**Module 6 - Spring Data JPA with Spring Boot, Hibernate**

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

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

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| | **Aspect** | **Explanation** | | --- | --- | | **What it is** | A **Java specification** (interface) for accessing, persisting, and managing data between Java objects and a relational database. | | **Who defines it** | Part of **Jakarta EE** (formerly Java EE) maintained by **Eclipse Foundation**. | | **What it does** | Defines how to map Java classes to database tables using annotations like @Entity, @Table, @Id, etc. | | **Key point** | It is **only an API** — it does not implement anything. You need a **provider** (like Hibernate) to use it. | | **Example Annotations** | @Entity, @Id, @OneToMany, @ManyToOne, etc. | | **Example API** | EntityManager, Query, CriteriaBuilder, etc. |   Think of JPA as the **interface** that standardizes ORM. |

**2. Hibernate**

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| | **Aspect** | **Explanation** | | --- | --- | | **What it is** | A **popular implementation** of JPA. It is a **framework** that provides the actual ORM functionality. | | **Who maintains it** | Developed and maintained by **Red Hat**. | | **JPA Implementation?** | Yes. Hibernate **implements JPA**, but also provides **additional features** beyond the JPA specification. | | **Additional Features** | Caching, custom SQL, dirty checking, enhanced fetch strategies, @Where, @Filter, etc. | | **Configuration** | Can use hibernate.cfg.xml or be configured via Spring Boot application.properties. | | **Query Support** | HQL (Hibernate Query Language), Criteria API, native SQL. |   Think of Hibernate as the **engine that powers JPA**. |

**3. Spring Data JPA**

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| | **Aspect** | **Explanation** | | --- | --- | | **What it is** | A **Spring module** that builds on top of JPA. It simplifies JPA-based repository access using **interfaces** and **query methods**. | | **Who maintains it** | Maintained by **Spring Team / VMware**. | | **Goal** | Eliminate boilerplate code for repositories and queries. | | **Features** | Auto-generated queries from method names (e.g., findByNameContaining()), custom queries with @Query, pagination, sorting, projections, auditing, etc. | | **Abstraction level** | High-level abstraction over JPA and Hibernate. | | **No implementation needed** | Just define an interface like extends JpaRepository<Entity, ID> — Spring auto-generates the implementation. |   Think of Spring Data JPA as a **powerful abstraction layer on top of JPA + Hibernate**. |