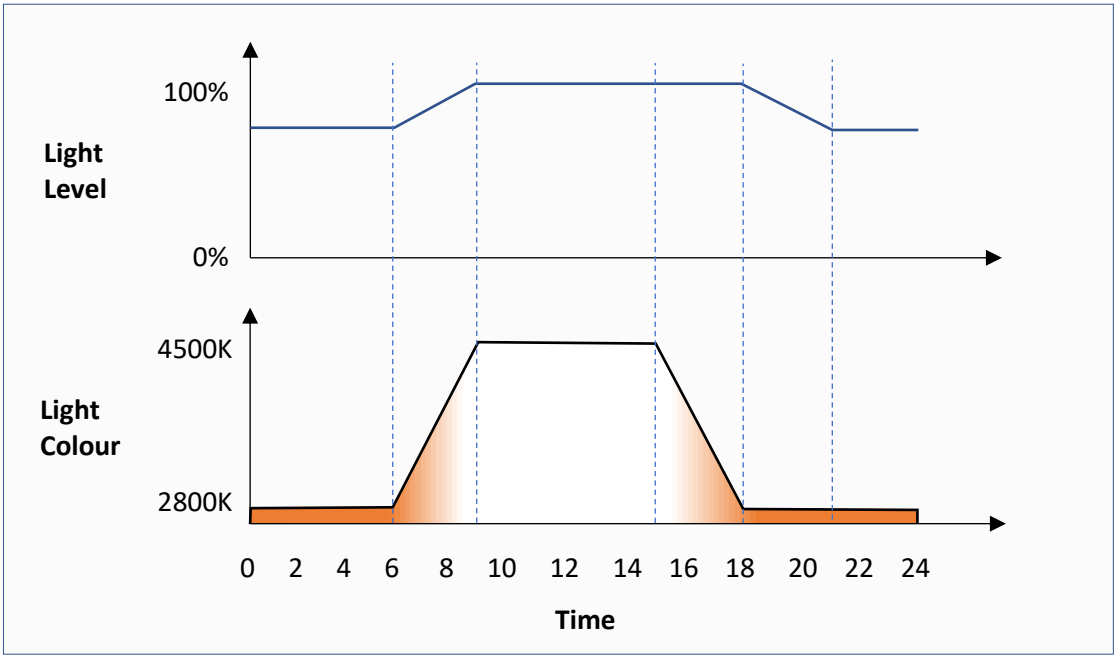
Introduction

Circadian Lighting is also known as human-centric, biodynamic, chronobiologic, biophilic, or melanopic lighting. It refers to the process of varying lighting levels and/or colour over the course of the day for the well-being of the room occupants.

A hypothetical example is shown below for the lighting control of an office space:



Hypothetical circadian lighting requirement for an office space

In this example, there are three changes to the lighting during the course of the day:

- 6AM: fade to 100% illumination, 4500K over 3 hours
- 3PM: fade to 2800K over 3 hours (no change in light level)
- 6PM: fade to 70% illumination over 3 hours (no change in colour)

DALI Type 8 Control Gear allows the setting of luminaire light level and colour, independently or together. The RAPIX system supports setting the colour in DALI Type 8 through a variety of means. Refer to App Note “APN-RAPIX-010 DALI Colour Control with RAPIX" for general details.

This Application Note describes the process of configuring the RAPIX system to use the circadian lighting example described above. This example configures DALI Devices 16 to 20 (DALI Group 4).

Configuring Circadian Lighting

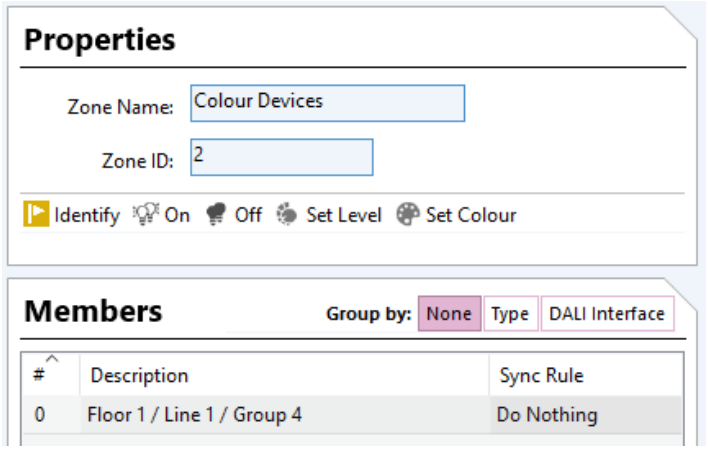
The simplest implementation of circadian lighting is by using ***Zone Controller schedules***.

A Zone Controller schedule event can change the lighting level and/or colour over periods up to many hours. This provides a very gradual transition that will not be noticeable by the occupants of an area.

For smaller sites that have no Zone Controllers, a similar solution can be achieved using the RAPIX eHub.

Circadian Lighting with RAPIX Zone Controllers

The first step is to put the DALI Devices (Group 4) into a RAPIX Zone.



RAPIX Zone containing the colour devices

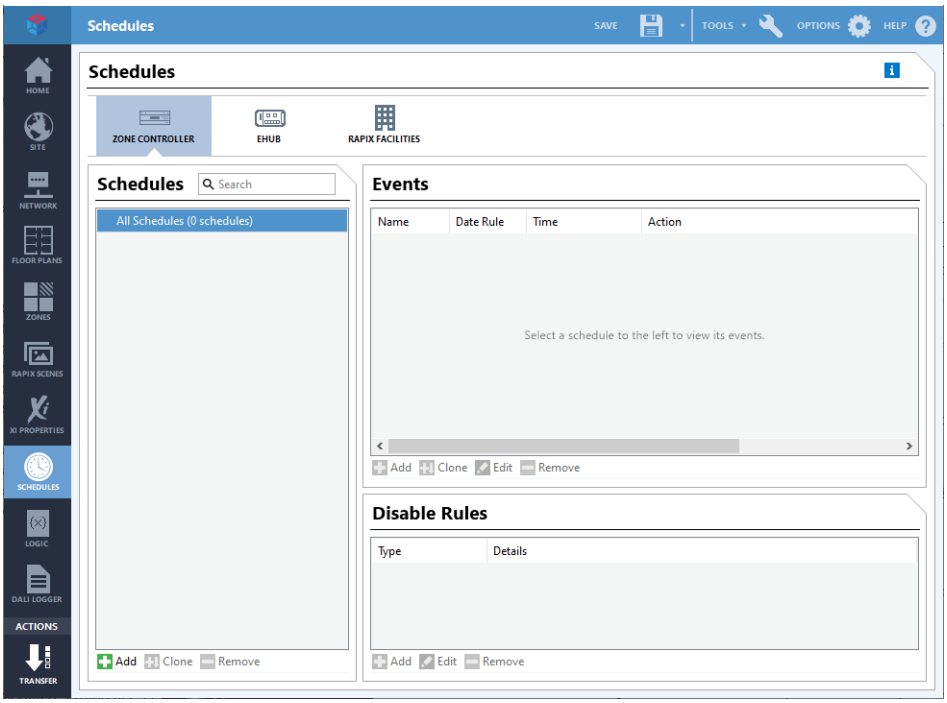
The second step is to create a schedule with the following events:

- 6AM: Fade Zone “Colour Devices” to 100% illumination, 4500K over 3 hours
- 3PM: Fade Zone “Colour Devices” to 2800K over 3 hours (no change in light level)
- 6PM: Fade Zone “Colour Devices” to 70% illumination over 3 hours (no change in colour)

For general information about creating schedules, refer to App Note “APN-RAPIX-014 RAPIX Schedules”.

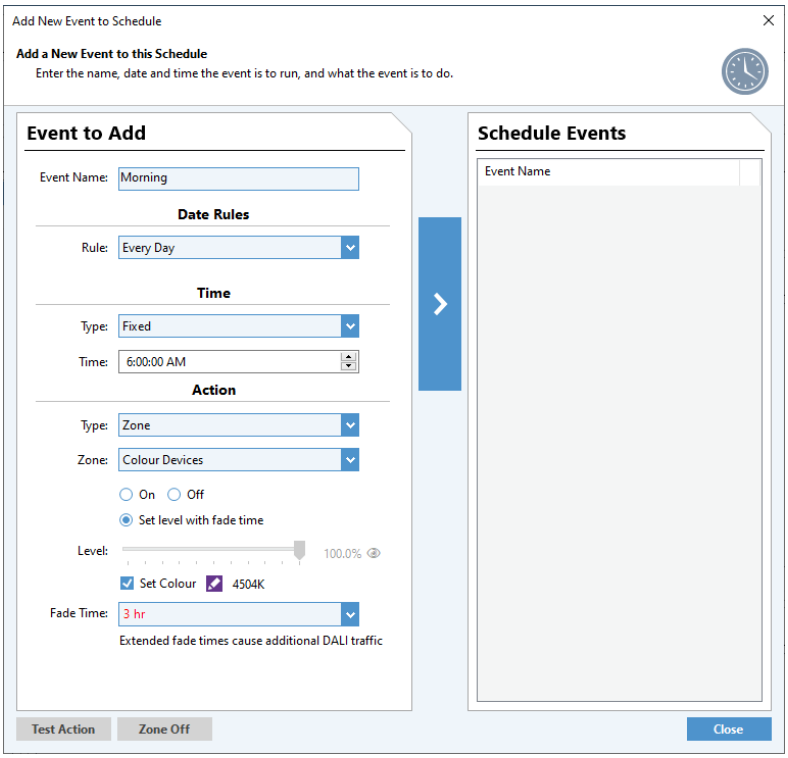
To add a schedule, select the **Schedules** tab and click on the **Add** button at the bottom of the Schedules panel.

Give the new schedule a name, then click on the **Add** button in the **Events** panel to add a new event.



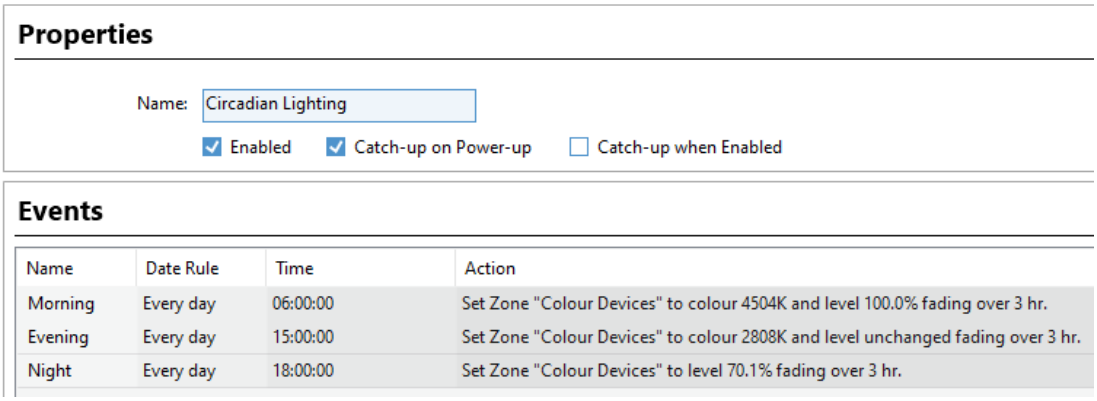
The schedules tab

Enter the details for the first event, then click on the > button to add the event to the schedule.



Adding the first schedule event

Repeat for all events.



The completed schedule

The final step is to transfer the updated project to the Zone Controller.

Variations

Colour Change Only

If the lighting level is controlled by wall switches or sensors, then the schedule events should be changed to set the colour only.

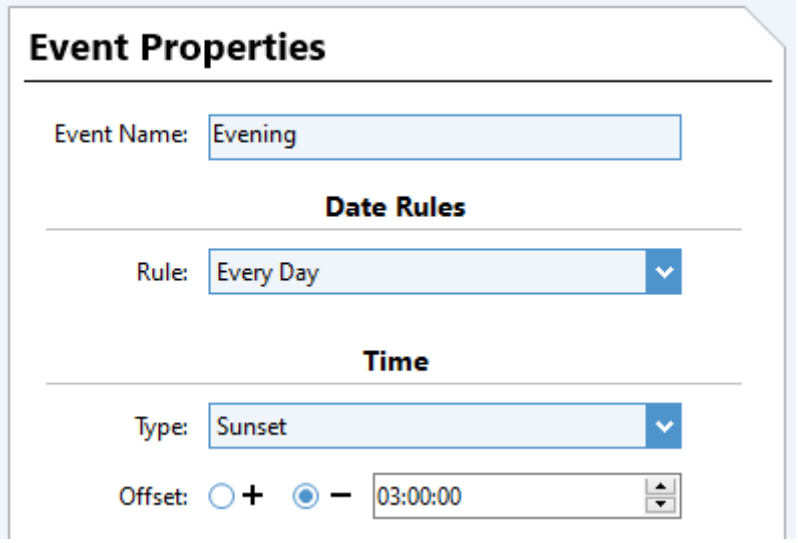
Sunrise/Sunset

The example uses fixed times for morning and evening. There may instead be a need for the lighting colour to change in relation to sunrise and sunset.

For this, the scheduled events might be something like this:

- Sunrise: Fade Zone “Colour Devices” to 100% illumination, 4500K over 3 hours
- Sunset – 3 hours: Fade Zone “Colour Devices” 2800K over 3 hours (no change in level)
- Sunset: Fade Zone “Colour Devices” to 70% illumination over 3 hours (no change in colour)

To create a schedule event based on sunrise or sunset, select the required details in the **Time** section of the schedule event editor:



Setting schedule event time for three hours before sunset

Circadian Lighting with RAPIX eHubs

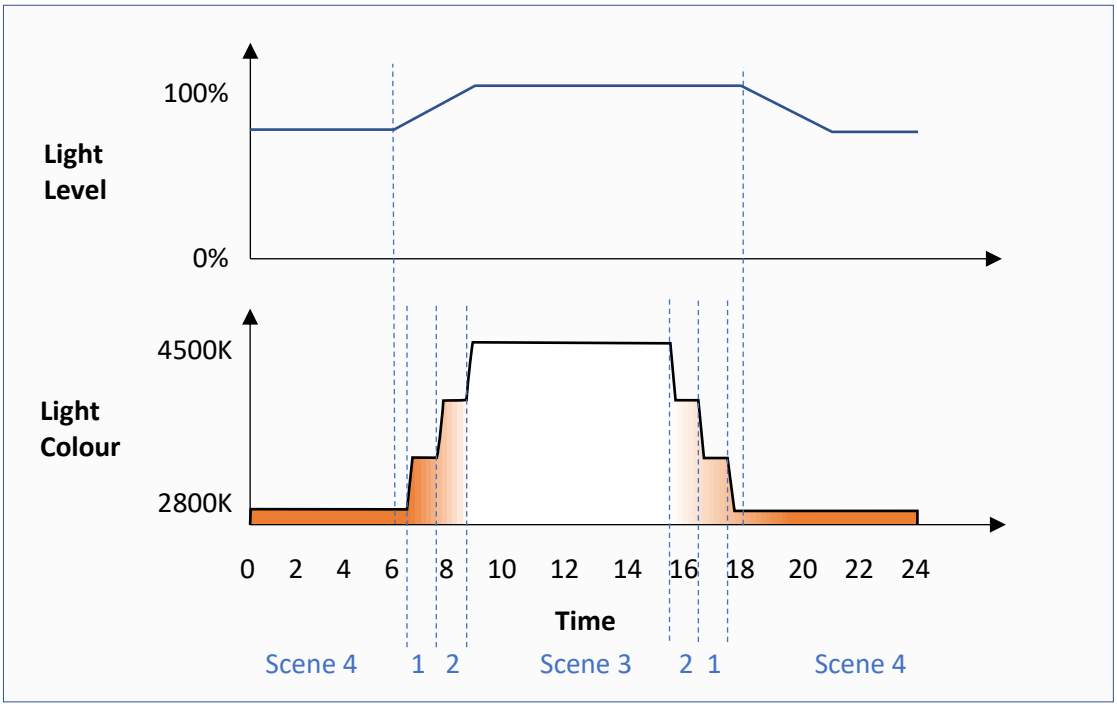
The schedules in a RAPIX eHub cannot set a lighting colour directly.

The process of configuring RAPIX eHubs for circadian lighting is:

1. Create DALI Scenes for the colour temperatures required.
2. Create RAPIX Scenes that use the DALI Scenes.
3. Create schedules to set the RAPIX Scenes at the required times.

Limitations

DALI Scenes only support fade times up to 90 seconds. The desired lighting colour profile will need to be approximated by a series of step changes. A small change in lighting over 90 seconds is not readily noticeable.



Modified circadian lighting requirement for use with DALI Scenes

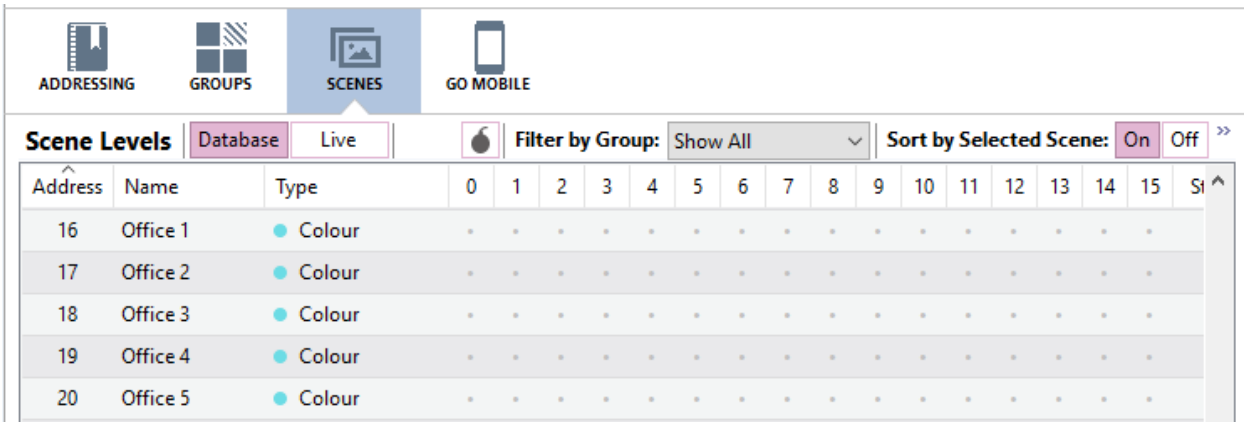
For this example, we are going to use four DALI Scenes as follows:

- DALI Scene 1: Colour = 3400K
- DALI Scene 2: Colour = 4000K
- DALI Scene 3: Colour = 4500K
- DALI Scene 4: Colour = 2800K

Configuring DALI Scenes

DALI Scene Tab

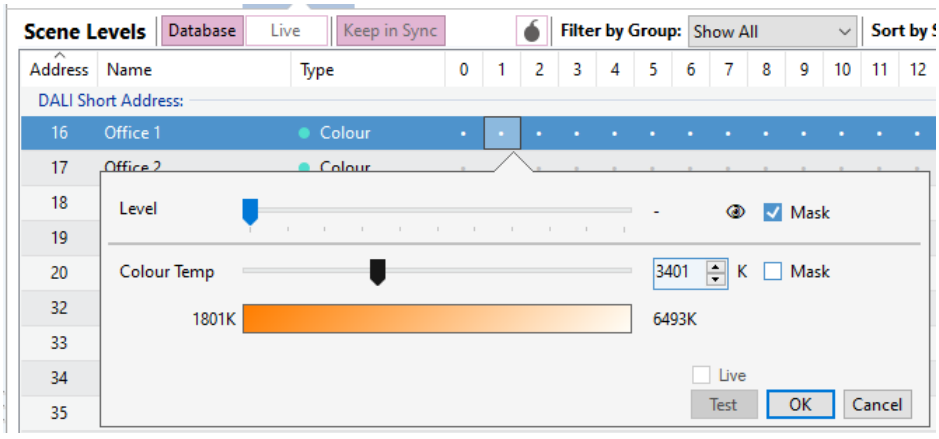
The simplest method of creating the DALI Scenes is to use the DALI Scene Tab.



The DALI Scene Tab

To set the details for DALI Scene 1:

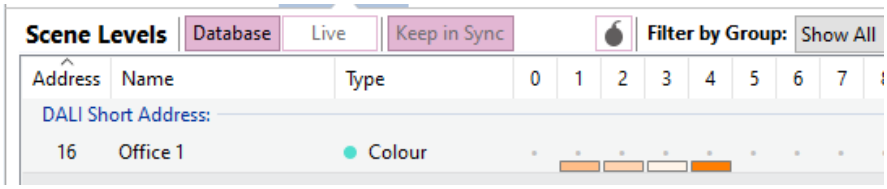
1. Click on the Scene 1 cell for the DALI device. The Scene Colour editor will appear.
2. Set the level to **MASK** (i.e. no change).
3. Set the colour temperature to 3400K by dragging the slider or using the numeric editor. Note that is not possible to select exactly 3400K – the nearest available is 3401K.
4. Click on **OK**, or anywhere off the colour editor form.



Editing a DALI Scene with colour 3400K

Repeat the process for DALI Scenes 2 to 4.

When complete, the grid shows all the DALI scene levels/colours for the device:



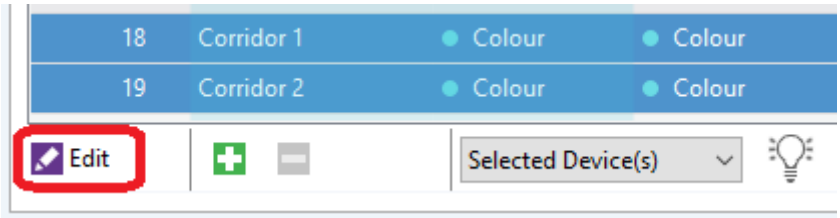
Completed DALI Scenes for device 16

Repeat the process for the other DALI Devices.

Device Editor

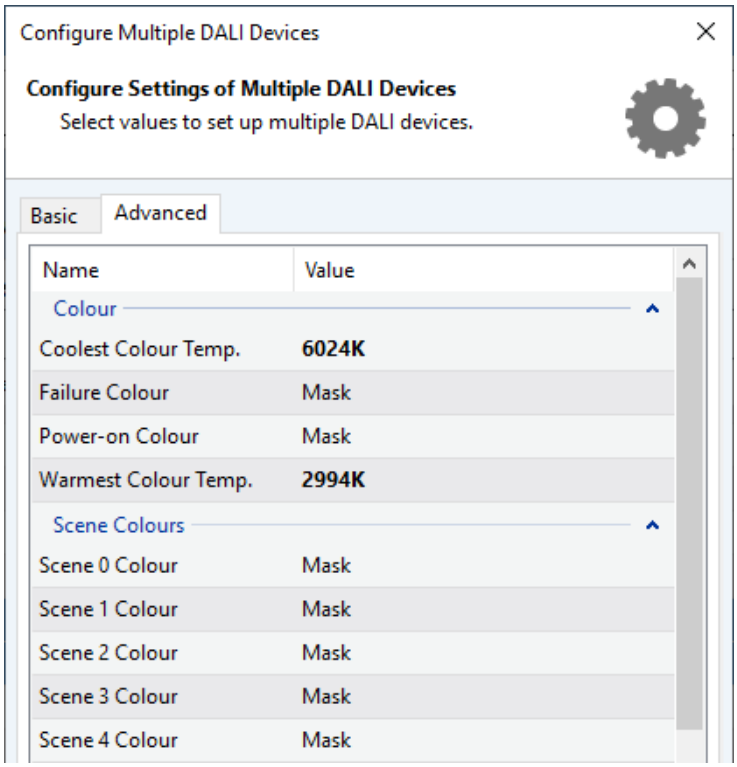
When editing DALI scenes in multiple devices it is quicker to edit them all at once. To do this:

1. Select all the required devices:
    a. CTRL + Click on each device; or
    b. Select one device, then SHIFT + Click another device to select the range
2. Click on the **Edit** button.



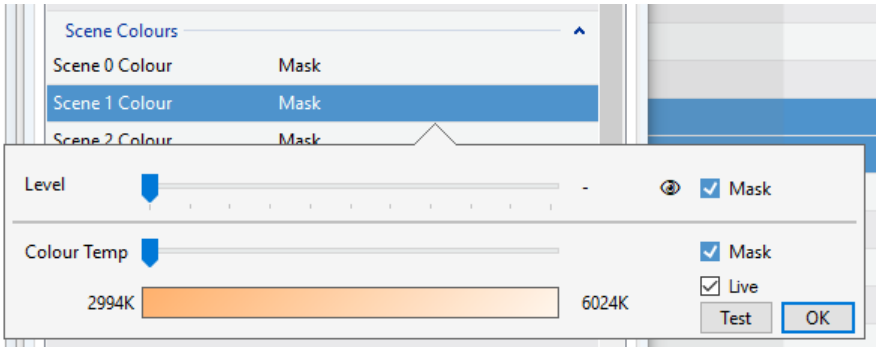
Editing Multiple DALI Type 8 Devices

3. The DALI Device Settings form will be shown.
4. Select the **Advanced** Tab.



The DALI Device Settings form for multiple DALI Type 8 devices

5. To edit the colour of a DALI Scene, click on the "value" column and the colour editor will appear.



Editing a scene colour in the device editor

6. Set the level and colour as described previously.

Note: When editing multiple DALI Type 8 devices, it is important to ensure that only devices supporting the same colour options are selected.

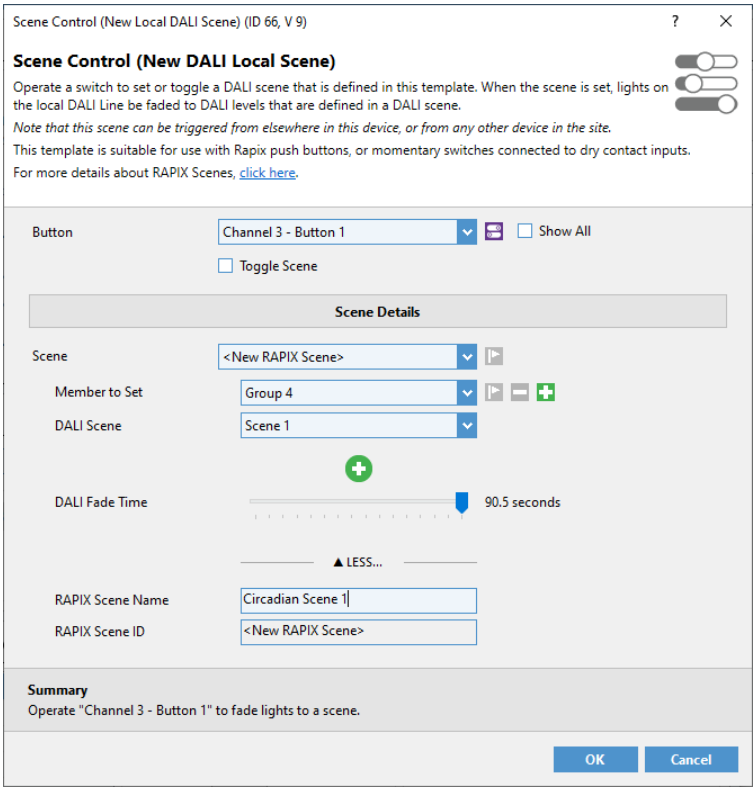
Creating the RAPIX Scenes

For this example, the DALI Devices are all in DALI Group 4. We need the following Scenes:

- "Circadian Scene 1": set DALI Scene 1 for Group 4 over 90.5 seconds
- "Circadian Scene 2": set DALI Scene 2 for Group 4 over 90.5 seconds
- "Circadian Scene 3": set DALI Scene 3 for Group 4 over 90.5 seconds
- "Circadian Scene 4": set DALI Scene 4 for Group 4 over 90.5 seconds

Creating a Colour Scene is the same as creating a normal Scene. Full details of RAPIX scenes are given in App Note “APN-RAPIX-015 RAPIX Scenes”.

The scenes need to be defined in the eHub using templates. If there are no buttons that will be used to set the scenes, it will be necessary to use “virtual” buttons to allow the scene to be configured. Use the “Scene Control (new Local DALI Scene)” template to define the four scenes:



Defining a scene to set Group 4 to DALI Scene 1

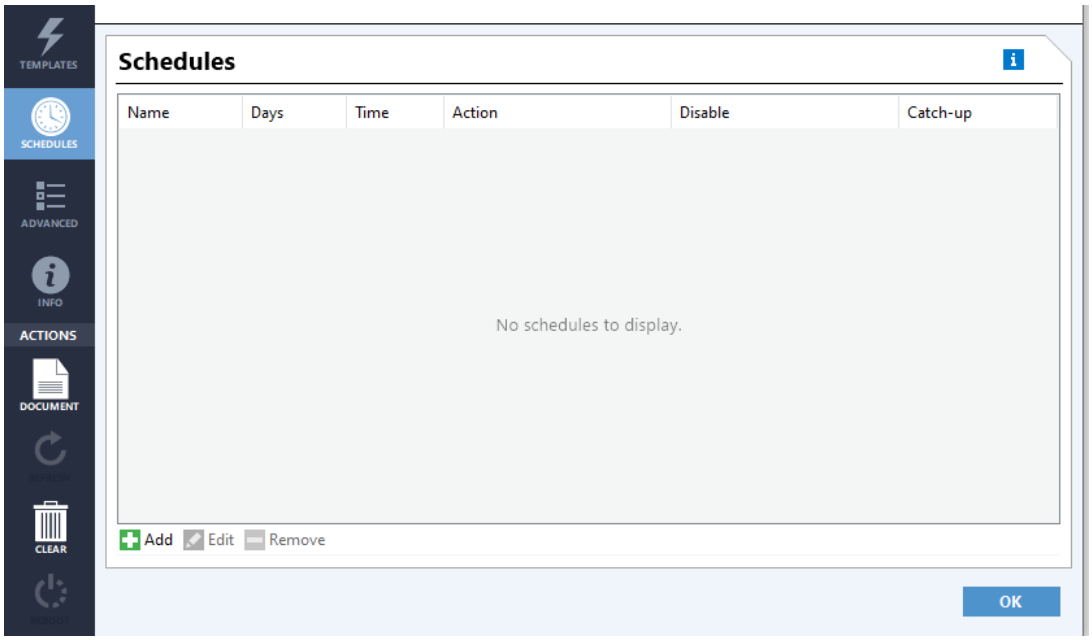
Creating the Schedules

For our example, we need the following schedule events:

- 6:00AM: Fade Zone lighting level to 100% over 3 hours
- 6:30 AM: Set “Circadian Scene 1”
- 7:30 AM: Set “Circadian Scene 2”
- 8:30 AM: Set “Circadian Scene 3”
- 3:30 PM: Set “Circadian Scene 2”
- 4:30 PM: Set “Circadian Scene 1”
- 5:30 PM: Set “Circadian Scene 4”
- 6:00PM: Fade Zone lighting level to 70% over 3 hours

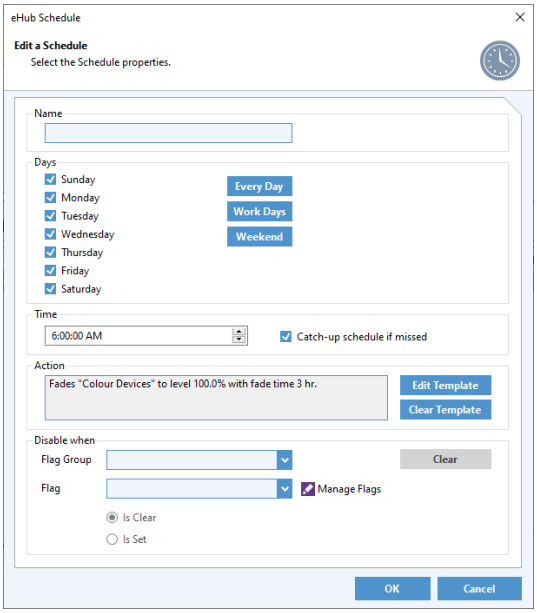
To create the Schedules, the steps are:

1. Select the eHub Schedules tab:



The eHub Schedules Tab

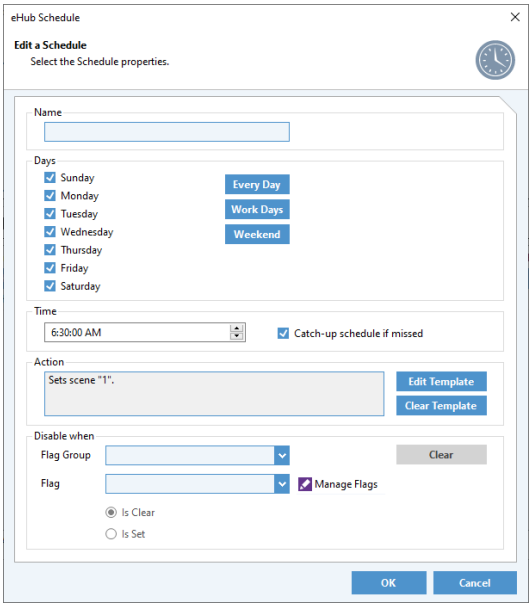
2. Add the first schedule:
    a. Click on the **Add** button
    b. Enter the details for the first schedule:



Adding the first schedule (fade level to 100% over 3 hours)

    c. To select the action for the schedule, click on the **Add Template** button.
    d. Select the **Zone On, Off or Preset** template
    e. Select the Zone, the level and the fade time and click on **OK**
    f. Click on **OK** to complete the schedule.

3. Add the second schedule
    a. Click on the **Add** button
    b. Enter the details for the second schedule



Adding the second schedule (set scene 1)

    c. To select the action for the schedule, click on the **Add Template** button.
    d. Select the **Scene Control** template
    e. Select the "Circadian Scene 1" and click on **OK**
    f. Click on **OK** to complete the schedule.

4. Repeat the steps above for the rest of the schedules.

Schedules

Name	Days	Time	Action	Disable	Catch-up
Schedule 1	Every day	6:00:00 AM	Fades "Colour Devices" to level 100.0% with fade time 3 hr.		Yes
Schedule 2	Every day	6:30:00 AM	Sets scene "1".		Yes
Schedule 3	Every day	7:30:00 AM	Sets scene "2".		Yes
Schedule 4	Every day	8:30:00 AM	Sets scene "3".		Yes
Schedule 5	Every day	3:30:00 PM	Sets scene "2".		Yes
Schedule 6	Every day	4:30:00 PM	Sets scene "1".		Yes
Schedule 7	Every day	5:30:00 PM	Sets scene "4".		Yes
Schedule 8	Every day	6:00:00 PM	Fades "Colour Devices" to level 70.1% with fade time 3 hr.		Yes

The completed schedules

Save the changes to the eHub when complete.

Change History

Rev	Date	Updated By	Comment
1	17 June 2022	D. S.	First Release

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APN-RAPIX-011-01 June 2022