Difference between JPA, Hibernate, and Spring Data JPA

# Java Persistence API (JPA)

- A standard/specification (JSR 338) for ORM (Object-Relational Mapping) in Java.  
- Defines interfaces and annotations for managing relational data in Java applications.  
- Does NOT provide any implementation.  
- Requires an implementation like Hibernate, EclipseLink, or OpenJPA.

# Hibernate

- An ORM framework that implements the JPA specification.  
- Can be used both as a native API and via JPA.  
- Manages JDBC connection, SQL generation, transaction handling, caching, etc.  
- One of the most widely used JPA providers.

# Spring Data JPA

- A part of Spring Framework that simplifies JPA and ORM operations.  
- Provides an abstraction layer over JPA implementations like Hibernate.  
- Minimizes boilerplate code by auto-generating queries from method names.  
- Supports pagination, sorting, and custom query methods.  
- Automatically manages transactions.

# Code Comparison

🔸 Using Hibernate (Manual Approach):

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;  
}

🔹 Using Spring Data JPA (Simplified):

// Repository  
public interface EmployeeRepository extends JpaRepository<Employee, Integer> {}  
  
// Service  
@Autowired  
private EmployeeRepository employeeRepository;  
  
@Transactional  
public void addEmployee(Employee employee) {  
 employeeRepository.save(employee);  
}

# Summary Table

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| --- | --- | --- | --- |
| Feature | JPA | Hibernate | Spring Data JPA |
| Type | Specification (API) | Implementation (ORM tool) | Framework abstraction over JPA |
| Transaction Management | Not provided | Manual | Automatic via Spring |
| Query Creation | JPQL (manual) | HQL (manual) | Derived queries, JPQL, native queries |
| Implementation Required? | Yes | No | No |
| Boilerplate Code | Moderate | High | Very Low |