Difference Between JPA, Hibernate, and Spring Data JPA

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Java Persistence API (JPA)

- A specification under JSR 338 for mapping Java objects to relational database tables.
- Defines interfaces and annotations like @Entity, @Id, and EntityManager.
- Does not provide an actual implementation—only a set of standards to follow.
- Requires an implementation like Hibernate to function.

Hibernate

- A widely-used ORM framework and one of the implementations of JPA.
- Translates Java classes and objects into database tables and rows.
- Provides additional features beyond JPA, like caching, fetching strategies, etc.
- Developers are responsible for managing session and transaction handling unless integrated with Spring.

Spring Data JPA

- A part of the Spring ecosystem that simplifies database operations using JPA.
- Does not implement JPA, but works on top of a JPA provider like Hibernate.
- Eliminates boilerplate code by allowing interface-based repository definitions.
- Offers built-in transaction management and auto-generated queries using method names.

Code Snippet Comparison

Hibernate

java
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```
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 (Exception e) {
      if (tx != null) tx.rollback();
   } finally {
      session.close();
   }
   return employeeID;
}
```

- Manual handling of session and transaction.
- Requires more lines of code for basic operations.

Spring Data JPA

EmployeeRepository.java

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

EmployeeService.java

java
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```
@Autowired
private EmployeeRepository employeeRepository;
@Transactional
public void addEmployee(Employee employee) {
   employeeRepository.save(employee);
}
```

- Uses JpaRepository to reduce the need for boilerplate code.
- Spring automatically manages the transaction and implementation.