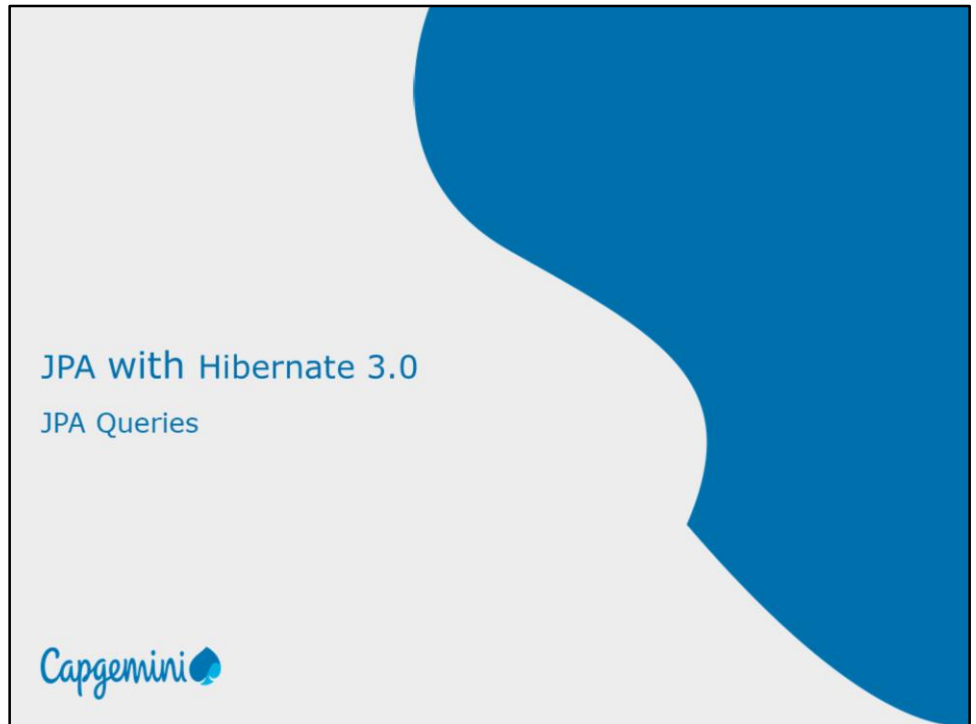


**Instructor Notes:**



**Instructor Notes:**

### Lesson Objectives

After completing this lesson, participants will be able to understand:

- JPQL
- JPA Query API
- Working with JPA Queries



**Instructor Notes:**

5.1: JPQL

**Why JPQL?**

Entity Manager's find() method can be used to locate single entity only based on primary key value.

What if you want to load data based on complex criteria?

For example:

- Load employees residing in "Pune"
- Find orders placed between given two dates.
- Load and combine two entities data for reporting.

**Solution  
?**

**JAVA PERSISTENCE QUERY LANGUAGE!**

**Instructor Notes:**

Discuss major issues of JDBC. For example, we need to do a manual conversion of rows from database to objects vice versa.

## 5.1: JPQL

**What is JPQL?**

JPQL is used to make queries against entities stored in a relational database.

JPQL is object-oriented as it automatically populates object with data received from database

Benefits of using JPQL:

- JPQL is portable across implementer and database
- Uses SQL-like syntax to query entities, requires less effort to learn
- No manual conversion of row data into object and vice-versa

The Java Persistence Query Language (JPQL) is a platform-independent object-oriented query language defined as part of the Java Persistence API (JPA) specification.

JPQL is used to make queries against entities stored in a relational database.

The JPQL defines queries for entities and their persistent state. The query language allows you to write portable queries that work regardless of the underlying data store.

The JPQL can be considered as an object oriented version of SQL. Users familiar with SQL should find JPQL very easy to learn and use.

The main difference between SQL and JPQL is that SQL works with relational database tables, records and fields, whereas JPQL works with Java classes and objects.

**Instructor Notes:**

5.1: JPQL

**JPQL Query Syntax**

JPQL query syntax is similar to SQL syntax.

Difference between SQL and JPQL

- JPQL works on Java Classes, Objects and Properties
- SQL works on Database tables, rows and columns

```
SELECT ... FROM ...
[WHERE ...]
[GROUP BY ... [HAVING ...]]
[ORDER BY ...]
```

```
DELETE FROM ... [WHERE ...]
```

```
UPDATE ... SET ... [WHERE ...]
```

As shown in the slide, there is no difference between SQL and JPQL query syntax. Consider the following Entity class,

```
@Entity
public class Book implements Serializable {
    @Id
    private Long id;
    private String bookTitle;
    private String author;
    private Double price;
    // getter and setter methods
}
```

If you want to find all books written by author 'Jim Kathy', then you need to write JPQL select statement on above entity class as given below:

```
SELECT b.id,b. bookTitle,b.price --property reference
FROM Book b                    --object reference
WHERE b.author = 'Jim Kathy';
```

Where as the below query counts total books object available in data store.

```
SELECT COUNT(b.id)
FROM Book b;
```

**Instructor Notes:**

## 5.2: JPA Query API

**JPA Query API**

JPA provides two interfaces to query database:

- Query
- TypedQuery<T>

JPA 2 introduced TypedQuery interface which extends Query to query results in a type safe manner.

Below table list important methods of these interfaces:

| Method            | Purpose   |
|-------------------|---|
| getSingleResult() | Executes SELECT statement and returns a single object result                  |
| getResultList()   | Executes SELECT statement and returns the query result as an list of objects. |
| executeUpdate()   | Execute an UPDATE or DELETE statement.  |

Queries are represented in JPA 2 by two interfaces - the old Query interface, which was the only interface available for representing queries in JPA 1, and the new TypedQuery<T> JPA interface that was introduced in JPA 2.

The TypedQuery interface extends the Query interface.

It is easier to run queries and process the query results in a type safe manner when using the TypedQuery interface.

The Query/TypedQuery<T> interface defines two methods for running SELECT queries:

1. **getSingleResult()** - for use when exactly one result object is expected.
2. **getResultList()** - for general use in any other case.

For UPDATE and DELETE use **executeUpdate()** method.

**Note:** The Query interface should be used mainly when the query result type is unknown or when a query returns polymorphic results. When a more specific result type is expected, use the TypedQuery interface.

**Instructor Notes:**

5.3: Working with JPA Queries

**Working with JPA Queries**

Query work starts with an `EntityManager`, which serves as a factory for both `Query` and `TypedQuery`.

The `EntityManager` interface has an overloaded `createQuery()` method with the following signature:

- `Query createQuery(java.lang.String query)`
- `TypedQuery<T> createQuery(java.lang.String query, T resultClass)`

```
Query query = entityManager.createQuery("Select s FROM Student s");
```

```
TypedQuery<Student> query = entityManager.createQuery  
("SELECT student from Student student",  
Student.class);
```

`EntityManager` interface has a `createQuery` method with the following signature:

```
<T> TypedQuery<T> createQuery(java.lang.String  
qlString,  
java.lang.Class<T> resultClass)
```

The first argument is JPQL string query and second argument is the typed class, which indicates return object type, upon query execution.

**Instructor Notes:**

5.3: Working with JPA Queries

**Query Examples**

The following queries to find single book with id 'B13455'

```
String qStr = "SELECT book FROM Book book WHERE  
book.id='B13455' ";  
TypedQuery<Book> query = entityManager.createQuery(qStr ,  
Book.class);  
Book book = query.getSingleResult();
```

To list all books from store:

```
String qStr = "SELECT book FROM Book book ";  
TypedQuery<Book> query = entityManager.createQuery(qStr,  
Book.class);  
List<book> bookList = query.getResultList();
```

Query interface should be used mainly when the query result type is unknown or when a query returns polymorphic results and the lowest known common denominator of all the result objects is Object.

When a more specific result type is expected queries should usually use the TypedQuery.

**Note:** For type safety and to avoid runtime cast exceptions, it is always good practice to work with TypedQuery<T>.



**Instructor Notes:**

5.3: Working with JPA Queries

**Dynamic queries with parameters**

JPA allows developer to create dynamic queries which are more efficient and can be built dynamically at runtime.

The following code retrieves a book object from the database by its title using named parameter "ptitle":

```
String qStr = "SELECT book FROM Book book WHERE  
book.title=:ptitle";  
TypedQuery<Book> query =  
entityManager.createQuery(qStr, Book.class);  
query.setParameter("ptitle", "Introduction to JPA");  
Book book = query.getSingleResult();
```

Query parameters enable the definition of reusable queries. Such queries can be executed with different parameter values to retrieve different results.

There are multiple ways to pass parameters to query.

1. Named Parameters (:name)
2. Ordinal Parameters (?index)
3. Criteria Query Parameters

The slide example shows example of named parameter "ptitle", which is later injected using setParameter() method on query.

**Note:** Named parameters should always preceded by colon (:).

While setting the date related parameters, one should make use of TemporalType to indicate a specific mapping of java.util.Date or java.util.Calendar. For example,

```
em.createQuery("SELECT s FROM Student s " +  
"WHERE s.startDate BETWEEN :start AND :end")  
.setParameter("start", start, TemporalType.DATE)  
.setParameter("end", end, TemporalType.DATE)  
.getResultList();
```

**Instructor Notes:**

5.3: Working with JPA Queries

**Named Queries**

JPA also provides a way for building static queries, as named queries, using the `@NamedQuery` and `@NamedQueries` annotations.

This approach is considered to be a good practice in JPA to prefer named queries over dynamic queries whenever possible.

Named queries are defined on Entity and created using `createNamedQuery()` method of `EntityManager`.

```
@Entity
@Table(name = "books")
@NamedQueries(
    @NamedQuery(name = "getAllBooks", query = "SELECT book FROM
    Book book"))
public class Book implements Serializable { ..... }
```

Named queries enables developer to write static queries. Such queries are written on an entity class with class level annotations called `@NamedQueries` and `@NamedQuery`.

`@NamedQueries` accepts array of `@NamedQuery`, whereas `@NamedQuery` requires name and query.

Slide shows an example to create a named query "getAllBooks". Once defined later on we can create and execute named query as shown below:

```
Query query =
entityManager.createNamedQuery("getAllBooks");
List<Book> bookList= query.getResultList();
```

**Instructor Notes:**

5.3: Working with JPA queries

Demo

JPAQueries



**Instructor Notes:**

Lab



Working with JPQL



**Instructor Notes:**

### Summary

In this lesson, you have learned about:

- What is JPQL
- JPA Query API
- Working with JPA queries



**Instructor Notes:****Review Question**

Question 1: Which of the following method is used to create named query?

- `EntityManager.createQuery()`
- `EntityManager.createNamedQuery()`
- Both



Question 2: While working with JPQL, manual conversion of table row data into object is not needed.

- True/False