**Difference between JPA, Hibernate and Spring Data JPA** 

**1. Java Persistence API (JPA)**

* **Type:** Specification (JSR 338)
* **Role:** Defines standard for object-relational mapping (ORM)
* **Function:** Interfaces and annotations like @Entity, EntityManager, @Id
* **Key Point:** No implementation—needs a provider like Hibernate

**2. Hibernate**

* **Type:** ORM Framework (JPA Provider)
* **Role:** Implements JPA + adds extra features
* **Function:** Handles session, transaction, caching, fetching, etc.
* **Key Point:** Can be used standalone or as a JPA implementation

**3. Spring Data JPA**

* **Type:** Spring Project (Abstraction)
* **Role:** Simplifies JPA usage using repositories
* **Function:** Auto-generates queries, eliminates boilerplate, supports pagination, etc.
* **Key Point:** Works **on top of JPA and its providers** (usually Hibernate)

**Code Comparison:**

public Integer addEmployee(Employee employee) {

Session session = factory.openSession();

Transaction tx = null;

Integer employeeID = null;

try {

tx = session.beginTransaction();

employeeID = (Integer) session.save(employee);

tx.commit();

} catch (HibernateException e) {

if (tx != null) tx.rollback();

e.printStackTrace();

} finally {

session.close();

}

return employeeID;

}

#### **Spring Data JPA Example**

**EmployeeRepository.java**

public interface EmployeeRepository extends JpaRepository<Employee, Integer> { }

**EmployeeService.java**

@Autowired

private EmployeeRepository employeeRepository;

@Transactional

public void addEmployee(Employee employee) {

employeeRepository.save(employee);

}

**Comparison Table**

| **Feature** | **JPA (API)** | **Hibernate** | **Spring Data JPA** |
| --- | --- | --- | --- |
| Type | Specification | Implementation (Framework) | Abstraction Layer |
| Boilerplate Code | Medium | High | Very Low |
| Dependency | javax.persistence | org.hibernate | org.springframework.data.jpa |
| Requires EntityManager | Yes | Yes (or Session) | No (uses Repositories) |
| Query Language | JPQL | HQL / JPQL | Method name queries / JPQL |
| Additional Features | No | Caching, HQL, Validators | Pagination, Sorting, Custom Queries |
| Ease of Use | Medium | Moderate | High |
| Underlying Implementation | Needs provider | Implements JPA | Uses JPA + Provider (e.g., Hibernate) |