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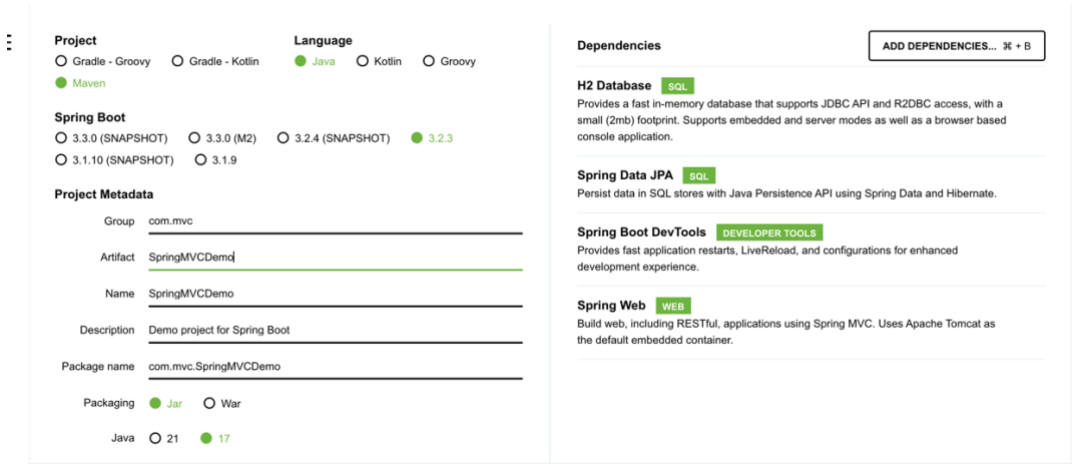
1. Spring Boot Maven Project

1.1. Create a Spring boot maven project with the following dependencies from start.spring.io



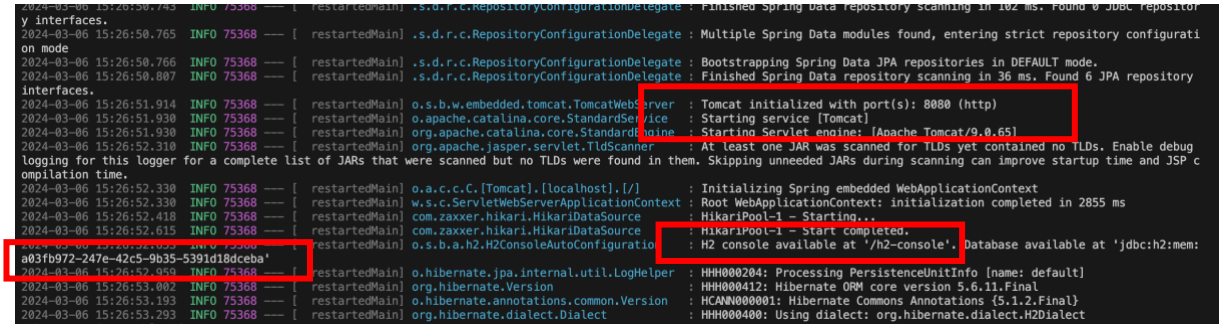
1.2. Unzip the project and open in the editor

1.3. The embedded tomcat with spring boot web includes a light weight server which is the tomcat core and is capable of processing HTTP requests and send JSON as a response

1.4. Applications that use devtools will automatically restart whenever files on the classpath change

2. Understand web environment and H2 database

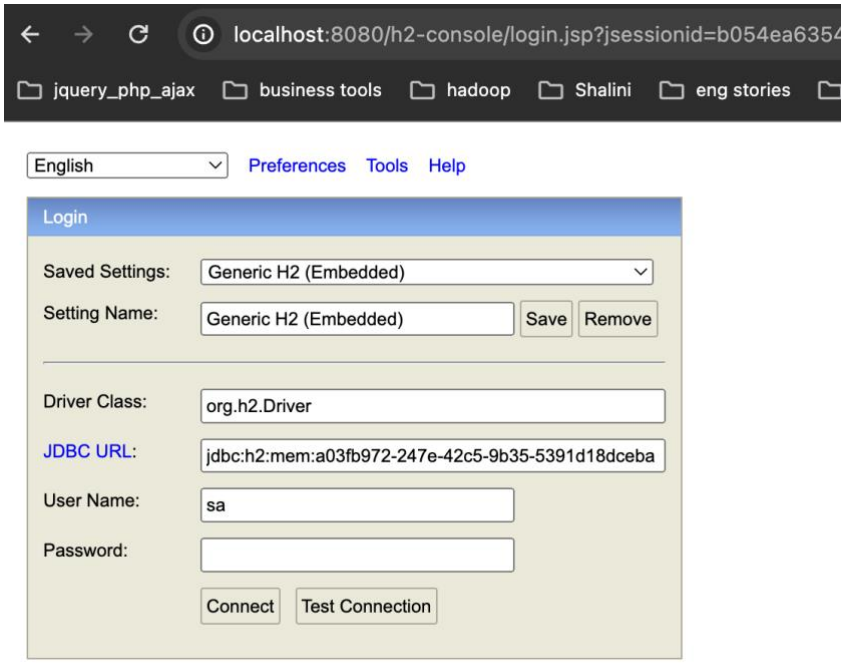
2.1. Run the main method and observe the console.



2.2. Notice tomcat is running on port 8080

2.3. H2 console is available at /h2-console with the url starting with jdbc:h2:mem:<some id>. Default username is sa and no password.
This id is random and keeps changing whenever the server is restarted

2.4. Open browser and type in the url http://localhost:8080/h2-console and copy paste the h2 url from the console as shown in below screen:



2.5. Since url keeps on changing lets override the default url and update the application.properties as follows:

spring.h2.console.enabled=true
spring.datasource.url=**jdbc:h2:mem:testdb**
spring.jpa.show-sql=true
#spring.jpa.generate-ddl=true

2.6. Now stop the server and restart to see the output in console for the changed url for h2-console. Login to h2 databse on the browser using **jdbc:h2:mem:testdb**

2.7. Tomcat server bby default runs on port 8080. To change the port add below in application.properties file
server.port=8081

2.8. Stop the server and restart, you will notice now tomcat is available at port 8081. Verify by going on the browser and typing http://localhost:8081/h2-console

3. Rest Controller

3.1. Create a class HelloRestController as follows:

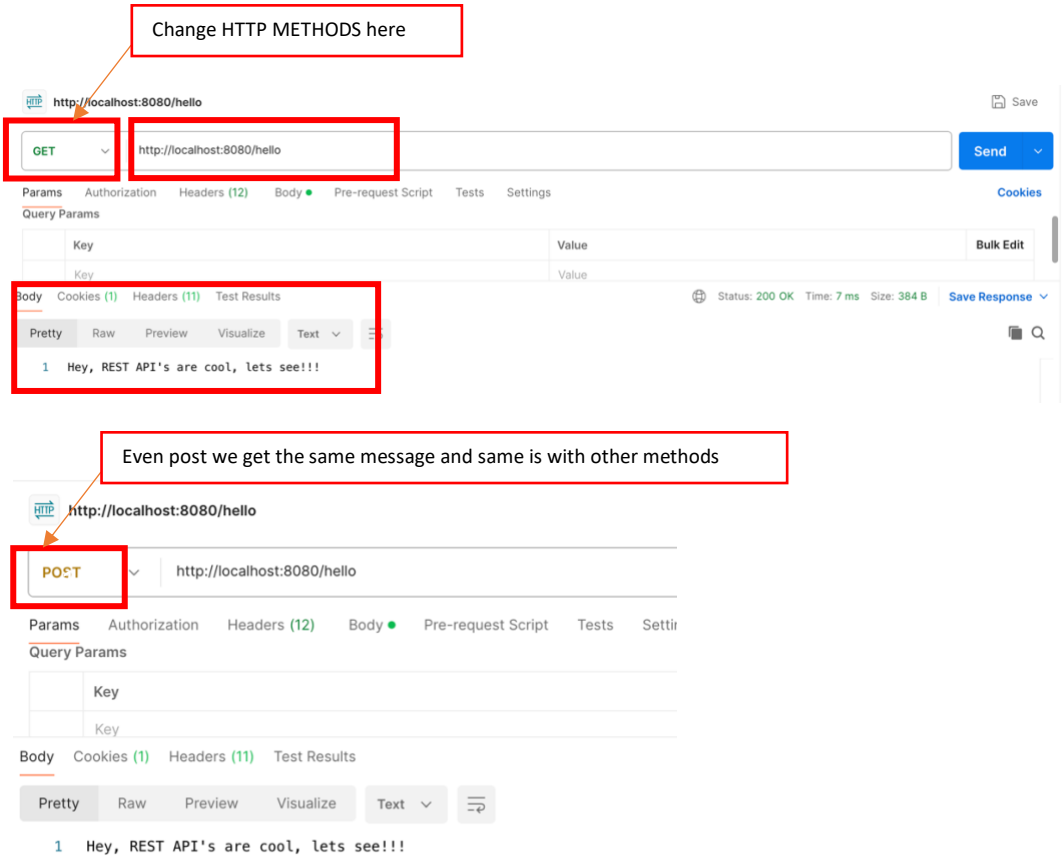
```
@RestController // @Controller + @ResponseBody
public class HelloRestController{

        @RequestMapping("/hello")
```

```
        public String greet()
        {
                return "Hey, REST API's are cool, lets see!!! ";
        }
}
```

3.2. Run the class with main method and open the browser at url:
http://localhost:8080/hello

3.3. The output should be the message as returned by the greet()

3.4. Open postman and type url in address bar, select various HTTP methods on the left as shown below and you should get the same message as output for all HTTP methods:



4. HTTP METHODS Mapping

4.1. Let's add specific methods to map for specific HTTP requests since methods are used as follows:
- 4.1.1. GET: fetch data
- 4.1.2. PUT : update data
- 4.1.3. POST : insert data
- 4.1.4. DELETE : delete data

4.2. Update HelloRestController as follows:

```
 @GetMapping("/get")
public String send()
{
        return "FROM GET ONLY";
```

```
}
@PostMapping("/add")
public String post()
{
	return "FROM POST ONLY";
}
@PutMapping("/update")
public String put()
{
	return "FROM PUT ONLY";
}
@DeleteMapping("/delete")
public String delete()
{
	return "FROM DELETE ONLY";
}
```

4.3. Now restart the server and test above methods via postman. The urls for request will be as follows:

4.3.1. Change the HTTP method in postman to GET and type in below url to see message from GetMapping
http://localhost:8080/get

4.3.2. Change the HTTP method in postman to POST and type in below url to see message from PostMapping
http://localhost:8080/add

4.3.3. Change the HTTP method in postman to PUT and type in below url to see message from PutMapping
http://localhost:8080/update

4.3.4. Change the HTTP method in postman to DELETE and type in below url to see message from DeleteMapping
http://localhost:8080/delete

4.4. Conventionally, REST URI should only contain noun and verbs are passed as part of HTTP method. Modify the above class to have a single URI for the respective HTTP method:

```
@RestController()
@RequestMapping("/api")
public class HelloRestController{

	....
	@GetMapping()
	public String send()
	{
		return "FROM GET ONLY";
	}
	@PostMapping()
	public String post()
	{
		return "FROM POST ONLY";
	}
	@PutMapping()
	public String put()
	{
		return "FROM PUT ONLY";
	}
	@DeleteMapping()
	public String delete()
```

```
        {
                return "FROM DELETE ONLY";
        }
}
```

4.5. Now restart the server, type below url in postman and just by changing the HTTP methods, respective messages will be displayed.

http://localhost:8080/api

5. Prepare model

5.1. Create Employee class as follows:

```
import jakarta.persistence.*;
import org.antlr.v4.runtime.misc.NotNull;

@Entity
public class Employee {
   @Id
   @GeneratedValue(strategy = GenerationType.IDENTITY)
   @NotNull
   private int eid;
   @Column(nullable = true)
   private String ename;
   private String email;
   private String phone;

   private String password;


   public Employee() {
   }

   public Employee(int eid, String ename, String email, String phone, String password) {
      this.eid = eid;
      this.ename = ename;
      this.email = email;
      this.phone = phone;
      this.password = password;

   }
// getters and setters
   // constructor

   public int getEid() {
      return eid;
   }

   public void setEid(int eid) {
      this.eid = eid;
   }

   public String getEname() {
      return ename;
```

```
    }

    public void setEname(String ename) {
        this.ename = ename;
    }

    public String getEmail() {
        return email;
    }

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

    public String getPhone() {
        return phone;
    }

    public void setPhone(String phone) {
        this.phone = phone;
    }

    public String getPassword() {
        return password;
    }

    public void setPassword(String password) {
        this.password = password;
    }


    @Override
    public String toString() {
        return "Employee{" +
                "eid=" + eid +
                ", ename='" + ename + '\'' +
                ", email='" + email + '\'' +
                ", phone='" + phone + '\'' +
                ", password='" + password + '\'' +
                '}';
    }
}
```

6. Prepare repository

6.1. Create EmployeeRepository as follows:

```
import com.mvc.SpringBootMVCDemo.entity.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, Integer> {

    public Employee findByEmail(String email);
```

```
    // select password from employee where email=?
    @Query("select password from Employee where email=:email")
    public String findPasswordByEmployeeEmail(String email);
}
```

7. Prepare service layer

7.1. Create EmployeeService as follows:

```
import com.mvc.SpringBootMVCDemo.entity.Employee;
import com.mvc.SpringBootMVCDemo.exception.InvalidCredentialsException;
import com.mvc.SpringBootMVCDemo.repo.EmployeeRepository;
import jakarta.persistence.EntityExistsException;
import jakarta.persistence.EntityNotFoundException;
import jakarta.transaction.Transactional;
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.stereotype.Service;

import java.util.ArrayList;
import java.util.List;
import java.util.Optional;

@Service
public class EmployeeService {
    @Autowired
    private EmployeeRepository employeeRepository;


    public EmployeeService() {
        System.out.println("emp service");
    }
    public Employee insertEmployee(Employee employee) {
        if (! employeeRepository.existsById(employee.getEid())) {
            Employee savedEmployee = this.employeeRepository.save(employee);
            return savedEmployee;
        }
        throw new EntityExistsException("Employee with id "+employee.getEid()+" already exists, hence
cannot save");
    }


    public Employee findEmployeeByEmail(String email){
        return this.employeeRepository.findByEmail(email);
    }

    public Employee getEmployeeById(int eid) {
        System.out.println("Emp service "+eid);
        return this.employeeRepository
                .findById(eid).orElseThrow(()-> new EntityNotFoundException("Employee "+eid+" not
found"));
    }
```

```
    public List<Employee> getEmployees(){
        List<Employee> employees = new ArrayList<Employee>();
        this.employeeRepository.findAll().forEach(employees::add);
        return employees;
    }

    public Page<Employee> getFilteredEmployees(Integer pageno, Integer size){

        Pageable pageable = PageRequest.of(pageno, size, Sort.by(Sort.Direction.DESC, "email"));
        List<Employee> employees = new ArrayList<Employee>();
        return this.employeeRepository.findAll(pageable);

    }

    public Employee updateEmployee(Employee employee) {
        if(!this.employeeRepository.existsById(employee.getEid()))
            throw new EntityNotFoundException("Employee "+employee.getEid()+" not found and cannot
be updated");
        return this.employeeRepository.save(employee);
    }

    @Transactional
    public boolean deleteEmployee(int eid) {
        if(!this.employeeRepository.existsById(eid))
            throw new EntityNotFoundException("Employee "+eid+" not found and cannot be deleted");
        this.employeeRepository.deleteById(eid);
        return true;
    }

    public boolean loginEmployee(String email, String password) throws InvalidCredentialsException
    {

        String pwd = this.employeeRepository.findPasswordByEmployeeEmail(email);
        if(pwd!=null)
        {
            if(pwd.equals(password))
                return true;
        }
        throw new InvalidCredentialsException("Invalid credentials, Please try again");
    }
}
```

8. Prepare Seed Data

8.1. Add below code in class with main method to create seed data

```
 @Autowired
 private EmployeeService employeeService;

 @Bean
public void initialize()
{
            Employee emp = new Employee();
            emp.setEname("Sia");
            emp.setEmail("sia@test.com");
            emp.setPassword("sia123");
```

```
        emp.setPhone("9898989898");

        Employee e = employeeService.insertEmployee(emp);

        Employee em = new Employee();
        em.setEname("John");
        em.setEmail("john@test.com");
        em.setPassword("john1235");
        em.setPhone("7654323456");

        Employee e = employeeService.insertEmployee(em);

    }
```

9. Expose REST API GET for Employees

9.1. Create EmployeeRestController as follows:

```
 @RestController
@RequestMapping("/employees")
public class EmployeeRestController {

        @Autowired
        private EmployeeService employeeService;


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

        @GetMapping("/{id}")
        public Employee getEmployeeById(@PathVariable("id") int id)
        {
                return this.employeeService.getEmployeeById(id);
        }
}
```

9.2. Restart the server and get employees data by sending request to :

// Will return all employees
http://localhost:8080/employees

// Will return employee by id
http://localhost:8080/employees/1

9.3. Trying passing the id of an employee that does not exist and you will see an exception which is not the right way of sending an error response:

http://localhost:8080/employees/10.

10. Handle error message : ResponseEntity

10.1. Instead of returning Employee object, better to wrap Object instance within the ResponseEntity.

10.2. ResponseEntity : represents the whole HTTP response: status code, headers, and body. As a result, we can use it to fully configure the HTTP response.
If we want to use it, we have to return it from the endpoint; Spring takes care of the rest.
ResponseEntity is a generic type. Consequently, we can use any type as the response body:

10.3. Modify the getEmployeeById message to change the response type

```
 @GetMapping(path ="/{eid}")
public ResponseEntity<Object> getEmployeeById(@PathVariable int eid) {
		System.out.println("Emp id "+eid);
		Employee emp =  this.employeeService.getEmplopyeeById(eid);
		return ResponseEntity.ok(emp);

		try {
			Employee emp =  this.employeeService.getEmplopyeeById(eid);
			return ResponseEntity.ok(emp);
		}
		catch(Exception e)
		{
			System.out.println(e.getMessage());
			//return ResponseEntity.noContent().build();
			return ResponseEntity.status(HttpStatus.NOT_FOUND)
					.body(new AppResponse(Messages.FAILURE,e.getMessage()));
		}
}
```

10.4. Restart the server and see for the response in postman

11. REST API – POST

11.1. Add below method in EmployeeRestController

```
 @PostMapping
public ResponseEntity<Object> insertEmployee(@RequestBody Employee employee)
{
		System.out.println(employee);
		if (employeeService.insertEmployee(employee))
			return ResponseEntity.status(HttpStatus.CREATED).build()

		return ResponseEntity.badRequest();
}
```

11.2. Restart the server and test for post

12. REST API – DELETE

12.1. Add below method in EmployeeRestController

```
 @DeleteMapping("/{eid}")
public Map<String, String> deleteEmployeeById(@PathVariable int eid)
{
```

```
		Map<String, String> map = new HashMap<String, String>();
		if(this.employeeService.deleteEmployee(eid))
			map.put("SUCESS", eid+ " deleted");
		else
			map.put("ERROR", eid+ " count not be deleted");
		return map;
	}
```

12.2. Restart the server and test for delete

13. REST API – PUT

13.1. Add below method in EmployeeRestController

```
	 @PutMapping
	public ResponseEntity<Object> insertEmployee(@RequestBody Employee employee)
	{
		System.out.println(employee);
		if (employeeService.updateEmployee(employee))
			return ResponseEntity.ok(employee)
		return ResponseEntity.badRequest();
	}
```

13.2. Restart the server and test for post