**Washing Machine System**

**Design**

Documentation of a project for the purpose of the course BIE-SI1.

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# Architecture

This chapter describes the architecture of the web application SUZ dorm application.

The web application for students and administration to reserve and manage schedules of dorm appliances will be implemented as a Java application based on the following the technologies:

* SpringBoot framework
* Tomcat
* Gradle
* Docker
* Postgres
* HTML, CSS, JavaScript
* Java 15+
* Mockito

The web application will run on the server, where the application makes request to get information. The server hosts the database where all the data is stored and can run in all environments and be available for any of the standard web browsers.

Using of the SpringBoot framework will allow us to generate out database in our Postgres database and access any needed information from the tables.

All this is located in the docker environment which allows us to easily place our server anywhere.

The current server prototype is built with the ability to expand in an agile development style depending on our user’s needs, and all parts have unit tests that must be run successfully for the server to operate.

# Class Diagram

This package describes the classes and packages of the implementation of the web application based on the Spring Framework.

In the whole model, only important classes and their methods are shown. The primitive getters and setters are not shown.



Figure 1 - Package Diagram

## Business Layer

This package contains definitions of various classes that are used in various places in the system as DTOs (Data Transfer Objects) that carry the data between processes.

### dto



Figure 2 - dto

### CreateReservationDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| createTime | Date |  |
| endTime | Instant |  |
| startTime | Instant |  |
| Student\_id | Integer |  |
| washingMachine\_id | Integer |  |

### CreateWashingMachienDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| buildingNumber | Integer |  |
| floorNumber | Integer |  |
| Status | Boolean |  |

### KeyCreateDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| returnStatus | Boolean |  |
| Student\_id | Integer |  |
| washingMachine\_id | Integer |  |

### KeyDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| Id | Integer |  |
| returnStatus | Boolean |  |
| washingMachine\_id | Boolean |  |

### ReservationCreateDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| createData | LocalDate |  |
| endTime | Instant |  |
| startTime | Instant |  |
| Student\_id | Integer |  |
| washingMachine\_id | Integer |  |

### ReservationDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| createDate | LocalDate |  |
| endTime | Instant |  |
| Id | Integer |  |
| startTime | Instant |  |
| Student\_id | Integer |  |
| washingMachine\_id | Integer |  |

### SendSwapListForDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| endTime | Instant |  |
| Res\_id | Integer |  |
| Res\_student | Integer |  |
| startTime | Instant |  |
| Swap\_id | Integer |  |
| Swap\_student | Integer |  |
| washingMachine\_id | Integer |  |

### StudentCreateDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| currentOccupent | Boolean |  |
| firstName | String |  |
| lastName | String |  |
| peneltyPoints | Integer |  |

### StudentDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| currentOccupent | Boolean |  |
| firstName | String |  |
| Id | Integer |  |
| lastName | String |  |
| peneltyPoints | Integer |  |

### StudentRoomDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| firstName | String |  |
| lastName | String |  |
| peneltyPoints | Integer |  |
| roomNumber | Integer |  |

### SwapRequestCreateDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| Reason | String |  |
| Student\_id | Integer |  |
| timeReq | Instant |  |

### SwapRequestDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| id | Integer |  |
| Reason | String |  |
| Status | Boolean |  |
| student\_id | Integer |  |
| timeReq | Instant |  |

### WashingMachineCreateDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| buildingNumber | Integer |  |
| floorNumber | Integer |  |
| Status | Boolean |  |

### WashingMachineDto

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| buildingNumber | Integer |  |
| floorNumber | Integer |  |
| Id | Integer |  |
| Status | Boolean |  |

### service

Part of the business layer containing the services that interact with the presentation layer and the data layer.



Figure 3 - service

#### KeyService

This is the class for the Key Service

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | KeyDTO | Parameters:  **keyCreateDTO: KeyCreateDTO** - |
| deleteById | void | Parameters:  **id: Integer** - |
| findAll | List<KeyDTO> |  |
| findById | Optional<Key> | Parameters:  **id: Integer** - |
| findByIdAsDTO | Optional<KeyDTO> | Parameters:  **id: Integer** - |
| findByStudent | KeyDTO | Parameters:  **student\_id: Integer** - |
| findByWashingMachineAndReturnStatus | List<KeyDTO> | Parameters:  **washingMchine\_id: Integer** - |
| returnKey | KeyDTO | Parameters:  **key\_id: Integer** - |
| toDTO | KeyDTO | Parameters:  **key: Key** - |
| update | KeyDTO | Parameters:  **id: Integer** -  Parameters:  **keyCreateDTO: KeyCreateDTO** - |

#### ReservationService

This is the class for the Reservation Service

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| addSwapRequest | void | Parameters:  **reservation\_id: Integer** -  Parameters:  **swapRequestDto: SwapRequestDto** - |
| create | ReservationDto | Parameters:  **reservationCreateDto: ReservationCreateDto** - |
| deleteSwapRequest | void | Parameters:  **reservation\_id: Integer** - |
| findAllSwapRequestToStudent | List<SendSwapListForDto> | Parameters:  **Student\_ID: Integer** - |
| findByID | Optional<Reservation> | Parameters:  **id: Integer** - |
| findByIDAsDTO | Optional<ReservationDto> | Parameters:  **id: Integer** - |
| findByMachine | List<ReservationDto> | Parameters:  **WashingMachine\_ID: Integer** - |
| findByStudent | List<ReservationDto> | Parameters:  **Student\_ID: Integer** - |
| findBySwapRequest | ReservationDto | Parameters:  **SwapRequest\_ID: Integer** - |
| toDTO | ReservationDto | Parameters:  **reservation: Reservation** - |
| toDTO | Optional<ReservationDto> | Parameters:  **optionalReservation: Optional<Reservation>** - |
| toSLLDTO | SendSwapListForDto | Parameters:  **reservation: Reservation** -  Parameters:  **swapRequest: SwapRequest** - |
| updateSwapRequest | void | Parameters:  **swapRequestDto: SwapRequestDto** - |

#### StudentService

This is the class for the Student Service

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | StudentDto | Parameters:  **studentCreateDto: StudentCreateDto** - |
| deleteById | void | Parameters:  **id: Integer** - |
| findAll | List<StudentDto> |  |
| findByID | Optional<Student> | Parameters:  **id: Integer** - |
| findByIDAsDTO | Optional<StudentDto> | Parameters:  **id: Integer** - |
| findStudentRoomById | Optional<StudentRoomDto> | Parameters:  **id: Integer** - |
| toDTO | StudentDto | Parameters:  **student: Student** - |
| toDTO | Optional<StudentDto> | Parameters:  **optionalStudent: Optional<Student>** - |
| update | StudentDto | Parameters:  **id: Integer** -  Parameters:  **studentCreateDto: StudentCreateDto** - |

#### SwapRequestService

This is the class for the Swap Request Service

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| approveSwapRequest | void | Parameters:  **swapRequestDto: SwapRequestDto** - |
| create | SwapRequestDto | Parameters:  **swapRequestCreateDto: SwapRequestCreateDto** - |
| deleteById | void | Parameters:  **id: Integer** - |
| findAll | List<SwapRequestDto> |  |
| findByID | Optional<SwapRequest> | Parameters:  **id: Integer** - |
| findByIDAsDTO | Optional<SwapRequestDto> | Parameters:  **id: Integer** - |
| findByStudent | List<SwapRequestDto> | Parameters:  **student\_id: Integer** - |
| toDTO | SwapRequestDto | Parameters:  **swapRequest: SwapRequest** - |
| toDTO | Optional<SwapRequestDto> | Parameters:  **optionalSwapRequest: Optional<SwapRequest>** - |
| update | SwapRequestDto | Parameters:  **id: Integer** -  Parameters:  **swapRequestCreateDto: SwapRequestCreateDto** - |

#### WashingMachineService

This is the class for the Washing Machine Service

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | WashingMachineDto | Parameters:  **washingMachineCreateDto: WashingMachineCreateDto** - |
| findByBuildingValidateDto | List<WashingMachineDto> | Parameters:  **building\_id: Integer** - |
| findByID | Optional<WashingMachine> | Parameters:  **washingMachine\_id: Integer** - |
| toDTO | WashingMachineDto | Parameters:  **washingMachine: WashingMachine** - |

## Data Layer

The data layer is responsible for data persistence. It consists of classes implementing the DTOs.

### entity

Diagram for the entities in the Washing Machine System. Contains definitions of entity classes for the storage in the SQL database.



Figure 4 - entity

### Key

| **Attribute name** | **Data type** | **Description** |
| --- | --- | --- |
| Id | Integer |  |
| returnStatus | Boolean | Boolean=false |

### WashingMachine

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| floorNumber | Integer |  |
| Id | Integer |  |
| Status | Boolean | Boolean = false |

### Building

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| Address | String |  |
| Id | Integer |  |
| Location | Integer |  |
| Name | String |  |
| Number | Integer |  |

### Student

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| CurrentOccupant | Boolean | Boolean = false |
| firstName | String |  |
| Id | Integer |  |
| lastName | String |  |
| peneltyPoints | Integer |  |

### Reservation

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| createdDate | LocalDate |  |
| endTime | Instant |  |
| Id | Integer |  |
| startTime | Instant |  |

### Room

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| Id | Integer |  |
| number | Integer |  |

### SwapRequest

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| Id | Integer |  |
| Reason | String |  |
| Status | Boolean |  |
| timeReq | Integer |  |

### RoomHistoryId

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| roomId | Integer |  |
| studentId | Integer |  |

### RoomHistory

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| endDate | LocalDate |  |
| Id | RoomHistoryId |  |
| stertDate | LocalDate |  |

### repository

Defines the interface for the Base Repository and the packages it interacts with.



Figure 5 - repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| deleteById | void | Parameters:  **id: ID** - |
| findAll | List<T> |  |
| findAllById | List<T> | Parameters:  **ids: Iterable<ID>** - |
| findById | Optional<T> | Parameters:  **id: ID** - |
| save | <S extends T> | Parameters:  **entity: S** - |

#### Base Entity Repository

Defines the interfaces for the Base Entity Repository.



Figure 6 – Base Entity Repository

##### BaseKeyRepository

This is the class for the Base Key Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findByStudent | T | Parameters:  **student: Student** - |
| findByWashingMachine | List<T> | Parameters:  **washingmachine: WashingMachine** - |

##### BaseReservationRepository

This is the class for the Base Reservation Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| deleteByEndTimeBefore | void | Parameters:  **instant: Instant** - |
| findByStudent | List<T> | Parameters:  **entity: Student** - |
| findByStudent\_Id | List<T> | Parameters:  **id: ID** - |
| findByWashingMachine | List<T> | Parameters:  **washingmachine: WashingMachine** - |
| findReservationBySwapReq\_Id | Optional<T> | Parameters:  **id: ID** - |

##### BaseRoomRepository

This is the class for the Base Room Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findRoomHistoriesById\_StudentId | List<T> | Parameters:  **id: ID** - |

##### BaseSwapRequestRepository

This is the class for the Base Swap Request Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findByStudent | List<T> | Parameters:  **student: Student** - |

##### BaseWashingMachineRepository

This is the class for the Base Washing Machine Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findWashingMachinesByBuilding\_Id | List<T> | Parameters:  **id: ID** - |

#### Entity Repository

Defines the interfaces for the Entity Repository. These inherit from the Base Entity Repo interfaces shown previously.



Figure 7 – Entity Repository

##### BuildingRepository

This is the class for the Bulding Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<Building> |  |
| findById | Optional<Building> | Parameters:  **id: Integer** - |

##### KeyRepository

This is the class for the Key Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<Key> |  |
| findById | Optional<Key> | Parameters:  **id: Integer** - |
| findByStudent | Key | Parameters:  **student: Student** - |
| findByWashingMachine | List<Key> | Parameters:  **washingmachine: WashingMachine** - |

##### ReservationRepository

This is the class for the Reservation Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| deleteByEndTimeBefore | void | Parameters:  **instant: Instant** - |
| findAll | List<Reservation> |  |
| findById | Optional<Reservation> | Parameters:  **id: Integer** - |
| findByStudent | void | Parameters:  **student: Student** - |
| findByStudent\_Id | List<Reservation> | Parameters:  **integer: Integer** - |
| findByWashingMachine | List<Reservation> | Parameters:  **washingMachine: WashingMachine** - |
| findReservationBySwapReq\_Id | Optional<Reservation> | Parameters:  **swapRequest\_id: Integer** - |
| save | Reservation | Parameters:  **reservation: Reservation** - |

##### RoomHistoryRepository

This is the class for the Room History Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<RoomHistory> |  |
| findById | Optional<RoomHistory> | Parameters:  **id: Integer** - |
| findRoomHistoriesById\_studentId | List<RoomHistory> | Parameters:  **student\_id: Integer** - |

##### RoomRepository

This is the class for the Room Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<Room> |  |
| findById | Optional<Room> | Parameters:  **id: Integer** - |

##### 

##### StudentRepository

This is the class for the Student Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<Student> |  |
| findById | Optional<Student> | Parameters:  **Id: Integer** - |

##### SwapRequestRepository

This is the class for the Swap Request Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<SwapRequest> | d |
| findById | Optional<SwapRequest> | Parameters:  **Id: Integer** - |
| findByStudent | List<SwapRequest> | Parameters:  **student: Student** - |
| save | SwapRequest | Parameters:  **swapRequest: SwapRequest** - |

##### WashingMachineRepository

This is the class for the Washing Machine Repository

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| findAll | List<WashingMachine> |  |
| findById | Optional<WashingMachine> | Parameters:  **id: Integer** - |
| findWashingMachineByBuilding\_Id | List<WashingMachine> | Parameters:  **building\_id: Integer** - |

## Presentation Layer

The presentation layer is responsible for sharing information with a user or other systems. It consists of a web user interface. On the backend, the presentation layer communicates with the rest of the backend functionality and database through controllers.

### controller



Figure 8 - controller

#### KeyController

This class is the controller for manipulation with keys.

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | ResponseEntity<KeyDTO> | Parameters:  **keyCreateDTO: KeyCreateDTO** - KeyCreateDTO with all the information needed to create the Key |
| getAll | List<KeyDTO> |  |
| getKeyByStudent | KeyDTO | Parameters:  **student\_id: Integer** - Id of the student |
| getKeyByWashingMachine | List<KeyDTO> | Parameters:  **washingMachine\_id: Integer** - Id of the washing machine |
| giveKey | KeyDTO | Parameters:  **id\_student: Integer** - Id of the student  Parameters:  **id\_key: Integer** - Id of the key |
| readKey | KeyDTO | Parameters:  **keyId: Integer** - Id of the key |
| returnKey | KeyDTO | Parameters:  **id\_key: Integer** - Id of the key |

#### ReservationController

This is the class for the Reservation Controller

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | ResponseEntity<String> | Parameters:  **reservationCreateDto: ReservationCreateDto** - |
| getReservationsByStudent | List<ReservationDto> | Parameters:  **id\_student: Integer** - |
| getReservationsBySwapRequest | ReservationDto | Parameters:  **id\_swap: Integer** - |
| getReservationsByWm | List<ReservationDto> | Parameters:  **id\_wm: Integer** - |

#### StudentController

This is the class for the Student Controller

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| create | ResponseEntity<StudentDto> | Parameters:  **studentCreateDto: StudentCreateDto** - |
| readStudent | StudentRoomDto | Parameters:  **studentId: Integer** - |

#### 

#### SwapRequestController

This is the class for the Swap Request Controller

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| approveSwapRequest | void | Parameters:  **reservation\_id: Integer** -  Parameters:  **swap\_req\_id: Integer** - |
| create | ResponseEntity<String> | Parameters:  **reason: String** -  Parameters:  **reservation\_id: Integer** -  Parameters:  **student\_id: Integer** - |
| getToStudentSwapRequests | List<SendSwapListForDto> | Parameters:  **id\_student: Integer** - |
| readStudentSwapRequests | List<SwapRequestDto> | Parameters:  **studentId: Integer** - |
| rejectSwapRequest | void | Parameters:  **reservation\_id: Integer** -  Parameters:  **swap\_req\_id: Integer** - |

#### WashingMachineController

This is the class for the Washing Machine Controller

| **Method name** | **Return type** | **Description** |
| --- | --- | --- |
| getValidatedWashingMachineByBuilding | List<WashingMachineDto> | Parameters:  **id\_building: Integer** - |

# Sequence Diagram

The realization of some of the use cases of the Washing Machine Reservation System are described.

## Create Reservation

Describes the realization of the user to create a reservation in the system.

When the HTTP request is receives, it is handled in the create method of the ReservationController class. This one calls the create function of the ReservationService class. Then, this one uses the method findById of the StudentRepository to find the Student object. It also uses the function findById of the WashingMachineRepository to find the WashingMachine object. With both objects it creates the Reservation object. Finally, this Reservation object is saved to the database using the save method of the ReservationRepository and converted to DTO with the method toDTO to be returned to the client.



Figure 9 – Create Reservation Diagram

## Create Swap Request

Describes the process to create a swap request.



Figure 10 – Create Swap Request Diagram

## Return Key

Describes the process of returning a key to the receptionist after use of the dorm facilities.

When the HTTP Request is received, the function returnKey of the KeyController class is called. This one calls the method returnKey from the KeyService. Then, this one uses the function findById of the KeyRepository to find the Optional<Key> object, gets the Key using the get method of the Optional<Key> object and changes its status to True (the key is now on the reception) and its student to null (no student has now the key). Finally, it converts the Key object to KeyDto using the method toDTO of the KeyService to return it to the client.



Figure 11 – Return Key