALS:

This course offers a comprehensive and detail-oriented treatment of the **Java Persistence API (JPA)** for developers interested in implementing persistence tiers for enterprise applications. We cover JPA basics including simple object/relational concepts and annotations, persistence contexts and entity managers, and configuration via `persistence.xml`. We get a good grounding in the **Java Persistence Query Language (JPQL)**, working with a JPQL console. The course then moves into advanced mapping techniques, the Criteria API, lifecycle hooks, validation, locking, and caching. Students will complete the course with a firm understanding of JPA architecture and plenty of hands-on experience.

This version of the course supports JPA 2.1 with a choice of two providers: EclipseLink 2.6, which is pre-configured for course exercises, and Hibernate® 5.0. Switching providers is just a matter of moving a few lines in and out of XML comments in the relevant `persistence.xml` file, and we encourage instructors to demonstrate both providers, to illustrate portability and for comparison of some finer points.

The course also supports either the Derby or Oracle® RDBMS. Derby is bundled with the course software and is pre-configured; a script is included to change over to Oracle configurations for all exercises and schema-creation scripts are available for both.

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Learning Objectives

- Understand the value of object/relational mapping and JPA's role as a standard for ORM implementations.
- Develop JPA entities using JPA annotations to align the Java classes, properties, and types to relational tables, columns, and types.
- Create entity managers and instantiate persistence contexts to perform create/retrieve/update/delete (CRUD) operations.
- Implement entity relationships of all cardinalities, including unidirectional and bidirectional relationships.
- Map composite primary keys, inheritance relationships, eager/lazy fetching, and cascading operations.
- Use JPQL to write object-oriented queries, and process query results.
- Use the Criteria API to define queries programmatically, and take advantage of type safety

using the Metamodel API.

- Build reusable façades that encapsulate simpler and more complex persistence operations.
- Implement persistence lifecycle event handlers.
- Define JSR-303 validation constraints on JPA entities and see them enforced by the JPA provider.
- Manage concurrent operations via optimistic or pessimistic locking strategies.
- Understand the actions of the local and shared entity caches, and use them appropriately while avoiding over-caching pitfalls

CONSPECT:

- Introduction to JPA
 - Object/Relational Mapping
 - Mismatches Between Relational and Object Models
 - The Java Persistence API
 - JPA Architecture
 - Entity Metadata
 - The Entity Manager
 - JPA Providers
- Single-Table Mapping
 - Annotations
 - JavaBean Standards
 - Property, Field, and Mixed Access
 - Table and Column Mapping
 - Primary Keys and Key Generation
 - Type Mappings
 - Temporal and Enumerated Types
 - Embedded Types
 - Converters
- Mapping Associations
 - @Embeddable Types
 - Entity Relationships
 - @ManyToOne Relationships
 - @OneToOne Relationships
 - @OneToMany Relationships
 - @ManyToMany Relationships
 - Eager and Lazy Loading
- Entity Managers

- Putting Entities to Work
- persistence.xml
- Entity State and Transitions
- Managing Transactions
- Persistence Operations
- Creating Queries
- Named Queries
- Query Parameters
- Native Queries
- Stored-Procedure Queries
- JPQL
 - The Java Persistence Query Language
 - Query Structure
 - Path Expressions
 - Filtering
 - Scalar Functions
 - Using Native Functions
 - Operators and Precedence
 - between, like, in
 - is null, is empty
 - Ordering
 - Aliases
 - Grouping
 - Aggregate Functions
 - Joins
 - Fetch Joins
 - Constructors
 - Updates and Deletes
- Persistence Components
 - Encapsulating Persistence Logic
 - Design Considerations
 - Testability
 - Transaction Control
 - Exception Handling
 - Generic Types
- Advanced Mappings

- Inheritance Strategies
- Single-Table Strategy
- Joined-Table Strategy
- Table-Per-Concrete-Class Strategy
- Querying Over Inheritance Relationships
- Secondary Tables
- Composite Primary Keys
- @IdClass and @EmbeddedId
- Derived Identifiers
- @ElementCollection
- Default Values
- @Version Fields
- Cascading and Orphan Removal
- Detachment and Merging
- . The Criteria API
 - History of the Criteria API
 - Criteria Query Structure
 - The MetaModel API and Query Type Safety
 - Tuples
 - Joins
 - Predicates
 - Building Expressions
 - Ordering
 - Grouping
 - Encapsulating Persistence Logic
 - Façades
 - Range Queries
 - Updates and Deletes
- Lifecycle
 - Lifecycle Events
 - Method Annotations
 - Entity Listeners
- Validation
 - JSR-303 Validation
 - Constraint Annotations
 - Validation Modes

- Validation Groups
- Handling Validation Exceptions
- Locking
 - Concurrency
 - Updates to the Same and Related Entities
 - Pessimistic Locking
 - Lock Types
 - Who Blocks Whom
 - Deadlocking and Timeouts
 - Optimistic Locking
 - The @Version Annotation
 - Optimistic Read and Write Locking
 - Error Handling
 - Combining Locking Strategies
- Caching
 - Caching
 - Persistence Context as Transactional Cache
 - Shared (2nd-Level) Cache
 - Pros and Cons
 - Cache Configuration
 - Eviction
 - Effects of Locking on Caching

REQUIREMENTS:

- A strong [Java programming](#) background is essential for this course -- consider Course 103
- Knowledge of relational database concepts and SQL is recommended -- consider Course 301 [Introduction to SQL](#) -- but is not strictly required.
- Prior experience with [JDBC](#) will be a plus but is not required.

Difficulty level



CERTIFICATE:

The participants will obtain certificates signed by Capstone Courseware.

TRAINER:

Authorized Capstone Courseware Trainer.