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Hibernate Framework

Introduction to JPA

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Module Objectives

At the end of this module, you will be able to:

- Explain the features of JPA
- Demonstrate the understanding of the JPA Architecture and the components of the architecture
- Explain the significance of the EntityManagerFactory, EntityManager and Entity
- Explain persistence unit
- Demonstrate the use of JPA

Topic Agenda

JPA Introduction

JPA Architecture & Configuration

JPA Annotations

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JPA Introduction

Java Persistence API

- JPA is one of the specification of J2EE
- It allows the programmer to develop the persistence layer for their apps
- JPA is developed to standardize the Java ORM technologies
- JPA is not a product and can’t be used as it is for persistence
- It needs an ORM implementation to work and persist Java objects
- The major implementations of JPA specification are
  - Toplink
  - OpenJPA
  - Hibernate
  - iBATIS

JPA Contribution Areas

- The Java Persistence API
- The Query Language
- Object relational mapping metadata

Why JPA

- JPA is a standardized specification (version 1.0) and part of EJB3 specification
- Many free ORM frameworks are available which can be used to develop applications of any size
- Application developed in JPA is portable across many servers and persistence products (ORM frameworks).
- Can be used with both JEE and JSE applications
- JSE 5 features such as annotations can be used
- Provides both annotations and xml based configuration support

Features Of JPA

- Standardized O/R mapping
- Facilitates POJO based persistence.
- Application Server is optional with JPA.
- Support for Unidirectional and Bi-Directional relationships
- User friendly retrieval methods

JPA Architecture & Configuration

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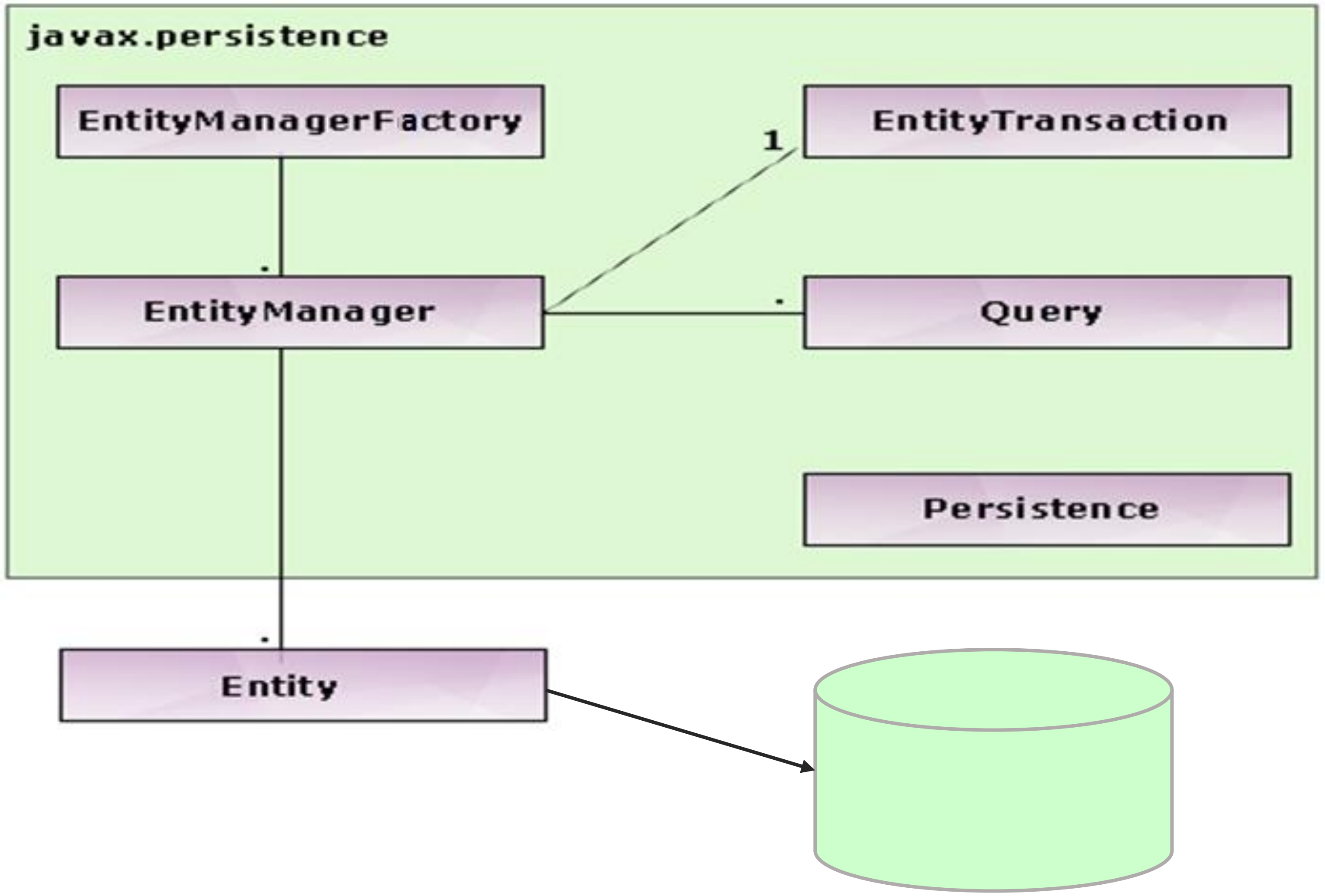
JPA Architecture



JPA Classes and Interfaces

- EntityManagerFactory
  - It creates and manages multiple EntityManager instances
  - EntityManagerFactory is a singleton object and represents the details of the data source
  - One factory for every data source
- EntityManager
  - It manages the persistence operations on objects
- Entity
  - Entities are the persistence objects, stores as records in the database

JPA Classes and Interfaces Continued…

- EntityTransaction
  - For each EntityManager, operations are maintained by EntityTransaction
- Persistence
  - Contain static methods to obtain EntityManagerFactory instance
- Query
  - Implemented by each JPA vendor to obtain relational objects that meet the criteria
- The above classes and interfaces are used for storing entities into a database as a record

Entity

- Entity is a lightweight persistence domain object.
- Entity class represents a database table.
- Entity instance represents a row in the database table.
- Entity uses annotations to map java fields to the database.
- Entity must follow the java bean naming conventions.
- Must implement serializable if transferred through the network

Entity Example

```
@Entity @Table(name=“Employee")
public class Employee {
    @Id @Column(name="EmpId")
     private int empId;
    @Column(name="FirstName")
     private String firstName;
    @Column(name=“LastName")
    private String lastName;
    @Column(name="Email")
    private String email;

public int getEmpId() {return empId; }
public void setEmpId(int empId) {
this.empId = empId; }
public String getFirstName() {return
firstName; }
public void setFirstName(String firstName) {
this.firstName = firstName; }
public String getLastName() { return
lastName; }
public void setLastName(String lastName) {
this.lastName = lastName; }
public String getEmail() { return email; }
public void setEmail(String email) {
this.email = email; }
}
```

Managing Entities

- Entities are managed by EntityManager
- Entity ManagerFactory is used to create EntityManager
- EntityManager is instantiated for every connection/transaction.
- EntityManager defines the methods to manage the entity life cycle
- Example:
  - persist(), remove(), find() etc

Persistence Context

- Every entity manager is associated with a persistence context
- Persistence context defines the scope under which entity instances are created, persisted and removed
- Persistence context is analogous to a container of entity instances where each entity has a live connection with the database
- Any changes done to the entity within the persistence context is reflected in the database
- There will be one and only one instance of an entity class within a persistence context
- Like a transaction persistence context can be propagated to several methods within a transaction

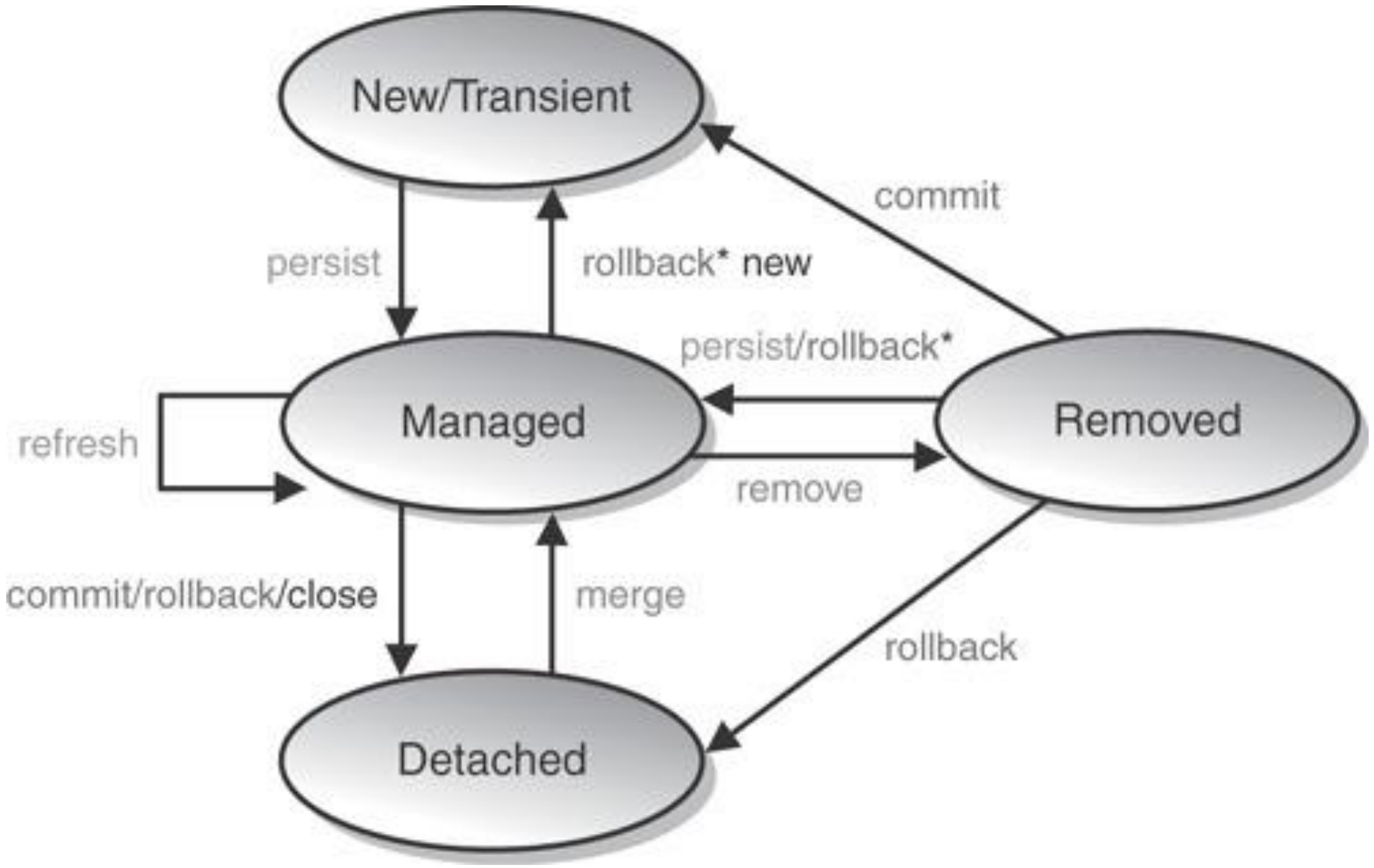
Persistence Unit

- A persistence unit defines a set of all entity classes that are managed by EntityManager instances in an application
- This set of entity classes represents the data contained within a single data store
- Persistence units are defined by the persistence.xml configuration file
- A Persistence Unit defines which classes are Persistent and which Persistence Provider should be used

Entity Lifecycle

- New/Transient
  - No persistent identity
  - Not yet associated with the persistence context
- Managed
  - Have a persistent identity and associated with the persistent context
- Detached
  - Have a persistent identity but not associated with the persistent context
- Removed
  - Have a persistent identity and also associated with the persistent context but are scheduled for removal from the database

Entity Lifecycle Continued…



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JPA Annotations

Entity And Schema

- @Entity
  - By default, JPA assumes that a Java class is non-persistent and not eligible for JPA services unless it is decorated with this annotation
  - Use this annotation to designate a plain old Java object (POJO) class as an entity so that you can use it with JPA services.
- @Table
- @Column
  - By default, JPA assumes that an entity's name corresponds to a database table of the same name
  - And that an entity's data member names correspond to database columns with the same names

Identity And Constraints

- JPA assumes that each entity must have at least one field or property that serves as a primary key
  - Use these annotations to specify one of the following:
  - one @Id
  - multiple @Id and an @IdClass
  - one @EmbeddedId
- @GeneratedValue
  - Use the @GeneratedValue annotation if you want JPA to provide and manage entity identifiers
- @UniqueConstraint
  - Use this annotation to specify unique constraint

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Composition

- Some objects cannot exist on their own, but can only be embedded within owning entities
- Use these annotations to specify objects that are embedded and to override how they are mapped in the owning entity's table
  - @Embeddable
  - @Embedded

@GeneratedValue: Strategy

- IDENTITY: to use a database identity column
- SEQUENCE: to use a database sequence
- TABLE: to assign primary keys for the entity using an underlying database table to ensure uniqueness
- AUTO: to choose a primary key generator that is most appropriate for the underlying database

- By default, JPA chooses the type is AUTO

@GeneratedValue: Generator

- Default: JPA assigns a name to the primary key generator it selects
- If this name is awkward, a reserved word, incompatible with a pre-existing data model, or invalid as a primary key generator name in your database, set generator to the String generator name you want to use

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Summary

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Thank You