Exercise 1: Employee Management System - Overview and Setup

Model
Employee

```
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String designation;
    private double salary;

    @ManyToOne
    @JoinColumn(name = "department_id")
    private Department department;
}
```

```
Department
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

import java.util.List;

@Entity
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    @OneToMany(mappedBy = "department")
    private List<Employee> employees;
}
```

Repository

EmployeeRepository

```
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

import java.util.List;

@Entity
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    @OneToMany(mappedBy = "department")
    private List<Employee> employees;
}
```

DepartmentRepository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Department;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

@Repository
public interface DepartmentRepository extends JpaRepository<Department,
Long> {
}
```

Service

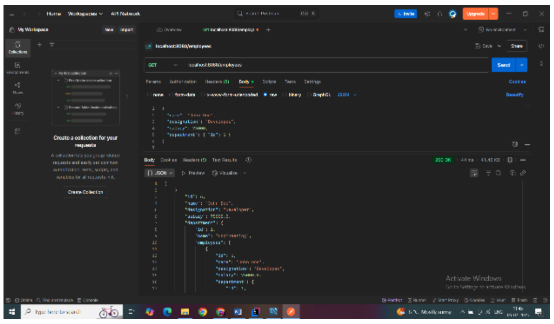
EmployeeService

```
package com.example.Employee.Management.service;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.repository.EmployeeRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class EmployeeService {
```

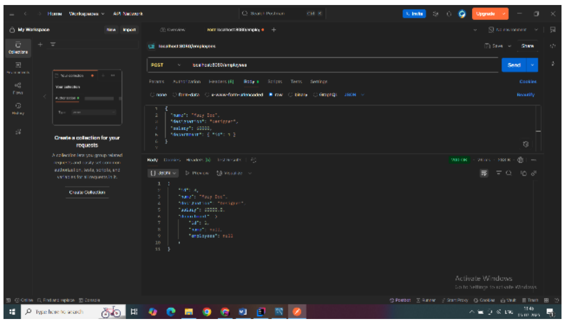
```java
    @Autowired
    private EmployeeRepository employeeRepository;

    public List<Employee> getAllEmployees() {
        return employeeRepository.findAll();
    }

    public Employee saveEmployee(Employee employee) {
        return employeeRepository.save(employee);
    }
}
```

```java
Controller
EmployeeController

package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;

    @GetMapping
    public List<Employee> getEmployees() {
        return employeeService.getAllEmployees();
    }

    @PostMapping
    public Employee createEmployee(@RequestBody Employee employee) {
        return employeeService.saveEmployee(employee);
    }
}
```

OUTPUT:



```
GET    localhost:8080/employees

{
  "name": "John Doe",
  "designation": "Developer",
  "salary": 75000,
  "department": { "id": 1 }
}

200 OK

[
    {
        "id": 6,
        "name": "John Doe",
        "designation": "Developer",
        "salary": 75000.0,
        "department": {
            "id": 1,
            "name": "Engineering",
            "employees": [
                {
                    "id": 6,
                    "name": "John Doe",
                    "designation": "Developer",
                    "salary": 75000.0,
                    "department": {
                        "id": 1,
```



```
POST   localhost:8080/employees

{
  "name": "Mary Doe",
  "designation": "Designer",
  "salary": 65000,
  "department": { "id": 1 }
}

200 OK

{
    "id": 4,
    "name": "Mary Doe",
    "designation": "Designer",
    "salary": 65000.0,
    "department": {
        "id": 1,
        "name": null,
        "employees": null
    }
}
```

Exercise 2: Employee Management System - Creating Entities

ENTITIES

Department

```
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Table(name = "employee")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;

    @ManyToOne
    @JoinColumn(name = "department_id")  // foreign key column in
'employee' table
    private Department department;
}
```

```
EMPLOYEE

package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

import java.util.List;

@Entity
@Table(name = "department")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String name;

    @OneToMany(mappedBy = "department", cascade = CascadeType.ALL, fetch =
FetchType.LAZY)
    @ToString.Exclude
    private List<Employee> employees;
}
```

Exercise 3: Employee Management System - Creating Repositories

Repository

Employee

```


package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

@Repository
public interface EmployeeRepository extends JpaRepository<Employee, Long> {
}
```

Department

```

package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Department;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

@Repository
public interface DepartmentRepository extends JpaRepository<Department,
Long> {
}
```

Exercise 4: Employee Management System - Implementing CRUD Operations

```

Controller

EmployeeController

package com.example.Employee.Management.controller;
```

```java
import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.repository.EmployeeRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeRepository employeeRepository;

    @PostMapping
    public Employee createEmployee(@RequestBody Employee employee) {
        return employeeRepository.save(employee);
    }

    @GetMapping
    public List<Employee> getAllEmployees() {
        return employeeRepository.findAll();
    }

    @GetMapping("/{id}")
    public Employee getEmployeeById(@PathVariable Long id) {
        return employeeRepository.findById(id).orElse(null);
    }
}
```

DepartmentController

```java
package com.example.Employee.Management.controller;



import com.example.Employee.Management.model.Department;
import com.example.Employee.Management.repository.DepartmentRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/departments")
public class DepartmentController {

    @Autowired
    private DepartmentRepository departmentRepository;

    @PostMapping
    public Department createDepartment(@RequestBody Department department)
{
        return departmentRepository.save(department);
    }

    @GetMapping
    public List<Department> getAllDepartments() {
        return departmentRepository.findAll();
    }
    @GetMapping("/{id}")
    public Department getDepartmentById(@PathVariable Long id) {
        return departmentRepository.findById(id).orElse(null);
    }
}
```

Exercise 5: Employee Management System - Defining Query Methods

1.Custom Query Methods

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

import java.util.List;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {

    // 1. Find employees by name
    List<Employee> findByName(String name);

    // 2. Find employees by department id
    List<Employee> findByDepartmentId(Long departmentId);

    // 3. Find employees whose salary is greater than a certain value
    List<Employee> findBySalaryGreaterThan(Double salary);
}
```

```
2. @Query Annotation-Based Methods

package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.data.jpa.repository.Query;
import org.springframework.data.repository.query.Param;

import java.util.List;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {

    // JPQL query: Find by designation
    @Query("SELECT e FROM Employee e WHERE e.designation = :designation")
    List<Employee> getEmployeesByDesignation(@Param("designation") String
designation);

    // Native SQL: Find top N employees by salary
    @Query(value = "SELECT * FROM employee ORDER BY salary DESC LIMIT
:limit", nativeQuery = true)
    List<Employee> getTopPaidEmployees(@Param("limit") int limit);
}
```

```
3.Named Queries (@NamedQuery)
Employee
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Getter @Setter @ToString
@NamedQueries({
        @NamedQuery(name = "Employee.findByEmail",
                query = "SELECT e FROM Employee e WHERE e.email = :email"),
        @NamedQuery(name = "Employee.findByDepartmentAndSalary",
                query = "SELECT e FROM Employee e WHERE e.department.id =
:deptId AND e.salary > :minSalary")
})
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;
    private String designation;
    private Double salary;

    @ManyToOne
    @JoinColumn(name = "department_id")
    private Department department;
}
```

EmployeeRepository

```
import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.data.jpa.repository.Query;
import org.springframework.data.repository.query.Param;

import java.util.List;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {
    @Query(name = "Employee.findByEmail")
    Employee findByEmail(@Param("email") String email);

    @Query(name = "Employee.findByDepartmentAndSalary")
    List<Employee> findByDepartmentAndSalary(@Param("deptId") Long deptId,
@Param("minSalary") Double minSalary);

}
```

Exercise 6: Employee Management System - Implementing Pagination and Sorting

```
Entities
Employee

package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Table(name = "employee")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    private String email;

    private String designation;

    private Double salary;

    @ManyToOne(fetch = FetchType.LAZY)
    @JoinColumn(name = "department_id") // foreign key column
    @ToString.Exclude // to avoid recursive printing
    private Department department;
}


Department


package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

import java.util.List;

@Entity
@Table(name = "department")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    // One department can have many employees
    @OneToMany(mappedBy = "department", cascade = CascadeType.ALL)
    @ToString.Exclude // to prevent recursive output
    private List<Employee> employees;
}
```

Repository

EmployeeRepository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.Pageable;
import org.springframework.data.jpa.repository.JpaRepository;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {

    Page<Employee> findAll(Pageable pageable);

    Page<Employee> findByDepartmentId(Long departmentId, Pageable
pageable);
}
```

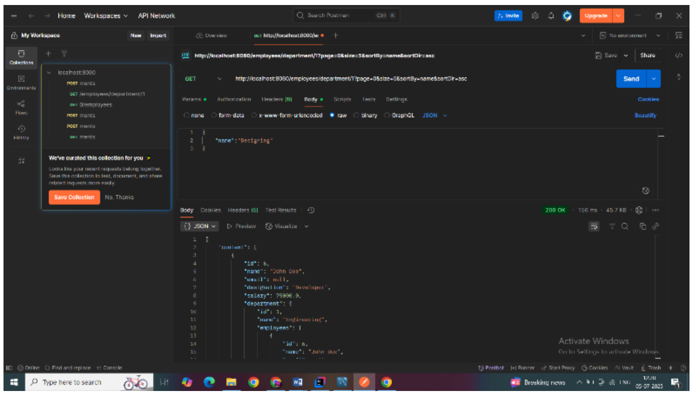
EmployeeService

```
import org.springframework.data.domain.Pageable;
import org.springframework.stereotype.Service;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    public Page<Employee> getAllEmployees(Pageable pageable) {
        return employeeRepository.findAll(pageable);
    }

    public Page<Employee> getEmployeesByDepartment(Long deptId, Pageable
pageable) {
        return employeeRepository.findByDepartmentId(deptId, pageable);
    }
}
```

```

EmployeeController

```

```java
package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.PageRequest;
import org.springframework.data.domain.Pageable;
import org.springframework.data.domain.Sort;
import org.springframework.web.bind.annotation.*;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;

    // Basic Pagination & Sorting
    @GetMapping
    public Page<Employee> getAllEmployees(
            @RequestParam(defaultValue = "0") int page,       // page
number
            @RequestParam(defaultValue = "5") int size,       // page size
            @RequestParam(defaultValue = "id") String sortBy, // field name
            @RequestParam(defaultValue = "asc") String sortDir // asc/desc
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getAllEmployees(pageable);
    }

    // Filter by department with pagination & sorting
    @GetMapping("/department/{deptId}")
    public Page<Employee> getEmployeesByDepartment(
            @PathVariable Long deptId,
            @RequestParam(defaultValue = "0") int page,
            @RequestParam(defaultValue = "5") int size,
            @RequestParam(defaultValue = "id") String sortBy,
            @RequestParam(defaultValue = "asc") String sortDir
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getEmployeesByDepartment(deptId, pageable);
    }
}
```

OUTPUT:



```
GET http://localhost:8080/employees/department/1?page=0&size=5&sortBy=name&sortDir=asc
```

```
{
    "name":"Designing"
}
```

200 OK · 156 ms · 45.7 KB

```
{
    "content": [
        {
            "id": 6,
            "name": "John Doe",
            "email": null,
            "designation": "Developer",
            "salary": 75000.0,
            "department": {
                "id": 1,
                "name": "Engineering",
                "employees": [
                    {
                        "id": 6,
                        "name": "John Doe",
```

Exercise 7: Employee Management System - Enabling Entity Auditing

Model

Auditable

```java
package com.example.Employee.Management.model;

import jakarta.persistence.Column;
import jakarta.persistence.EntityListeners;
import jakarta.persistence.MappedSuperclass;
import lombok.Getter;
import lombok.Setter;
import org.springframework.data.annotation.*;
import org.springframework.data.jpa.domain.support.AuditingEntityListener;

import java.time.LocalDateTime;

@Getter
@Setter
@MappedSuperclass
@EntityListeners(AuditingEntityListener.class)
public abstract class Auditable {

    @CreatedDate
    @Column(updatable = false)
    private LocalDateTime createdDate;

    @LastModifiedDate
    private LocalDateTime lastModifiedDate;

    @CreatedBy
    @Column(updatable = false)
    private String createdBy;

    @LastModifiedBy
    private String modifiedBy;
}
```

Employee

```java
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import lombok.*;

@Entity
@Table(name = "employee")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Employee extends Auditable{

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    private String email;

    private String designation;

    private Double salary;

    @ManyToOne(fetch = FetchType.LAZY)
    @JoinColumn(name = "department_id") // foreign key column
    @ToString.Exclude // to avoid recursive printing
    private Department department;
}
```

Department

```java
@Entity
@Table(name = "department")
@Getter
@Setter
@NoArgsConstructor
@AllArgsConstructor
@ToString
public class Department extends Auditable {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    // One department can have many employees
    @OneToMany(mappedBy = "department", cascade = CascadeType.ALL)
    @ToString.Exclude // to prevent recursive output
    private List<Employee> employees;
}
```

Config

```
package com.example.Employee.Management.config;

import org.springframework.context.annotation.Configuration;
import org.springframework.data.jpa.repository.config.EnableJpaAuditing;

@Configuration
@EnableJpaAuditing
public class AuditConfig {
}
```

EmployeeRepository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.Pageable;
import org.springframework.data.jpa.repository.JpaRepository;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {

    Page<Employee> findAll(Pageable pageable);

    Page<Employee> findByDepartmentId(Long departmentId, Pageable
pageable);
}
```

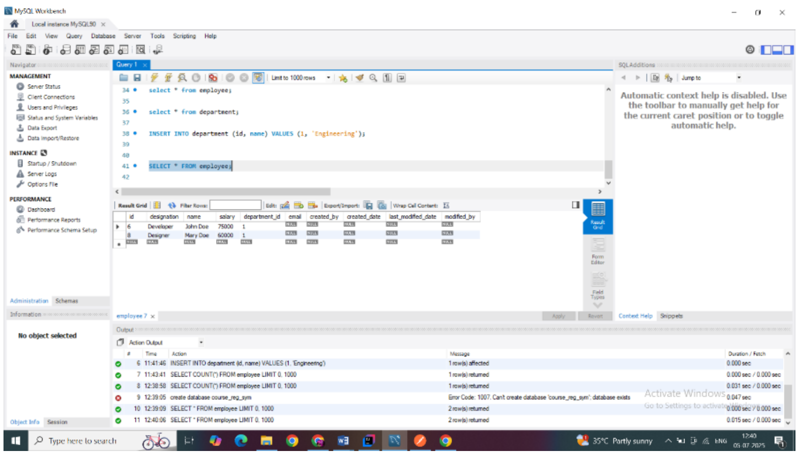
EmployeeService

```
package com.example.Employee.Management.service;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.repository.EmployeeRepository;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.Pageable;
import org.springframework.stereotype.Service;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    public Page<Employee> getAllEmployees(Pageable pageable) {
        return employeeRepository.findAll(pageable);
    }

    public Page<Employee> getEmployeesByDepartment(Long deptId, Pageable
pageable) {
        return employeeRepository.findByDepartmentId(deptId, pageable);
    }
}
```

EmployeeController

```
package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.PageRequest;
import org.springframework.data.domain.Pageable;
import org.springframework.data.domain.Sort;
import org.springframework.web.bind.annotation.*;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;

    // Basic Pagination & Sorting
    @GetMapping
    public Page<Employee> getAllEmployees(
            @RequestParam(defaultValue = "0") int page,        // page
number
            @RequestParam(defaultValue = "5") int size,        // page size
            @RequestParam(defaultValue = "id") String sortBy, // field name
            @RequestParam(defaultValue = "asc") String sortDir // asc/desc
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getAllEmployees(pageable);
    }

    // Filter by department with pagination & sorting
    @GetMapping("/department/{deptId}")
    public Page<Employee> getEmployeesByDepartment(
            @PathVariable Long deptId,
            @RequestParam(defaultValue = "0") int page,
            @RequestParam(defaultValue = "5") int size,
            @RequestParam(defaultValue = "id") String sortBy,
            @RequestParam(defaultValue = "asc") String sortDir
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getEmployeesByDepartment(deptId, pageable);
    }
}
```

OUTPUT:



```
select * from employee;

select * from department;

INSERT INTO department (id, name) VALUES (1, 'Engineering');


SELECT * FROM employee;
```

id	designation	name	salary	department_id	email	created_by	created_date	last_modified_date	modified_by
6	Developer	John Doe	75000	1	NULL	NULL	NULL	NULL	NULL
8	Designer	Mary Doe	60000	1	NULL	NULL	NULL	NULL	NULL
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

```
#  Time      Action                                                   Message                                                                Duration / Fetch
6  11:41:46  INSERT INTO department (id, name) VALUES (1, 'Engineering')  1 row(s) affected                                                    0.000 sec
7  11:43:41  SELECT COUNT(*) FROM employee LIMIT 0, 1000                1 row(s) returned                                                      0.000 sec / 0.000 sec
8  12:38:58  SELECT COUNT(*) FROM employee LIMIT 0, 1000                1 row(s) returned                                                      0.031 sec / 0.000 sec
9  12:39:05  create database course_reg_sym                            Error Code: 1007. Can't create database 'course_reg_sym'; database exists  0.047 sec
10 12:39:09  SELECT * FROM employee LIMIT 0, 1000                       2 row(s) returned                                                      0.000 sec / 0.000 sec
11 12:40:06  SELECT * FROM employee LIMIT 0, 1000                       2 row(s) returned                                                      0.015 sec / 0.000 sec
```

Exercise 8: Employee Management System - Creating Projections

Projection

```
package com.example.Employee.Management.projection;

interface DepartmentInfo {
    String getName();
}
```

```
package com.example.Employee.Management.projection;

public interface EmployeeInfo {
    String getName();

    String getDesignation();

    DepartmentInfo getDepartment();
}
```

```
DTO

package com.example.Employee.Management.DTO;

public class EmployeeDTO {
    private String name;
    private String departmentName;

    public EmployeeDTO(String name, String departmentName) {
        this.name = name;
```

```java
        this.departmentName = departmentName;
    }

    // Getters
    public String getName() {
        return name;
    }

    public String getDepartmentName() {
        return departmentName;
    }
}
```

Repository

```java
package com.example.Employee.Management.repository;

import com.example.Employee.Management.DTO.EmployeeDTO;
import com.example.Employee.Management.projection.EmployeeInfo;
import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.data.jpa.repository.Query;

import java.util.List;

public interface EmployeeRepository extends JpaRepository<Employee, Long> {
    List<EmployeeInfo> findAllBy(); // returns projection
    @Query("SELECT new
com.example.Employee.Management.dto.EmployeeDTO(e.name, e.department.name)
FROM Employee e")
    List<EmployeeDTO> fetchEmployeeDTOs();
}
```

Controller

```java
package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.projection.EmployeeInfo;
import com.example.Employee.Management.repository.EmployeeRepository;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.data.domain.Page;
import org.springframework.data.domain.PageRequest;
import org.springframework.data.domain.Pageable;
import org.springframework.data.domain.Sort;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;
    @Autowired
    private EmployeeRepository employeeRepository;
    // Basic Pagination & Sorting
    @GetMapping
    public Page<Employee> getAllEmployees(
            @RequestParam(defaultValue = "0") int page,       // page
number
            @RequestParam(defaultValue = "5") int size,       // page size
            @RequestParam(defaultValue = "id") String sortBy, // field name
            @RequestParam(defaultValue = "asc") String sortDir // asc/desc
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getAllEmployees(pageable);
    }
    @GetMapping("/projection/interface")
    public List<EmployeeInfo> getEmployeeInterfaceProjection() {
        return employeeRepository.findAllBy();
    }

    // Filter by department with pagination & sorting
    @GetMapping("/department/{deptId}")
    public Page<Employee> getEmployeesByDepartment(
            @PathVariable Long deptId,
            @RequestParam(defaultValue = "0") int page,
            @RequestParam(defaultValue = "5") int size,
            @RequestParam(defaultValue = "id") String sortBy,
            @RequestParam(defaultValue = "asc") String sortDir
    ) {
        Sort sort = sortDir.equalsIgnoreCase("asc") ?
Sort.by(sortBy).ascending()
                : Sort.by(sortBy).descending();
        Pageable pageable = PageRequest.of(page, size, sort);
        return employeeService.getEmployeesByDepartment(deptId, pageable);
    }
}
```

Exercise 9: Employee Management System - Customizing Data Source Configuration

Entity

Audit

```
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import java.time.LocalDateTime;
```

```java
@Entity
public class Audit {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String action;

    private LocalDateTime timestamp;

    public Long getId() {
        return id;
    }

    public void setId(Long id) {
        this.id = id;
    }

    public String getAction() {
        return action;
    }

    public void setAction(String action) {
        this.action = action;
    }

    public LocalDateTime getTimestamp() {
        return timestamp;
    }

    public void setTimestamp(LocalDateTime timestamp) {
        this.timestamp = timestamp;
    }
}
```

Employee

```java
package com.example.Employee.Management.model;

import jakarta.persistence.*;

@Entity
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;

    @ManyToOne
    @JoinColumn(name = "department_id")
    private Department department;

    // Getters and setters
    public Long getId() {
        return id;
    }

    public void setId(Long id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }

    public Department getDepartment() {
        return department;
    }

    public void setDepartment(Department department) {
        this.department = department;
    }
}
```

Department

```java
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import java.util.List;

@Entity
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    @OneToMany(mappedBy = "department")
    private List<Employee> employees;

    // Getters and setters
    public Long getId() {
        return id;
    }

    public void setId(Long id) {
        this.id = id;
    }
    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public List<Employee> getEmployees() {
        return employees;
    }

    public void setEmployees(List<Employee> employees) {
        this.employees = employees;
    }
}
```

Repository

AuditRepository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Audit;
import org.springframework.data.jpa.repository.JpaRepository;

public interface AuditRepository extends JpaRepository<Audit, Long> {
}
```

EmployeeRepository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;

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

Service

AuditService

```
@Service
public class AuditService {

    @Autowired
    private AuditRepository auditLogRepository;
```

```java
    public void logAction(String action) {
        Audit log = new Audit();
        log.setAction(action);
        log.setTimestamp(LocalDateTime.now());
        auditLogRepository.save(log);
    }
}
```

EmployeeService

```java
package com.example.Employee.Management.service;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.repository.EmployeeRepository;
import com.example.Employee.Management.service.AuditService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    @Autowired
    private AuditService auditService;

    public Employee saveEmployee(Employee employee) {
        Employee saved = employeeRepository.save(employee);
        auditService.logAction("Created employee: " + saved.getName());
        return saved;
    }

    public List<Employee> getAllEmployees() {
        return employeeRepository.findAll();
    }
}
```

EmployeeController

```java
package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;

    @PostMapping
    public Employee createEmployee(@RequestBody Employee employee) {
        return employeeService.saveEmployee(employee);
    }

    @GetMapping
    public List<Employee> getAllEmployees() {
        return employeeService.getAllEmployees();
    }
}
```

Exercise 10: Employee Management System - Hibernate-Specific Features

Model
Employee

```
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import org.hibernate.annotations.CacheConcurrencyStrategy;
import org.hibernate.annotations.DynamicInsert;
import org.hibernate.annotations.DynamicUpdate;

@Entity
@DynamicInsert  // only include non-null fields in insert statement
@DynamicUpdate  // only include modified fields in update statement
public class Employee {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;
    private String email;

    @ManyToOne
    @JoinColumn(name = "department_id")
    private Department department;

    // Getters and setters
    public Long getId() {
        return id;
    }

    public void setId(Long id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
```

```java
        this.name = name;
    }

    public String getEmail() {
        return email;
    }

    public void setEmail(String email) {
        this.email = email;
    }
```

Department

```java
package com.example.Employee.Management.model;

import jakarta.persistence.*;
import org.hibernate.annotations.DynamicInsert;
import org.hibernate.annotations.DynamicUpdate;

import java.util.List;

@Entity
@DynamicInsert  // only include non-null fields in insert statement
@DynamicUpdate
public class Department {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;

    private String name;

    @OneToMany(mappedBy = "department")
    private List<Employee> employees;

    // Getters and setters
    public Long getId() {
        return id;
    }

    public void setId(Long id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    public List<Employee> getEmployees() {
        return employees;
    }

    public void setEmployees(List<Employee> employees) {
        this.employees = employees;
    }

    public Department(Long id) {
        this.id = id;
    }
}
```

Service

EmployeeService

```java
package com.example.Employee.Management.service;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.repository.EmployeeRepository;
import com.example.Employee.Management.service.AuditService;
import jakarta.transaction.Transactional;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

import java.util.List;

@Service
public class EmployeeService {

    @Autowired
    private EmployeeRepository employeeRepository;

    @Autowired
    private AuditService auditService;

    public Employee saveEmployee(Employee employee) {
        Employee saved = employeeRepository.save(employee);
        auditService.logAction("Created employee: " + saved.getName());
        return saved;
    }

    public List<Employee> getAllEmployees() {
        return employeeRepository.findAll();
    }

    @Transactional
    public void saveEmployeesInBatch(List<Employee> employees) {
        for (int i = 0; i < employees.size(); i++) {
            employeeRepository.save(employees.get(i));
            // flush and clear periodically to avoid memory issues
            if (i % 20 == 0) {
                employeeRepository.flush(); // add `extends
JpaRepository<Employee, Long>, JpaSpecificationExecutor<Employee>` to
enable this
            }
        }
    }

}
```

Repository

```
package com.example.Employee.Management.repository;

import com.example.Employee.Management.model.Employee;
import org.springframework.data.jpa.repository.JpaRepository;

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

Controller

```
package com.example.Employee.Management.controller;

import com.example.Employee.Management.model.Employee;
import com.example.Employee.Management.service.EmployeeService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.http.ResponseEntity;
import org.springframework.web.bind.annotation.*;

import java.util.List;

@RestController
@RequestMapping("/employees")
public class EmployeeController {

    @Autowired
    private EmployeeService employeeService;

    @PostMapping
    public Employee createEmployee(@RequestBody Employee employee) {
        return employeeService.saveEmployee(employee);
    }

    @GetMapping
    public List<Employee> getAllEmployees() {
        return employeeService.getAllEmployees();
    }
    @PostMapping("/batch")
    public ResponseEntity<String> saveEmployeesBatch(@RequestBody
List<Employee> employees) {
        employeeService.saveEmployeesInBatch(employees);
        return ResponseEntity.ok("Batch inserted successfully");
    }

}
```