INSTITUTO POLITÉCNICO NACIONAL
ESCUELA SUPERIOR DE CÓMPUTO

DISTRIBUTED DATABASES

"Furniture Administration Multibase System (FAS)"

Project Report

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Abstract

Within this report we will see the design and modeling of a multidatabase system in which two companies: Mueblerias Quetzal and Teatro Aktuar, allow to the managers and administrators of teatro aktuar request furniture for a play and make an order of it. We made a description about the features and the design about the developed system, its representing database model, at conceptual and logical level, along with the insight for why this system was created.

The architecture modeling will be show, along with the actor modeling and other UML diagrams which allowed us to create the application.

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Background

The following two companies are cooperatively working to increase their marketing and the positive impact to clients.

- **Mueblerías Quetzal.**

    The organization is dedicated to producing furniture and distribute them across the Metropolitan Area of the México City. This organization wholesales furniture and retails to different client types, as people or enterprises. The organization recently implemented an e-commerce system for retails and an inventory control system.

- **Teatro Aktuar**

    Theater, has been one of the most popular and cultural activities in the history of the humanity, regrettably, now this activity it's losing ground against the Cinema or Internet, that's why this company wants to bring near the theater's management with the spectators through his new system, where you can search and buy your ticket as an spectator or manage the entrances, plays and schedules of the theater.

Both of them work in the metropolitan area, there is a contract that allows Teatro Aktuar company to use the rented furniture in their performances, Teatro Aktuar is responsible for the integrity of the furniture which belongs to the Mueblerias Quetzal Company.

The Mueblerias Quetzal Company is obligated to proportionate (according to existences) the furniture needed per each performance-tour and once finished the performance-tour Teatro Aktuar is mandatory to return the furniture without alterations.

Objective

Develop a multidatabase system solution that allows to the Teatro Aktuar company administrate the furniture rented from Mueblerías Quetzal to their performance-tours, and registered the operations related to the Mueblerías Quetzal Inventory, specially inputs and outputs in warehouses of Mueblerias Quetzal.

The scope of the project is to

- Manage the furniture used per each performance.
- Control amount of the furniture used by performance-tours.
- Operate without affecting Mueblerías Quetzal Inventory control.
- Control the inputs and output of Mueblerías Quetzal warehouses

Actor Modeling

In this section we describe the principal actors, their responsibilities and the requirements they ask for according to both companies necessities.

Inventory Management Executive (IME)   *(Mueblerías Quetzal)*

The IME has the obligation of keep the information integrity of models inside the warehouses and produced by the company in order to administrate the furniture existences.

IME-01: The Inventory ME requires that in the inventory the rented furniture to Teatro Aktuar get registered outputs and inputs from warehouses.

IME-02: The Inventory ME need to know the date, lot, and the amount of furniture were inputted and outputted according to the contract previously described.

Warehouse Manager (WM)   *(Mueblerías Quetzal)*

The WM is the responsible of all operations inside the warehouse such as control inputs and outputs, know the existences per furniture-model and bring reports to their superiors.

WM-01: The WM needs that when furniture were going to be used by Teatro Aktuar it gets automatically registered so the furniture keep separated until the logistics and shipping department made the delivery.

WM-02: The WM requires to know how much existences per each furniture the warehouse has. Taking into account the rented furniture that is been returned at that time.

Administration Executive (AE)   *(Teatro Aktuar)*

The AE has the total control of information about theater shows, employees and show materials.

AE-01: The AE needs a report of furniture rented and / or delivered in a play, on a specific day. **DEPRECATED !!!**

Theater Manager (TM)   *(Teatro Aktuar)*

The TM can edit the theater billboard, make sales, cancel tickets and add plays.

TM-01: The TM needs to rent the furniture for the plays and add them to the inventory.

Play (Performance) Director (PD)   *(Teatro Aktuar)*

The PD is in charge of the furniture rented for his play.

PD-01: The PD needs to know which furniture is under his responsibility.
PD-02: The PD needs to know the deadline to return the furniture. **DEPRECATED !!!**

System Requirements

SR-01: The system is mandatory to register the input and output operations with the amount of furniture per model needed and the date of the operation.
Ref: IME-02, WM-02.

SR-02: The system must instantly persist the input and outputs operations at Mueblerias Quetzal database server.
Ref: IME-01, WM-01, WM-02.

SR-03: The system must record the dates of rent and deadline that the Aktuar Theater has to return the rented furniture.
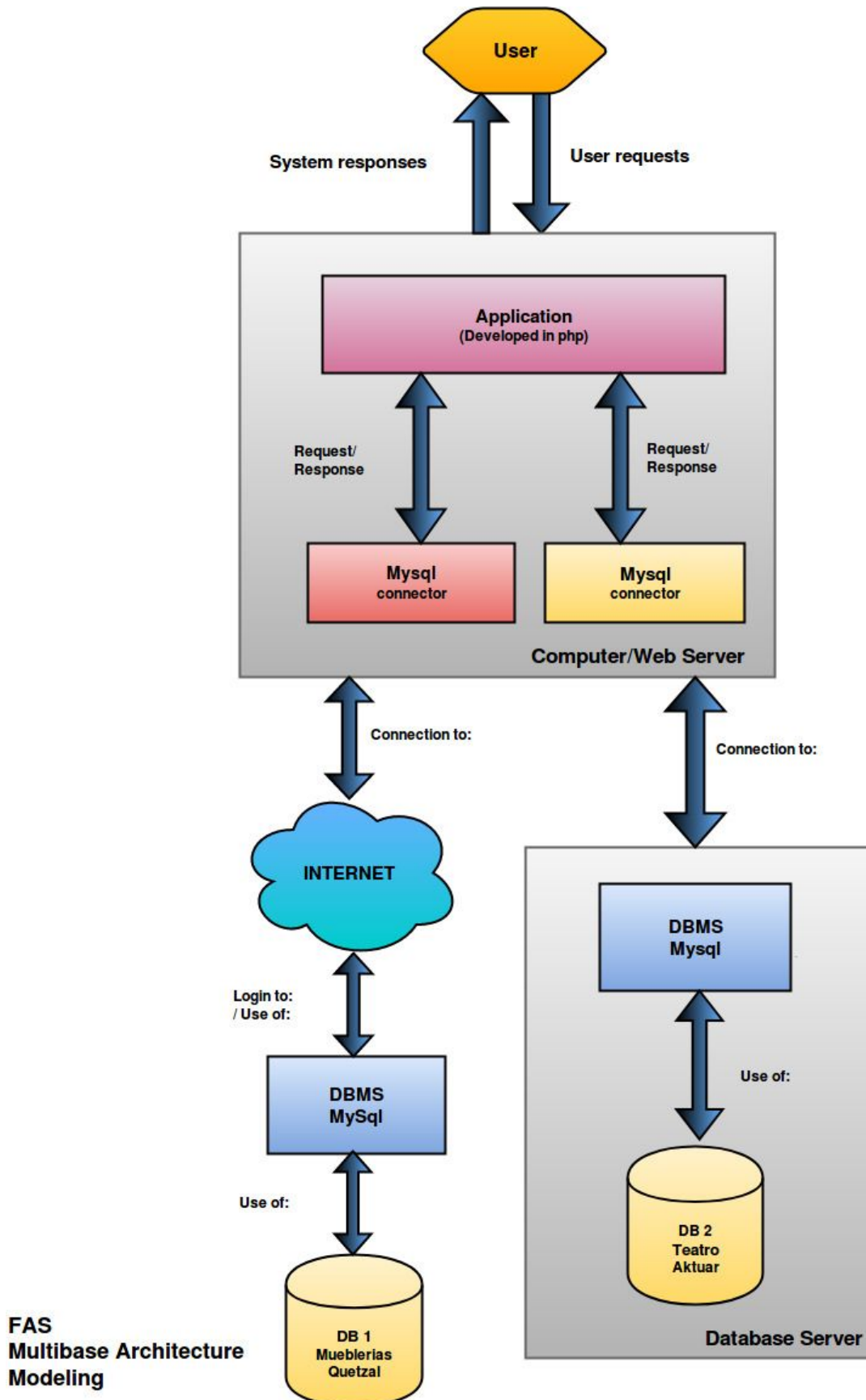**Ref: AE-01, PD-02   DEPRECATED !!!**

SR-04: The system must have an inventory of leased furniture for each play, and the director that is responsible for such furniture.
Ref: TM-01, PD-01

Architecture Modeling

In the following figure we show the architecture that the system will have.

User

System responses   User requests

Application
(Developed in php)

Request/
Response   Request/
Response

Mysql
connector   **Mysql**
connector

Computer/Web Server

Connection to: Connection to:

INTERNET

DBMS
Mysql

Login to:
/ Use of: Use of:

DBMS
MySql

Use of:

DB 2
Teatro
Aktuar

FAS
Multibase Architecture
Modeling

DB 1
Mueblerias
Quetzal

Database Server

Development Tools and Features

The development of the project is been made with the following features grouped in Local Database Server (Teatro Aktuar), Local Web Server (Teatro Aktuar) and Database Server (Mueblerías Quetzal).

<u>Database Server Features</u>   *(Teatro Aktuar)*
        Server: Localhost via UNIX socket
        Server type: MariaDB
        Server version: 10.1.20-MariaDB - MariaDB Server
        Protocol version: 10
        User: id2689058_ddb2@2a02:4780:bad:c0de::13
        Database: id2689058_ddb2
        Server charset: UTF-8 Unicode (utf8)

<u>Web Server Features</u>   *(Teatro Aktuar)*
        Apache/2.4.6 (CentOS) OpenSSL/1.0.1e-fips
        Database client version: libmysql - mysqlnd 5.0.12-dev
        PHP extension: MySQL Improved Extension (mysqli), curl, mbstring
        PHP extension: phpMyAdmin v4.6.6 o mayor
        PHP version: 7.0.8

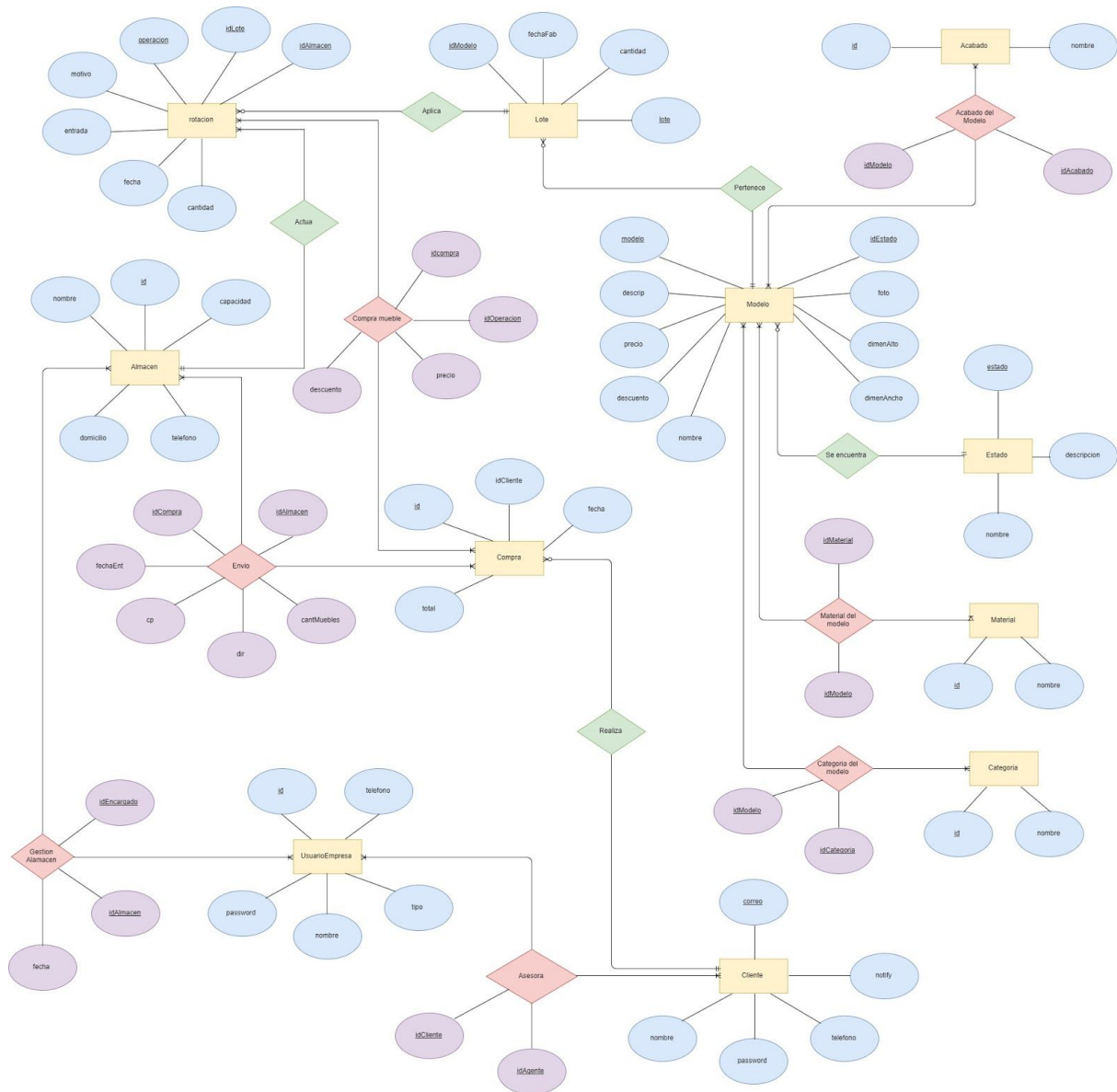<u>Database Server Features</u>   *(Mueblerías Quetzal)*
        Server: Localhost via UNIX socket
        Server type: MariaDB
        Server version: 10.1.20-MariaDB - MariaDB Server
        Protocol version: 10
        User: id2689058_sgviddb@2a02:4780:bad:c0de::13
        Database: id2689058_sgviddb
        Server charset: UTF-8 Unicode (utf8)

The PHP-JS-CSS-HTML programing and markup languages were chosen for this development because of the facility to make responsive and user-friendly interfaces, also allow us to speed up the development to accomplish the deadline time.
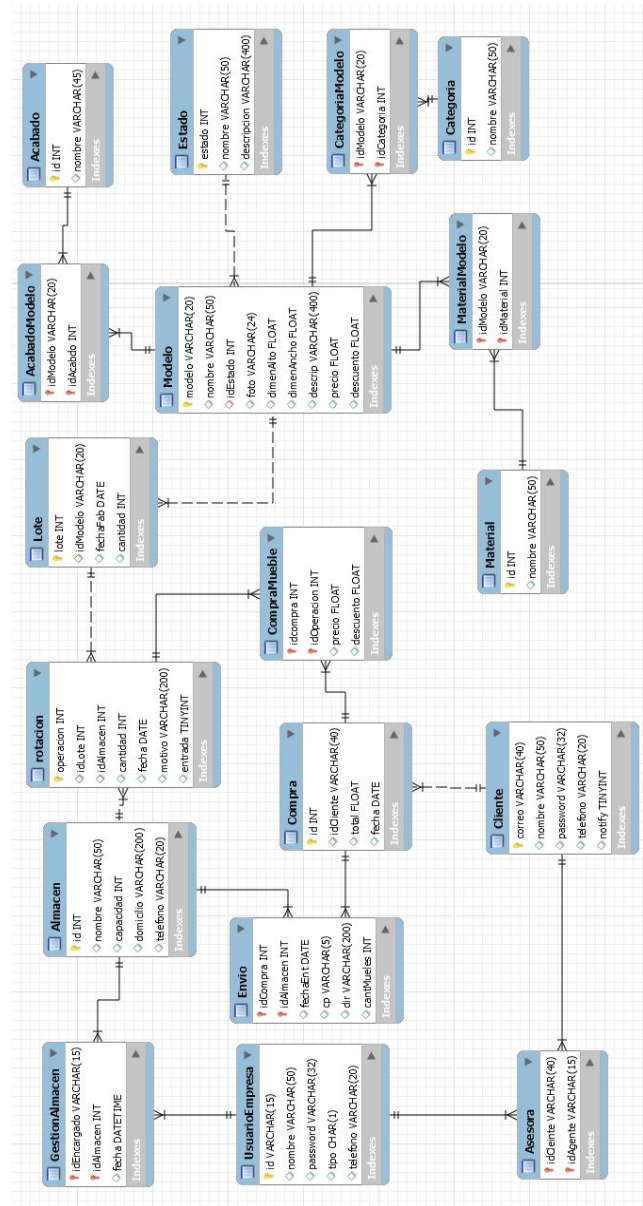
Database Modeling

In this section we specified the databases ambit and structure by their entity-relation model and relational model for each company databases.
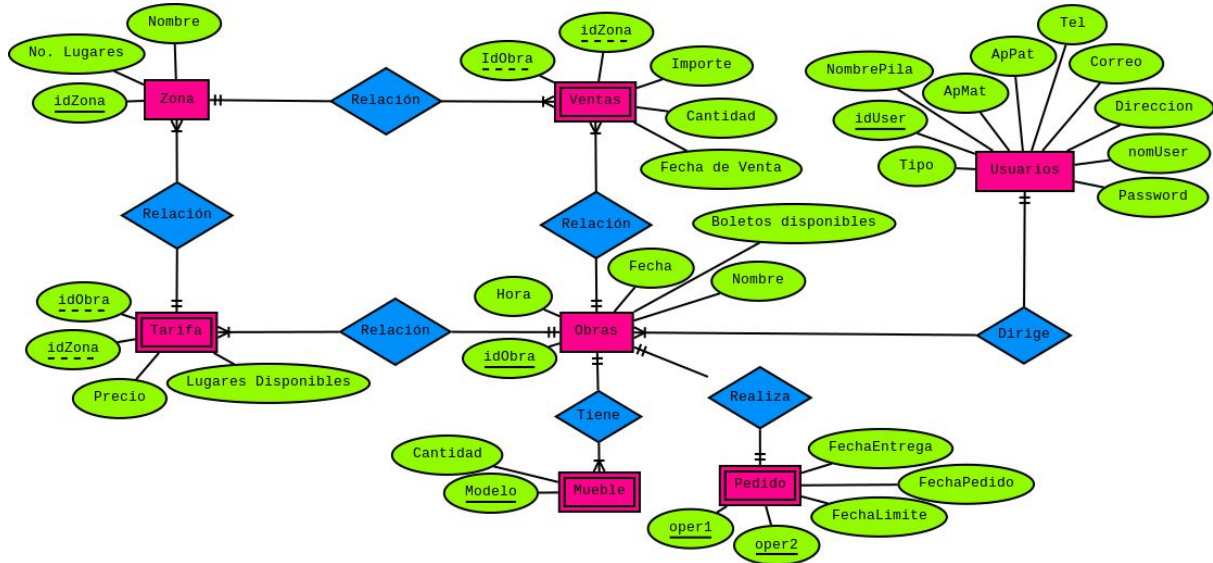
ER Model - Mueblerías Quetzal Database

SGVI ENTITY - RELATION DIAGRAM

**Relational Model - Mueblerías Quetzal Database**

ER Model - Teatro Aktuar

The following database structures were updates from previous version in order to support the requirements of the system.
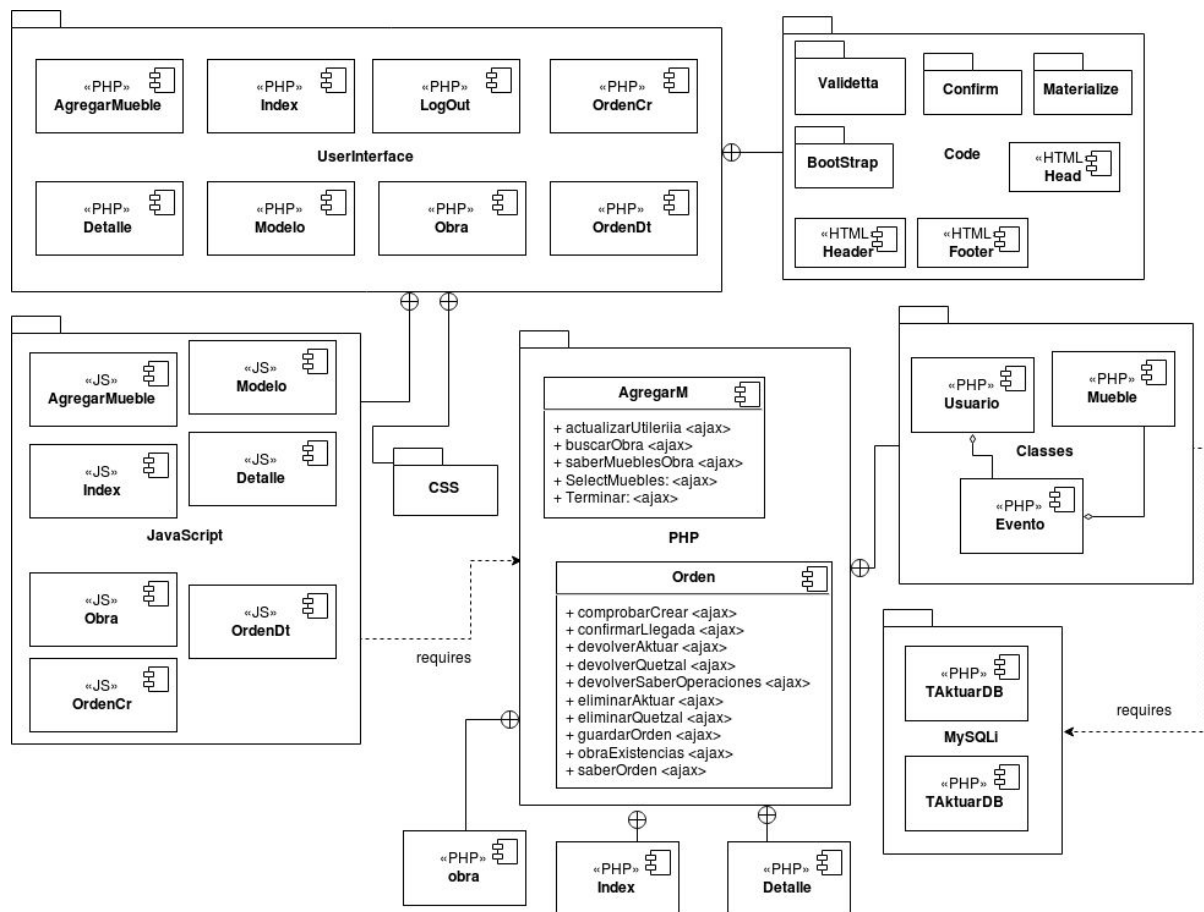

It was needed to add the tables "Pedido" and "Mueble"; and the linkages that show the relations "Usuario-Obra", "Obra-Mueble" and "Obra-Pedido".
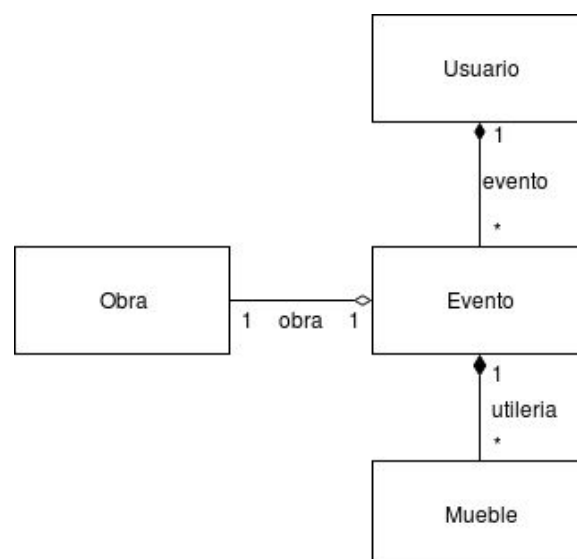
Relational Model - Teatro Aktuar Database
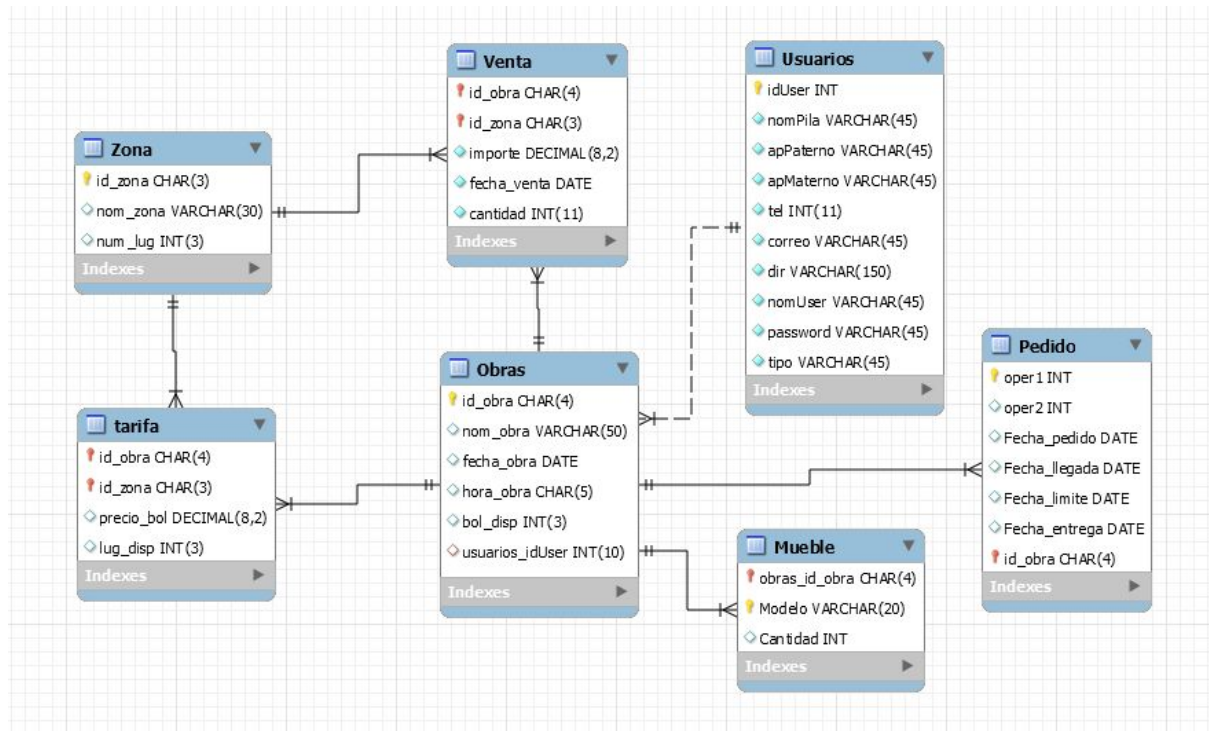
Components Modeling

Class Diagram Modeling

The following UML class diagram model represent all the classes required for implement the programming logic.

Nextly, we present the more relevant and important methods for each class. the constructors gets and sets

Obra
- String Nombre

Evento
- int directorID
- int eventoID
- Obra obra
- Date fecha
- Mueble utilería[ ]

Usuario
- String nombre
- int usuarioID
- String password

Mueble
- String nombre
- double alto
- double ancho
- double profundidad
- String descripcion

The main classes needed are shown in the previous diagram but classes like DBManager are not shown because of its short time-life period, The DBManager class has multiple aggregation relations to each classes of the programming logic, and vice-versa, in order to maintain the simplicity of diagram the class was not shown neither its relations.

Use-Cases modeling

In the next image we used use-cases diagram to represent all the execution ways that are allowed per each kind of actor. Than after, for each use-case we present the description..
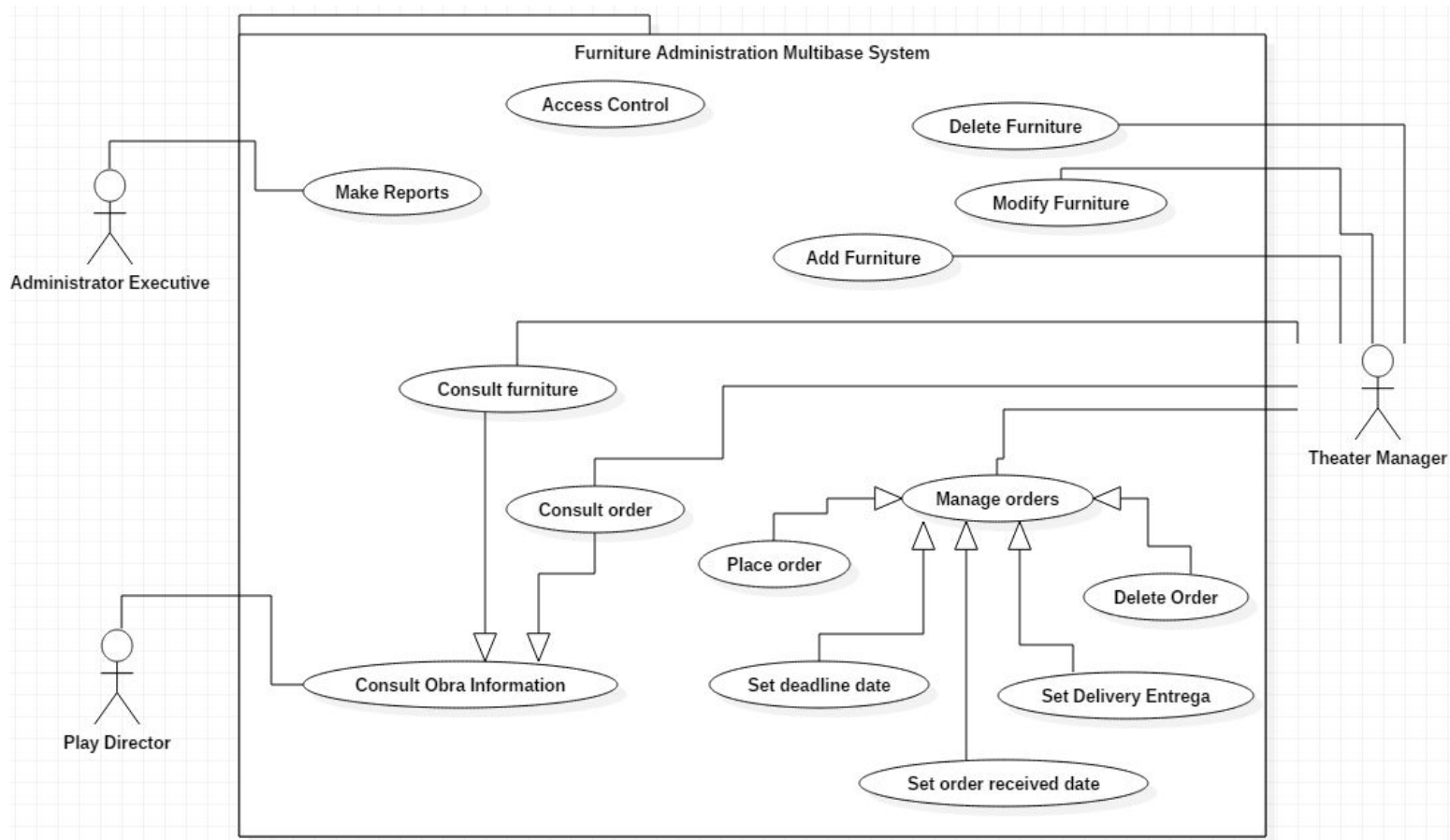
All use-case description consists on a data table for attributes and the principal trajectory taking into account most relevant alternative trajectories.

UC-00 Access Control

Name:	Access Control	Autor:	Daniel I. Ortega
Version:	1.0	Revisor:	David Flores
Actor:	All actors (Play Director, Administrator Executive, Theater Manager)		
Purpose:	Authenticate and allow the access to the specified actors.		
Inputs:	User, Password	Output:	UI - Main Menu
Origin:	Keyboard	Destination:	Screen
Preconditions:	The user should be registered in Teatro Aktuar's Database.		

Postconditions:	The system proportionate permissions according to specific actor.		
Errors:	1. Denied Access (AT1) 2. Connection Error (AT2)		
Observations:	All use-cases extends from the uc-00 (Access Control). the correspondent extend lines were not specified in the diagram in order to maintain the simplicity. Even though they are considered in the development.		

Trajectory UC-00

1. The user introduces the user identifier and password in UI - Login
2. The user confirms the operation pressing the button Entrar
3. The system verifies that user and password inputs were correct. (**AT1**,**AT2**)
    3.1. **AT1**: The system displays the message "Error de Conexión".
    3.2. **AT1**: *Fatal Error* system cannot operate.
    3.3. **AT2**: The system shows the message "Acceso Denegado".
    3.4. **AT2**: Redirects to beginning of this use-case.
4. The system creates the session with required user attributes
5. The system redirect to UI -Main Menu

UC-01 Make Reports (of the placed orders) **DEPRECATED !!!**

Name:	Make Reports	Autor:	Alfaro de León Irvin
Version:	1.0	Revisor:	Emanuel Badillo
Actor:	Administrator Executive		
Purpose:	Make reports of orders placed to take control of inventory.		
Inputs:	Report information	Output:	Confirmation message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The report must be generated based on an existing registered order in the database.		
Postconditions:	The system proportionate permissions according to specific actor.		
Errors:	1. Denied Access (AT1) 2. Connection Error (AT2) 3. Registration does not exist		
Observations:	To generate a report, it must be processed with the records of a completed purchase.		

UC-02 Add Furniture (required per each Play)

Name:	Add Furniture	Autor:	Eric López
Version:	1.0	Revisor:	David Flores
Actor:	Theatre Manager		
Purpose:	Add furniture that a play must require		
Inputs:	Play, Furniture data	Output:	Confirmation Message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The user must be registered in Teatro Aktuar's database as a Theatre Manager. The play must exist, this means that the play is registered in Teatro Aktuar's database. The furniture that will be added to the play must exist, this means that is registered in Mueblerias Quetzal's database.		
Postconditions:	The furniture will be assigned to the requested play, and will be available to further modifications.		
Errors:	1. Connection Error (AT 1) 2. Quantity not valid Error (AT 2) 3. Object does not exists or cannot be founded Error (AT 3) 4. Object has been already registered (AT 4)		
Observations:			

Trajectory UC-02

1. The user specify the play that wants to add the furniture.
    1.1   **AT3:** The system displays the message "The specified play does not exists or cannot be founded".
    1.2   **AT3**: *Querying Error* object does not exists or cannot be founded.

2. The system displays all the furniture that Mueblerías Quetzal can provide.
   2.1 **AT1**: The system displays the message "Error de Conexión".
   2.2 **AT1**: *Fatal Error* system cannot operate.
3. The user select which furniture wants, and specify the quantity of each one.
   3.1 **AT2:** The system displays a message in the field "Cantidad no válida"
   3.2 **AT2:** *Validation Error* quantity not valid.
4. The user confirms the operation pressing the button Agregar.
   4.1 **AT4:** The system displays the message "The specified furnitured has already been added to the play".
   4.2 **AT4:** *Insertion Error* object has been already registered
5. The system proceeds to make the changes.
   5.1 **AT1**: The system displays the message "Error de Conexión".
   5.2 **AT1**: *Fatal Error* system cannot operate.
6. The system adds the furniture of the play.
7. The system displays the message "Muebles agregados".

UC-03 Modify Furniture (required per each Play)

Name:	Modify Furniture	Autor:	David Flores
Version:	1.2	Revisor:	Eric López
Actor:	Theater Manager		
Purpose:	Change the furniture assigned to a Play		
Inputs:	Play, Furniture	Output:	Confirmation message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The user should be registered in Teatro Aktuar's Database as a Theater Manager, and the play should be register in Teatro Aktuar's Database. The furniture that will be added to the play must exist, this means that is registered in Mueblerias Quetzal's database.		
Postconditions:	The furniture assigned to the play would be changed to the new ones		
Errors:	1. Connection Error (AT1) 2. Quantity not valid Error (AT2)		
Observations:	Ok everything seems to be alright :p		

Trajectory UC-03

1. The user specify the play to change its furniture.
2. The system consult which furniture have been assigned to the play.
   2.1. **AT1**: The system displays the message "Error de Conexión".
   2.2 **AT1**: *Fatal Error* system cannot operate.
3. The user chooses the furniture that need to be changed.
4. The user chooses the new furniture for the Play
5. The user specifies the quantity of each one.
   5.1. **AT2:** The system displays a message in the field "Cantidad no válida"
   5.2. **AT2:** *Validation Error* Quantity not valid.and decides the quantity of the new furniture.
6. The user confirms the operation pressing the button Cambiar.
7. The system proceeds to make the changes.
   7.1. **AT1**: The system displays the message "Error de Conexión".
   7.2. **AT1**: *Fatal Error* system cannot operate.
8. The system changes the furniture of the play.
9. The system displays the message "Muebles cambiados".

UC-04 Delete Furniture (required per each Play)

Name:	Delete Furniture	Autor:	David Flores
Version:	1.0	Revisor:	
Actor:	Theater Manager		
Purpose:	Delete furniture that are not required to the play		
Inputs:	Play, furnitures	Output:	Confirmation message
Origin:	Mouse and Keyboard	Destination:	Screen
Preconditions:	The play should have furniture assigned to it. The user should be registered in Teatro Aktuar's Database as a Theater Manager, and the play should be register in Teatro Aktuar's Database. The furnitures should be registered in Mueblerias Quetzal DB		
Postconditions:	The selected furniture would be deleted from the Play		
Errors:	1. Connection Error (AT1)		
Observations:			

Trajectory UC-04

1. The user specify the play to change its furniture.
2. The system consult which furniture have been assigned to the play.
   2.1. **AT1**: The system displays the message "Error de Conexión".
   2.2. **AT1**: *Fatal Error* system cannot operate.
3. The user chooses the furniture that need to be eliminated.
4. The user specifies the quantity that he wants to remove.
5. The user confirms the operation pressing the button Cambiar.
6. The system proceeds to make the changes.
   6.1. **AT1**: The system displays the message "Error de Conexión".
   6.2. **AT1**: *Fatal Error* system cannot operate.
7. The system changes the furniture of the play removing the furniture specificated.
8. The system displays the message "Muebles cambiados".

UC-05 Manage Orders DEPRECATED !!!

UC-06 Create Order

Name:	Place Order	Autor:	Alejandro Chavarria Ortiz
Version:	1.0	Revisor:	Diego Cruz Mondragon
Actor:	Theater manager		
Purpose:	Make the furniture orders needed for the works.		
Inputs:	Information of order	Output:	Confirmation message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The Actor (TM) must be logged previously, Order must not be pre-registered		
Postconditions:	The order must be confirmed at the end of its registration.		
Errors:	1. Denied Access (AT1) 2. Connection Error (AT2) 3. Existing registration		
Observations:			

Trajectory UC-06

1. The user introduces the user identifier and password in UI - Login
2. The user confirms the operation pressing the button Entrar
3. The system verifies that user and password inputs were correct. (AT1,AT2)

3.1. AT1: The system displays the message "Error de Conexión".
3.2. AT1: *Fatal Error* system cannot operate.
3.3. AT2: The system shows the message "Acceso Denegado".
3.4. AT2: Redirects to beginning of this use-case.
4. The system displays a form to register the order.
5. The user completes the form
6. User saves the register

UC-07 Delete Order

Name:	Delete Order	Autor:	Diego Cruz Mondragon
Version:	1.0	Revisor:	Miguel Angel Flores Aguilera
Actor:	Theater Manager(TM)		
Purpose:	Delete the furniture orders for the plays		
Inputs:	Order ID	Output:	Message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The TM must be logged previously The order must be stored in the system		
Postconditions:	The deleted order must not be appear in the system.		
Errors:	The Actor introduced a not exist ID		
Observations:			

Trajectory UC-07

1. The user introduces the user identifier and password in UI - Login
2. The user confirms the operation pressing the button Entrar
3. The system verifies that user and password inputs were correct. (**AT1**,**AT2**)
    3.1. **AT1**: The system displays the message "Error de Conexión".
    3.2. **AT1**: *Fatal Error* system cannot operate.
    3.3. **AT2**: The system shows the message "Acceso Denegado".
    3.4. **AT2**: Redirects to beginning of this use-case.
4. The system displays a screen where the actor clicks on the button "Eliminar Ordenr"
5. The system displays a screen where requires an ID in a input label
6. The actor introduces it and click on the button "Eliminar" (AT3)
    6.1. **AT3**: The system doesn't recognize the ID in the database.
    6.2. **AT3**: Displays a message
7. User saves the register

UC-08 Set Order Received Date DEPRECATED !!!

Name:	Set Order Received Date	Autor:	Miguel Angel Flores Aguilera
Version:	1.0	Revisor:	Emanuel G. Badillo Arellano
Actor:	Theater Manager(TM)		
Purpose:	Set date of received furniture to have an order of data.		
Inputs:	Order ID	Output:	Confirmation message
Origin:	Keyboard	Destination:	Screen
Preconditions:	The TM must be logged previously. Have an existing stage play		
Postconditions:	The order is registered in the stage plays schedule		
Errors:	1. Stage play does not exist(**AT1**) 2. The form have empty fields(**AT2**)		
Observations:			

Trajectory UC-08

1. The actor introduces the Stage Play name on the search box
2. The system search information about entry
    2.1. AT1: The system notifies that Stage Play does not exist
    2.2. AT1: The system focus the cursor in search box
3. The user select the Stage play which will be registered in the order schedule
4. The System displays a screen where the actor registers the order
5. The user introduces information about the order and click on the button "Confirmar"
    5.1. AT2: The system notifies that exist empty fields
    5.2. AT2: The system focus cursor on the first field that detects empty
    5.3. AT2: The user introduces missing information and click on button "Confirmar"
6. The System displays a confirmation message
7. The system redirect to search-screen

UC-09 Set Deadline Date DEPRECATED !!!

Name:	Set Deadline Date	**Autor:**	Miguel Angel Flores Aguilera
Version:	1.0	**Revisor:**	Emanuel G. Badillo Arellano
Actor:	Theater Manager(TM)		
Purpose:	Set date of received furniture to have an order of data.		
Inputs:	Order ID	**Output:**	Confirmation message
Origin:	Keyboard	**Destination:**	Screen
Preconditions:	The TM must be logged previously. Have an existing stage play		
Postconditions:	The order is registered in the stage plays schedule		
Errors:	3. Stage play does not exist(**AT1**) 4. The form have empty fields(**AT2**)		
Observations:			

UC-10 Set Delivery Date DEPRECATED !!!

Name:	Set Delivery Date	**Autor:**	Miguel Angel Flores Aguilera
Version:	1.0	**Revisor:**	Emanuel G. Badillo Arellano
Actor:	Theater Manager(TM)		
Purpose:	Set date of received furniture to have an order of data.		
Inputs:	Order ID	**Output:**	Confirmation message
Origin:	Keyboard	**Destination:**	Screen
Preconditions:	The TM must be logged previously. Have an existing stage play		
Postconditions:	The order is registered in the stage plays schedule		
Errors:	5. Stage play does not exist(**AT1**) 6. The form have empty fields(**AT2**)		
Observations:			

UC-11 Consult Obra (plays) Information

Name:	Consult Obra Information	Autor:	Daniel Ortega
Version:	1.0	Revisor:	Evelyn Reyes
Actor:	Theater Manager, Play Director		
Purpose:	Allow the actors to see information about specific orders or either to see information about furniture of specific obra		
Inputs:	The Obra identifier	Output:	UI- Obra information/Detail
Origin:	Keyboard	Destination:	Screen
Preconditions:	The author should have been authenticated and had been given permissions to him.		
Postconditions:	None		
Errors:	1. Connection Error (**AT1**) 2. Incorrect Obra identifier (**AT2**)		
Observations:	This use case is a generalization of UC-12 and UC-13		

Trajectory UC-11

1. The user pushes the button indicating that requires consult information about the plays (**AT1,AT2**)
   - 1.1. **AT1**: The system cannot establish a connection to DB
   - 1.2. **AT2**: The system displays message "No existe la obra <obra>"
2. The system only loads the plays the author leads/leaded in case the author is a Play Director.actor-type, in case the author is a Theater Manager actor-type.the system loads all the plays
3. Include **UC-12**, **UC-13**

UC-12 Consult Furniture (de los cuales está a cargo).

Name:	Consult furniture	Autor:	Daniel Ortega
Version:	1.0	Revisor:	Evelyn Reyes
Actor:	Theater Manager, Play Director		
Purpose:	Allow the actors to see information about furniture of specific obra		

| Inputs:	Obra identifier	Output:	UI - Obra Detail
Origin:	keyboard	Destination:	Screen
Preconditions:	The actor should have been authenticated and had been given permissions to him.		
Postconditions:	None		
Errors:	3. Connection Error (**AT1**) 4. Not order associated to that obra (**AT2**)		
Observations:	This use-case is an specification of consult obra information		

Trajectory UC-12

1. The system receives the obra identifier and build the query
2. The system authenticate in Teatro Aktuar's database if exists the obra (**AT1,AT2**)
   - 2.1.   **AT1**: The system cannot establish a connection to DB
   - 2.2.   **AT1**: The system displays message "Error de Conexión"
   - 2.3.   **AT2**: The system receives empty set
   - 2.4.   **AT2**: The system displays message "No existe la obra <obra>"
3. The system receives the data from database according to the obra identifier
4. The system shows the furniture information of the obra identifier.
5. The user observes the information displayed.

UC-13 Consult Order

Name:	Consult Order	Autor:	Daniel Ortega
Version:	1.0	Revisor:	Eric López
Actor:	Theater Manager, Play Director		
Purpose:	Allow the actors to see information about specific orders		
Inputs:	obra identifier	Output:	UI - Obra Information
Origin:	Keyboard	Destination:	Screen
Preconditions:	The actor should have been authenticated and had been given permissions to him.		
Postconditions:	None		
Errors:	5. Connection Error (**AT1**) 6. Not order associated to that obra (**AT2**)		
Observations:	This use-case is an specification of consult obra information		

Trajectory UC-13

6. The system receives the obra identifier and build the query
7. The system authenticate in Teatro Aktuar's database if exists the obra (**AT1,AT2**)
   7.1. **AT1**: The system cannot establish a connection to DB
   7.2. **AT1**: The system displays message "Error de Coneccion"
   7.3. **AT2**: The system receives empty set
   7.4. **AT2**: The system displays message "No existe la obra <obra>"
8. The system receives the data from database according to the obra identifier
9. The system shows the order information of the obra identifier.
10. The user observes the information displayed.

Sequences Modeling

The most representative programming modules are described by its correspondent sequence model, those sequence models represents a guide of how the implementation style should be made.

Login Sequence Diagram:
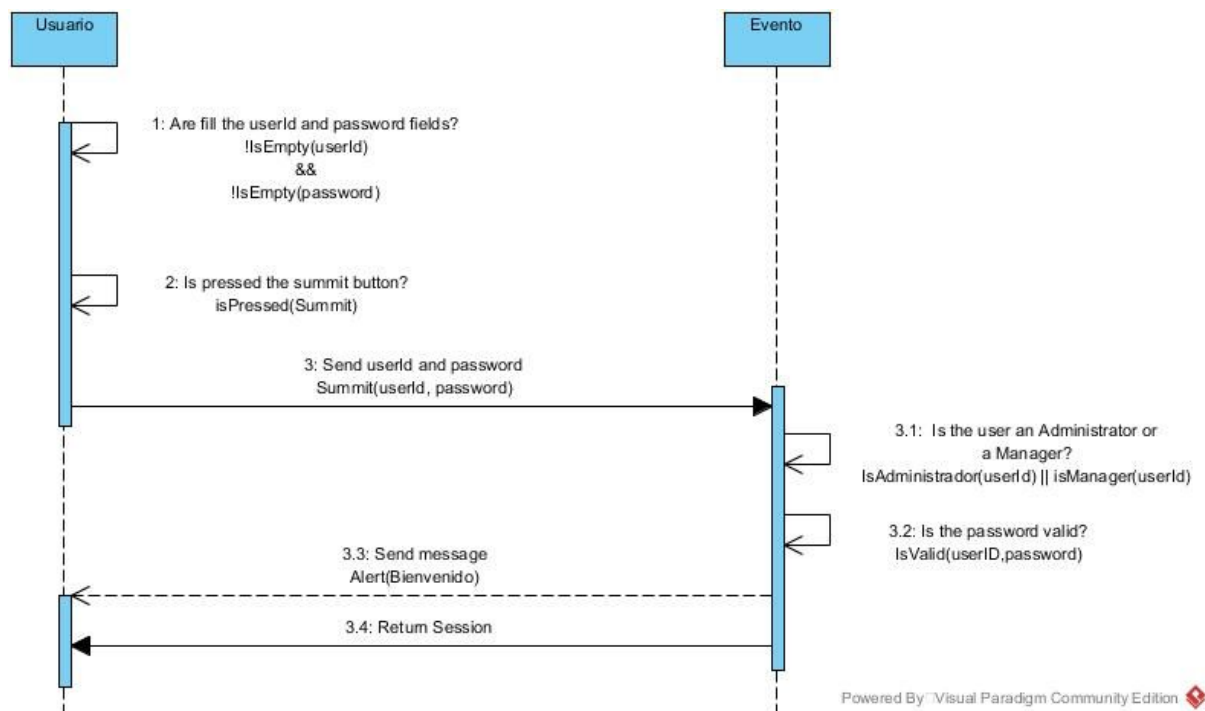
Add Furniture to a play Sequence Diagram:
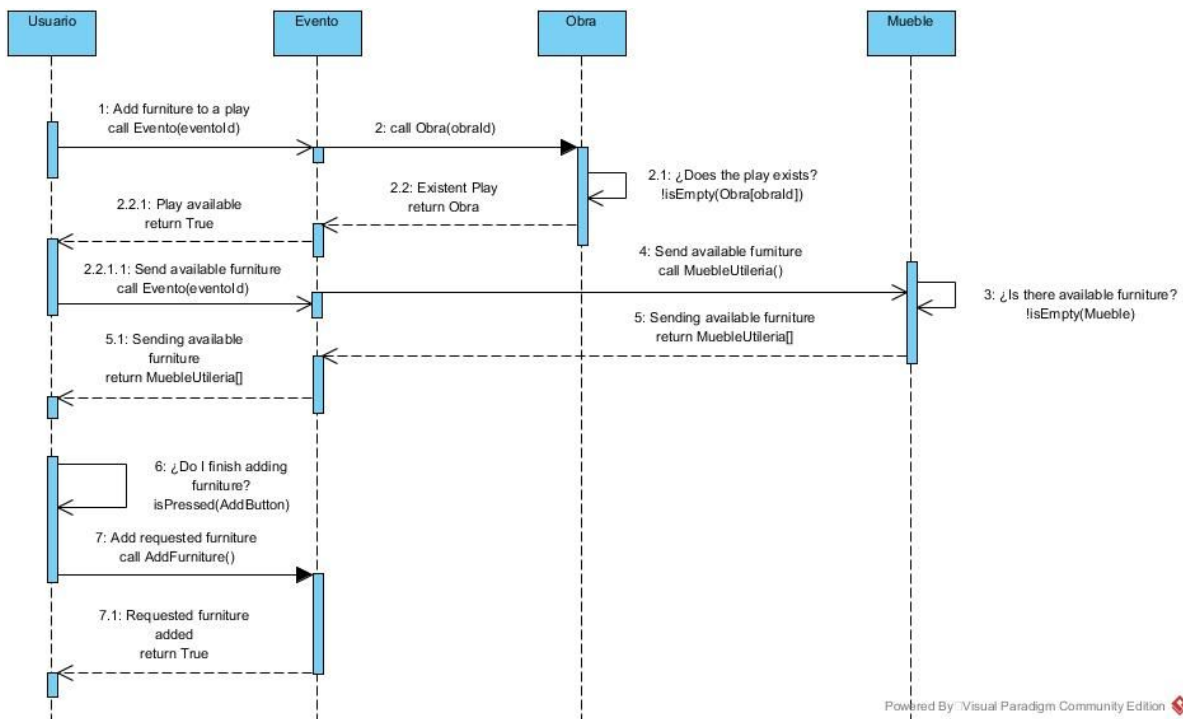
Delete furniture from a play Sequence Diagram:
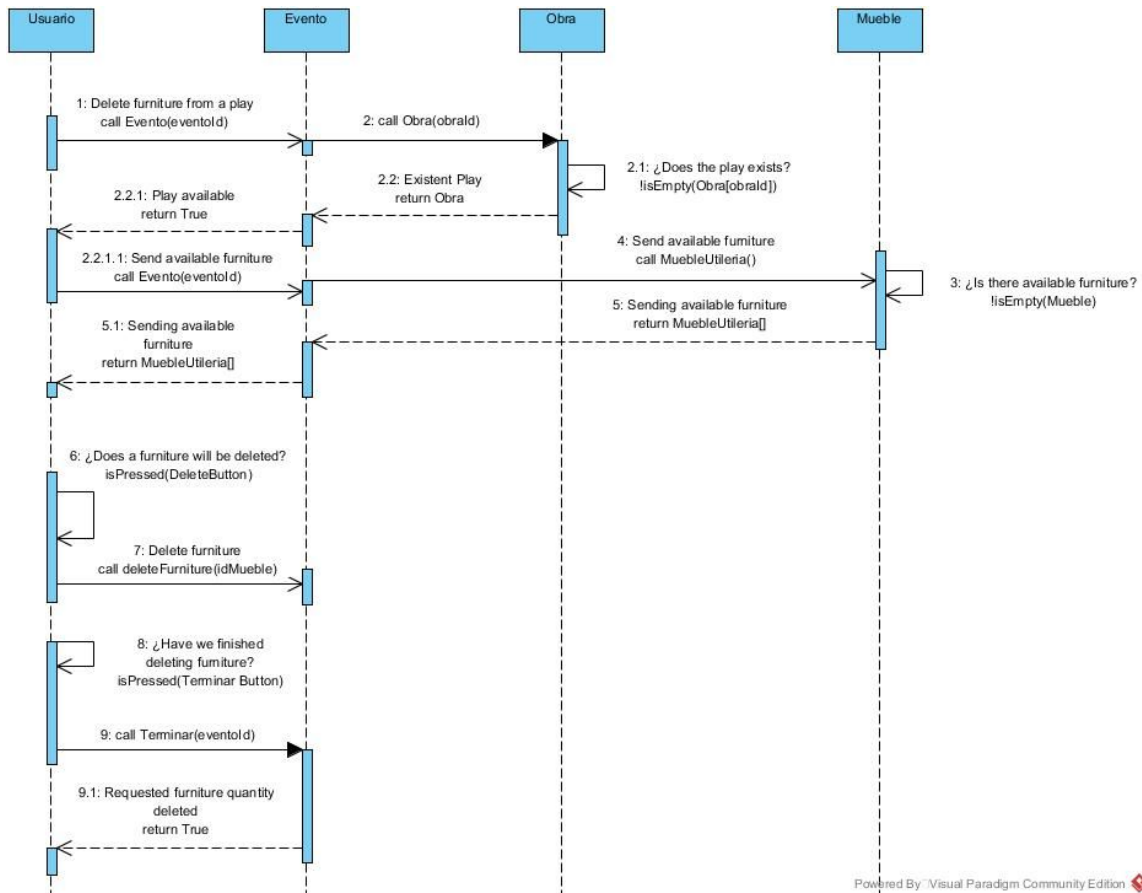
Create order Sequence Diagram:
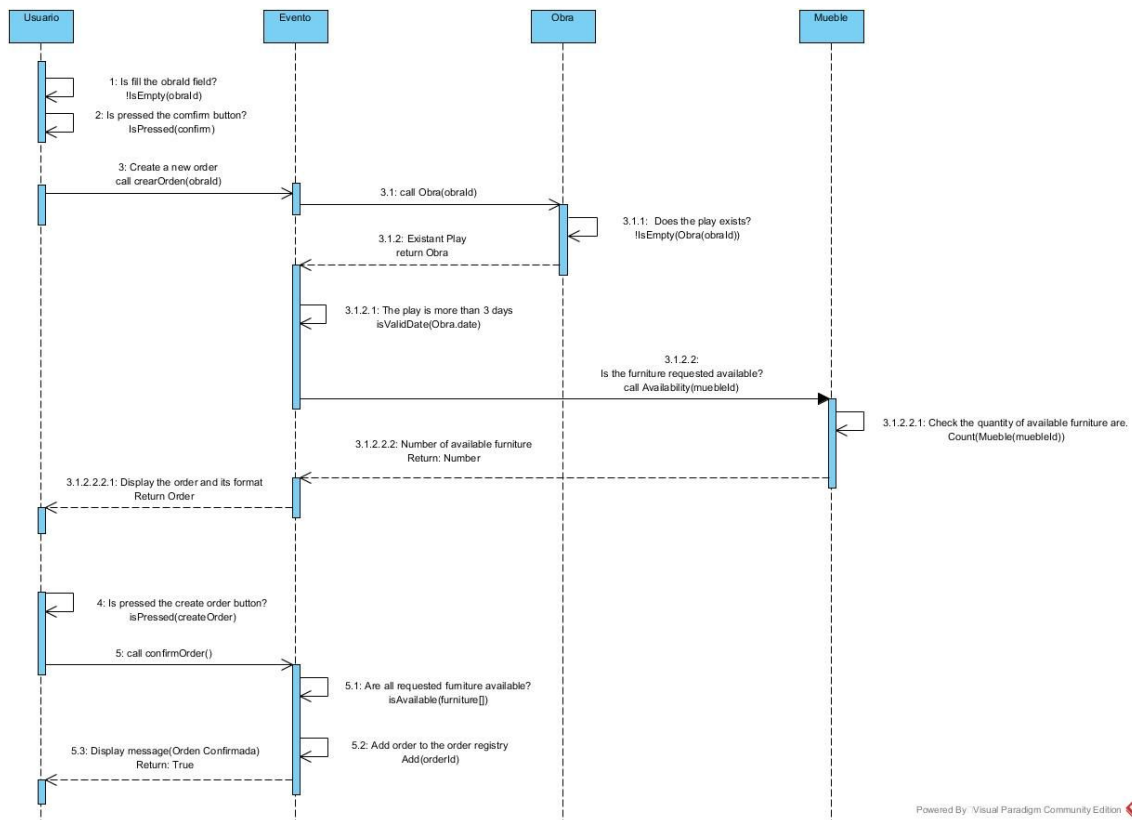
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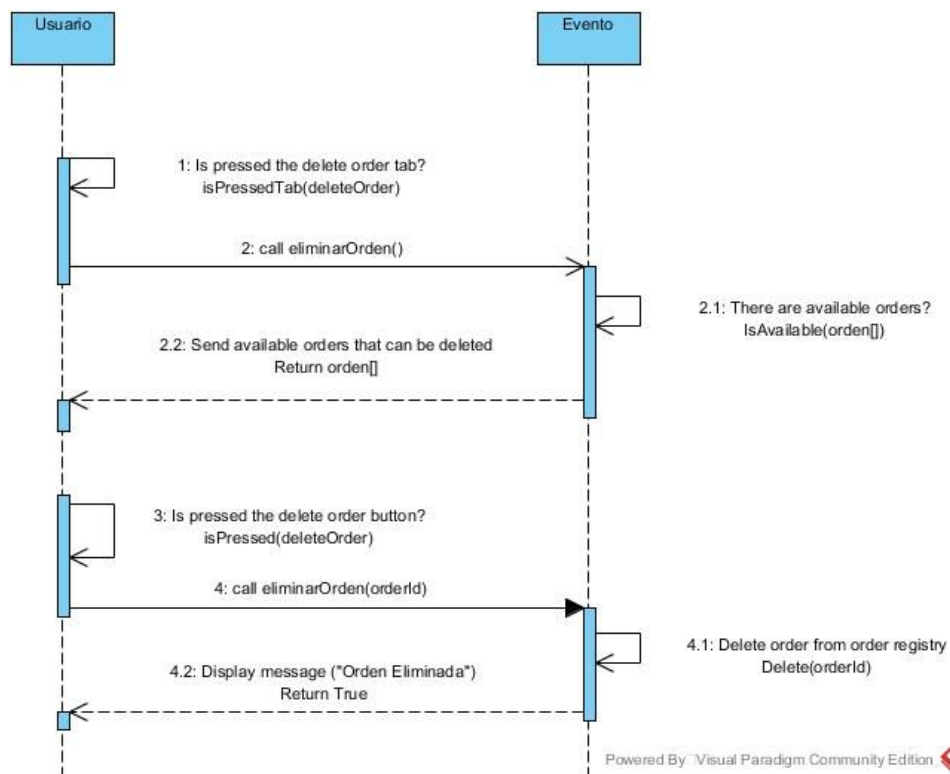
Logout Sequence Diagram:
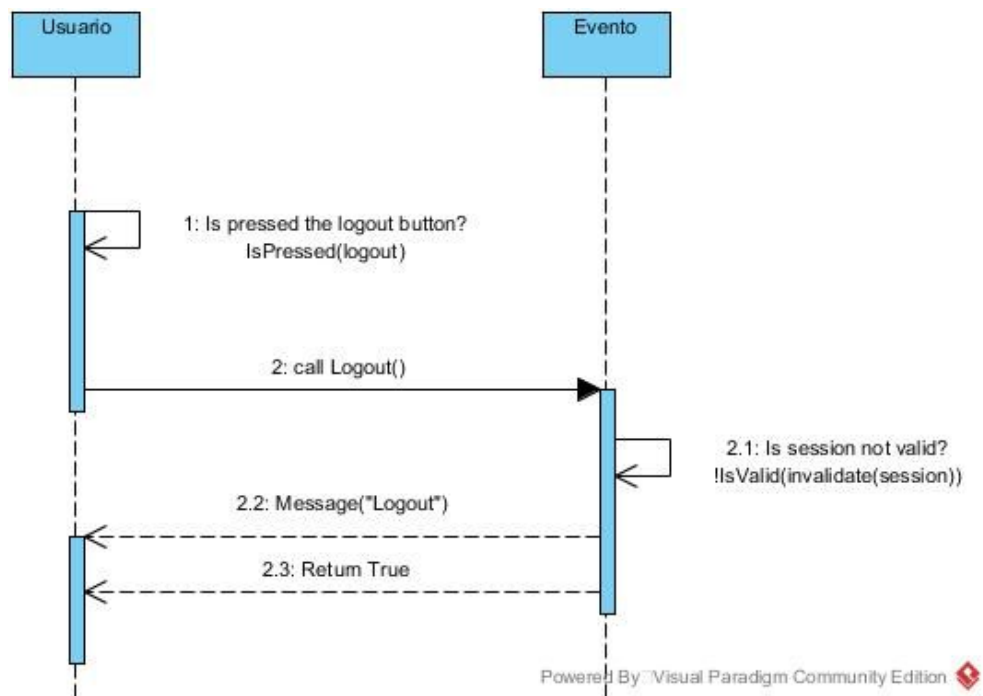
Screenshots of the system implementation
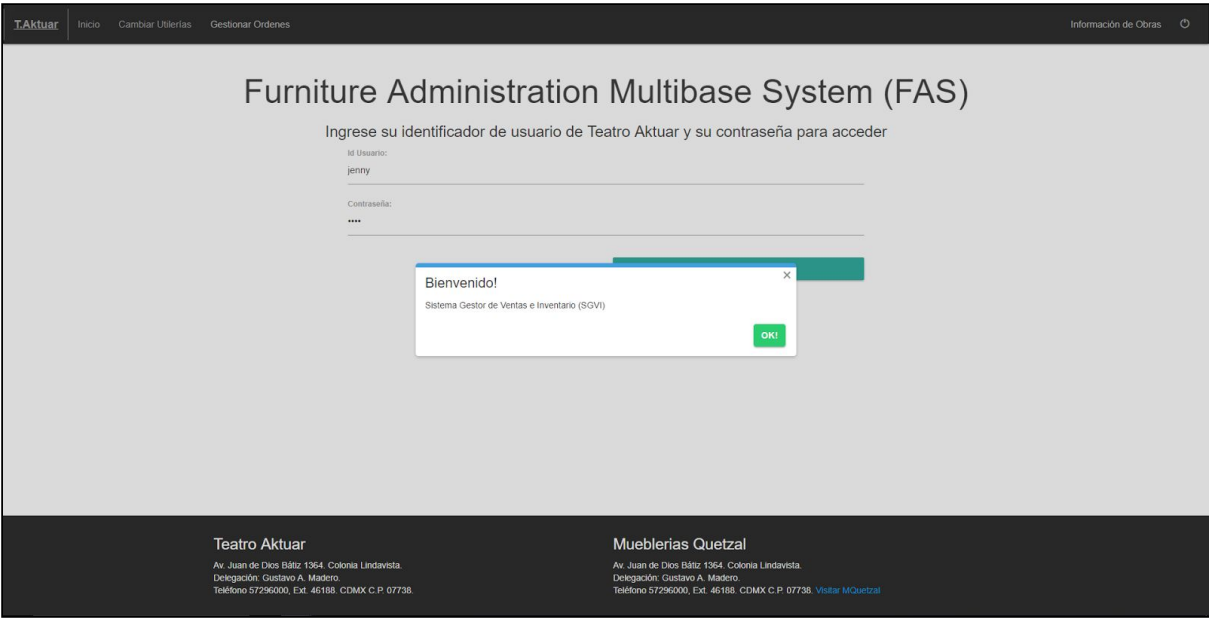
Figure 1.Accessing to the system
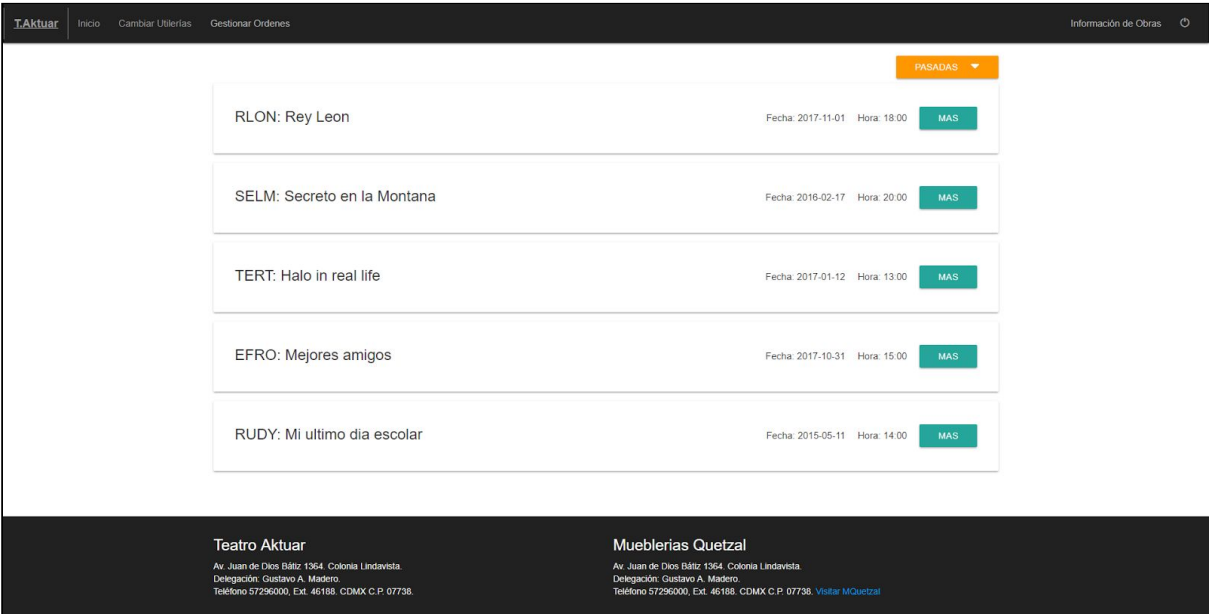
Figure 2. Consulting plays information

Figure 3. Managing furniture belonging to a play

Figure 4. Managing Order (order creation)

Figure 5. Managing Order (deleting order)

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