Hibernate Criteria

Design by: DieuNT1

Lesson Objectives

1
- Understand the Hibernate Object States/Lifecycle.

2
- Understand the HCQL be used in Hibernate 4 or 5.

3
- Understand the **basic steps** to create a Criteria query.

4
- Able to use Hibernate Query Language to Join, Aggregation Functions, Pagination.

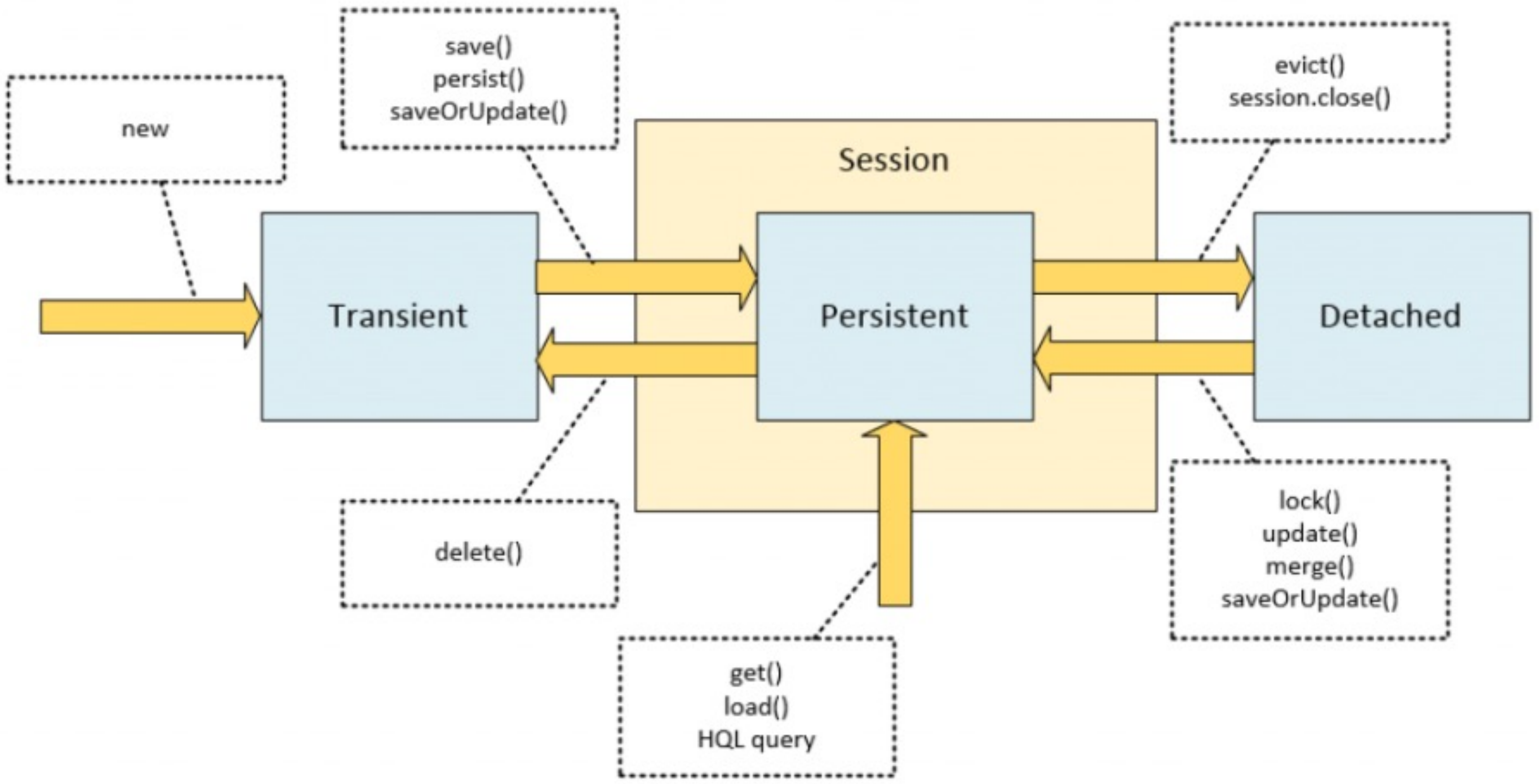
Agenda

- Hibetnate Object States/Lifecycle
- Session methods: save(), persist(), saveOrUpdate(), update(), merge()
- Hibernate 5 Criteria Query Language
  - ✓ Introduction
  - ✓ Basic steps to create a CriteriaQuery
  - ✓ Hibernate Criteria Examples

Section 01

HIBETNATE OBJECT STATES/LIFECYCLE

Hibetnate Object States/Lifecycle



Hibetnate Object States/Lifecycle

- **Transient**:
  - ✓ The transient state is the initial state of an object.
  - ✓ Once we create an instance of POJO (Plain Old Java Object) class, then the object entered in the transient state.
  - ✓ An object is not associated with the Session. So, the transient state is not related to any database.
  - ✓ The transient objects exist in the heap memory. They are independent of Hibernate.
  - ✓ **Example**:

```
// Here, object enters in the transient state.
1.Employee e=new Employee();
2.e.setId(101);
3.e.setFirstName("Gaurav");
4.e.setLastName("Chawla");
```

Hibetnate Object States/Lifecycle

❖ **Persistent**:

- ✓ As soon as the object associated with the Session, it entered in the persistent state.
- ✓ The object is in the persistence state/persistence context when we save or persist it.
- ✓ Each object represents the row of the database table.
- ✓ So, modifications in the data make changes in the database.
- ✓ **Example**:

```
1.session.save(e);
2.session.persist(e);
3.session.update(e);
4.session.saveOrUpdate(e);
5.session.lock(e);
6.session.merge(e);
```

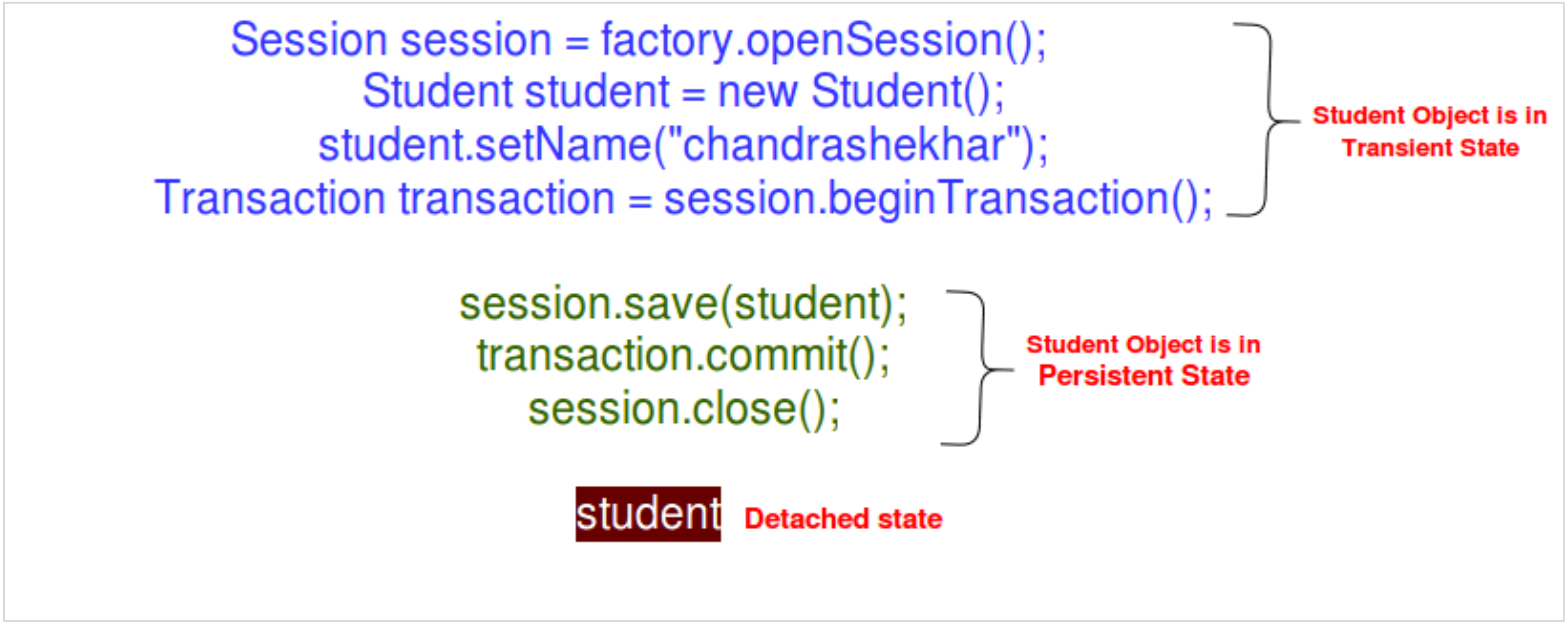
Hibetnate Object States/Lifecycle

- **Detached**:
  - ✓ Once we either close the session or clear its cache, then the object entered into the detached state.
  - ✓ As an object is no more associated with the Session, modifications in the data don't affect any changes in the database.
  - ✓ However, the detached object still has a representation in the database.
  - ✓ If we want to persist the changes made to a detached object, it is required to reattach the application to a valid Hibernate session.
  - ✓ To associate the detached object with the new hibernate session, use any of these methods - lock(), merge(), refresh(), update() or save() on a new session with the reference of the detached object.
  - ✓ **Example**:

```
1.session.close();
2.session.clear();
3.session.detach(e);
4.session.evict(e);
```

Hibetnate Object States/Lifecycl

❖ Example:



```
Session session = factory.openSession();
Student student = new Student();
student.setName("chandrashekhar");
Transaction transaction = session.beginTransaction();

session.save(student);
transaction.commit();
session.close();

student
```

Student Object is in Transient State
Student Object is in Persistent State
Detached state

persist() method

- void **persist(Object o)**: The *persist* method is intended for adding a new entity instance to the persistence context, i.e. transitioning an instance from transient to *persistent* state.

```
Person person = new Person();
person.setName("John");
session.persist(person);
```

- ✓ The *person* object has transitioned from *transient* to *persistent* state.
- ✓ The object is in the persistence context now, but not yet saved to the database.
- ✓ The generation of *INSERT* statements will occur only upon commiting the transaction, flushing or closing the session.
- ✓ If an instance is *detached*, you should expect an exception, either upon calling this method, or upon committing or flushing the session.

save() method

- Serializable **save(Object o):** The *save* method is an "original" Hibernate method that does not conform to the JPA specification.

```
Person person = new Person();
person.setName("John");
Long id = (Long) session.save(person);
```

  - ✓ The call of save on a *detached* instance creates a new *persistent* instance and assigns it a new identifier, which results in a duplicate record in a database upon committing or flushing.

merge() method

- **Object merge(Object o):** The main intention of the *merge* method is to update a *persistent* entity instance with new field values from a *detached* entity instance.

```
Person person = new Person();
person.setName("John");
session.save(person);

session.evict(person);
person.setName("Mary");

Person mergedPerson = (Person) session.merge(person);
```

- ✓ if the entity is *detached*, it is copied upon an existing *persistent* entity;
- ✓ if the entity is *transient*, it is copied upon a newly created *persistent* entity;
- ✓ if the entity is *persistent*, then this method call does not have effect on it (but the cascading still takes place).

update() method

- **void update(Object o):** As with *persist* and *save*, the *update* method is an “original” Hibernate method that was present long before the *merge* method was added. Its semantics differs in several key points:
  - the *update* method transitions the passed object from *detached* to *persistent* state;
  - this method throws an exception if you pass it a *transient* entity.

```
Person person = new Person();
person.setName("John");
session.save(person);
session.evict(person);

person.setName("Mary");
session.update(person);
```

saveOrUpdate() method

- **void saveOrUpdate(Object o):** This method appears only in the Hibernate API and does not have its standardized counterpart. Similar to *update*, it also may be used for reattaching instances.

```
Person person = new Person();

person.setName("John");

session.saveOrUpdate(person);
```

  - ✓ The main difference of *saveOrUpdate* method is that it does not throw exception when applied to a *transient* instance; instead, it makes this *transient* instance *persistent*.

Conclusion

- If you *don't have any special requirements*, as a rule of thumb, you should stick to the **persist** and **merge** methods, because they are standardized and guaranteed to conform to the JPA specification.
- They are also portable in case you decide to switch to another persistence provider, but they may sometimes appear not so useful as the “original” Hibernate methods, *save*, *update* and *saveOrUpdate*.

Section 02

HIBERNATE 5 CRITERIA QUERY LANGUAGE

Hibernate Criteria Query Language (

- Criteria queries offer a type-safe alternative to HQL, JPQL and native SQL queries (*org.hibernate.Criteria* API).

- Criteria queries are a programmatic, type-safe way to express a query.

- Criteria queries are essentially an object graph, where each part of the graph represents an increasing (as we navigate down this graph) more atomic part of the query.

Advantage of HCQL

- The Criterion API (*org.hibernate.Criteria*) is one of the **best** parts of Hibernate.
- The syntax is **simple** and very **intuitive**, so it is **easy** for the java programmer to add criteria.
- It offers compile-time syntax checking, **convenience** of use.

Create Criteria in Hibernate 5

The basic steps to create a Criteria query are:

- 1 - Create a CriteriaBuilder instance by calling the Session.getCriteriaBuilder() method.

```
CriteriaBuilder builder = session.getCriteriaBuilder();
```

- 2 - Create a query object by creating an instance of the CriteriaQuery interface.

```
CriteriaQuery<T> query = builder.createQuery(T.class);
```

- 3 - Set the query Root by calling the from() method on the CriteriaQuery object to define a range variable in FROM clause.

```
Root<T> root = query.from(T.class);
```

- 4 - Specify what the type of the query result will be by calling the select() method of the CriteriaQuery object.

```
query.select(root);
```

- 5 - Prepare the query for execution by creating a org.hibernate.query.Query instance by calling the Session.createQuery() method, specifying the type of the query result.

```
Query<T> q = session.createQuery(query);
```

- 6 - Execute the query by calling the getResultList() or getSingleResult() method on the org.hibernate.query.Query object.

```
List<T> list = q.getResultList();
```

Create Criteria in Hibernate 5

❖ **Example 1**: Selecting an entity

```
CriteriaBuilder builder = session.getCriteriaBuilder();

CriteriaQuery<Departments> criteria = builder
                    .createQuery(Departments.class);

Root<Departments> root = criteria.from(Departments.class);
criteria.select(root);
List<Departments> departments = session.createQuery(criteria)
                    .getResultList();
```

Create Criteria in Hibernate 5

❖ **Example 2**: Selecting an expression

```
CriteriaBuilder builder = session.getCriteriaBuilder();

CriteriaQuery<Departments> criteria = builder
                    .createQuery(Departments.class);

Root<Departments> root = criteria.from(Departments.class);

criteria.multiselect(root.get("deptId"), root.get("deptName"));

List<Departments> departments = session.createQuery(criteria)
                    .getResultList();
```

Create Criteria in Hibernate 5

❖ **Example 3**: Selecting multiple values

```
CriteriaBuilder builder = session.getCriteriaBuilder();

CriteriaQuery<Object[]> criteria = builder.
                           createQuery( Object[].class );
Root<Person> root = criteria.from( Person.class );

Path<Long> idPath = root.get("id");
Path<String> nickNamePath = root.get("nickName");

criteria.select( builder.array( idPath, nickNamePath ) );
criteria.where( builder.
                       equal(root.get("nickName"), "John Doe" ) );

List<Object[]> idAndNickNames = session.
                           createQuery( criteria ).getResultList();
```

Create Criteria in Hibernate 5

❖ **Example 3**: Selecting multiple values

```
CriteriaBuilder builder = session.getCriteriaBuilder();

CriteriaQuery<Object[]> criteria = builder.
                              createQuery( Object[].class );
Root<Person> root = criteria.from( Person.class );

Path<Long> idPath = root.get("id");
Path<String> nickNamePath = root.get("nickName");

criteria.select( builder.array( idPath, nickNamePath ) );
criteria.where( builder.
                         equal(root.get("nickName"), "John Doe" ) );

List<Object[]> idAndNickNames = session.
                              createQuery( criteria ).getResultList();
```

Create Criteria in Hibernate 5

- **Using *Expressions***
  - ✓ The *CriteriaBuilder* can be used to restrict query results based on specific conditions.
  - ✓ By using *CriteriaQuery where()* method and provide *Expressions* created by *CriteriaBuilder.*
- **Common Examples:**
  - ✓ *To get items having a price more than 1000:*

```
criteria.select(root).where(builder.gt(root.get("itemPrice"), 1000));
```

  - ✓ *Getting items having itemPrice less than 1000:*

```
criteria.select(root).where(builder.lt(root.get("itemPrice"), 1000));
```

  - ✓ *Items having itemNames contain Chair:*

```
criteria.select(root).where(builder.like(root.get("itemName"), "%chair%"));
```

  - ✓ *Records having itemPrice in between 100 and 200:*

```
criteria.select(root).where(builder.between(root.get("itemPrice"), 100, 200));
```

Create Criteria in Hibernate 5

- **Common Examples:**
  - ✓ *To check if the given property is null:*

    criteria.select(root).where(builder.isNull(root.get("itemDescription")));
  - ✓ *To check if the given property is not null:*

    criteria.select(root).where(builder.isNotNull(root.get("itemDescription")));
- **Criteria API allows us to easily chain expressions**:

```
Predicate greaterThanPrice = builder
                     .gt(root.get("itemPrice"), 1000);
Predicate chairItems = builder
                     .like(root.get("itemName"), "Chair%");
criteria.where(builder.and(greaterThanPrice, chairItems));
```

Create Criteria in Hibernate 5

❖ Sorting

```
criteria.orderBy(

builder.asc(root.get("itemName")),

builder.desc(root.get("itemPrice")));
```

Create Criteria in Hibernate 5

❖ GROUP BY and HAVING example

```
List<Departments> departments = session.createQuery(criteria)
                     .getResultList();

CriteriaBuilder builder = session.getCriteriaBuilder();

CriteriaQuery<Object[]> criteriaQuery =
                              builder.createQuery(Object[].class);
Root<Employee> root = criteriaQuery.from(Employee.class);
    criteriaQuery.multiselect(builder.count(root.get("name")),
                          root.get("salary"), root.get("department"));
    criteriaQuery.groupBy(root.get("salary"), root.get("department"));
    criteriaQuery.having(builder.greaterThan(root.get("salary"), 30000));

Query<Object[]> query = session.createQuery(criteriaQuery);
List<Object[]> list = query.getResultList();
```

Create Criteria in Hibernate 5

❖ **FROM and JOIN example**

```
session = HibernateUtils.getSessionFactory().openSession();
CriteriaBuilder builder = session.getCriteriaBuilder();
// Using FROM and JOIN
CriteriaQuery<Employees> criteriaQuery = builder
                    .createQuery(Employees.class);
Root<Employees> empRoot = criteriaQuery.from(Employees.class);
Root<Departments> deptRoot = criteriaQuery.from(Departments.class);
criteriaQuery.select(empRoot);

criteriaQuery.where(builder.equal(empRoot.get("department"),
                    deptRoot.get("deptId")));

Query<Employees> query = session.createQuery(criteriaQuery);
List<Employees> list = query.getResultList();

return list;
```

Create Criteria in Hibernate 5

HCQL Pagination

```java
public List<UserInfor> search(int pageNumber, int pageSize) {
    Session session = sessionFactory.getCurrentSession();
    CriteriaBuilder criteriaBuilder = session.getCriteriaBuilder();
    CriteriaQuery<UserInfor> criteriaQuery =
                                criteriaBuilder.createQuery(UserInfor.class);
    Root<UserInfor> root = criteriaQuery.from(UserInfor.class);
    criteriaQuery.select(root);

    Query<UserInfor> query = session.createQuery(criteriaQuery);
    query.setFirstResult((pageNumber - 1) * pageSize);
    query.setMaxResults(pageSize);

    List<UserInfor> listOfUser = query.getResultList();
    sessionFactory.close();

    return listOfUser;
}
```

Create Criteria in Hibernate 5

❖ Aggregate functions examples

- ✓ ***Count number of employees:***

```
CriteriaQuery<Long> criteriaQuery = builder.createQuery(Long.class);
Root<Employees> root = criteriaQuery.from(Employees.class);
criteriaQuery.select(builder.count(root));
Query<Long> query = session.createQuery(criteriaQuery);
long count = query.getSingleResult();
System.out.println("Count = " + count);
```

- ✓ ***Get max salary***

```
CriteriaQuery<Integer> criteriaQuery = builder.createQuery(Integer.class);
Root<Employees> root = criteriaQuery.from(Employees.class);
criteriaQuery.select(builder.max(root.get("salary")));
Query<Integer>      query =    session.createQuery(criteriaQuery);
int maxSalary =     query.getSingleResult();
System.out.println("Max Salary = " + maxSalary);
```

Create Criteria in Hibernate 5

❖ Aggregate functions examples

✓ *Get Average Salary*

```
CriteriaQuery<Double> criteriaQuery = builder.createQuery(Double.class);
Root<Employees> root = criteriaQuery.from(Employees.class);
criteriaQuery.select(builder.avg(root.get("salary")));
Query<Double> query = session.createQuery(criteriaQuery);
double avgSalary = query.getSingleResult();
System.out.println("Average Salary = " + avgSalary);
```

✓ *Count distinct employees*

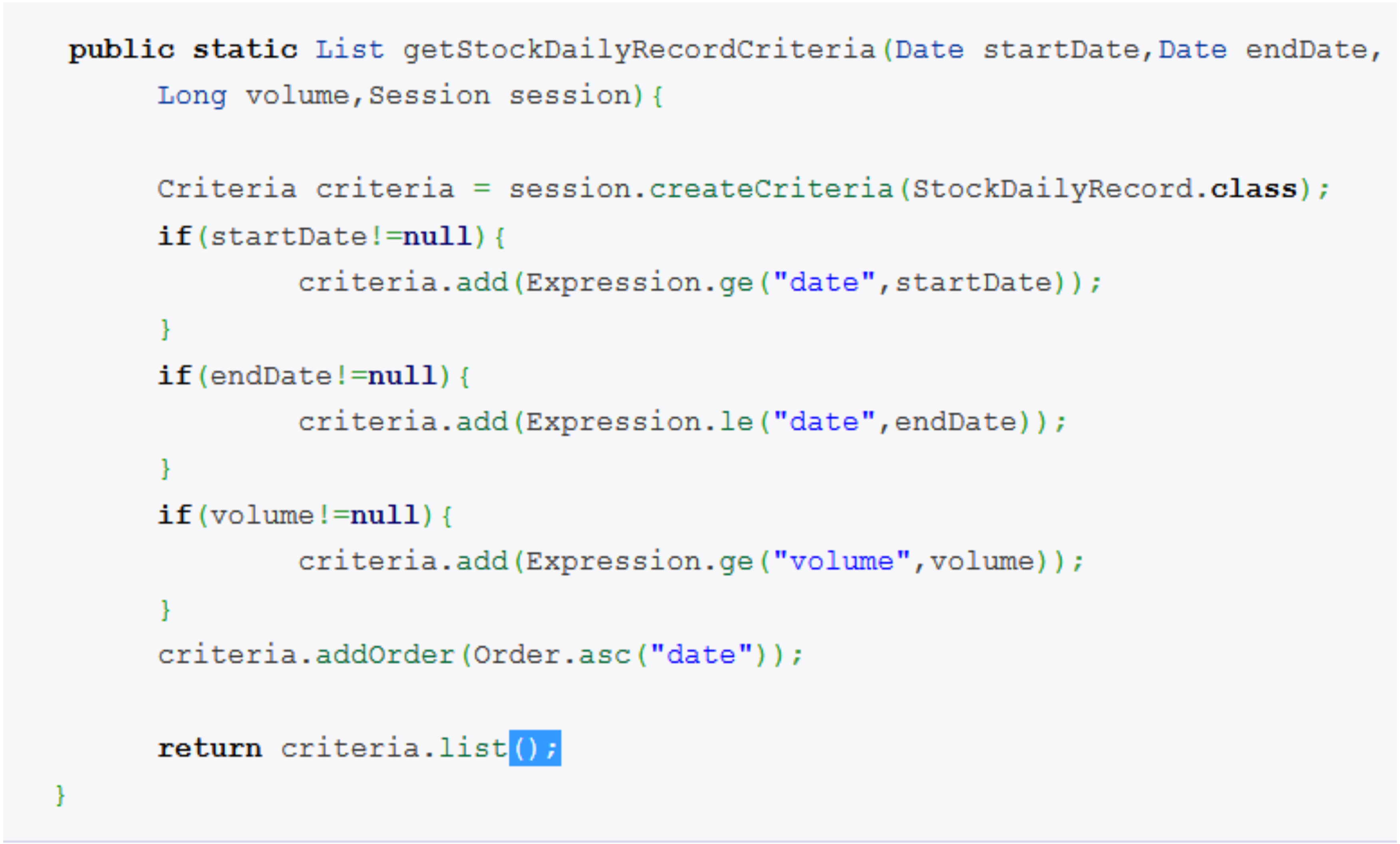
```
CriteriaQuery<Long> criteriaQuery = builder.createQuery(Long.class);
Root<Employees> root = criteriaQuery.from(Employees.class);
criteriaQuery.select(builder.countDistinct(root));
Query<Long> query = session.createQuery(criteriaQuery);
long distinct = query.getSingleResult();
System.out.println("Distinct count = " + distinct);
```

Section: tham khảo thêm

HIBERNATE 4 CRITERIA QUERY LANGUAGE

(CHỈ CẦN LỰA CHỌN HIBERNATE 4 OR 5)

Criteria Queries Hibernate 4



```
  public static List getStockDailyRecordCriteria(Date startDate,Date endDate,
        Long volume,Session session){

        Criteria criteria = session.createCriteria(StockDailyRecord.class);
        if(startDate!=null){
                criteria.add(Expression.ge("date",startDate));
        }
        if(endDate!=null){
                criteria.add(Expression.le("date",endDate));
        }
        if(volume!=null){
                criteria.add(Expression.ge("volume",volume));
        }
        criteria.addOrder(Order.asc("date"));

        return criteria.list();
 }
```

Restrictions class

The commonly used methods of Restrictions class are as follows:

- **public static SimpleExpression lt(String propertyName,Object value)**: sets the **less than** constraint to the given property.
- **public static SimpleExpression le(String propertyName,Object value)**: sets the **less than or equal** constraint to the given property.
- **public static SimpleExpression gt(String propertyName,Object value)**: sets the **greater than** constraint to the given property.
- **public static SimpleExpression ge(String propertyName,Object value)**: sets the **greater than or equal** than constraint to the given property.
- **public static SimpleExpression ne(String propertyName,Object value):** sets the **not equal** constraint to the given property.
- **public static SimpleExpression eq(String propertyName,Object value):** sets the **equal** constraint to the given property.
- **public static Criterion between(String propertyName, Object low, Object high):** sets the **between** constraint.
- **public static SimpleExpression like(String propertyName, Object value):** sets the **like** constraint to the given property.

Restrictions class

- **Restrictions.eq, lt, le, gt, ge**

  (Criteria Queries : Equal (eq), Not Equal(ne), Less than (lt), Less than or equal(le), greater than (gt),greater than or equal(ge) and Ordering the results(Order.asc/desc))

  Make sure the volume is great than 10000.

```
Criteria criteria = session.createCriteria(StockDailyRecord.class)
    .add(Restrictions.gt("volume", 10000));
```

- **Restrictions.like, between, isNull, isNotNull**

  Make sure the stock name is start with 'MKYONG' and follow by any characters.

```
Criteria criteria = session.createCriteria(StockDailyRecord.class)
    .add(Restrictions.like("stockName", "MKYONG%"));
```

(http://docs.jboss.org/hibernate/core/3.3/api/org/hibernate/criterion/Expression.html)

Criteria Query Samples

- **Criteria ordering query**

```
criteria.addOrder(Order.asc("dateOfBirth"));
criteria.addOrder(Order.desc("salary"));
```

- **Criteria restrictions query**

```
// HQL: tr.storeId=:storeId
criteria.add(Restrictions.eq("tr.storeId", storeId));
// HQL: tr.r.trafficTime>=:minDate
criteria.add(Restrictions.ge("tr.trafficTime", minDate));
// HQL: tr.r.trafficTime<:maxDate
criteria.add(Restrictions.lt("tr.trafficTime", maxDate));
criteria.add(Restrictions.between("dateOfBirth",
                                 startDate, endDate));
```

Criteria Query Samples

❖ Criteria restrictions query

```
criteria.add(Restrictions.like("name", "%th%"));
criteria.add(Restrictions.like("name", "%"+name+"%"));
```

Projections & Aggregations

```
Criteria cr = session.createCriteria(Employee.class);

// To get total row count.
cr.setProjection(Projections.rowCount());

// To get average of a property.
cr.setProjection(Projections.avg("salary"));

// To get distinct count of a property.
cr.setProjection(Projections.countDistinct("firstName"));

// To get maximum of a property.
cr.setProjection(Projections.max("salary"));

// To get minimum of a property.
cr.setProjection(Projections.min("salary"));

// To get sum of a property.
cr.setProjection(Projections.sum("salary"));
```

Create Criteria in Hibernate 4

```
public List<UserInfor> search(int pageNumber, int pageSize,
                                         int searchType, int departmentId) {

    Session session = sessionFactory.openSession();
    Criteria criteria = session.createCriteria(UserInfor.class);
     // Criteria with @JoinColumn (User (N) – (1) Department
    Criteria depCrit = criteria.createCriteria("department");
    if(departmentId > 0) {
      depCrit.add(Restrictions.like("departmentId", departmentId ));
    }
    if (searchType == 1) {
      criteria.add(Restrictions.like("isAdmin", 1));
    }
    if (searchType == 2) {
      criteria.add(Restrictions.like("isEnable", 0));
    }
    if (searchType == 3) {
      criteria.add(Restrictions.like("isEnable", 1));
    }
    criteria.setFirstResult((pageNumber - 1) * pageSize);
    criteria.setMaxResults(pageSize);

    List<UserInfor> listOfUser = criteria.list();

    return listOfUser;

}
```

Summary

- Hibetnate Object States/Lifecycle
- Session methods: save(), persist(), saveOrUpdate(), update(), merge()
- Hibernate 5 Criteria Query Language
  - ✓ Introduction
  - ✓ Basic steps to create a CriteriaQuery
  - ✓ Hibernate Criteria Examples

Thank you