Database Connections, HikariCP, and Connection Pooling in Spring Boot

1. What is a Database Connection?

- A database connection is a TCP connection between your application and the database server.

- It's expensive to create, so we use connection pooling to reuse them.

2. What is Connection Pooling?

- A connection pool maintains ready-to-use DB connections in memory.

- Connections are borrowed for transactions and returned afterward.

3. What is HikariCP?

- HikariCP is Spring Boot's default high-performance connection pool.

- Fast, lightweight, and optimized.

- Auto-configured with spring-boot-starter-data-jpa.

Example properties:

spring.datasource.url=jdbc:mysql://localhost:3306/mydb

spring.datasource.username=root

spring.datasource.password=root

spring.datasource.hikari.maximum-pool-size=10

4. How It Works in Spring Boot

- On startup, HikariCP initializes the pool.

- Each @Transactional method borrows a connection.

- After commit/rollback, the connection is returned.

5. One Transaction = One Connection

- A transaction always uses one connection.

- Different transactions (even from same user) may use different connections.

6. Real-World Analogy Airport Check-In Counters

- User = Passenger, Connection = Check-in counter, HikariCP = Counter manager

- No counter is reserved; reused for next passenger.

7. Connection ID & Reuse

- Each DB connection has a unique ID.

- Connections are reused, so the same ID may appear again.

8. Useful Hikari Properties

spring.datasource.hikari.maximum-pool-size=10

spring.datasource.hikari.minimum-idle=5

spring.datasource.hikari.idle-timeout=600000

spring.datasource.hikari.max-lifetime=1800000

spring.datasource.hikari.connection-timeout=30000

9. Best Practices

- Set pool size according to DB and usage.

- Avoid leaks by returning connections properly.

- Use @Transactional for auto-handling.

Summary Table:

Concept	Description
Connection	A link to DB; expensive to create
Connection Pool	Pre-created reusable DB connections
HikariCP	Spring Boots default connection pool
One Transaction	Uses one connection from the pool
Connection Reuse	Happens between transactions
Tied to Users?	No, users dont own connections
Spring Role	Uses HikariCP under the hood