

D3.2.1

Smart Lighting System Specification

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| Abstract: | This document intends to capture general specification for the Smart Lighting System in the form of Use Cases. The Smart Lighting solution will be a web application that will let authorized users to interact with the underlying smart grid infrastructure in order to operate and/or extract information from the public lighting sub-system, thus enabling a more efficient management over the public lighting service. Therefore, the solution must include a set of management capabilities like on/off commands, real time status, energy consumption and schedules update. |
| Keywords: | Smart, Grid, Public, Lighting |

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List of acronyms

| | |
|-----|-------------------------------------|
| API | Application Program Interface |
| GUI | Graphical User Interface |
| DTC | Distribution Transformer Controller |
| EB | Energy Box |

1 Objective

This document intends to capture general specification for the Smart Lighting System in the form of Use Cases.

A Use Case shows the functional dependencies between external entities (actors) and the system being analysed, thus providing a good and technological agnostic understanding of the system.

2 Business Scenario: Smart Lighting System

A Smart Grid transforms the way power is distributed and used, adding intelligence throughout the grid to dramatically reduce outages and faults, improving responsiveness, handling current and future demand, increasing efficiency and management costs. The Smart Grid uses sensor meters, digital controls and analytic tools to automate and monitor the flow and delivery of energy to consumers, enabling a two-way flow of electricity and information among the power plant, the appliance and the points in between. Through Smart Grids it is also possible to incorporate new sustainable energies such as wind and solar generation, and interact locally with distributed power sources, or plug-in electrical vehicles.

As part of a Smart Grid, the Smart Lighting System will provide public lighting management functionalities like on/off commands, real time status, energy consumption and schedules update. The accuracy and timely information in those systems is crucial because decisions are taken in real time. No information, or information later in time, represents inaccurate analysis that will turn in bad decisions. To prevent this kind of situations, information must be suitably protected. This is especially important in the increasingly interconnected world.

Information security for Smart Grid infrastructure feeds from information security enforced on the electric sector world and the telecommunications world. Both these worlds have systems which deal with millions of customers, highly critical assets for the functioning of society, storing sensible customer information, and potentially generating detailed information about customer habits.

In particular the Smart Lighting System, as a system designed for control the public lighting, does not have critical data related with customers consumptions, making data confidentiality as part of the information security issues, less critical than data integrity, availability or authenticity.

3 System Architecture

The Smart Lighting solution will be a web application that will let authorized users to interact with the underlying Smart Grid infrastructure in order to operate and/or extract information from the public lighting sub-system, thus enabling a more efficient management over the public lighting service. Therefore, the solution must include a set of management capabilities like on/off commands, real time status, energy consumption and schedules update.

The overall solution consists of several components which, articulated among themselves, allow us to address the objectives preconized for the system. The main components of this solution are:

- **IT Systems:** systems and applications for management and central data processing such as energy metering management and commercial systems.
- **Scada/Dms:** (Supervisory Control and Data Acquisition/Distribution Management System) Systems and applications for supervision, control, optimization and management of power distribution networks.

- **Distribution Transformer Controller:** local control equipment to be installed at switching stations (including modules for measuring, actuation, processing, interface, communication, etc.).
- **Energy Box:** devices to be installed at consumers/producers (including modules for measuring, actuation, processing, interface, communication, etc.).

The following picture depicts the overall system architecture:

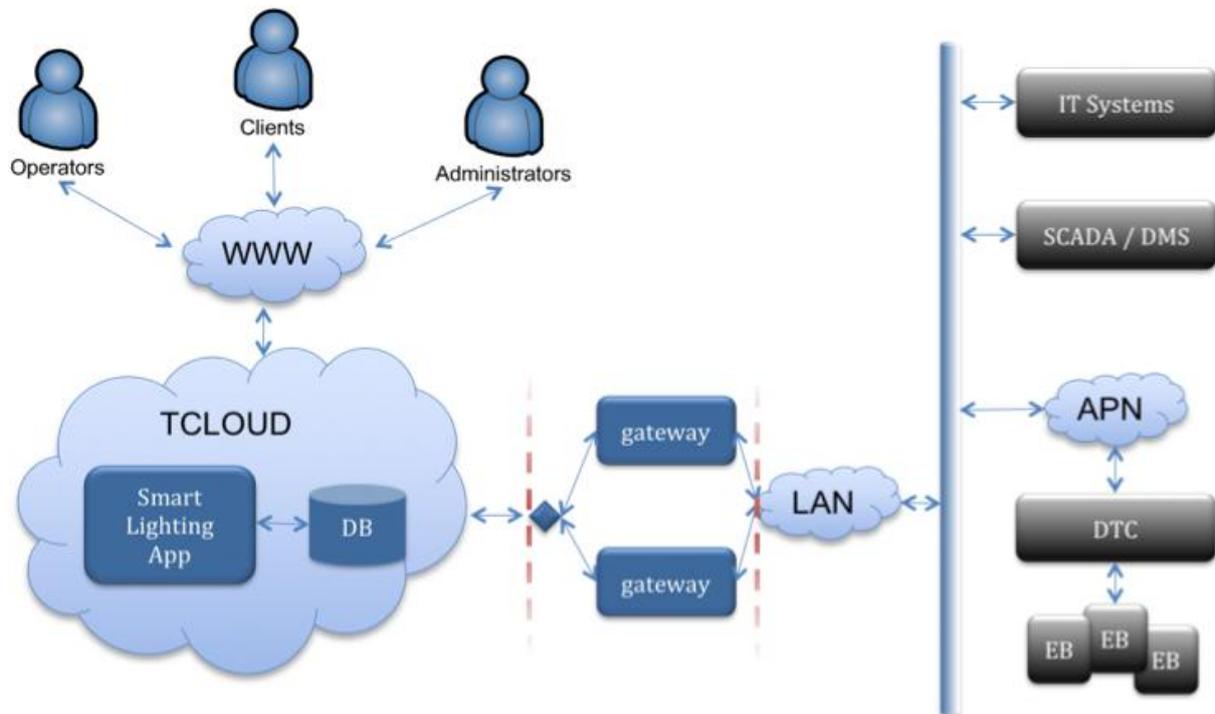


Figure 1: Smart Lighting Architecture

4 Actors

The following actors were identified:

- Operators (Municipalities, EDP)
- Clients (Municipalities)
- Administrators (EDP)

5 Business Functions

At a high level, the Smart Lighting solution must provide the following business functions:

- Monitor consumptions
- Monitor state and anomaly events (alarms)
- Manage lighting Services and Schedules
- Manage public lighting settings
- Actuate over control circuits
- Manage settings of public lighting intelligent devices (DTC & EB)

6 Use Cases

In this section we collect the use cases that help on understanding the business functions that were identified for the Smart Lighting System. We organize the use cases into four main categories:

- Public Lighting Management
- System Administration
- Alarm Management
- Reporting

The following picture depicts the four use case categories in the form of high level use cases.

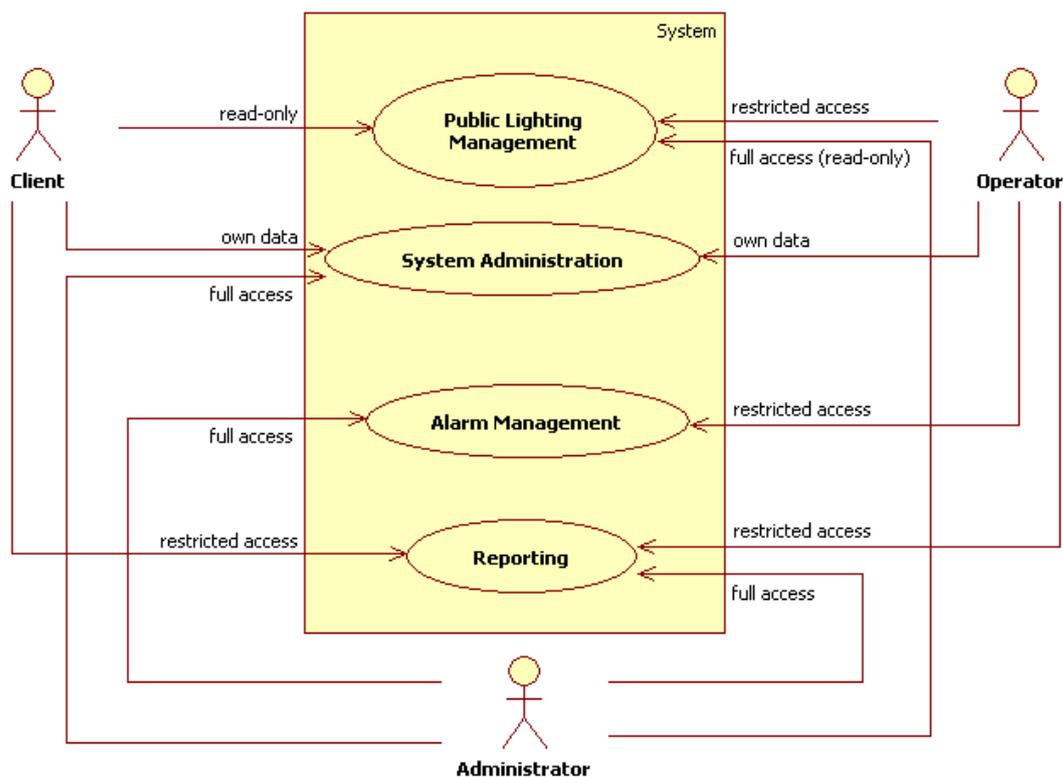


Figure 2: Smart Lighting High Level Use Cases

Troughout this document use case diagrams, the following access rights applies:

- Own data : read-write access to the user personal data.
- Read-only : read access to whole data.
- Restricted access : read-write access to data belonging to the user Operational Area.
- Restricted access (read-only) : read access to data belonging to the user Operational Area.
- Full access : read-write access to whole data.
- Full access (read-only) : read access to data belonging to the user Operational Area.

The Public Lighting Management set of functions lets users operate the Smart Lighting System, as is the case of Operators, or display information about the configurations that were applied to the system, if the user accessing the application is either a Client or an Administrator. The difference between the Client and the Administrator capabilities on this

matter lies on the fact that the Client is bound to a so called “Operational Area”, which is a concept used to define a subset of the network being operated, whereas the Administrator has read-only access to the whole available data.

The System Administration set of functions is used to access and manipulate user information. Both the Client and the Operator are only allowed to act on the information pertaining to them, whereas the Administrator has full access to all of the functions contained in this category.

The Alarm Management category deals with the ability both Operators and Administrators have to see abnormal condition events that are displayed in the form of alarms.

The last category that was identified for the Smart Lighting solution is the Reporting category, which enables users to generate reports about many of the operational aspects of the system. Again, both the Client and the Operator have restricted access to these functions, since they are only allowed to see the part of the information that is relevant to the section of the system they are assigned to. As for the Administrator, there is no limitation whatsoever on the information he can access when using these functions.

6.1 Public Lighting Management

The Public Lighting Management category is the cornerstone of the solution in the sense that it contains most of the functions that let users operate the system. As the operation of a Smart Lighting System requires the configuration of several different aspects of the application, the resulting functions are quite numerous and hard to lay out on a single use case diagram.

Therefore, and for the sake of readability of this document, the functions were split across several diagrams, each of which acting as a detailed view of a specific use case that was contained into a previous diagram. By doing so, we expect to provide the reader with a “drill-down” view of the functionalities of the system, as he walks through the several diagrams being presented.

6.1.1 Public Lighting Management Use Cases

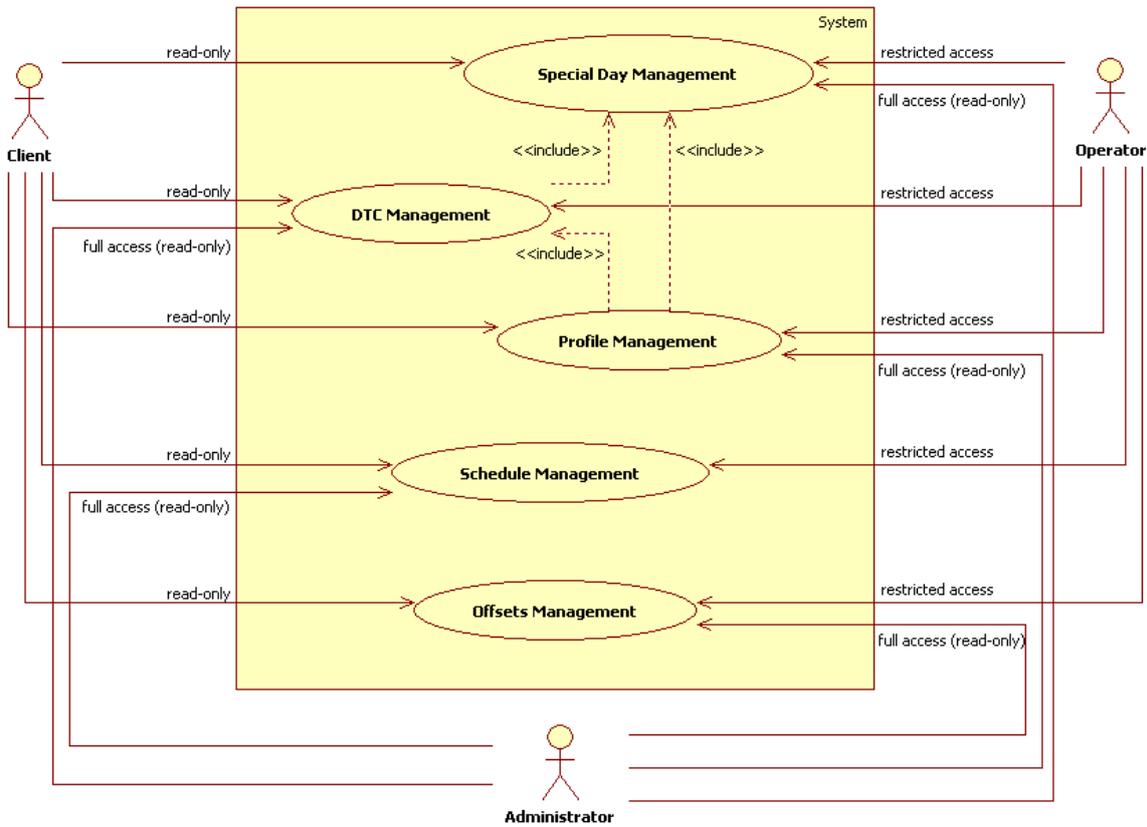


Figure 3: Public Lighting Management Diagram

The main purpose of Public Lighting Management use case is to manage DTC settings regarding the public lighting control. Therefore the Smart Lighting solution has to effectively map the relevant DTC data structures, in order to end users intuitively and efficiently manage public lighting settings. Figure 4 depicts DTC data structures, relevant to public lighting.

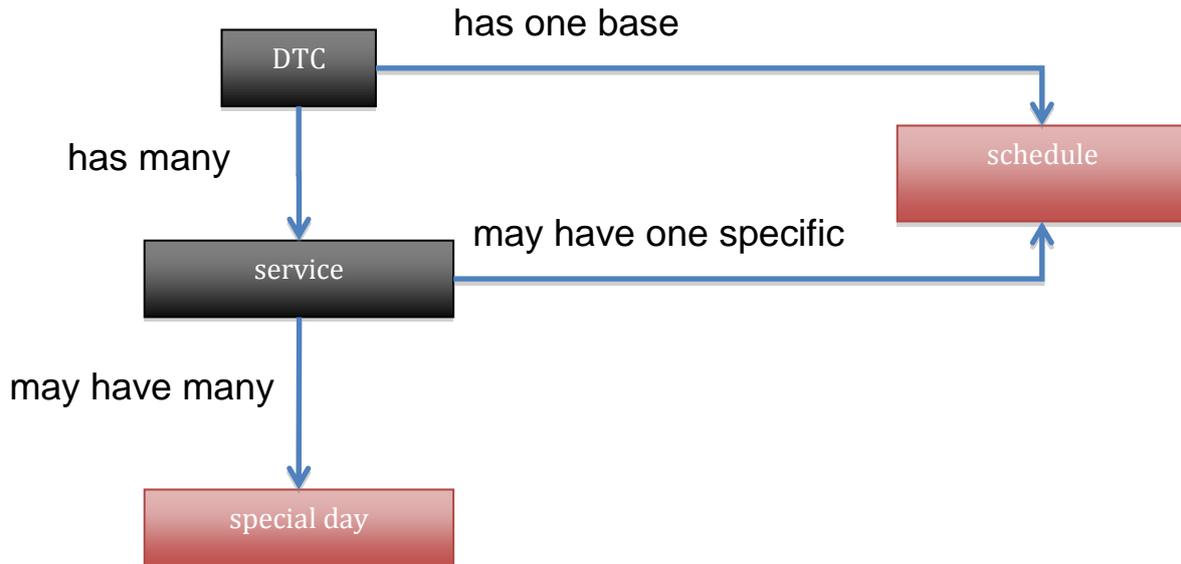


Figure 4: DTC Data Structures

- A Service consists in a logical structure that hides the actual electrical circuits that are being used by a DTC in order to provide public lighting functionalities. More specifically, a single DTC may be used to manage one or more distinct public lighting electrical circuits. Each of these may belong to the same Service or not.
- A Schedule defines how and when a given DTC Service should be turned on or off in order to control the underlying public lighting infra-structure. For that, a Schedule is comprised by timetables. Each timetable defines 2 points: the switch off point and the switch on point. There are three possibilities for defining how to turn on and off a DTC: specific time; astronomical clock (based on the DTC coordinates); and by means of a light sensor. Besides the switching mode, a timetable should also define a starting day. Each timetable remains active from its starting day up to the starting day of the following timetable defined for the same schedule. The last timetable remains active forever.
- A Special Day is used to allow exceptions to the public lighting normal operation. Thus, if there is a Special Day configuration for a particular day of the year, for a particular DTC Service, the DTC will use that configuration instead of the Schedule definition, but for that day only.
- Within a Schedule it is also possible to tell the DTC to apply an Offset to the time that is provided. The idea is to avoid all DTCs located at the same region to switch their circuits at the very same time, which could cause disturbance to the distribution network.

So, in order for the Smart Lighting solution to be able to set that information on a large number of DTCs in a manageable way, the solution must have carefully designed data structures that help the user operate the system.

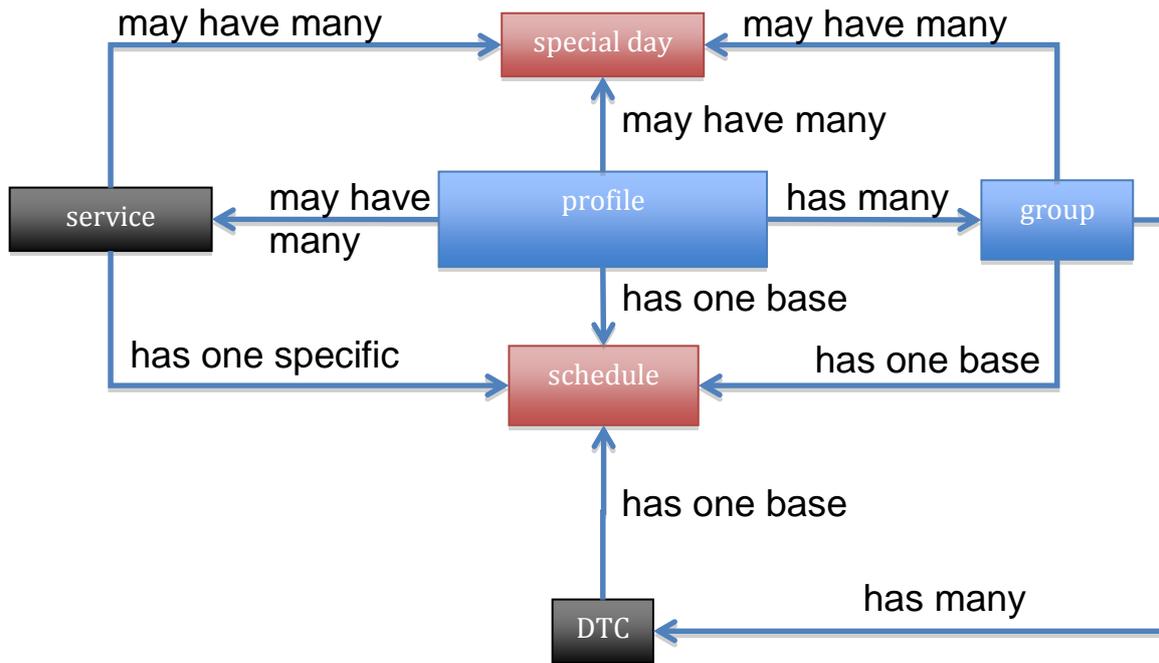


Figure 5: Smart Lighting Data Structures

Figure 5 depicts these information structures and how they relate with each other in order to drive the full set of functionalities related with the Public Lighting Management capabilities of the system. The red boxes represent the actual information that is stored into DTCs. The gray boxes represent the data structures that mimic the actual equipments (DTCs and their circuits, which are exposed in the form of Services). The blue boxes are the logical structures that are used to aggregate information as follows:

- A Profile contains a set of Groups of DTCs and may contain one or more Service definitions. All DTCs having the same Service as the ones defined by the Profile will have the Service settings updated in order to match the settings of the Services associated with the Profile. Regarding the base Schedule and Special Day definitions, the values defined at the Profile will be passed on to its Groups and correspondent DTCs unless these definitions are overridden either at the Group or at the DTC level.
- A DTC may be associated into Groups for Public Lighting Management purposes. All DTCs belonging to the same Group, may inherit the base Schedule and Special Day definitions of the Group (in the case the DTC does not override these settings).

So, when the time comes to actually send the information to the DTCs, the system must apply a top-down approach in order to create the bundle of information that is conveyed to each DTC according to the following rules:

- If the DTC has a base Schedule set, it is used, otherwise it will use the one defined at its Group. Only if the Group has no base Schedule set, then the base Schedule of the Profile is used.
- The same rule is used to find out the Special Days to be sent.
- As for the Services, all the Services associated with the Profile the DTC is bound to (by means of its Group) are sent.

6.1.1.1 Special Day Management Use Cases

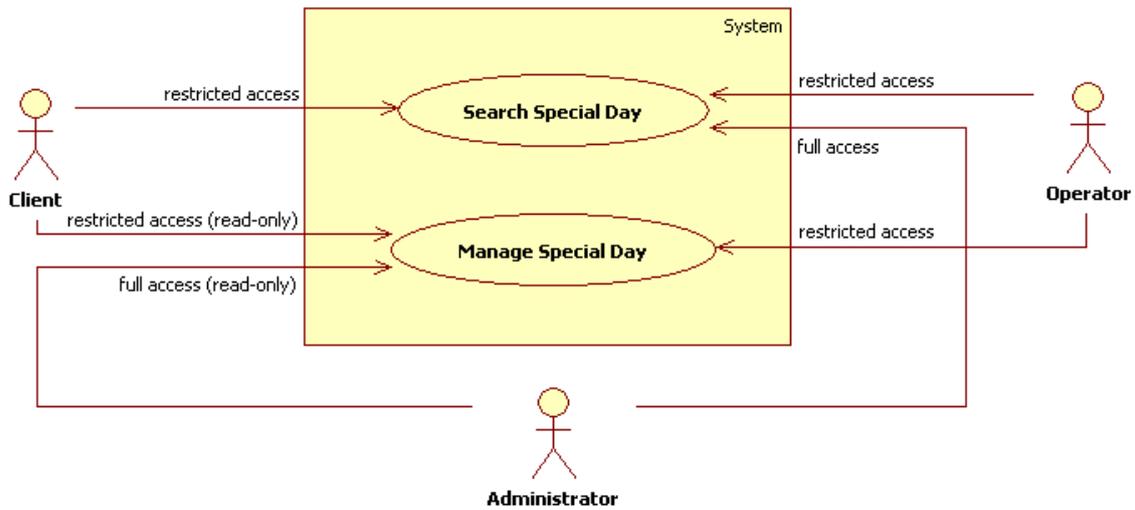


Figure 6: Special Day Management Diagram

In the Special Day Management use case users may search for Special Day definitions and act on them, depending on the permissions they have.

| USE CASE ID | UC 100 – Search Special Day |
|---------------------------------------|---|
| DESCRIPTION | A user may search for all Special Days that match a given query. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | The information matching the search criteria is displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Public Lighting</i> option and then selects the <i>Special Days</i> sub-option; 3. A search screen is presented to the user displaying all Special Days registered in the application by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria. |
| ALTERNATE FLOW (Search Returned No | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the |

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| Results) | <p>user;</p> <p>2. The data grid is replaced by a message stating that no results matching the search criteria were found.</p> |
| SAFEGUARDS | <ul style="list-style-type: none"> Available Special Days must be restricted to those the user is allowed to access from its Operational Area, if the user is a Client or an Operator. An Administrator may search for any special day. |

6.1.1.1.1 Manage Special Day Use Cases

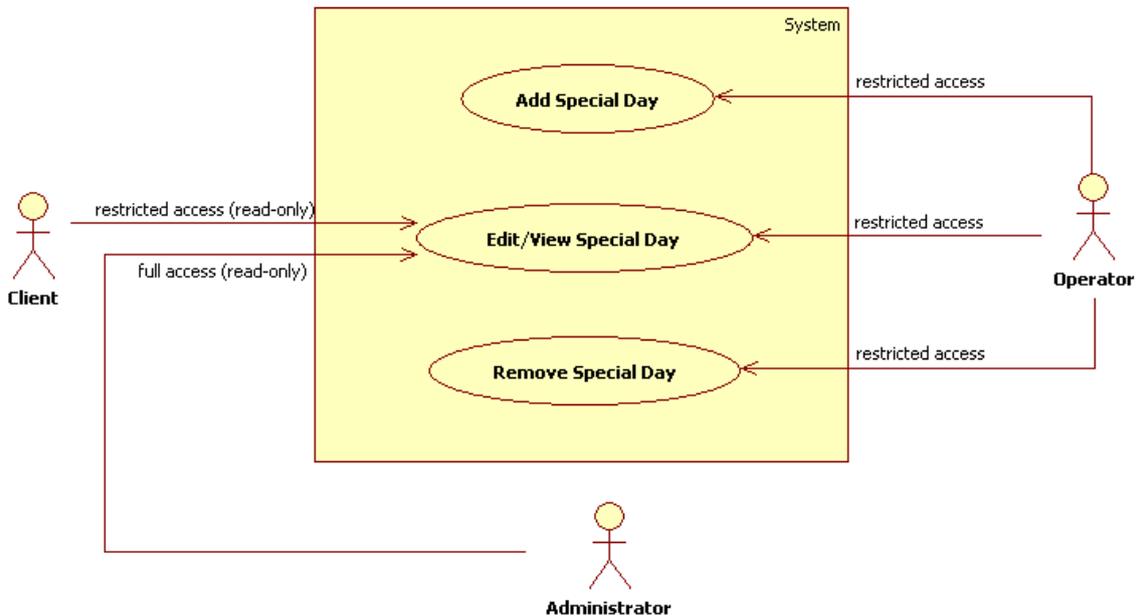


Figure 7: Manage Special Day Diagram

An Operator may act on Special Day definitions either by creating, updating or deleting them. Both Administrator and Client are only allowed to view the information.

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| USE CASE ID | UC 110 – Add Special Day |
| DESCRIPTION | User adds Special Day to the platform. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. The creation of Special Days is always performed within a detail page of a Profile, Group or DTC. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Smart Lighting DB has been updated with the new Special Day and assigned to the proper Profile, Group, or DTC. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user hits the <i>Add Special Day</i> button present in any of the detail pages for a Profile, Group or DTC; The <i>Add Special Day</i> page is displayed; The user enters the name for that Special Day and |

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| | <p>sets the date;</p> <ol style="list-style-type: none"> 4. The user hits the button <i>Save</i>; 5. The Special Day will be assigned to the appropriate Profile, Group, or DTC it was called from; 6. The application goes back to the original page where the new Special Day can be seen as being created. |
| ALTERNATE FLOW (Cancel Special Day Creation) | <ol style="list-style-type: none"> 1. In the step 4 of the normal flow, the user hits the button <i>Cancel</i> instead; 2. The original page is reloaded and no new Special Day record is presented to the user. |
| SAFEGUARDS | <ul style="list-style-type: none"> • The Special Day may only be assigned to Profiles, Groups, DTCs the user has access to. • Only existing dates in the future must be allowed. • Available Profiles, Groups, DTC must be restricted to those the user is allowed to from his Operational Area. • The operation is recorded into an audit log. |

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| USE CASE ID | UC 120 – Edit/View Special Day |
| DESCRIPTION | The use case explains how to get access to the detail page of a Special Day record. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • The user may access this functionality from any of the pages that display Special Day records. These pages are: <ul style="list-style-type: none"> ○ The <i>Search Special Day</i> page; ○ The <i>Profile Details</i> page; ○ The <i>Group Details</i> page; ○ The <i>DTC Details</i> page. • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The Smart Lighting DB has been updated with the new Special Day definitions and assigned to the proper Profile, Group, or DTC. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses one of the pages that contains references to Special Days records (ex. the <i>Search Special Day</i> page); 2. The user clicks on the name of the Special Day whose details he wants to access; 3. The application displays the page containing the details of the selected Special Day record; 4. If the user is not an Operator he cannot change anything; 5. If the user is an Operator he may change any of the |

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| | <p>attributes of the Special Day record;</p> <ol style="list-style-type: none"> The user presses the <i>Save</i> button; The application goes back to the page where the Special Day record was accessed from; |
| ALTERNATE FLOW (The user accessing the special day detail is a Client) | <ol style="list-style-type: none"> In the step 3 of the normal flow, the user is not allowed to change anything; The user hits the button <i>Go Back</i>; The application goes back to the page where the Special Day record was accessed from; |
| ALTERNATE FLOW (Cancel Special Day Edition) | <ol style="list-style-type: none"> In the step 6 of the normal flow, the user hits the button <i>Cancel</i> instead; The application goes back to the page where the Special Day record was accessed from; |
| SAFEGUARDS | <ul style="list-style-type: none"> Both Clients and Operators may only access Special Days that are stored in their operation areas. Only Operator users may edit Special Day settings. An Administrator may view any Special Day- Only existing dates in the future must be allowed for update. The operation is recorded into an audit log. |

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| USE CASE ID | UC 130 – Remove Special Day |
| DESCRIPTION | The use case explains how a Special Day record may be deleted from the system. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> The user may access this functionality from any of the pages that display Special Day records. These pages are: <ul style="list-style-type: none"> The <i>Search Special Day</i> page; The <i>Profile Details</i> page; The <i>Group Details</i> page; The <i>DTC Details</i> page. A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Smart Lighting DB has been updated by deleting the Special Day and removing any assignments to the Profile, Group, or DTC that existed. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses one of the pages that contains references to Special Days records (ex. the <i>Search Special Day</i> page); On the Special Day data grid, the user selects the action <i>Remove</i> of a specific Special Day record; A popup window is displayed for the user to confirm the execution of the action; The user presses the <i>OK</i> button; The Special Day data grid is reloaded and the |

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| | Special Day that was removed does not show anymore. |
| ALTERNATE FLOW (Cancel Special Day Removal) | <ol style="list-style-type: none"> In the step 4 of the normal flow, the user hits the button <i>Cancel</i> instead; The Special Day data grid remains unchanged. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only an Operator user may delete Special Days. The user may only access Special Days that belong to his Operational Area. The operation is recorded into an audit log. |

6.1.1.2 DTC Management Use Cases

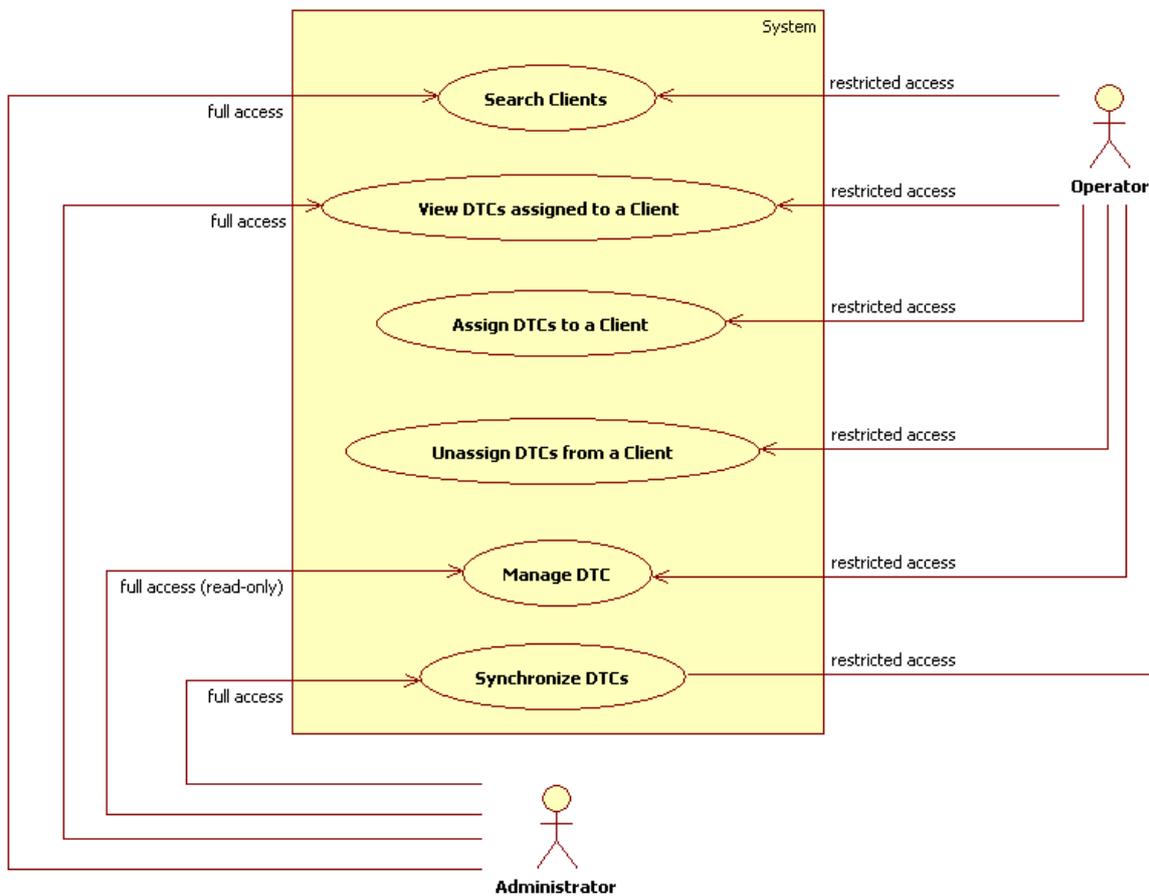


Figure 8: DTC Management Diagram

The DTC Management use case defines the functions used to manage DTCs that are assigned to Clients i.e. that are under their responsibility. The Operator has full access to the DTCs that belong to his area of responsibility. The Administrator may view any DTC that exists in the systems but cannot promote any changes on their data.

One of the most important functions of this set of use cases is the ability to synchronize DTCs with the information being manipulated by the users. This operation is often called *DTC upload*.

| USE CASE ID | UC 140 – Search Client |
|--|---|
| DESCRIPTION | This use case explains how an authorized user may search for specific public lighting Clients in order to see all DTCs that are associated with them. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The requested information is displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Public Lighting</i> option and then selects the <i>Search Client</i> sub-option; 3. A search screen is presented to the user displaying all Clients registered in the application by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; 2. The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Administrator and Operator users may search for clients. • The Operator may only access information about the clients he has the right to. • The Administrator may search for any Client. |

| USE CASE ID | UC 150 – View DTCs Assigned to a Client |
|-----------------|---|
| DESCRIPTION | This use case explains how an authorized user can display all DTCs assigned to a Client. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The Client's DTCs are displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. From the <i>Search Clients</i> page results set, the user chooses a Client and clicks on its name; 2. The application shows the page containing the list of DTCs that are currently assigned to that Client, by |

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| | <p>means of a paginated data grid;</p> <p>3. The user may navigate back and forth on the result set, assign new DTCs to this Client or unassign DTCs from this Client.</p> |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Administrator and Operator users may view the DTC's assigned to a Client. • The Operator may only access information about the Clients he has the right to. • The Administrator can view any DTC assignment. |

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| USE CASE ID | UC 160 – Assign DTCs to a Client |
| DESCRIPTION | This use case explains how an authorized user may assign DTCs to a Client. |
| ACTORS | <ul style="list-style-type: none"> • Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. • Available DTCs concern only to public lighting. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The DTC is assigned to the Client. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses page containing the DTCs assigned to a client by following the UC140 and UC150 normal flows; 2. The user hits the <i>Assign DTCs</i> button; 3. The application shows a global DTC search page; 4. The user enters a search criteria for finding the DTCs he wants to assign to the current Client; 5. From the result set, the user selects all DTCs to be assigned and click the <i>Assign</i> button; 6. The application prompts the user to acknowledge the operation; 7. The user selects the <i>OK</i> button; 8. The selected DTCs become assigned to the current Client and the application returns to the page containing the Client DTCs. |
| ALTERNATE FLOW (Cancel Assignment) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, the user chooses the <i>Cancel</i> button instead; 2. The application remains on the same page without changing anything. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • The user may only assign DTCs that belong to his operational area. • The user may only update the information of Clients that belong to his operational area. • Available DTCs concern only to public lighting. |

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| | <ul style="list-style-type: none"> The operation is recorded into an audit log. |
| USE CASE ID | UC 170 – Unassign DTCs from a Client |
| DESCRIPTION | This use case explains how an authorized user may unassign DTCs from a Client. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The association between the DTC and the Client is removed. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses page contained the DTCs assigned to a Client by following UC140 and UC150 normal flows; The user selects the <i>Unassign</i> action of the record belonging to the DTC he wants to unassign; The record belonging to that DTC is removed from the list. |
| ALTERNATE FLOW (Multiple Unassignment) | <ol style="list-style-type: none"> In the step 2 of the normal flow, the user hits the <i>Assign DTCs</i> button; The application shows a global DTC search page; The user enters a search criteria for finding the DTCs he wants to unassign from the current Client; From the result set, the user selects all DTCs to unassign and click the <i>Unassign</i> button; The application prompts the user to acknowledge the operation; The user selects the <i>OK</i> button; The selected DTCs become unassigned from the current Client and the application returns to the page containing the client DTCs. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. The user may only update the information of Clients that belong to his operational area. The operation is recorded into an audit log. |

| | |
|--------------------|--|
| USE CASE ID | UC 175 – Synchronize DTCs |
| DESCRIPTION | This use case shows how the changes introduced into the Smart Lighting System are transmitted to the underlying DTCs. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Schedule, Offset and Special Days information is sent to the DTCs. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses the <i>Synchronize DTCs</i> page; |

| | |
|-------------------------------|--|
| | <ol style="list-style-type: none"> 2. A list of all DTCs that need to be synchronized is shown to the user; 3. The user hits the <i>Synchronize</i> button; 4. The system kicks off the synchronization process; 5. The user may keep track on the status of the synchronization process by inspecting the <i>DTC Synchronization Status</i> report described by UC 570. |
| <p>ALTERNATE FLOW ()</p> | |
| <p>SAFEGUARDS</p> | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • The user may only synchronize DTCs that belong to his Operational Area. • The operation is recorded into an audit log. |

6.1.1.2.1 Manage DTC Use Cases

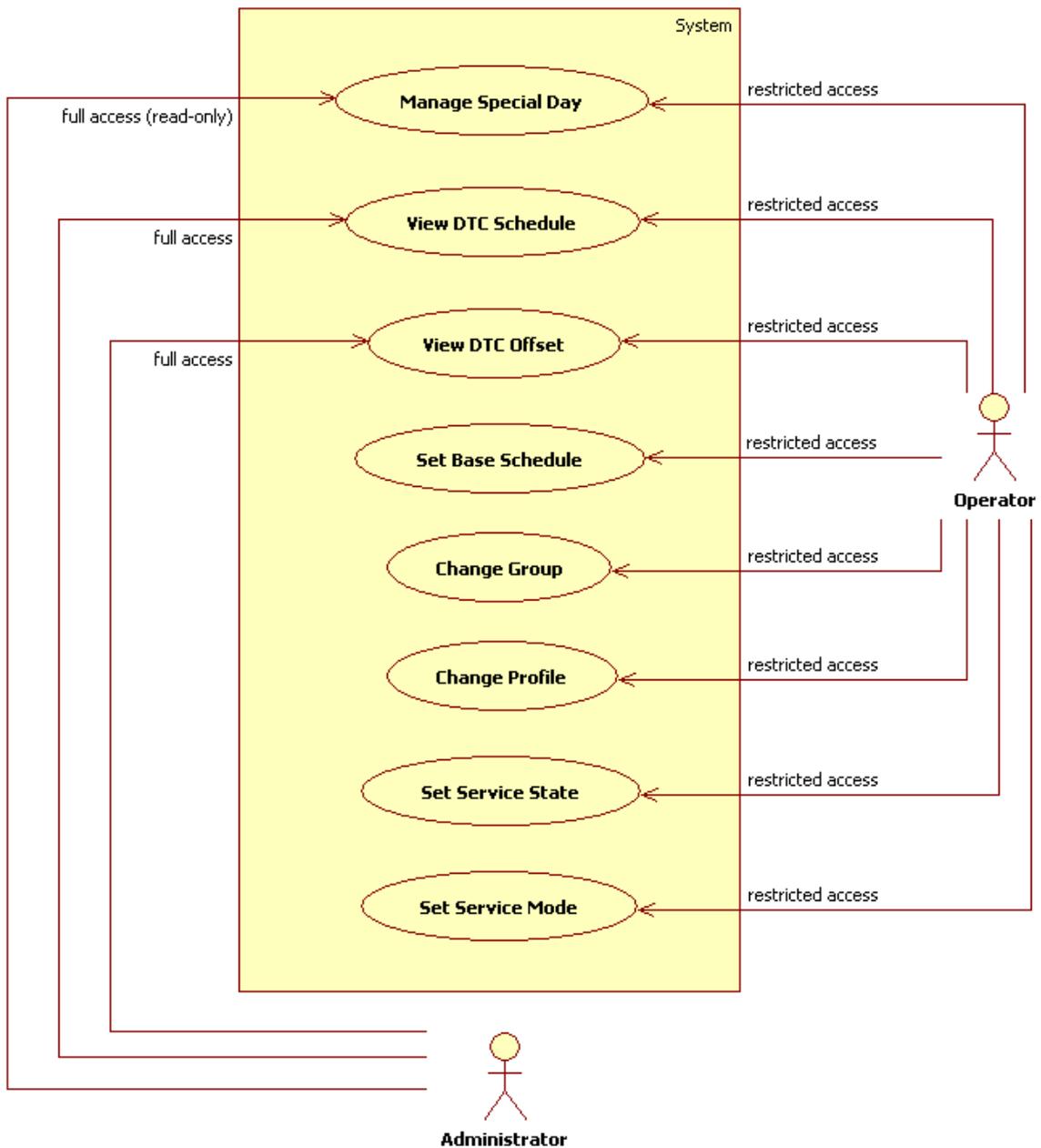


Figure 9: Manage DTC Diagram

Managing a DTC consists in either updating its public lighting settings or act directly on it by sending controls.

| | |
|--------------------|--|
| USE CASE ID | UC 175 – Manage Special Day |
| DESCRIPTION | An Operator may act on Special Day definitions either by creating, updating or deleting them. Both Administrator and Client are only allowed to view the information. Use Case specified in chapter 6.1.1.1.1 |

| USE CASE ID | UC 180 – View DTC Schedule |
|-----------------------|--|
| DESCRIPTION | This use case explains how an authorized user may access the Schedules that are configured for a particular DTC. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The DTC Schedule information is displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. From the list of Client DTCs, the user selects the DTC whose detail he wants to access; 2. On the <i>DTC Detail</i> page the user selects the <i>View Schedule</i> button; 3. The application displays the Schedules that are configured for that DTC: Base, Specific and Special Days. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator and Administrator users may perform this operation. • The Operator may only query DTCs that belong to his Operational Area. • The Administrator may query any DTC. |

| USE CASE ID | UC 190 – View DTC Offset |
|-----------------------|---|
| DESCRIPTION | This use case explains how an authorized user may access the Offset that is configured for a particular DTC. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The Offset information is shown to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. From the list of Client DTCs, the user selects the DTC whose detail he wants to access; 2. On the <i>DTC Detail</i> page the user selects the <i>View Offset</i> button; 3. The application displays the Offsets that are configured for each of the Services of that DTC. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator and Administrator users may perform this operation. • The Operator may only query DTCs that belong to his Operational Area. • The Administrator may query any DTC. |

| USE CASE ID | UC 200 – Change DTC Group |
|-----------------------|--|
| DESCRIPTION | This use case explains how an authorized user may change the Group a DTC is associated with directly from the <i>DTC Details</i> page. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC Group is changed accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the list of Client DTCs, the user selects the DTC whose detail he wants to access; On the <i>DTC Detail</i> page the user selects a different Group from the <i>Group</i> combo-box; The user hits the <i>Save</i> button; The DTC configuration is updated accordingly. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. The user may only act on DTCs that belong to his Operational Area. The operation is recorded into an audit log. |

| USE CASE ID | UC 210 – Change DTC Profile |
|-----------------------|---|
| DESCRIPTION | This use case explains how an authorized user may change the Profile a DTC is associated with directly from the <i>DTC Details</i> page. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC Profile is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the list of Client DTCs, the user selects the DTC whose detail he wants to access; On the <i>DTC Detail</i> page the user selects a different Profile (<i>Profile</i> combo-box), which may also force the selected Group to change as well (<i>Group</i> combo-box); The user hits the <i>Save</i> button; The DTC configuration is updated accordingly. |
| ALTERNATE FLOW () | - |
| SAFEGUARD | <ul style="list-style-type: none"> Only Operator users may perform this operation. The user may only act on DTCs that belong to his Operational Area. The operation is recorded into an audit log. |

| USE CASE ID | UC 220 – Set DTC Base Schedule |
|-----------------------|--|
| DESCRIPTION | This use case explains how an authorized user may change the base Schedule of a DTC from the <i>DTC Details</i> page. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC base Schedule is updated |
| NORMAL FLOW | <ol style="list-style-type: none"> From the list of Client DTCs, the user selects the DTC whose detail he wants to access; On the <i>DTC Detail</i> page the user selects a different base Schedule from the <i>Base Schedule</i> combo-box; The user hits the <i>Save</i> button; The DTC configuration is updated accordingly. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. The user may only act on DTCs that belong to his Operational Area. The operation is recorded into an audit log. |

| USE CASE ID | UC 230 – Set DTC Service State |
|-----------------|---|
| DESCRIPTION | This use case enables a user to send control instructions to one or more distant devices. In this use case it is possible to manually switch on or off the public lighting of one specific area. |
| ACTORS | <ul style="list-style-type: none"> Operator. |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation, The DTC must be in the MANUAL mode. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC Service state is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the list of Client DTCs, the user selects the DTC whose detail he wants to access; On the <i>DTC Detail</i> page the user clicks on the state of a Service of that DTC; A confirm dialog is shown asking for confirmation; The user confirms the action; The state changes to its opposite state (ex. from ON to OFF); After validation, the command will be send to the DTC; The command is executed; The DTC collects the result (confirmation process); The system processes the information; The new information is displayed on the Public Lighting Status Report. |

| | |
|--|--|
| ALTERNATE FLOW (User cancels operation) | <ol style="list-style-type: none"> At step 3 of the normal flow, the user decides to cancel the action; The command is not sent to the DTC; The DTC state remains unchanged. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. Only DTCs that are in MANUAL mode can have their state changed by the user. The user may only act on DTCs that belong to his Operational Area. The operation is recorded into an audit log. The state change event received from the DTC is recorded into the alarm log. |

| USE CASE ID | UC 240 – Set DTC Service Mode |
|--|---|
| DESCRIPTION | This use case behaves in the exact same way as the previous one. The difference is that the control is sent to change the Service mode of a particular DTC Service (ex. AUTO to MANUAL) instead of its state; |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC Service state is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the list of Client DTCs, the user selects the DTC whose detail he wants to access; On the <i>DTC Detail</i> page the user clicks on the mode of a Service of that DTC; A confirm dialog is shown asking for confirmation; The user confirms the action; The mode changes to its opposite state (ex. from AUTOMATIC to MANUAL); After validation, the command will be send to the DTC; The command is executed; The DTC collects the result (confirmation process); The system processes the information; The new information is displayed on the Public Lighting Status Report; |
| ALTERNATE FLOW (User cancels operation) | <ol style="list-style-type: none"> At step 3 of the normal flow, the user decides to cancel the action; The command is not sent to the DTC; The DTC mode remains unchanged. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. The user may only act on DTCs that belong to his Operational Area. |

6.1.1.3 Profile Management Use Cases

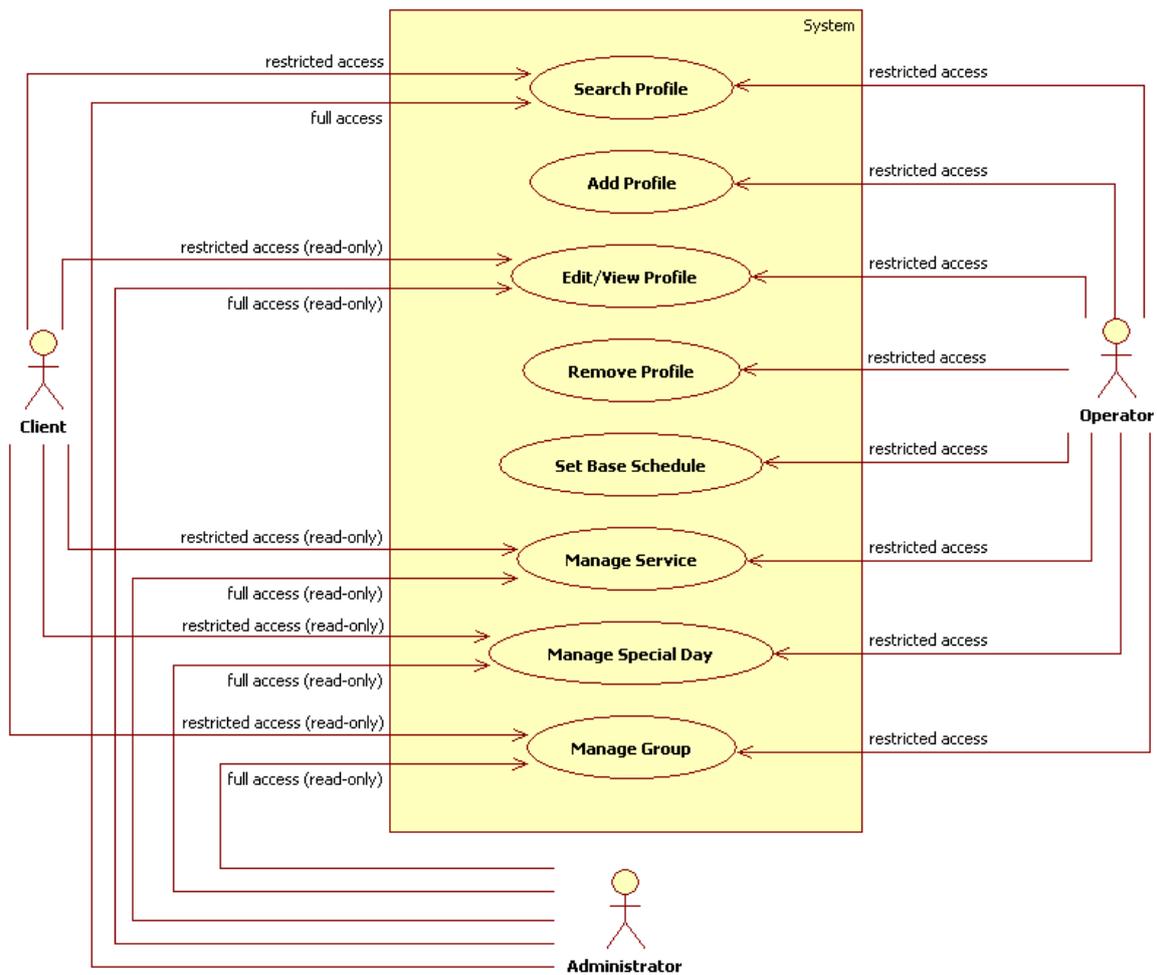


Figure 10: Profile Management Diagram

The Profile Management use cases comprise those functions that let users manipulate the Profile definitions. An Operator may only act on Profiles that belong to the same Operational Area as his own, whereas the Administrator may access all public lighting Profiles, but in read-only mode. The Client is only entitled to view profile information whose Operational Area matches the area of his own.

| USE CASE ID | UC 250 – Search Profile |
|-----------------|---|
| DESCRIPTION | This is used to search application’s public lighting Profiles. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The public lighting Profiles the user searched for are displayed. |

| | |
|-----------------------|---|
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user chooses the Profile option from the Smart Lighting application's menu; 2. A list with all the public lighting Profiles is shown; 3. In the <i>name</i> text field, the user writes part of the desired profile name, if needed uses the % wild card, and hits search; 4. The application refreshes the Profile's list and only the Profiles whose names match the typed one are shown. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> • The user may only access information he's allowed to. |

| | |
|---|---|
| USE CASE ID | UC 260 – Add Profile |
| DESCRIPTION | This action adds a new public lighting Profile to the application. |
| ACTORS | <ul style="list-style-type: none"> • Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • A new public lighting Profile is added to the system and associated to the user's Operational Area. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. User should hit <i>Add Profile</i> button present on the <i>Profile List</i> page; 2. <i>Add Profile</i> page is displayed; 3. User fills all needed fields and hits <i>Save</i>; 4. The application goes to the recently created <i>Profile's Detail</i> page. |
| ALTERNATE FLOW (Cancel Profile Creation) | <ol style="list-style-type: none"> 1. Anywhere between step 2 and 3 user hits <i>Cancel</i> button; 2. User is redirected to the <i>Profile's List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • The system should not allow the creation of more than one Profile with the same name for the same Operational Area. • The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 270 – Edit/View Profile |
| DESCRIPTION | This functionality displays and allows editing of application's Profile. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |

| | |
|---|--|
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Profile information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the <i>Profiles List</i> page, the user selects the Profile whose detail he wants to access; <i>Profile's Detail</i> page is shown; Editing is only allowed if the user is an Operator. If so changes to this Profile can be made; If changes were made the user hits <i>Save</i>. |
| ALTERNATE FLOW (Cancel Profile Change) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits <i>Cancel</i> button; User is redirected to the <i>Profile's List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may edit Profiles. An Operator may only update Profiles of his Operational Area. A Client may only view Profiles of his Operational Area. An Administrator may view any Profile. The operation is recorded into an audit log. |

| | |
|--|--|
| USE CASE ID | UC 280 – Remove Profile |
| DESCRIPTION | This functionality removes a specific public lighting Profile from the application. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Profile is removed from the application. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the Smart Lighting Profile's list hit remove for the desired Profile; A confirmation dialog is shown; User should hit <i>Ok</i>; Smart Lighting Profile's list is refreshed. The referred Profile is removed from the list and from the application. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> In step 3 user hits <i>Cancel</i>; Dialog box is closed without any modification. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only delete Profiles that belong to his Operational Area. Only Profiles without dependencies may be deleted. The operation is recorded into an audit log. |

| | |
|--|---|
| USE CASE ID | UC 290 – Set Base Schedule |
| DESCRIPTION | This functionality sets a Profile Base Schedule. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Profile information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> On the <i>Profile's Detail</i> page user chooses another Base Schedule from its combo-box; User hits <i>Save</i>. |
| ALTERNATE FLOW (Cancel Setting Profile Base Schedule) | <ol style="list-style-type: none"> In step 2 user hits <i>Cancel</i>; User is redirected to the <i>Profile's List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only update Profiles that belong to his Operational Area. Only Profiles without dependencies may be deleted. The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 295 – Manage Special Day |
| DESCRIPTION | <p>An Operator may act on Special Day definitions either by creating, updating or deleting them. Both Administrator and Client are only allowed to view the information.</p> <p>Use Case specified in chapter 6.1.1.1.1</p> |

6.1.1.3.1 Manage Service Use Cases

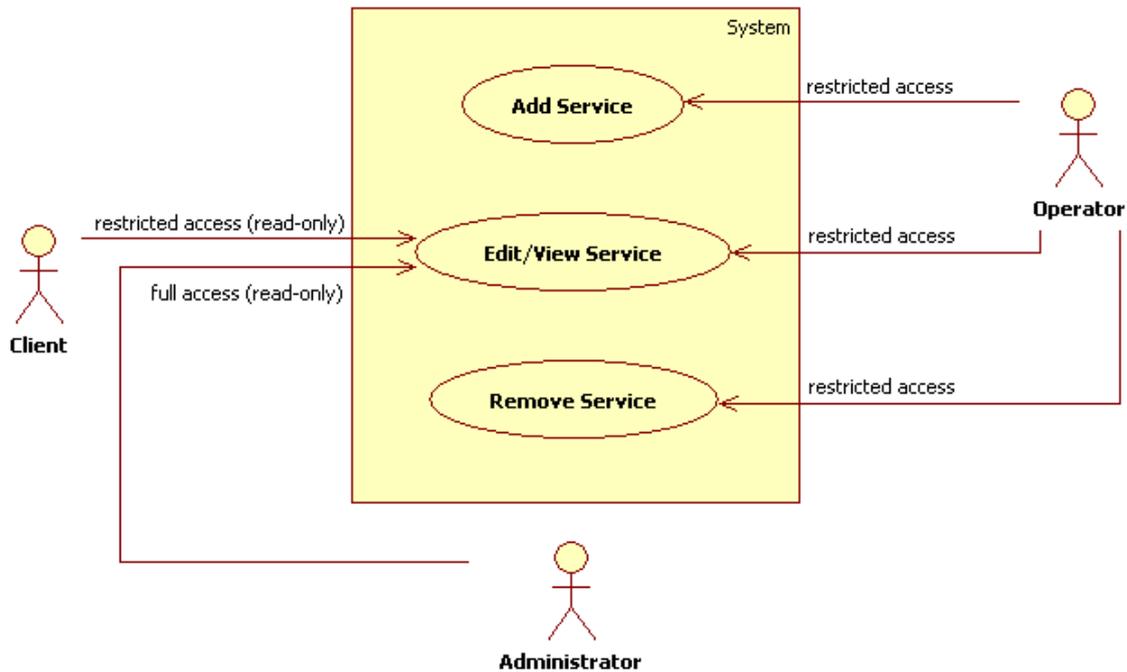


Figure 11: Manage Service Diagram

Managing a service may imply the creation, update and removal of a service. Administrators have full access to the information but only in read-only mode. Operators have read-write access to the information pertaining to their Operational Area whereas the Clients may only see the information they are bound to.

| USE CASE ID | UC 300 – Add Service |
|---|--|
| DESCRIPTION | Adds a public lighting Service to a specific public lighting Profile. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The new Service is added to the Profile. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the <i>Profile Detail</i> page hit <i>Add Service</i>; The <i>Add Service</i> page is displayed; The user sets its <i>name</i>, Schedule and Offset; The users hits <i>Save</i>; User goes back to the Profile detail page. |
| ALTERNATE FLOW (Cancel Service Creation) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits <i>Cancel</i>; User goes back to the <i>Profile Detail</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only update Profiles that belong to his Operational Area. |

| | |
|--|--|
| | <ul style="list-style-type: none"> The operation is recorded into an audit log. |
|--|--|

| | |
|--|---|
| USE CASE ID | UC 310 – Edit/View Service |
| DESCRIPTION | This functionality displays and allows editing of application's Service. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Service is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the <i>Profile's Details</i> page, the user selects the Service whose detail he wants to access; Services detail page is shown; Editing is only allowed if the user is an Operator. If so changes to this Service can be made; If changes were made the user hits <i>Save</i>. |
| ALTERNATE FLOW (Cancel Service Viewing) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits <i>Cancel</i> button; User is redirected to the Profile's list page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may edit Services. An Operator may only update Services that belong to Profiles of his Operational Area. A Client may only view the Services that belong to Profiles of his Operational Area. An Administrator may view Services from any Profile. The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 320 – Remove Service |
| DESCRIPTION | This functionality removes a determined public lighting Service from a Profile. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Service is removed from the Profile. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the Services list in <i>Profile Detail</i> page user hits remove on the desired Service; A confirmation dialog is shown; User should hit <i>Ok</i>; <i>Profile's Detail</i> page is refreshed. The referred public lighting Service is removed from from the current Profile. |

| | |
|--|---|
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> 1. In step 3 user hits <i>Cancel</i>; 2. Dialog box is closed. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • A user may only remove Services that belong to Profiles of his Operational Area. • The operation is recorded into an audit log. |

6.1.1.4 Manage Group Use Cases

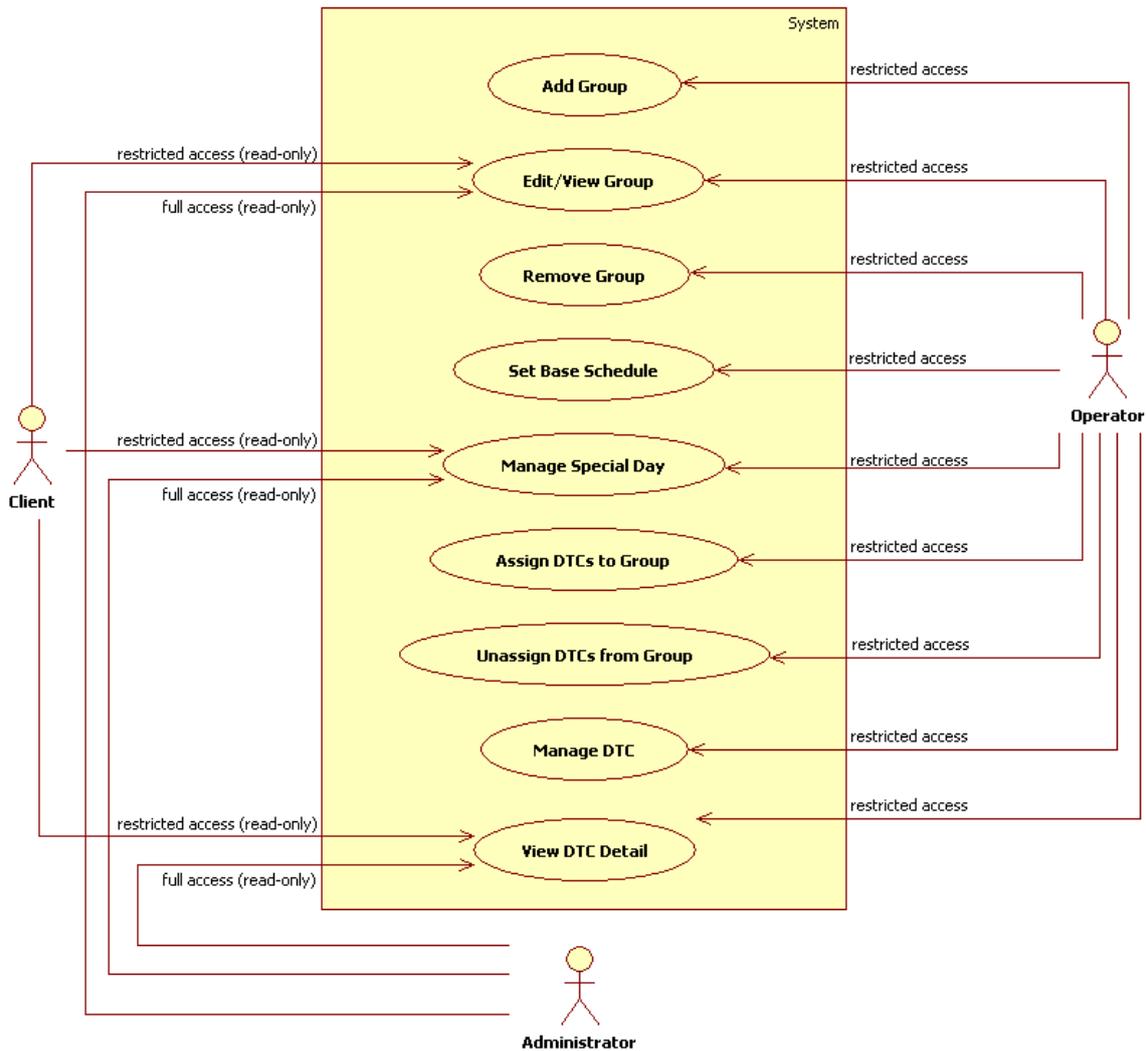


Figure 12: Manage Group Diagram

The Manage Group use case let users change the definitions of a Group (Operators) or, at least, access that information in a read-only fashion (Client and Administrators). With respect to the operations including DTCs, an Operator will only have access to those DTCs that belong to his Operational Area.

| USE CASE ID | UC 330 – Add Group |
|------------------------------------|---|
| DESCRIPTION | Adds a Group to a specific public lighting Profile. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> A new group is added to the Profile. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the <i>Profile Detail</i> page the user hits <i>Add Service</i>; The <i>Add Group</i> page is displayed; The user sets the <i>name</i>, Base Schedule and <i>description</i>; The users hits <i>Save</i>; User goes to the new <i>Group Detail</i> page. |
| ALTERNATE FLOW (Group Creation) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits <i>Cancel</i>; User goes back to the <i>Profile Detail</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only add Groups to Profiles of his Operational Area. The operation is recorded into an audit log. |

| USE CASE ID | UC 340 – Edit/View Group |
|--|---|
| DESCRIPTION | This functionality displays and allows editing of a Profile's Group. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Group information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the <i>Profiles Details</i> page, the user selects the Group whose detail he wants to access; <i>Group Detail</i> page is shown; Editing is only allowed if the user is an Operator. If so changes to this Group can be made; If changes were made the user hits <i>Save</i>. |
| ALTERNATE FLOW (Cancel Group Viewing) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits <i>Cancel</i> button; User is redirected to the <i>Profile's List</i> page; |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may edit Groups. Both Clients and Operators may only access Groups that belong to Profiles of their Operational Areas. Administrators may access Groups of any Operational Area. |

| | |
|--|--|
| | <ul style="list-style-type: none"> The operation is recorded into an audit log. |
|--|--|

| USE CASE ID | UC 350 – Remove Group |
|--|---|
| DESCRIPTION | This functionality removes a determined Group from a Profile. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Group is removed from the Profile. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the Group's list, in the public lighting <i>Profile's Detail</i> page, the user hits <i>Remove</i> for the desired Group; A confirmation dialog is shown; User should hit <i>Ok</i>; Public lighting <i>Profile's Detail</i> page is refreshed. The selected Group is removed from the list and from the application. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> In step 3 user hits <i>Cancel</i>; Dialog box is closed without any modification. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only delete groups from profiles of his operational area. The operation is recorded into an audit log. |

| USE CASE ID | UC 360 – Set Base Schedule |
|--|---|
| DESCRIPTION | This functionality sets a Group Base Schedule. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Group Base Schedule is updated. |
| NORMAL FLOW | <ol style="list-style-type: none"> On the <i>Group's Detail</i> page the user chooses from a specific combo-box another Base Schedule; User hits <i>Save</i>. |
| ALTERNATE FLOW (Cancel Setting Group Base Schedule) | <ol style="list-style-type: none"> Anywhere between step 1 and 2 user hits <i>Cancel</i>; User is redirected to the <i>Profile's Detail</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only modify Groups that belong to Profiles of his Operational Area. The operation is recorded into an audit log. |

| | |
|--------------------|--|
| USE CASE ID | UC 365 – Manage Special Day |
| DESCRIPTION | An Operator may act on Special Day definitions either by creating, updating or deleting them. Both Administrator and Client are only allowed to view the information. Use Case specified in chapter 6.1.1.1.1 |

| | |
|--|---|
| USE CASE ID | UC 370 – Assign DTCs to Group |
| DESCRIPTION | Assigns a DTC to a Group. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The DTC is assigned to the Group. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the <i>Group Detail</i> page the user hits <i>Add</i> under associated DTCs; A <i>DTC Search</i> page is displayed; If needed, the users use the search option, by setting all or part of the DTC name and clicking on <i>Search</i>; Mark the desired DTCs; Hit add selected; Click <i>Ok</i> on the confirmation dialog; <i>The current Group Detail</i> page is shown with all the newly assigned DTCs. |
| ALTERNATE FLOW (Cancel DTC Assignment) | <ol style="list-style-type: none"> Anywhere between step 2 and 5 user hits <i>Cancel</i>; User goes back to the <i>Group Detail</i> page. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> In step 6 user hits <i>Cancel</i>; Dialog box is closed without any modification. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may perform this operation. A user may only assign DTCs that belong to his Operational Area to Groups also contained into his Operational Area. The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 380 – Unassign DTCs from a Group |
| DESCRIPTION | Unassigns a DTC from a determined Group. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The association between the DTC and the Group is undone. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the <i>Group Detail</i> page the user hits <i>Add</i> under associated DTCs; A <i>DTC Search</i> page is displayed; |

| | |
|--|---|
| | <ol style="list-style-type: none"> 3. If needed, the user uses the search option, by setting all or part of the DTC name and clicking <i>Search</i>; 4. Mark three desired DTCs; 5. Hit <i>Remove</i> selected; 6. Click <i>Ok</i> on the confirmation dialog; 7. <i>Group Detail</i> page is shown without the selected DTCs. |
| ALTERNATE FLOW (Unassign DTC on list) | <ol style="list-style-type: none"> 1. In the DTCs list in <i>Group Detail</i> page user hits <i>Remove</i> on the desired DTC; 2. A confirmation dialog is shown; 3. User should hit <i>Ok</i>; 4. The current <i>Group's Detail</i> page is refreshed, and the selected DTC were removed from it. |
| ALTERNATE FLOW (Cancel DTC Unassignment) | <ol style="list-style-type: none"> 1. Anywhere between step 2 and 5 user hits <i>Cancel</i>; 2. User goes back to the <i>Group Detail</i> page. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> 1. In step 6 user hits <i>Cancel</i>; 2. Dialog box is closed without any modification. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • A user may act on DTCs that belong to his Operational Area. • The operation is recorded into an audit log. |

| | |
|--------------------|--|
| USE CASE ID | UC 385 – Manage DTC |
| DESCRIPTION | Managing a DTC consists in either updating its public lighting settings or act on it by sending controls. Use Case specified in chapter 6.1.1.2.1 |

| | |
|-----------------------|---|
| USE CASE ID | UC 390 – View DTC Detail |
| DESCRIPTION | This functionality displays the details of a DTC. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The information is displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. In a <i>Group's Detail</i> page user clicks on specific listed DTC; 2. <i>DTC Detail</i> page is shown. |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> • Both Clients and Operators may only access DTCs that belong to their Operational Areas. |

- An Administrator may view the details of any DTC.

6.1.1.5 Schedule Management Use Cases

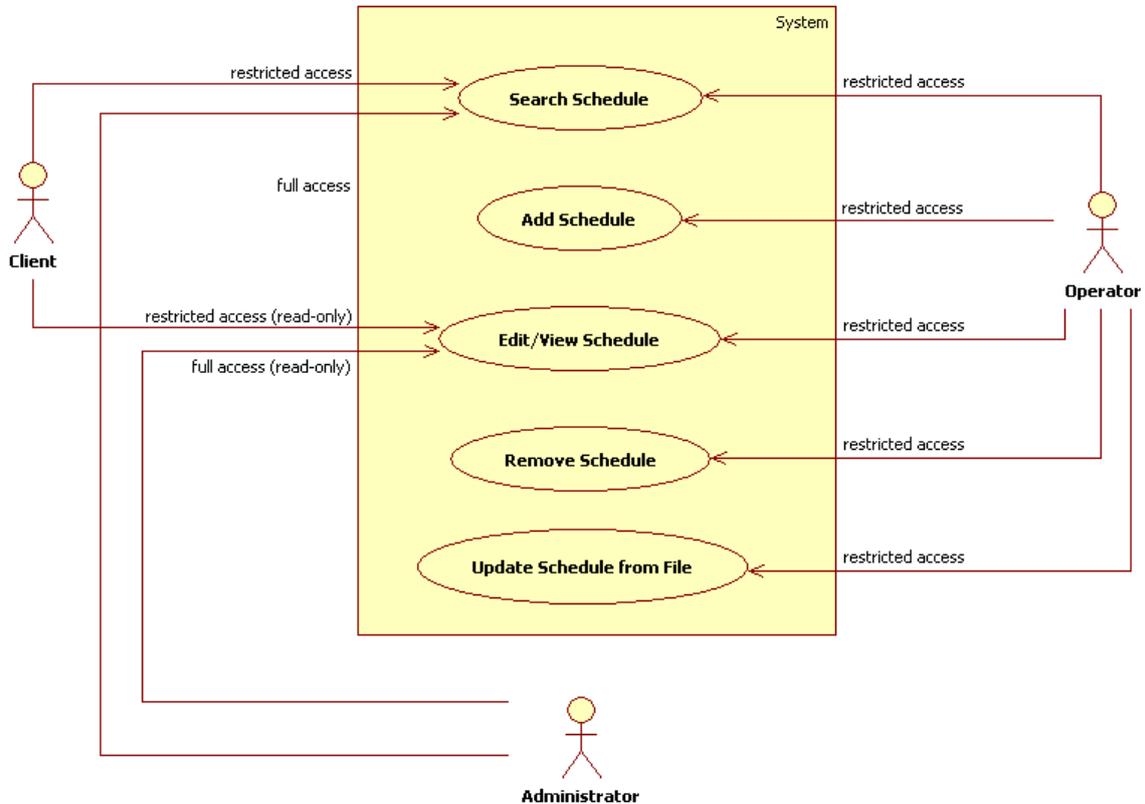


Figure 13: Schedule Management Diagram

The Schedule Management use cases define the functions that allow users to search, view, add, change or remove schedule definitions. The Client may access schedule information but not change, create or delete it.

| USE CASE ID | UC 400 – Search Schedule |
|-----------------|---|
| DESCRIPTION | This is used to search for application Schedules. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The list of Schedules that match the filtering criteria is shown to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user chooses the <i>Schedule</i> option from the Smart Lighting application’s menu; 2. A list with all the Schedules is shown; 3. In the <i>name</i> text field, the user writes part of the |

| | |
|-----------------------|---|
| | <p>desired Schedule name, if needed uses the % wild card, and hits <i>Search</i>;</p> <p>4. The application refreshes the Schedule list and only the Schedules whose names match the typed one are shown.</p> |
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> Both Clients and Operators may only view Schedules that belong to their Operational Area. An Administrator may search for any Schedule. |

| | |
|--|---|
| USE CASE ID | UC 410 – Add Schedule |
| DESCRIPTION | This action adds a new Schedule to the application. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> A new Schedule is added to the system and associated with the Operational Area of the user creating it. |
| NORMAL FLOW | <ol style="list-style-type: none"> User should hit <i>Add Schedule</i> button present on the <i>Schedules List</i> page; <i>Add Schedule</i> page is displayed; User fills all needed fields, generates/set the desired days timetable settings and hits <i>Save</i>; The application goes to the <i>Schedules List</i> page which now contains the recently created timetable. |
| ALTERNATE FLOW (Cancel Schedule Creation) | <ol style="list-style-type: none"> Anywhere between step 2 and 3 user hits <i>Cancel</i> button; User is redirected to the <i>Schedules List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users are allowed to create Schedules. It is not possible to create a new Schedule whose name matches the name of an existing Schedule for a particular Operational Area. The operation is recorded into an audit log. |

| | |
|--------------------|--|
| USE CASE ID | UC 420 – Edit/View Schedule |
| DESCRIPTION | This functionality displays and allows editing of an application's Schedule. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be |

| | |
|---|--|
| | authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Schedule information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the <i>Schedules List</i> page, the user selects the Schedule whose detail he wants to access; <i>Schedule's Detail</i> page is shown; Editing is only allowed if the user is an Operator. If so changes to this Schedule can be made; If changes were made hit <i>Save</i>. |
| ALTERNATE FLOW (Cancel Schedule Viewing) | <ol style="list-style-type: none"> Anywhere between step 2 and 4 user hits cancel button; User is redirected to the Schedules list page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users may edit Schedule information. It is not possible to create Schedules with dates in the past. Both Clients and Operators may only access Schedules that belong to their Operational Areas. An Administrator may view the details of any Schedule in the system. The operation is recorded into an audit log. |

| | |
|--|---|
| USE CASE ID | UC 430 – Remove Schedule |
| DESCRIPTION | This functionality removes a specific Schedule of the application. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Schedule is removed from the system. |
| NORMAL FLOW | <ol style="list-style-type: none"> In the Schedules list the user hits remove for the desired Schedule; A confirmation dialog is shown; User should hit Ok; Schedules list is refreshed. The referred Schedule is removed from the list and from the application. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> In step 3 user hits <i>Cancel</i>; Dialog box is closed without any modification. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator user may remove Schedules. Operators may only remove Schedules that belong to their Operational Areas. Only Schedules that are not in use by any Profile, Group, Service or DTC may be deleted. The operation is recorded into an audit log. |

| | |
|---|--|
| USE CASE ID | UC 440 – Update Schedule from File |
| DESCRIPTION | This functionality lets the user update the Schedule data based on information contained in a file. |
| ACTORS | <ul style="list-style-type: none"> • Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • Schedule is updated with time intervals specified in the file. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. In the Schedule page, available through the new Schedule option or after editing an existing Schedule, press <i>Insert</i> (in the action options) and <i>File</i> (in the Schedule type options) and hit <i>Choose File</i>; 2. In the open file dialog choose the desired file and hit <i>Ok</i>; 3. Several validations are made, if any fails a dialog is shown with the error line. Otherwise the page is refreshed and the new Schedule data is represented in it; 4. If this data is meant to be saved the user should hit <i>Save</i> otherwise <i>Cancel</i>. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> 1. Anywhere through step 1 to 4 user hits <i>Cancel</i>; 2. The file contents are ignored, and the Schedule settings remain the same. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may perform this operation. • A Schedule name is supposed to be unique. • Data is saved only if, after successfully importing a schedule file, user hits <i>Ok</i>. • The file contents should be valid both in terms of format and business logic (e.g. a timetable's ON time should be after the OFF time). • The operation is recorded into an audit log. |

6.1.1.6 Offset Management Use Cases

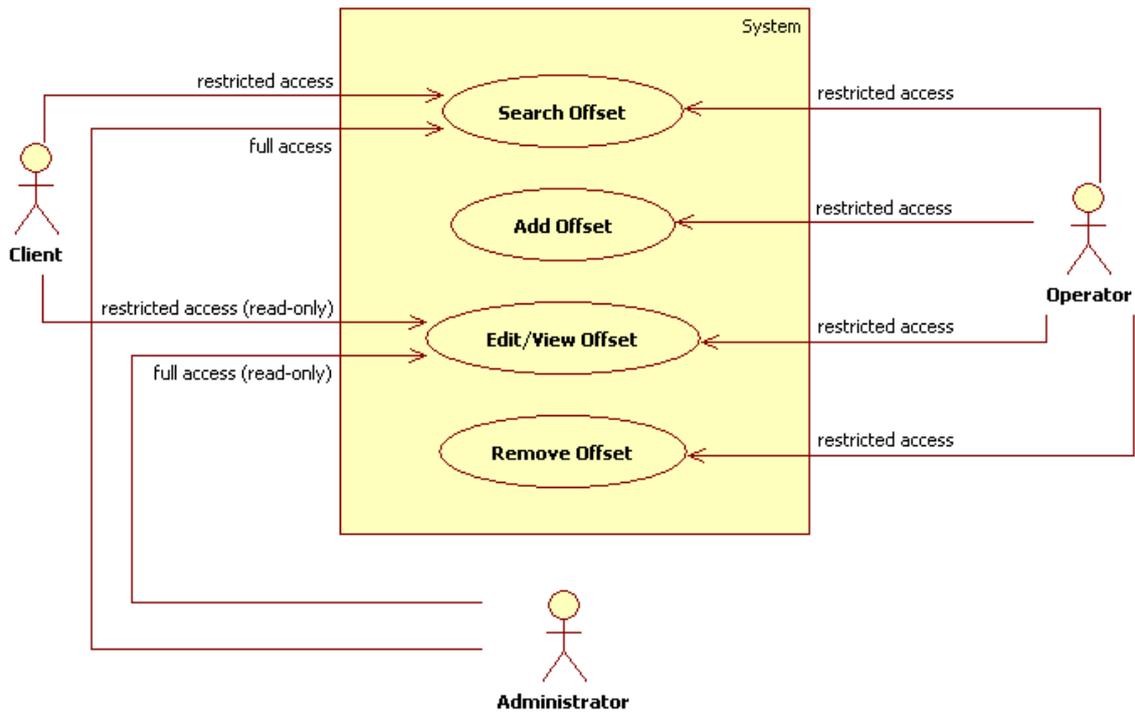


Figure 14: Offset Management Diagram

The Offset Management uses cases define the functions that allow users to search, view, add, change or remove offset definitions. The Client may access offset information but not act on it.

| USE CASE ID | UC 450 – Search Offset |
|-----------------|---|
| DESCRIPTION | This is used to search public lighting Offsets. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Offset list matching the filtering criteria is shown to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user chooses the <i>Offset</i> option from the Smart Lighting application’s menu; A list with all the Offsets is shown; In the <i>name</i> text field, the user writes part of the desired Offset name, if needed uses the % wild card, and hits <i>Search</i>; The application refreshes the Offsets list and only the Offsets which names are contained in the one written are show. |

| | |
|-----------------------|--|
| ALTERNATE FLOW () | - |
| SAFEGUARDS | <ul style="list-style-type: none"> Both Clients and Operators may only view Offsets that belong to their operational area. An Administrator may search for any Offset. |

| | |
|--|---|
| USE CASE ID | UC 460 – Add Offset |
| DESCRIPTION | This action adds a new Offset to the application. |
| ACTORS | <ul style="list-style-type: none"> Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> A new Offset is created into the system. |
| NORMAL FLOW | <ol style="list-style-type: none"> User should hit <i>Add Offset</i> button present on the <i>Offsets List</i> page; <i>Add Offset</i> page is displayed; User fills all needed fields and hits <i>Save</i>; The application goes to the <i>Offsets List</i> page which now contains the recently created Offset. |
| ALTERNATE FLOW (Cancel Offset Creation) | <ol style="list-style-type: none"> Anywhere between step 2 and 3 user hits <i>Cancel</i> button; User is redirected to the <i>Offset List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Operator users are allowed to create Offsets. It is not possible to create a new Offset whose name matches the name of an existing Offset for a particular Operational Area. The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 470 – Edit/View Offset |
| DESCRIPTION | This functionality displays and allows editing of an application's Offsets. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The Offset information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the <i>Offset's List</i> page the user clicks on a specific Offset; <i>Offset's Detail</i> page is shown; Editing is only allowed if the user is an Operator or an Administrator. If so, changes to this Offset can be made; |

| | |
|---|---|
| | 4. If changes were made the user hit <i>Save</i> . |
| ALTERNATE FLOW (Cancel Offset Viewing) | <ol style="list-style-type: none"> 1. Anywhere between step 2 and 4 user hits <i>Cancel</i> button; 2. User is redirected to the <i>Offset's List</i> page. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator users may edit Offset information. • The Offset value must be a positive number. • Both Clients and Operators may only access Offsets that belong to their Operational Area. • An Administrator may view any Offset in the system. • The operation is recorded into an audit log. |

| | |
|--|---|
| USE CASE ID | UC 480 – Remove Offset |
| DESCRIPTION | This functionality removes a determined Offset from the application. |
| ACTORS | <ul style="list-style-type: none"> • Operator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • To have access to this functionality, a user must be authenticated. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The Offset is removed from the system. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. In the Offsets list the user hits <i>Remove</i> for the desired Offset; 2. A confirmation dialog is shown; 3. User should hit <i>Ok</i>; 4. Offsets list is refreshed. The referred Offset is removed from the list and from the application. |
| ALTERNATE FLOW (Cancel confirmation dialog) | <ol style="list-style-type: none"> 1. In step 3 user hits <i>Cancel</i>; 2. Dialog box is closed without modifications. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Only Operator user may remove Offsets. • Operators may only remove Offsets that belong to their Operational Area. • Only Offsets that are not in use by any Service may be deleted. • The operation is recorded into an audit log. |

6.2 System Administration

The System Administration category comprises the functions related with the management of users and their data.

6.2.1 System Administration Use Cases

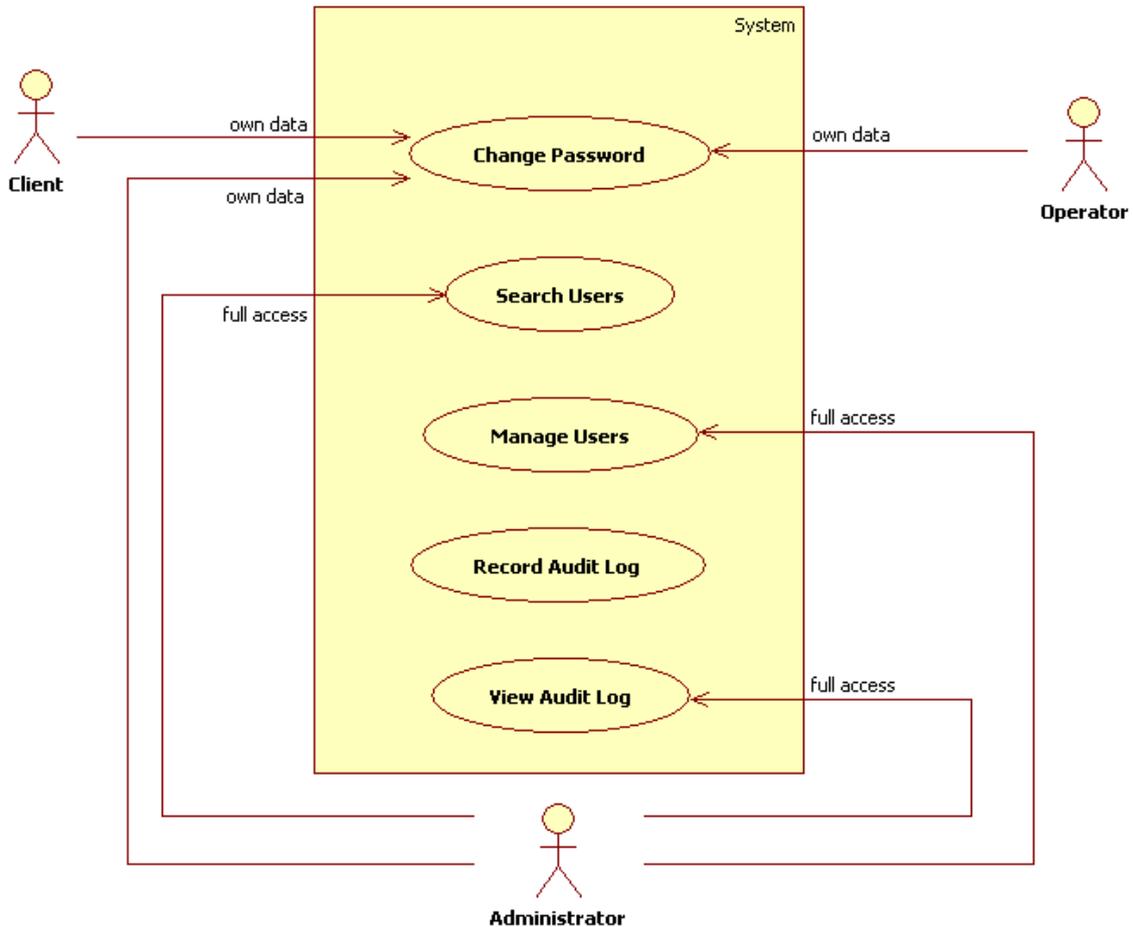


Figure 15: System Administration Diagram

The Administrator has full control over the System Administration functionalities, such as searching and managing users. The Change Password use case is available to all application users.

| | |
|-----------------------|--|
| USE CASE ID | UC 490 – Change Password |
| DESCRIPTION | A user may change its password. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |

| | |
|---|---|
| POST-CONDITIONS | <ul style="list-style-type: none"> The user password is updated. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses the Smart Lighting application via a web browser; From the top menu, the user selects the <i>Users</i> option and then selects the <i>Change Password</i> sub-option; The <i>Change Password</i> page is presented; The user enters the old password plus the new one (twice); The user hits the <i>Save</i> button; The application goes back to the application home page. |
| ALTERNATE FLOW (The user types the wrong old password) | <ol style="list-style-type: none"> In the step 4 of the normal flow, the user enters a wrong password for the old password; The application shows a warning popup stating that the password that was entered in not correct. |
| ALTERNATE FLOW (New password mismatch) | <ol style="list-style-type: none"> In the step 4 of the normal flow, the user enters a value in the new password confirmation box which is different from the one entered in the new password box; The application shows an error popup stating that the new password confirmation value is different from the new password value. |
| ALTERNATE FLOW (Cancel password change) | <ol style="list-style-type: none"> In the step 5 of the normal flow, the user presses the <i>Cancel</i> button instead; The application goes back to the application home page. |
| SAFEGUARDS | <ul style="list-style-type: none"> The operation is recorded into an audit log. User enters the new password twice in order to confirm the new value. |

| | |
|--------------------|--|
| USE CASE ID | UC 500 – Search User |
| DESCRIPTION | This functionality shows how an Administrator may search for specific users in order to check their details or act on them. |
| ACTORS | <ul style="list-style-type: none"> Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The list of users is displayed. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses the Smart Lighting application via a web browser; From the top menu, the user selects the <i>Users</i> option and then selects the <i>Manage Users</i> sub-option; The search user page is presented displaying all users registered in the application by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with |

| | |
|--|---|
| | <p>the data grid;</p> <ol style="list-style-type: none"> The user enters a search criteria and hits the <i>Search</i> button; The page reloads and shows the set of information matching the search criteria. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SECURITY REQUIREMENTS | <ul style="list-style-type: none"> Only Administrators may search for users. |

| | |
|-----------------------|---|
| USE CASE ID | UC 510 – Record Audit Log |
| DESCRIPTION | This use case describes the information that is stored into the audit log database as the users interact with the system. Since this operation is implicit, there are no actual actors involved. |
| ACTORS | <ul style="list-style-type: none"> None (implicit operation) |
| PRE-CONDITIONS | <ul style="list-style-type: none"> The user performs an operation that has impact on the system information. |
| POST-CONDITIONS | <ul style="list-style-type: none"> An audit log record is stored into the audit log database. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user performs an operation that must be stored into the system's audit log; The application stores the following information <ol style="list-style-type: none"> User performing the action; Timestamp; Action being performed; Result of the operation. |
| ALTERNATE FLOW () | - |
| SECURITY REQUIREMENTS | <ul style="list-style-type: none"> There's no way a user can bypass the record audit log process since it is a built-in system feature. |

| | |
|--------------------|--|
| USE CASE ID | UC 520 – View Audit Log |
| DESCRIPTION | An administrator may browse the audit log and analyse any operation performed by any user in the system. |
| ACTORS | <ul style="list-style-type: none"> Administrators |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The audit log information the administrator searched for is displayed. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses the Smart Lighting application via a web browser; |

| | |
|-----------------------|--|
| | <ol style="list-style-type: none"> 2. From the top menu, the user selects the <i>Administration</i> option and then selects the <i>View Audit Log</i> sub-option; 3. The search user page is presented displaying all audit log records registered in the application by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria. |
| ALTERNATE FLOW () | - |
| SECURITY REQUIREMENTS | <ul style="list-style-type: none"> • Only Administrator can access the audit log. |

6.2.2 Manage Users Use Cases

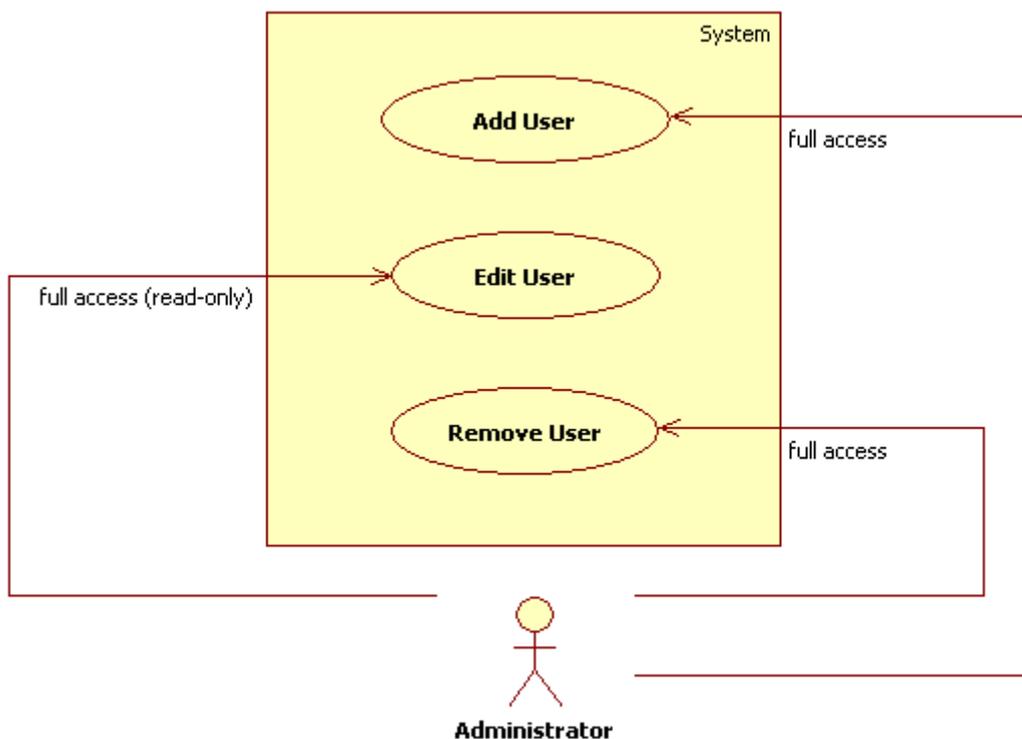


Figure 16: Manage Users Diagram

An Administrator may add, remove and update user information.

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|--------------------|--|
| USE CASE ID | UC 530 – Add User |
| DESCRIPTION | This functionality shows how an Administrator can add users. |

| | |
|--|--|
| ACTORS | <ul style="list-style-type: none"> Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> A new user is created into the system. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the search users page, the Administrator presses the <i>Add User</i> button; The application displays the user creation page to the Administrator; The Administrator is required to fill in the user information and whether the user is of type <i>Client</i>, <i>Operator</i> or <i>Administrator</i>; Upon completion, the Administrator presses the <i>Save</i> button; The new user is created and the application goes back to the search users page. |
| ALTERNATE FLOW (Mandatory fields are missing) | <ol style="list-style-type: none"> In the step 3 of the normal flow, the Administrator fails to fill in every required fields; After pressing the <i>Save</i> button, an error popup is displayed informing the user about the mandatory fields that were not filled in. |
| ALTERNATE FLOW (Cancel user creation) | <ol style="list-style-type: none"> In the step 4 of the normal flow, the Administrator chooses to press the <i>Cancel</i> button instead; The application goes back to the search users page and no user is created. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Administrator user may add new users. It is not possible to create more than one user with the same login. The operation is recorded into an audit log. |

| | |
|--------------------|---|
| USE CASE ID | UC 540 – Edit User |
| DESCRIPTION | This functionality shows how an Administrator can edit user information. |
| ACTORS | <ul style="list-style-type: none"> Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The user information is updated accordingly. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the search users page, the Administrator click on link embedded in the user name; The application displays the user edit page to the Administrator; The Administrator updates the user information; Upon completion, the Administrator presses the <i>Save</i> button; The user information is updated and the application goes back to the search users page. |
| ALTERNATE FLOW | <ol style="list-style-type: none"> In the step 3 of the normal flow, the Administrator |

| | |
|--------------------------------------|--|
| (Mandatory fields are missing) | <p>deletes one of the required fields;</p> <ol style="list-style-type: none"> After pressing the <i>Save</i> button, an error popup is displayed informing the user about the mandatory fields that were not filled. |
| ALTERNATE FLOW (Cancel edit user) | <ol style="list-style-type: none"> In the step 4 of the normal flow, the Administrator chooses to press the <i>Cancel</i> button instead; The application goes back to the search users page and the user information is left unchanged. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Administrator user may edit user information. Once created, the user login cannot be changed. The operation is recorded into an audit log. |

| USE CASE ID | UC 550 – Remove User |
|--|---|
| DESCRIPTION | This functionality shows how an Administrator can delete an user from the system. |
| ACTORS | <ul style="list-style-type: none"> Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The user is removed from the system. |
| NORMAL FLOW | <ol style="list-style-type: none"> From the search users page, the Administrator click on the <i>Remove</i> link of a specific user record; The application displays a confirmation dialog asking the user to acknowledge the operation; The Administrator presses the <i>OK</i> button; The user record is deleted and the application goes back to the search users page. |
| ALTERNATE FLOW (Cancel user deletion) | <ol style="list-style-type: none"> In the step 3 of the normal flow, the Administrator presses the <i>Cancel</i> button instead; The removal operation is cancelled and the application goes back to the search users page. |
| SAFEGUARDS | <ul style="list-style-type: none"> Only Administrator user may remove users. It is not possible for the Administrator to remove himself from the system. The operation is recorded into an audit log. |

6.3 Alarm Management

The Alarm Management functions allow users to be informed about abnormal situations that occur in the Smart Lighting System. These are not regular SCADA alarms, but rather information pertaining to the actual operation of the system, such as: communication problems, failed control execution or data synchronization problems.

6.3.1 Alarm Management Use Cases

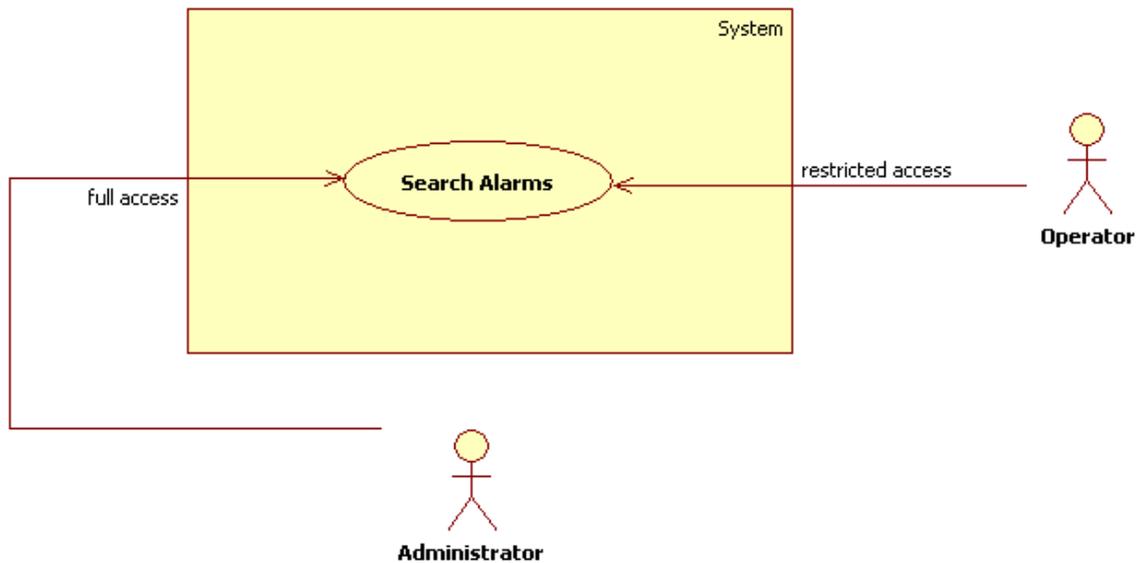


Figure 17: Alarm Management Diagram

| USE CASE ID | UC 560 – Search Alarms |
|--|---|
| DESCRIPTION | The alarm management use cases describe how alarms must be handled by the system and presented to the user. An alarm list is used to display outstanding information to the user, regarding the system he’s controlling. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The alarms are displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Alarms</i> option and then selects the <i>Search</i> sub-option; 3. The search alarms page is presented displaying all alarms received by the application by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; 2. The data grid is replaced by a message stating that |

| | |
|------------|--|
| | no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> Operator users may only view alarms related to events affecting their operational area. Administrators may view all alarms. |

6.4 Reporting

The Reporting category is comprised by the use cases for generating reports about the Smart Lighting System.

6.4.1 Reporting Use Cases

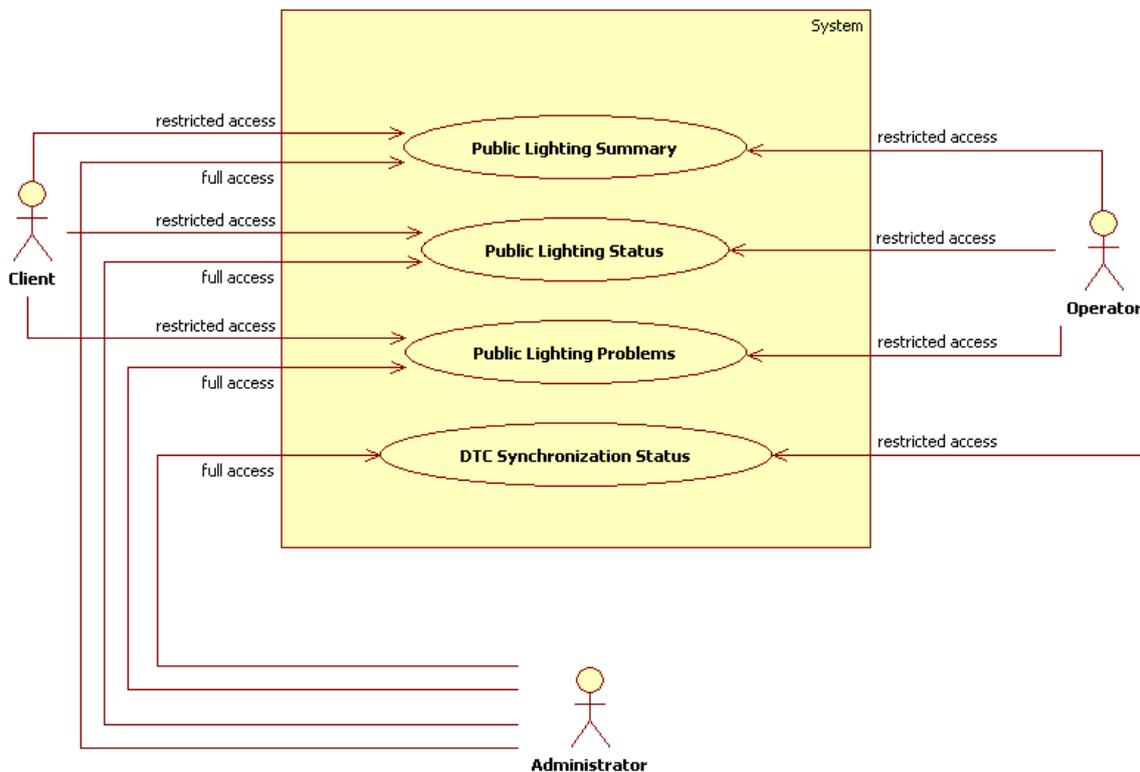


Figure 18: Reporting Diagram

The Client may access any of the reports that are used to understand the overall state of the Smart Lighting System: Summary, Status and Problems.

Both the Operator and the Administrator have access to one more report type; the one that contains the information about the DTC synchronization status.

The information access rules described earlier in this document also apply to the content of the reports being generated. Basically, the Administrator has access to the full set of information available whereas the Client and the Operator will only see the information concerning the Operational Area they are associated with.

| USE CASE ID | UC 570 – Public Lighting Summary |
|--|--|
| DESCRIPTION | The user uses this function to generate a Public Lighting Summary Report. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The report is generated and displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Public Lighting</i> option and then selects the <i>Reports</i> sub-option and then the <i>Summary</i> sub-option; 3. The report page shows up in the form of a search page, thus allowing the user to refine the result set, which is displayed by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria; 6. The user may choose to export the result set either to PDF or XLS files. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; 2. The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Operators and Clients may only view information related with their operational area. • Administrators may view all information. |

| USE CASE ID | UC 580 – Public Lighting Status |
|-----------------|--|
| DESCRIPTION | The user uses this function to generate a Public Lighting Status Report. |
| ACTORS | <ul style="list-style-type: none"> • Client • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The report is generated and displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Public</i> |

| | |
|--|---|
| | <p><i>Lighting</i> option and then selects the <i>Reports</i> sub-option and then the <i>Status</i> sub-option;</p> <ol style="list-style-type: none"> The report page shows up in the form of a search page, thus allowing the user to refine the result set, which is displayed by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; The user enters a search criteria and hits the <i>Search</i> button; The page reloads and shows the set of information matching the search criteria; The user may choose to export the result set either to PDF or XLS files. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> Operators and Clients may only view information related with their operational area. Administrators may view all information. |

| | |
|--------------------|---|
| USE CASE ID | UC 590 – Public Lighting Problems |
| DESCRIPTION | The user uses this function to generate a Public Lighting Problems Report. |
| ACTORS | <ul style="list-style-type: none"> Client Operator Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> The report is generated and displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> The user accesses the Smart Lighting application via a web browser; From the top menu, the user selects the <i>Public Lighting</i> option and then selects the <i>Reports</i> sub-option and then the <i>Problems</i> sub-option; The report page shows up in the form of a search page, thus allowing the user to refine the result set, which is displayed by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; The user enters a search criteria and hits the <i>Search</i> button; The page reloads and shows the set of information matching the search criteria; The user may choose to export the result set either to PDF or XLS files. |

| | |
|--|---|
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; 2. The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Operators and Clients may only view information related with their operational area. • Administrators may view all information. |

| USE CASE ID | UC 600 – DTC Synchronization Status |
|--|---|
| DESCRIPTION | The user uses this function to generate a DTC Synchronization Status Report. |
| ACTORS | <ul style="list-style-type: none"> • Operator • Administrator |
| PRE-CONDITIONS | <ul style="list-style-type: none"> • A valid login is required for performing this operation. |
| POST-CONDITIONS | <ul style="list-style-type: none"> • The report is generated and displayed to the user. |
| NORMAL FLOW | <ol style="list-style-type: none"> 1. The user accesses the Smart Lighting application via a web browser; 2. From the top menu, the user selects the <i>Public Lighting</i> option and then selects the <i>Reports</i> sub-option and then the <i>DTC Synchronization Status</i> sub-option; 3. The report page shows up in the form of a search page, thus allowing the user to refine the result set, which is displayed by means of a paginated data grid. The user may go back and forward by means of the page controls displayed with the data grid; 4. The user enters a search criteria and hits the <i>Search</i> button; 5. The page reloads and shows the set of information matching the search criteria; 6. The user may choose to export the result set either to PDF or XLS files. |
| ALTERNATE FLOW (Search Returned No Results) | <ol style="list-style-type: none"> 1. In the step 5 of the normal flow, there is no data available matching the search criteria entered by the user; 2. The data grid is replaced by a message stating that no results matching the search criteria were found. |
| SAFEGUARDS | <ul style="list-style-type: none"> • Operators may only view information related with their operational area. • Administrators may view all information. |