Below is the **concise, correct, and interview-grade explanation** of how the **Controller, Service, and Repository layers interact** in a Spring Boot application. This is the standard **3-layer architecture** used in industry.

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1. Roles (One Line Each)

- **Controller** → Handles HTTP requests and responses
- **Service** → Contains business logic and orchestration
- **Repository** → Handles database persistence

Each layer has **one responsibility** and **talks only to the adjacent layer**.

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2. Who Talks to Whom (Rule)

```
Controller → Service → Repository → Database
```

Reverse flow for responses.

🚫 **No layer skips another layer**

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3. Interaction Flow (Real Example)

Request: `POST /api/employees`

Step-by-step:

1. **Client (React/Postman)**
    - Sends HTTP request with JSON
2. **Controller**
    - Receives request
    - Converts JSON → DTO
    - Calls service method

```
employeeService.createEmployee(dto);
```

3. **Service**

- Applies business rules
- Converts DTO → Entity
- Calls repository

```
employeeRepository.save(employee);
```

4. **Repository**
   - Uses JPA/Hibernate
   - Executes SQL on database
5. **Database**
   - Stores data
   - Returns result
6. **Response travels back**

```
Database → Repository → Service → Controller → Client
```

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4. What Each Layer MUST NOT Do

Controller MUST NOT:

- Access database
- Contain business rules
- Call repository directly

Service MUST NOT:

- Handle HTTP (`@RequestBody`, `@PathVariable`)
- Return database entities directly (use DTOs)

Repository MUST NOT:

- Contain business logic
- Know about HTTP or DTOs

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5. Dependency Direction (Very Important)

```
Controller depends on Service
Service depends on Repository
```

```
Repository depends on JPA
```

Dependencies are **one-directional**.

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6. How Spring Wires Them (Key Insight)

At startup:

- Spring creates beans for all layers
- Injects dependencies via constructors

You never manually create objects.

```
public EmployeeController(EmployeeService service)
public EmployeeServiceImpl(EmployeeRepository repo)
```

Spring connects them.

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7. Visual Mental Model (Text Diagram)

```
[ HTTP ]
   ↓
[ Controller ]
   ↓
[ Service ]
   ↓
[ Repository ]
   ↓
[ PostgreSQL ]
```

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8. Why This Architecture Exists

- Separation of concerns
- Easier testing
- Replace database without touching controllers
- Clean, maintainable code

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9. Interview-Quality Summary (Memorize This)

> "The controller handles HTTP concerns, delegates business processing to the service layer, which in turn interacts with the repository abstraction for persistence. Each

> layer has a single responsibility and communicates only with the adjacent layer.”

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10. One Golden Rule (Remember Forever)

> **Controller = API Service = Brain Repository = Storage**

If you want next:

- Where DTOs fit in this interaction
- How transactions work across layers
- How validation flows before service execution

Say the topic name.