Prison Database Management

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The Project's Purpose:

The main goal of the project is to create a reliable system that organises the management system of a prison. Placing the appropriate data into the table, and keeping track of information. This project seeks to provide a robust and scalable solution for managing diverse aspects of a prison facility, ensuring effective data handling and streamlined operations.

The project will consist of a single database containing 4 tables, each having their own fields and establishing relationships with their appropriate tables. These tables are as follows, "*Prisoners*" handling the prisoners' information "*Labour*" handling the prisoners' assigned labour tasks, "*Cells*" managing information about different cell types and their associations with prisoners, and "*Districts*" handling the organization of cells within specific districts.

The Project's Files:

Prisoner	Prisoner Repository	Prisoner Controller
Labour	Labour Repository	Labour Controller
Cell	Cell Repository	Cell Controller
District	District Repository	District Controller

The project uses **Wampserver** to establish a database in **MySQL Workbench**. The connection is established within the "*application.properties*". The dependencies are:

1) **Spring Boot DevTools:** Provides many features among which, live reloading and automatic application restart
2) **Spring Web:** Offers features to simply web development, such as, managing web complement, HTTP requests, building RESTful services
3) **Spring Data JPA:** Provides high-level of abstraction for accessing files Java application.
4) **MySQL Driver:** Offers data manipulation and retrieval between Java applications and MYSQL database.

Entities:

District:

```java
@Entity
public class District {

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

    @Column(name = "District Name")
    String districtName;

    @Column(name = "District Location")
    String districtLocation;

    @OneToMany(mappedBy = "district", cascade = CascadeType.ALL)
    @JsonIgnore
    List<Cell> cell;

    // Getters and Setters
}
```

Cell:

```java
@Entity
```

```java
public class Cell {

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

    @Column (name = "Cell Type")
    String cellType;

    @OneToOne(mappedBy = "cell", cascade = CascadeType.ALL)
    @JsonIgnore
    Prisoner prisoner;

    @ManyToOne
    @JoinColumn(name = "district_id")
    District district;

    // Getters and Setters
}
```

Prisoner:

```java
@Entity
public class Prisoner {

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

    @Column (name = "Name")
    String name;

    @Column (name = "Surname")
    String surname;

    @Column (name = "Age")
    int age;

    @Column (name = "YearsOfImprisonment")
    int yearsOfImprisonment;

    @Column (name = "CrimeType")
    String crimeType;

    @ManyToMany
    @JoinTable(name = "prisoner_labour",
            joinColumns = @JoinColumn(name = "prisoner_id"),
            inverseJoinColumns = @JoinColumn(name = "labour_id"))
    List<Labour> labour;

    @OneToOne
    Cell cell;

    // Getters and Setters
}
```

Labour:

```java
@Entity
public class Labour {

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

    @Column(name = "Labour Type")
    String labourType;

    @Column(name = "Labour Hours")
    int labourHours;

    @ManyToMany(mappedBy = "labour", cascade = CascadeType.ALL)
    @JsonIgnore
    List<Prisoner> prisoner;

    // Getters and Setters
}
```

Annotations Explainations:

- **@Entity**: Marks a class as a JPA entity, representing a table in a relational database.
- **@Column(name = "Name")**: Specifies the mapping of a field or property to a column with the given name in the database.
- **(mappedBy = "entity", cascade = CascadeType.ALL):** specifying that the attribute "entity" in the associated entity is the owning side of the relationship, and defining cascade operations for the relationship.
- **@ManyToOne & @OneToMany**: Defines a many-to-one & one-to-many relationship between entities.
- **@OneToOne**: Indicates a one-to-one relationship between entities.
- **@ManyToMany**: Defines a many-to-many relationship between entities.
- **@JoinTable**: Specifies the join table for the many-to-many relationship, including the table name and the columns used for joining.
- **@JsonIgnore**: Instructs the serialization process to ignore the annotated field, preventing circular references or unwanted data from being included in the JSON representation.

Repository:

"**District**" and "**Labour**" have no special functions in "**Repository**":

```
public interface DistrictRepository extends JpaRepository<District, Long> {
}

public interface LabourRepository extends JpaRepository<Labour, Long>{
}
```

Cell:

```
public interface CellRepository extends JpaRepository<Cell, Long>{

    List<Cell> findByDistrictId(Long id);
}
```

Prisoner:

```
public interface PrisonerRepository extends JpaRepository<Prisoner, Long>{

    List<Prisoner> findByCellId(Long id);
    List<Prisoner> findByLabourId(Long id);
}
```

The repositories extend from "**JpaRepository"** which contain multiple prebuilt functions.
The "**findByEntityId"** method name follows the Spring Data JPA naming convention for query derivation

Controller:

All 4 controllers contain have the following CRUD operations:

- Returns a list of all entities’ record.
- Returns the entities’ record with the specified ID.
- Adds a new entity record to the database.
- Adds a list of entities records to the database.
- Updates an existing entity record with the specified ID.
- Deletes the entity’s record with the specified ID.
- Deletes all entity records in the database.

District:

```
@RestController
@RequestMapping("district")
public class DistrictController {

    @Autowired
    DistrictRepository districtRep;

    @GetMapping
    public List<District> getDistricts() {
        return districtRep.findAll();
    }

    @GetMapping("{id}")
    public Optional<District> getDistrict(@PathVariable Long id) {
        return districtRep.findById(id);
    }

    @PostMapping(value = "addDistrict", consumes = "application/json")
    public String addDistrict(@RequestBody District district) {
        districtRep.save(district);
        return "District Added";
    }

    @PostMapping(value = "addDistricts", consumes = "application/json")
    public String addDistricts(@RequestBody List<District> district) {
        districtRep.saveAll(district);
        return "Districts Added";
    }

    @PutMapping("updateDistrict/{id}")
    public String updateDistrict(@RequestBody District district, @PathVariable Long id) {
        District existingDistrict = districtRep.findById(id).get();
        existingDistrict.setDistrictName(district.getDistrictName());
        existingDistrict.setDistrictLocation(district.getDistrictLocation());
        districtRep.save(existingDistrict);
        return "District Updated";
    }

    @DeleteMapping("deleteDistrict/{id}")
    public String deleteDistrict(@PathVariable Long id) {
        districtRep.deleteById(id);
        return "District Deleted";
    }

    @DeleteMapping("deleteAllDistricts")
    public String deleteAllDistricts() {
        districtRep.deleteAll();
        return "All Districts Deleted";
    }
}
```

District custom function:

This function retrieves all prisoners depending on the District ID

```
@GetMapping("getPrisonerByDistrict/{id}")
public StringBuilder getPrisonerByDistrict(@PathVariable Long id) {
   StringBuilder result = new StringBuilder();
   districtRep.findById(id).get().getCell().stream()
              .forEach(c -> result.append(c.getPrisoner().getName() + " " +
                         c.getPrisoner().getSurname() + " " c.getPrisoner().getAge() + " " +
                         c.getPrisoner().getYearsOfImprisonment() + " " +
                         c.getPrisoner().getCrimeType() + "<br>"));
   return result;
}
```

Cell custom function:

This function adds a cell to the Cell entity preassigned to a District ID

```
    @PostMapping(value = "addCellWithDistrict/{id}", consumes = "application/json")
    public String addCellWithDistrict(@RequestBody Cell cell, @PathVariable Long id) {
        cell.setDistrict(districtRep.findById(id).get());
        cellRep.save(cell);
        return "Cell Added Along With Its Assigned District";
    }
```

This function adds a list of cells to the Cell entity preassigned to a District ID

```
    @PostMapping(value = "addCellsWithDistrict/{id}", consumes = "application/json")
    public String addCellWithDistricts(@RequestBody List<Cell> cells, @PathVariable Long id) {
        for (Cell cell : cells) {
            cell.setDistrict(districtRep.findById(id).get());
        }
        cellRep.saveAll(cells);
        return "Cells Added Along With Its Assigned District";
    }
```

This function assigns a District ID to a cell in Cell entity

```
    @GetMapping("assignDistrict/{cellId}/{disId}")
    public String assignDistrict(@PathVariable Long cellId, @PathVariable Long disId) {
        Cell cell = cellRep.findById(cellId).get();
        cell.setDistrict(districtRep.findById(disId).get());
        cellRep.save(cell);
        return "Cell Assigned To District";
    }
```

This function retrieves all cells based on District ID

```
    @GetMapping("getCellsByDistrict/{id}")
    public List<Cell> getCellsByDistrict(@PathVariable Long id){
        List<Cell> result = cellRep.findByDistrictId(id);
        return result;
    }
```

Prisoner customer functions:

Add prisoner to Prisoner entity with a preassigned Labour ID

```
    @PostMapping(value = "addPrisonerWithLabour/{id}", consumes = "application/json")
    public String addPrisonerWithLabour(@RequestBody Prisoner prisoner, @PathVariable Long id){
        if (prisoner.getLabour() == null) {
            prisoner.setLabour(new ArrayList<Labour>());
        }
        prisoner.getLabour().add(labourRep.findById(id).get());
        prisonerRep.save(prisoner);
        return "Prisoner Added With Their Corresponding Labour";
    }
```

Add prisoner to Prisoner entity with a preassigned Cell ID

```
    @PostMapping(value = "addPrisonerWithCell/{id}", consumes = "application/json")
    public String addPrisonerWithCell(@RequestBody Prisoner prisoner, @PathVariable Long id) {
        prisoner.setCell(CellRep.findById(id).get());
        prisonerRep.save(prisoner);
        return "Prisoner Added With Their Corresponding Cell";
    }
```

Add prisoner to Prisoner entity with a preassigned Cell ID and Labour ID

```
    @PostMapping(value = "addPrisonerWithCellAndLabour/{cellId}/{labId}", consumes =
       "application/json")
    public String addPrisonerWithCellAndLabour(@RequestBody Prisoner prisoner, @PathVariable
       Long cellId, PathVariable Long labId) {

        prisoner.setCell(CellRep.findById(cellId).get());
        if (prisoner.getLabour() == null) {
            prisoner.setLabour(new ArrayList<Labour>());
        }
        prisoner.getLabour().add(labourRep.findById(labId).get());
        prisonerRep.save(prisoner);
        return "Prisoner Added With Their Corresponding Cell And Labour";
    }
```

Add a list prisoner to Prisoner entity with a preassigned Labour ID

```
    @PostMapping(value = "addPrisonersWithLabour/{id}", consumes = "application/json")
    public String addPrisonersWithLabour(@RequestBody List<Prisoner> prisoner, @PathVariable
       Long id) {
        for (Prisoner p : prisoner) {
            if (p.getLabour() == null) {
                p.setLabour(new ArrayList<Labour>());
            }

            p.getLabour().add(labourRep.findById(id).get());
        }
        prisonerRep.saveAll(prisoner);
        return "Prisoner Added With Their Corresponding Labour";
    }
```

Assign a Cell ID to prisoner

```
    @GetMapping("assignCell/{priId}/{cellId}")
    public String assignCell(@PathVariable Long priId, @PathVariable Long cellId) {
        Prisoner prisoner = prisonerRep.findById(priId).get();
        prisoner.setCell(CellRep.findById(cellId).get());
        prisonerRep.save(prisoner);
        return "Prisoner Assigned To Cell";
    }
```

Assign a Labour ID to prisoner

```
    @GetMapping("assignLabour/{priId}/{labId}")
    public String assignLabour(@PathVariable Long priId, @PathVariable Long labId) {
        Prisoner prisoner = prisonerRep.findById(priId).get();
        prisoner.getLabour().add(labourRep.findById(labId).get());
        prisonerRep.save(prisoner);
        return "Prisoner Assigned To Labour";
    }
```

Display all of the prisoners that are assigned to labour

```
    @GetMapping("getPrisonersRelatedToLabour")
    public StringBuilder getPrisonersRelatedToLabour() {

        StringBuilder result = new StringBuilder();
        prisonerRep.findAll().stream().filter(p -> !p.getLabour().isEmpty())
                    .forEach(p -> result.append("Name: " + p.getName() + " " + p.getSurname() +
                          ". Age:" + p.getAge() + ". Years of imprisonment: "
                          p.getYearsOfImprisonment() + ". Crime Type: " + p.getCrimeType() +
                          ". <br>" + "Labour Type:" + p.getLabour().get(0).getLabourType() +
                          ", " + p.getLabour().get(0).getLabourHours()
                          + " Hours. <br>"));

        return result;
    }
```

Retrieves all prisoners based on Cell ID

```
    @GetMapping("getPrisonersByCell/{id}")
    public List<Prisoner> getPrisonersByCell(@PathVariable Long id) {
        List<Prisoner> result = prisonerRep.findByCellId(id);
        return result;
    }
```

Retrieves all prisoners based on Labour ID

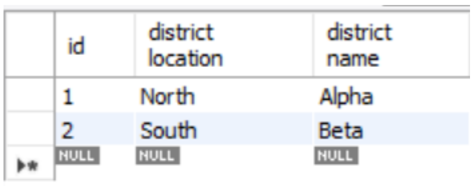
```
    @GetMapping("getPrisonersByLabour/{id}")
    public List<Prisoner> getPrisonersByLabour(@PathVariable Long id) {
        List<Prisoner> result = prisonerRep.findByLabourId(id);
        return result;
    }
```

Labour has no custom functions.

Usage of CRUD and Custom Functions:

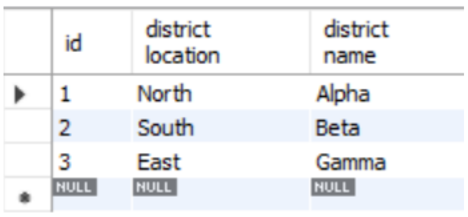
Create: “localhost:8088/district/addDistrict” || “localhost:8088/district/addDistricts”

Old:



	id	district location	district name
	1	North	Alpha
	2	South	Beta
▶*	NULL	NULL	NULL

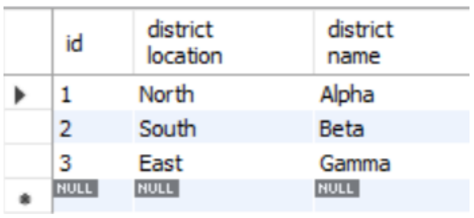
New:



	id	district location	district name
▶	1	North	Alpha
	2	South	Beta
	3	East	Gamma
*	NULL	NULL	NULL

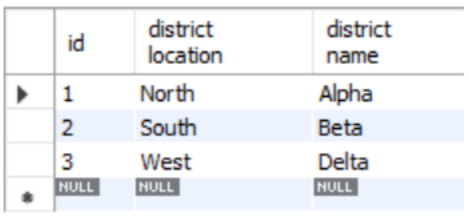
Update: “localhost:8088/district/updateDistrict”

Old:



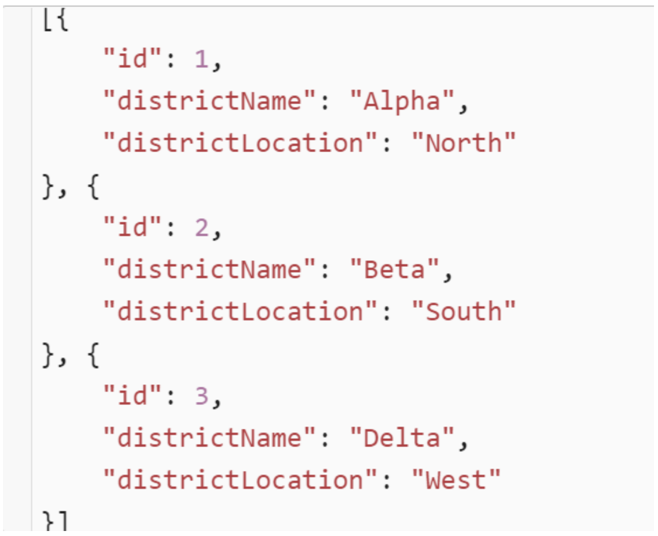
	id	district location	district name
▶	1	North	Alpha
	2	South	Beta
	3	East	Gamma
*	NULL	NULL	NULL

New:



	id	district location	district name
▶	1	North	Alpha
	2	South	Beta
	3	West	Delta
*	NULL	NULL	NULL

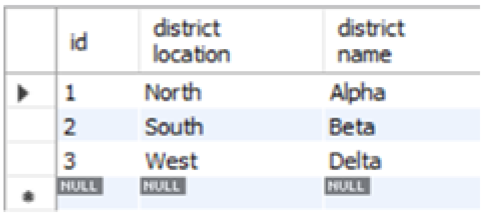
Read: “localhost:8088/district” || “localhost:8088/district/{id}”



```
[{
    "id": 1,
    "districtName": "Alpha",
    "districtLocation": "North"
}, {
    "id": 2,
    "districtName": "Beta",
    "districtLocation": "South"
}, {
    "id": 3,
    "districtName": "Delta",
    "districtLocation": "West"
}]
```

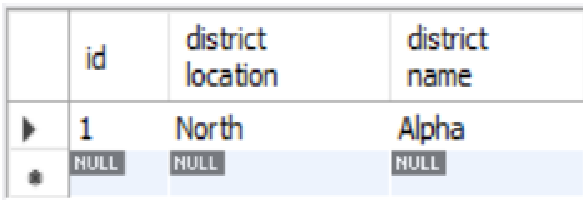
Delete: “localhost:8088/district/deleteDistrict/{id}” || “localhost:8088/district/deleteAllDistricts”

Old:



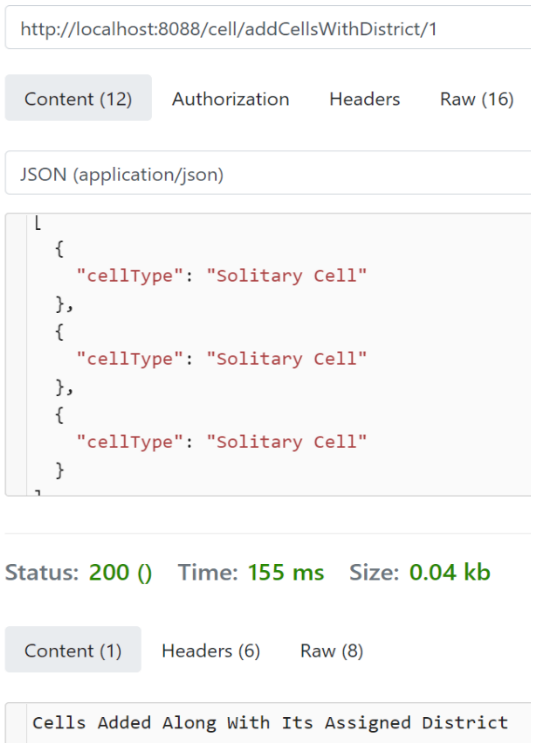
	id	district location	district name
▶	1	North	Alpha
	2	South	Beta
	3	West	Delta
*	NULL	NULL	NULL

New:



	id	district location	district name
▶	1	North	Alpha
*	NULL	NULL	NULL

Cell:



```
http://localhost:8088/cell/addCellsWithDistrict/1
```

Content (12) Authorization Headers Raw (16)

JSON (application/json)

```
[
  {
    "cellType": "Solitary Cell"
  },
  {
    "cellType": "Solitary Cell"
  },
  {
    "cellType": "Solitary Cell"
  }
]
```

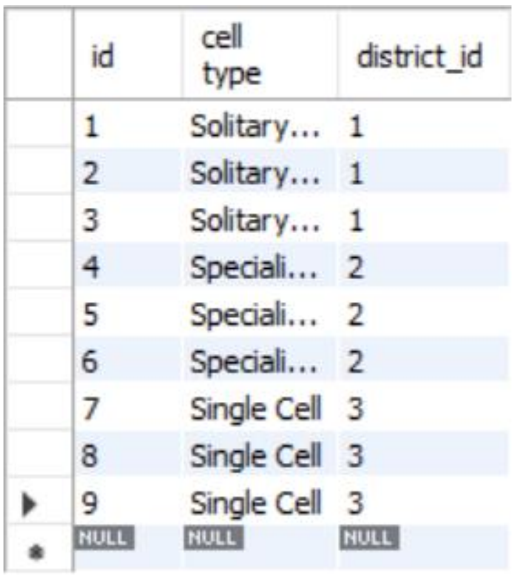
Status: 200 () Time: 155 ms Size: 0.04 kb

Content (1) Headers (6) Raw (8)

```
Cells Added Along With Its Assigned District
```

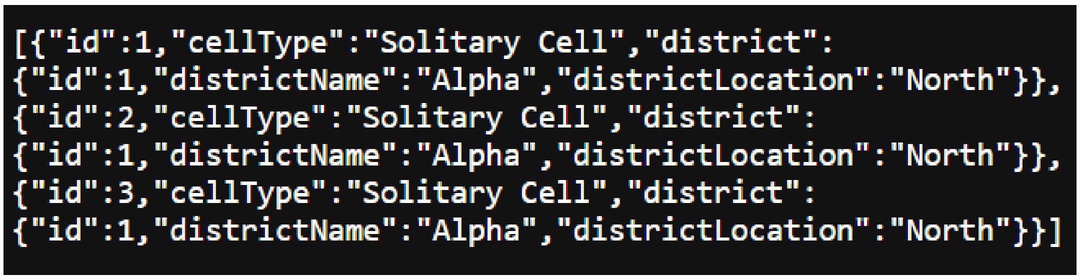
in this cell custom function we are able to a list of cells into the database with a preassigned distirct to them.

“http://localhost:8088/cell/addCellsWithDistrict/1”



	id	cell type	district_id
	1	Solitary...	1
	2	Solitary...	1
	3	Solitary...	1
	4	Speciali...	2
	5	Speciali...	2
	6	Speciali...	2
	7	Single Cell	3
	8	Single Cell	3
▶	9	Single Cell	3
*	NULL	NULL	NULL

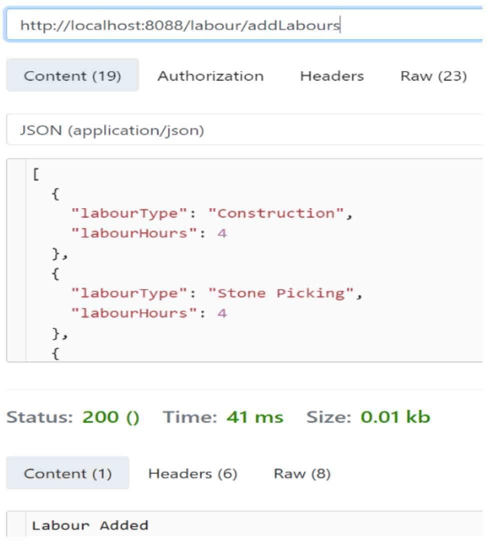
In this custom function we are able to view all of the cell depending on the distirct id.
“localhost:8088/cell/getCellsByDistrict/{id}”



```
[{"id":1,"cellType":"Solitary Cell","district":
{"id":1,"districtName":"Alpha","districtLocation":"North"}},
{"id":2,"cellType":"Solitary Cell","district":
{"id":1,"districtName":"Alpha","districtLocation":"North"}},
{"id":3,"cellType":"Solitary Cell","district":
{"id":1,"districtName":"Alpha","districtLocation":"North"}}]
```

Labour:

Adding a list of labour: **“localhost:8088/labour/addLabours”**



http://localhost:8088/labour/addLabours

Content (19) Authorization Headers Raw (23)

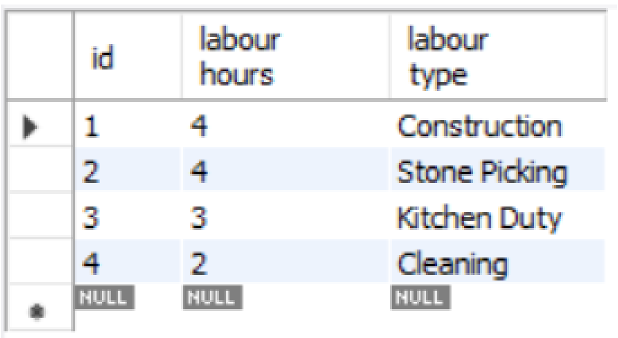
JSON (application/json)

```
[
  {
    "labourType": "Construction",
    "labourHours": 4
  },
  {
    "labourType": "Stone Picking",
    "labourHours": 4
  },
  {
```

Status: 200 () Time: 41 ms Size: 0.01 kb

Content (1) Headers (6) Raw (8)

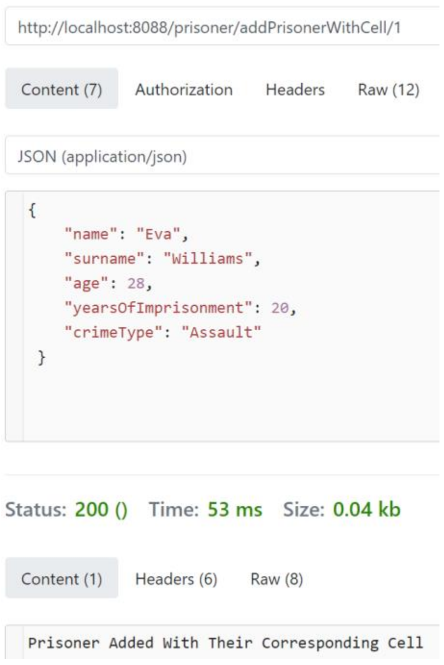
```
Labour Added
```



	id	labour hours	labour type
▶	1	4	Construction
	2	4	Stone Picking
	3	3	Kitchen Duty
	4	2	Cleaning
*	NULL	NULL	NULL

Prisoner:

Similar to the Cell Controller, in this Prisoner Controller we are able to add prisoner to a preassigned Labour or Cell or Labour & Cell at once. We are also able to assign multiple Prisoners to a Labour at once.



http://localhost:8088/prisoner/addPrisonerWithCell/1

Content (7) Authorization Headers Raw (12)

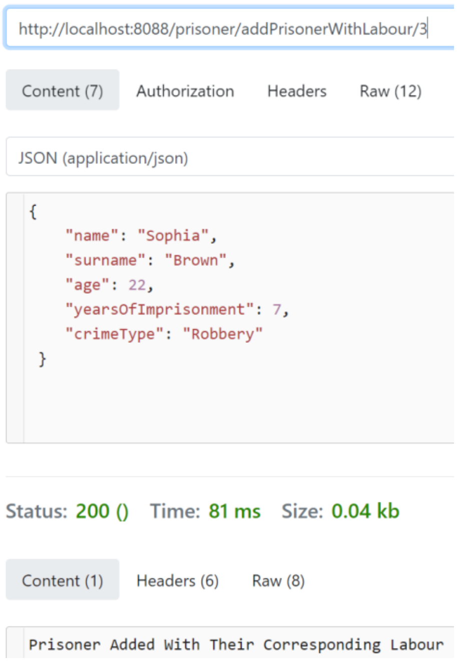
JSON (application/json)

```
{
    "name": "Eva",
    "surname": "Williams",
    "age": 28,
    "yearsOfImprisonment": 20,
    "crimeType": "Assault"
 }
```

Status: 200 () Time: 53 ms Size: 0.04 kb

Content (1) Headers (6) Raw (8)

```
Prisoner Added With Their Corresponding Cell
```



http://localhost:8088/prisoner/addPrisonerWithLabour/3

Content (7) Authorization Headers Raw (12)

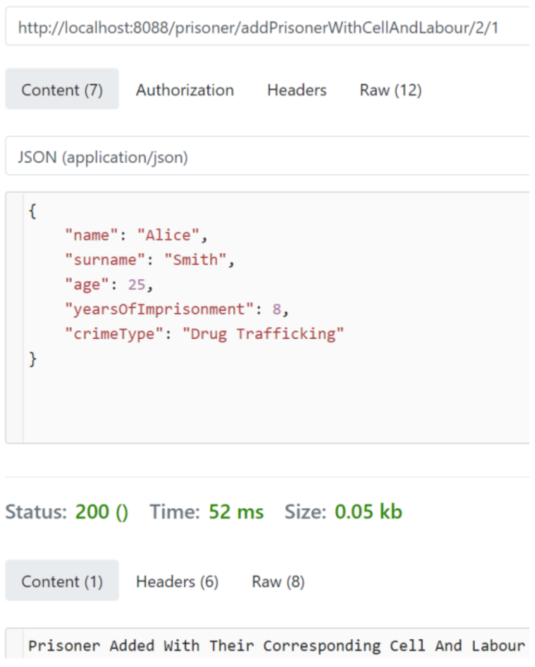
JSON (application/json)

```
{
    "name": "Sophia",
    "surname": "Brown",
    "age": 22,
    "yearsOfImprisonment": 7,
    "crimeType": "Robbery"
 }
```

Status: 200 () Time: 81 ms Size: 0.04 kb

Content (1) Headers (6) Raw (8)

```
Prisoner Added With Their Corresponding Labour
```



http://localhost:8088/prisoner/addPrisonerWithCellAndLabour/2/1

Content (7) Authorization Headers Raw (12)

JSON (application/json)

```
{
    "name": "Alice",
    "surname": "Smith",
    "age": 25,
    "yearsOfImprisonment": 8,
    "crimeType": "Drug Trafficking"
}
```

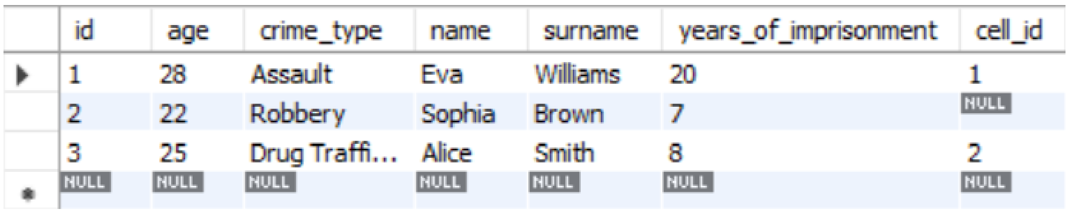
Status: 200 () Time: 52 ms Size: 0.05 kb

Content (1) Headers (6) Raw (8)

```
Prisoner Added With Their Corresponding Cell And Labour
```

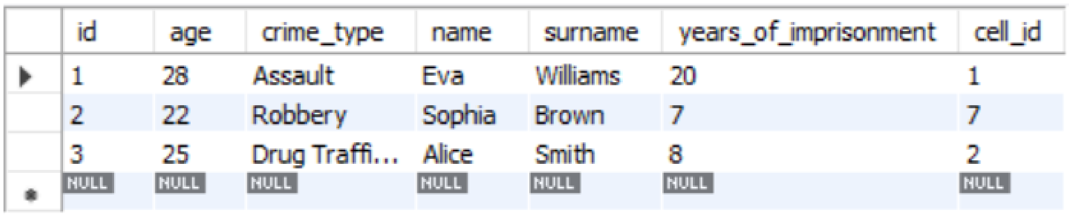
Assigning a cell to a prisoner: **“localhost:8088/prisoner/assignCell/{PrisonerID}/{CellID}”**

Before:



	id	age	crime_type	name	surname	years_of_imprisonment	cell_id
▶	1	28	Assault	Eva	Williams	20	1
	2	22	Robbery	Sophia	Brown	7	NULL
	3	25	Drug Traffi...	Alice	Smith	8	2
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL

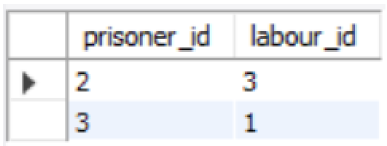
After:



	id	age	crime_type	name	surname	years_of_imprisonment	cell_id
▶	1	28	Assault	Eva	Williams	20	1
	2	22	Robbery	Sophia	Brown	7	7
	3	25	Drug Traffi...	Alice	Smith	8	2
*	NULL	NULL	NULL	NULL	NULL	NULL	NULL

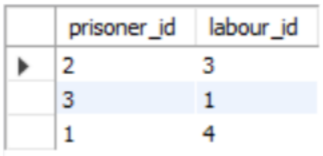
Assigning a labour to prisoner: **"localhost:8088/prisoner/assignLabour/{Prisoner}"**

Before:



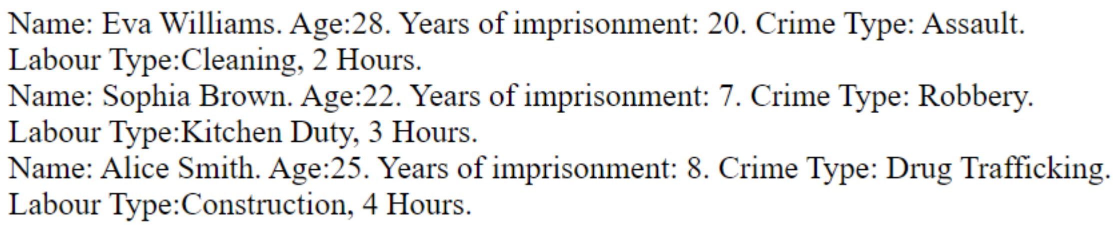
	prisoner_id	labour_id
▶	2	3
	3	1

After:



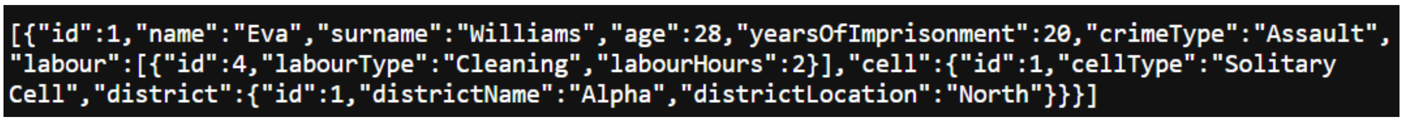
	prisoner_id	labour_id
▶	2	3
	3	1
	1	4

Displaying all of the Prisoners that have a relation with Labour:
"localhost:8088/prisoner/getPrisonersRelatedToLabour"



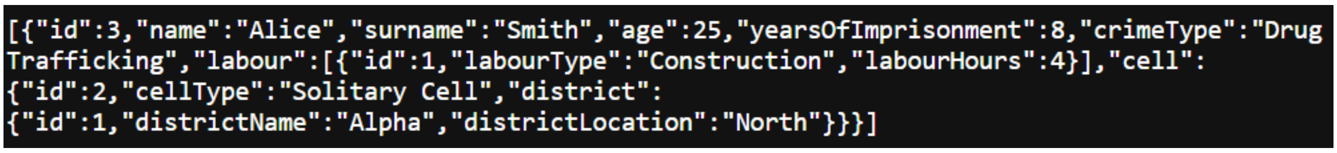
```
Name: Eva Williams. Age:28. Years of imprisonment: 20. Crime Type: Assault.
Labour Type:Cleaning, 2 Hours.
Name: Sophia Brown. Age:22. Years of imprisonment: 7. Crime Type: Robbery.
Labour Type:Kitchen Duty, 3 Hours.
Name: Alice Smith. Age:25. Years of imprisonment: 8. Crime Type: Drug Trafficking.
Labour Type:Construction, 4 Hours.
```

Display prisoners by cell id: **"localhost:8088/prisoner/getPrisonersByCell/{id}"**



```
[{"id":1,"name":"Eva","surname":"Williams","age":28,"yearsOfImprisonment":20,"crimeType":"Assault",
"labour":[{"id":4,"labourType":"Cleaning","labourHours":2}],"cell":{"id":1,"cellType":"Solitary
Cell","district":{"id":1,"districtName":"Alpha","districtLocation":"North"}}}]
```

Display prisoners by labour id: **"localhost:8088/prisoner/getPrisonersByLabour/{id}"**



```
[{"id":3,"name":"Alice","surname":"Smith","age":25,"yearsOfImprisonment":8,"crimeType":"Drug
Trafficking","labour":[{"id":1,"labourType":"Construction","labourHours":4}],"cell":
{"id":2,"cellType":"Solitary Cell","district":
{"id":1,"districtName":"Alpha","districtLocation":"North"}}}]
```

Thank you

Happy New Year