

Workbook and Worksheet Management

Overview

One of the most powerful features of **XLReporter** is that as part of generating reports automatically with its built-in Scheduler it manages the creation of workbooks and worksheets automatically.

This document is an in depth explanation on how **XLReporter** performs workbook and worksheet management.

Excel Primer

Before diving in, let's first clearly define what is meant by workbooks and worksheets in the context of Excel.

A workbook is an Excel file typically with the file extension *.xlsx*, though *.xls*, *.xslm* and *.xlsb* are also valid file extensions.

A worksheet is a tab within a workbook. A workbook may contain one or more worksheets. Worksheets can be visible or hidden in the workbook. At least one worksheet must always be visible in the workbook.

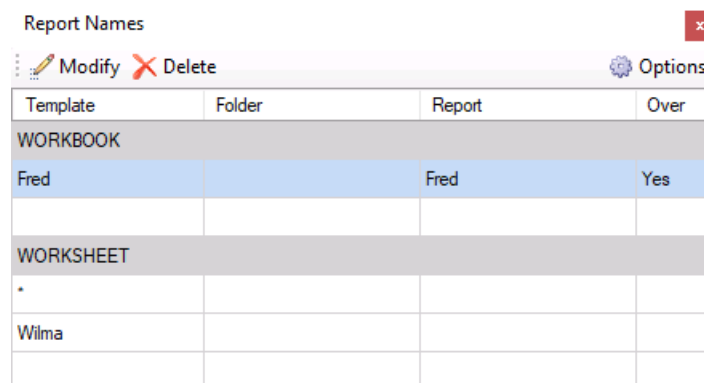
Workbooks, Worksheets and Actions

There are two elements in play when configuring the workbook and worksheet management of a report:

- The report naming convention defined in the report template
- The schedule action(s) that generate the report

Report Names

Report names are defined as part of the template in the Template Design Studio.



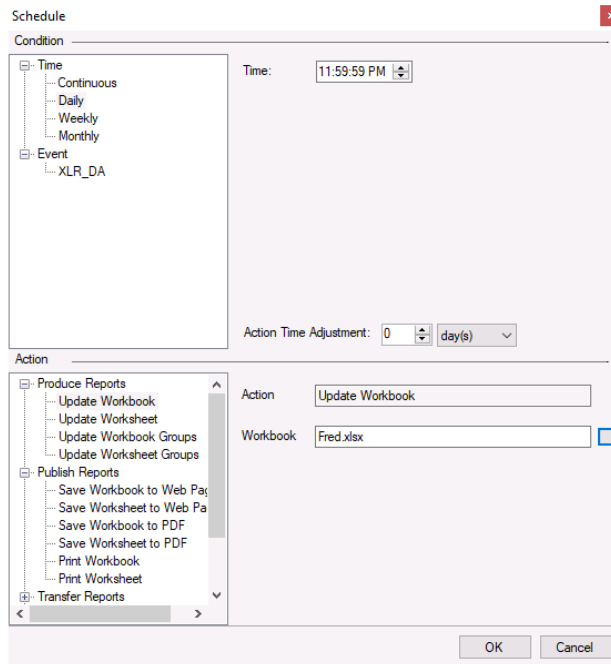
Template	Folder	Report	Over
WORKBOOK			
Fred		Fred	Yes
WORKSHEET			
•			
Wilma			

Report names can be defined on both the workbook and worksheet level. When reports are generated from the template, the name of the report follows what is configured here.

Schedule Action

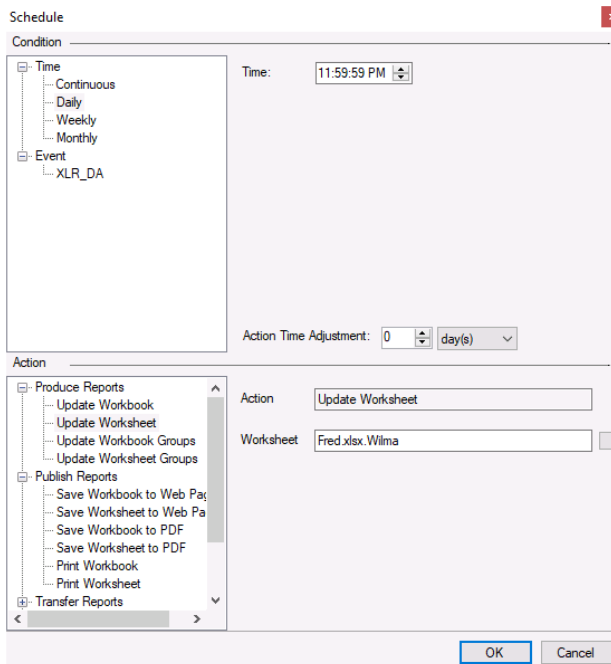
There are two main actions available in the Scheduler to generate reports: Update Worksheet and Update Workbook.

Update Workbook



This action updates data on every worksheet within the workbook. The parameter for this action is the name of the template workbook to update.

Update Worksheet



This action updates data on a specific worksheet within the workbook. The parameter for this action is the name of the template workbook and worksheet to update.

How it Works

Update Workbook

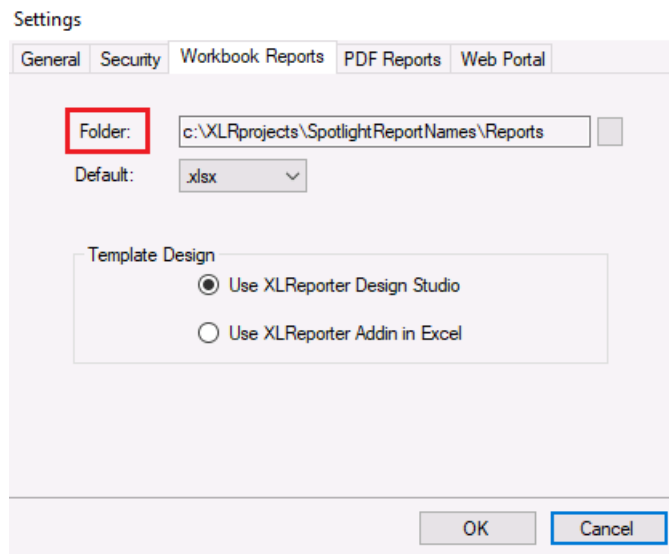
When this action is triggered, the **Workbook Report Name** setting is read from the template. If the workbook does not exist, it is created by copying the template workbook. Then every worksheet in the workbook is updated with data.

Update Worksheet

When this action is triggered, the **Workbook Report Name** setting is read from the template. If the workbook does not exist, it is created by copying the template workbook. Then the **Worksheet Report Name** for the specific worksheet is read. If the worksheet name is set and does not exist in the workbook it is created. Then the worksheet is updated with data.

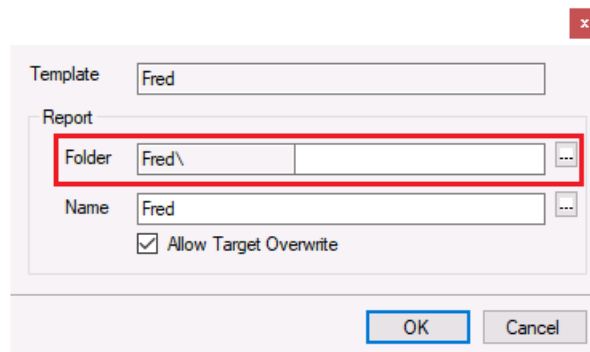
Where it's Saved

Reports are always saved in subfolders under the **Workbook Reports Folder** configured in the project.



There is a subfolder for every template that has reports generated for it.

Additional subfolders can be configured for the reports underneath the template folder.

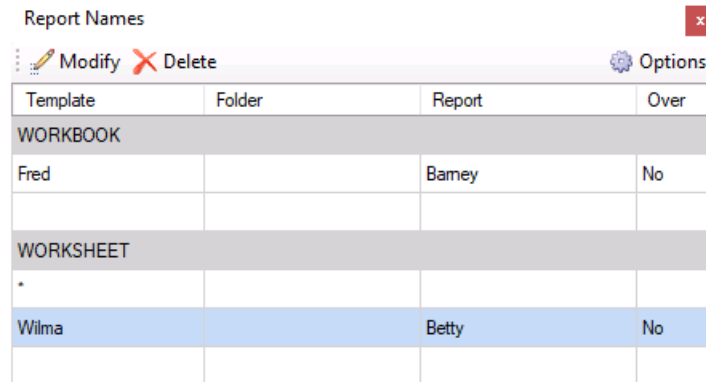


These are set as part of **Report Names** when configuring the **Workbook Name** as the Folder setting. One or more folders can be specified here.

A Simple Example

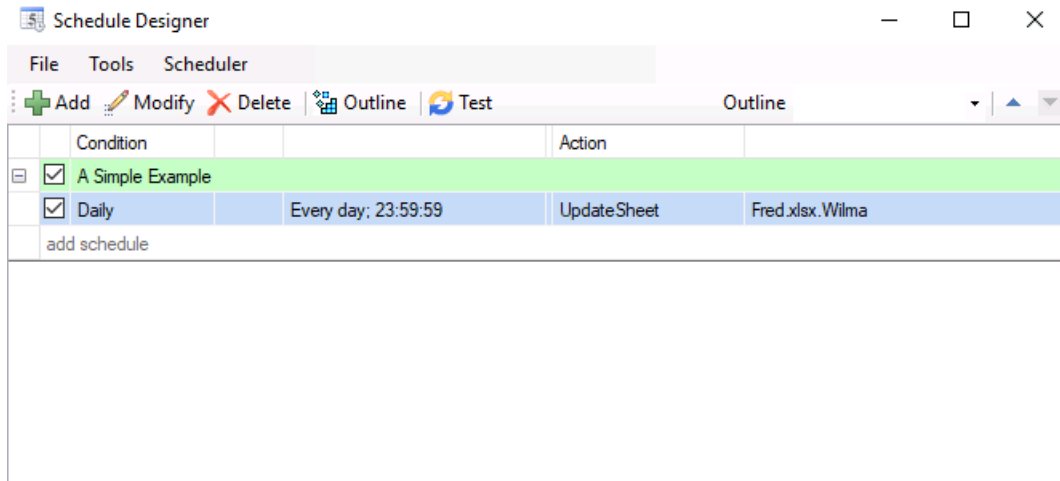
Let's consider the following example:

The template is named *Fred* and contains one worksheet named *Wilma*.



Template	Folder	Report	Over
WORKBOOK			
Fred		Barney	No
WORKSHEET			
Wilma		Betty	No

In **Report Names**, the **Workbook Report Name** is set to *Barney* and the **Worksheet Report Name** for *Wilma* is *Betty*.



Condition	Action
<input checked="" type="checkbox"/> A Simple Example	
<input checked="" type="checkbox"/> Daily	UpdateSheet Fred.xlsx.Wilma

In the schedule, the **Update Worksheet** action is set for *Fred.xlsx.Wilma* and is triggered **Daily** at 11:59:59 PM (the end of the day).

Every time the action is triggered, the following occurs:

- In **Workbook Reports Folder\Fred**, if *Barney.xlsx* does not exist, it is created by copying *Fred.xlsx* to this folder and renaming it *Barney.xlsx*.
- *Barney.xlsx* is opened.
- In *Barney.xlsx*, if the worksheet *Betty* does not exist, it is created by copying the *Wilma* worksheet and renaming it *Betty*.
- The worksheet *Betty* is updated with data.

Dynamic Report Names

While the example above demonstrates how report names work, it would not be a practical configuration because after the first trigger of the **Update Worksheet** action, every other **Update Worksheet** action will just keep adding more data to the *Betty* worksheet within the *Barney* workbook over and over again.

In reality report names need to be dynamic so that multiple workbooks and (possibly) worksheets are generated from the template. To accomplish this, both Workbook and Worksheet report names support using **XLReporter** Name Types and variables as part of the name.

Name Types are keywords for date and time values. For example, the Name Type {YYYY} is the four digit year, {MMM} is the three letter abbreviation for the month and {DD} is the day of the month.

Variables are placeholders for information and can be set from **XLReporter's Scheduler**. Variables can be set to hard coded text, Name Types, values from the process or a combination of any. There are 100 **Register** variables that can be used to hold information, {RG000} to {RG099}.

When Name Types and variables are used, the values are resolved in the report names before they are applied.

Scenarios

To understand the flexibility available using report names in conjunction with schedule actions, let's consider a series of reporting scenarios and what settings work. There are three types of reports to consider:

- **Continuous Report**
A Continuous Report is a report that is generated periodically from the schedule.
- **Discrete Report**
A Discrete Report is a report that is generated based on event(s) triggered in the process.
- **Hybrid Report**
A Hybrid Report is a report that is generated periodically but contains data that is populated based on event(s) triggered in the process.

Continuous Report: Daily Workbook, Daily Report Worksheet

In this scenario, the template workbook contains a single worksheet for the daily report. Every day a new report workbook is generated and the worksheet within that workbook is populated with the data for the daily report.

The screenshot shows the 'Schedule Designer' application window. On the left, there is a 'Report Names' table with columns for Template, Folder, Report, and Over. The table is divided into 'WORKBOOK' and 'WORKSHEET' sections. The 'WORKBOOK' section has one entry: 'DailyBookDailyReport' with 'Daily {DD}{MMM}{YYYY}' in the Report column and 'No' in the Over column. The 'WORKSHEET' section has one entry: 'Report'. On the right, the 'Scheduler' window shows a list of conditions and actions. The conditions are 'A Simple Example', 'Daily Workbook Daily Report Worksheet', and 'Daily'. The actions are 'UpdateSheet' and 'DailyBookDailyReport.xlsx.Report'. The schedule is set to 'Every day; 23:59:59'.

Template	Folder	Report	Over
WORKBOOK			
DailyBookDailyReport		Daily {DD}{MMM}{YYYY}	No
WORKSHEET			
		Report	

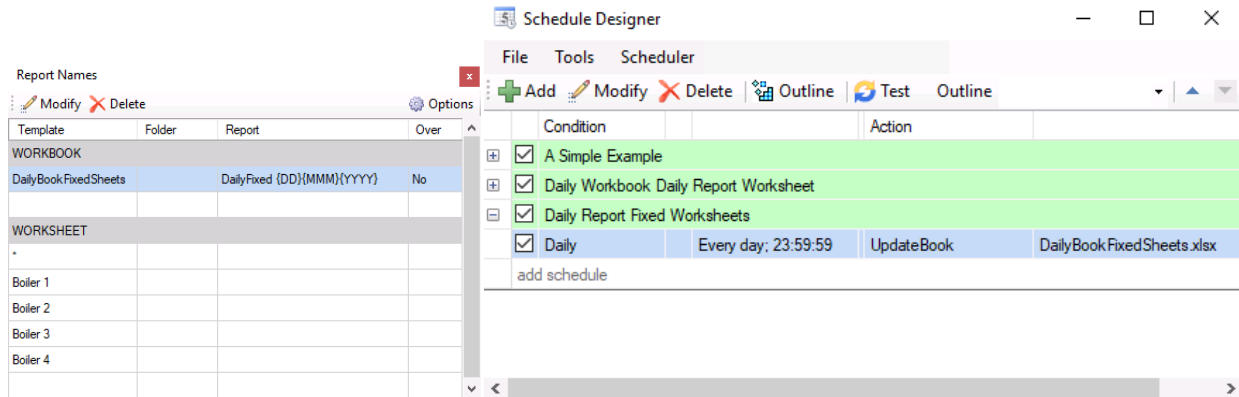
Condition	Action
<input checked="" type="checkbox"/> A Simple Example	
<input checked="" type="checkbox"/> Daily Workbook Daily Report Worksheet	
<input checked="" type="checkbox"/> Daily	UpdateSheet
	DailyBookDailyReport.xlsx.Report
add schedule	

The key here is that the **Workbook Report Name** contains Name Types for the year, month and day to create a unique workbook for every day.

Notice that there are no **Workbook Report Names** configured. The *Report* worksheet in each daily workbook will contain the data for the day.

Continuous Report: Daily Workbook, Fixed Worksheets

In this scenario, the template workbook contains multiple worksheets, each of which is a daily report for a specific piece of equipment. Every day a new report workbook is generated and each worksheet within that workbook is populated with the data for the daily report for that specific piece of equipment.



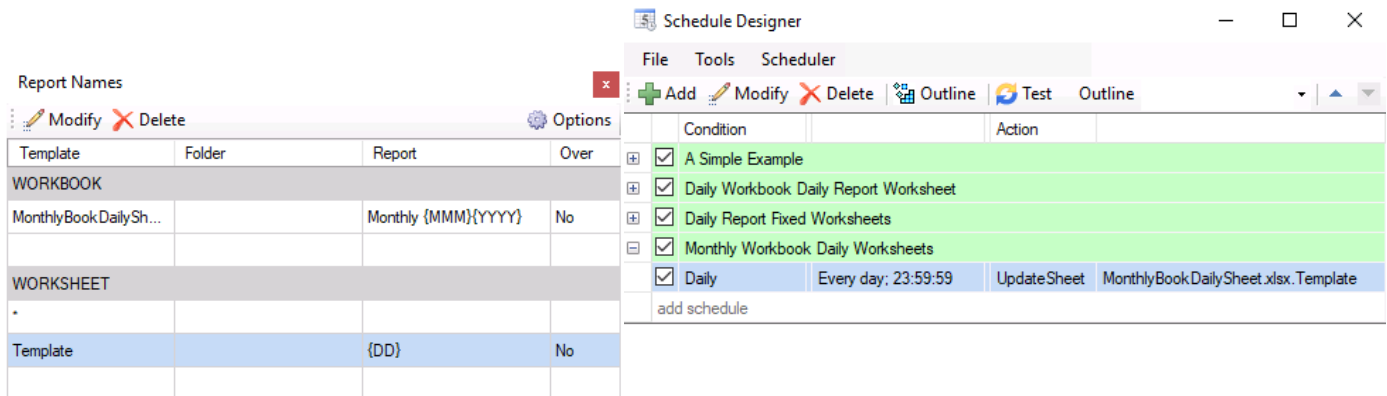
The key here is that the **Workbook Report Name** contains Name Types for the year, month and day to create a unique workbook for every day.

Notice that there are no **Workbook Report Names** configured. Every worksheet in each daily workbook will contain the data for the day for that specific piece of equipment.

The **Update Workbook** action is used here so that data is written to every worksheet at one time. If the worksheets within the report needed to be updated at different times, individual **Update Worksheet** actions would need to be configured.

Continuous Report: Monthly Workbook, Daily Worksheets

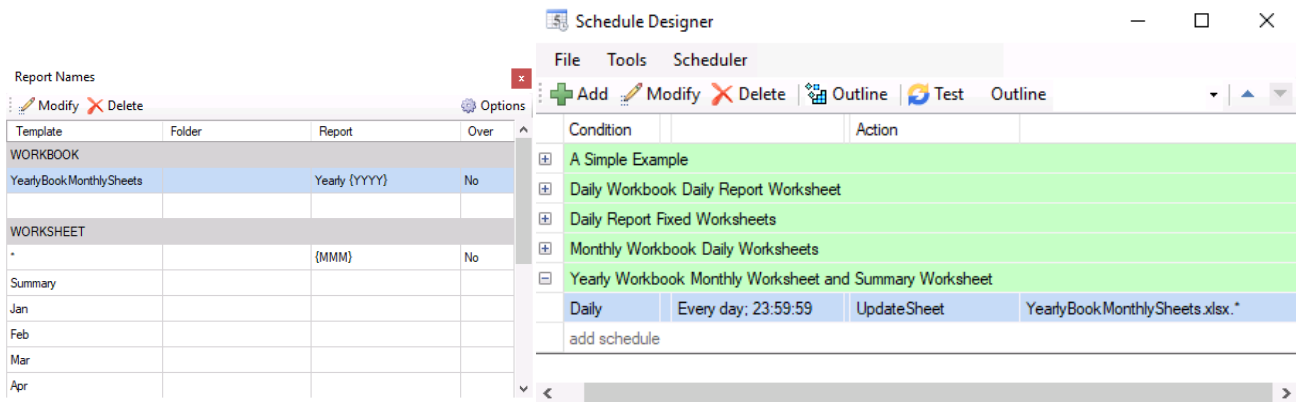
In this scenario, the template workbook contains a single worksheet for the daily report. Every month a new report workbook is generated and every day a new worksheet within that workbook is created and populated with the data for the daily report.



The key here is that the **Workbook Report Name** contains Name Types for the year and month while for *Template* worksheet, the name is configured to use the Name Type for the day.

Continuous Report: Yearly Workbook, Monthly Worksheets, and Summary Worksheet

In this scenario, the template workbook contains a multiple worksheets: a worksheet for each month, which is the monthly report, as well as a summary worksheet to summarize each month of the year. Every year a new report workbook is generated and every month data is written to the report worksheet for the month. The summary worksheet is comprised of the Excel formulas which are linked to cells on each of the month worksheets.



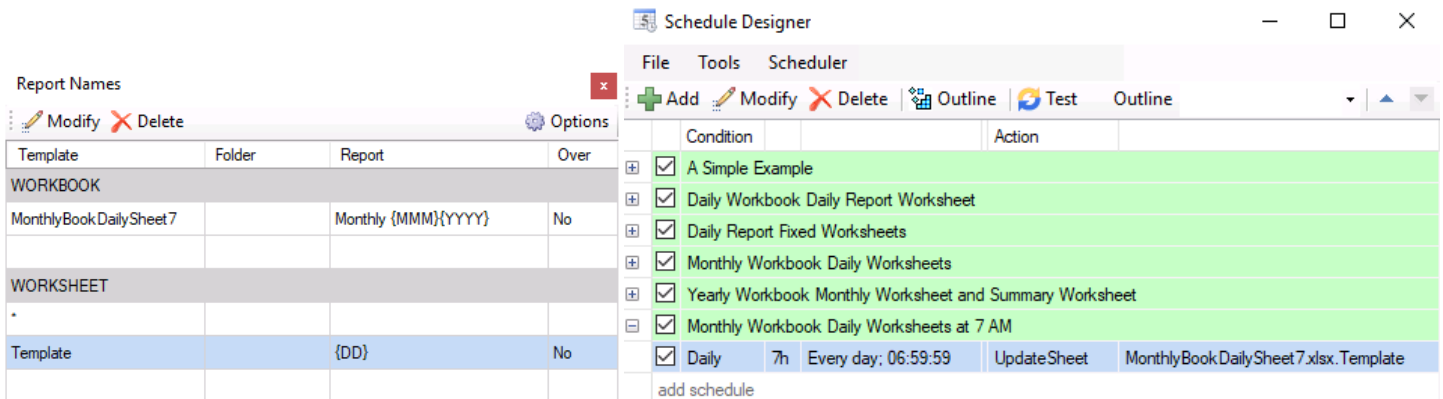
The key here is that the **Workbook Report Name** contains a Name Types for the year. Under **WORKSHEETS**, the * worksheet is set to the Name Type for the month.

The * is the default **Worksheet Report Name**. If a specific worksheet does not have a report name set and the * has a report name set, the report name for * is applied to the worksheet.

In the schedule, the **Update Worksheet** action is configured to update the * worksheet. This ensures that the worksheet for the current month is updated every time the action is triggered.

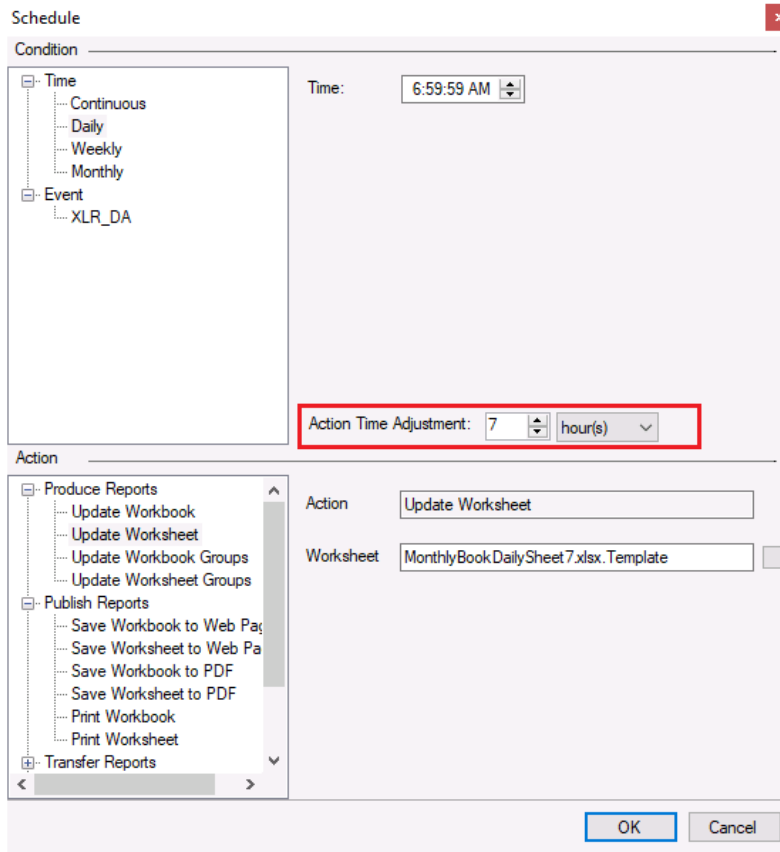
Continuous Report: Monthly Workbook, Daily Worksheets at 7AM

In this scenario, the template workbook contains a single worksheet for the daily report. Every month a new report workbook is generated and every day a new worksheet within that workbook is created and populated with the data for the daily report. However, instead of the daily report being midnight to midnight, the daily report is from 7AM to 7AM the next day.



The **Report Names** configured here are the same as that of the **Monthly Workbook Daily Worksheets** scenario previously described.

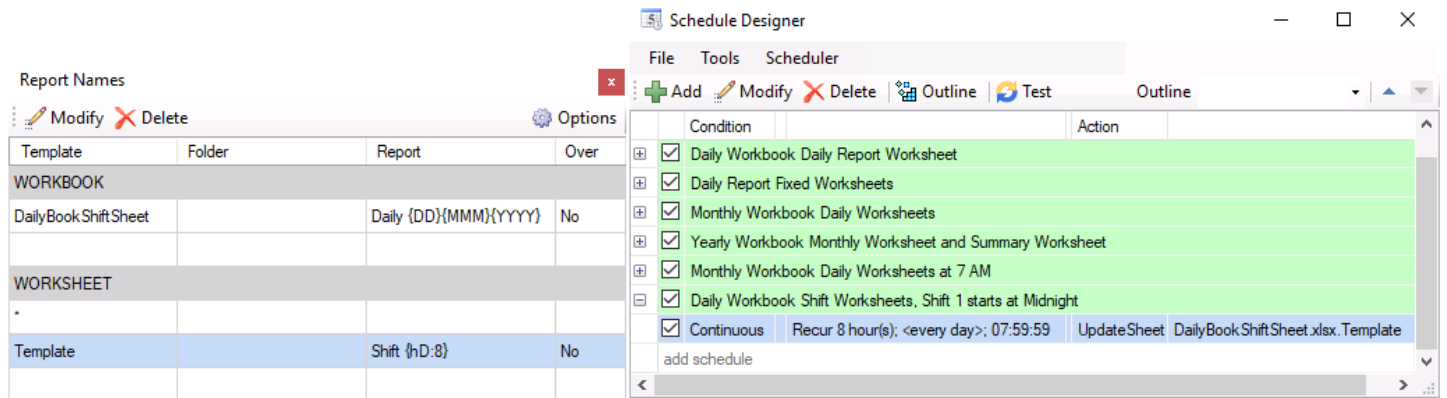
The key to this is in the schedule where the **Action Time Adjustment** is configured.



By setting **Action Time Adjustment** to *7 hours*, whenever the action is triggered the current date and time is subtracted by 7 hours and the resultant date and time is used to resolve any Name Type used in **Report Names**.

Continuous Report: Daily Workbook, Shift Worksheets, Shift 1 starts at Midnight

In this scenario, the template workbook contains a single worksheet for a shift report. There are three shifts per day: shift 1 from midnight to 8AM, shift 2 from 8AM to 4PM and shift 3 from 4PM to midnight. A new report workbook is created every day containing report worksheets for each shift of that day.

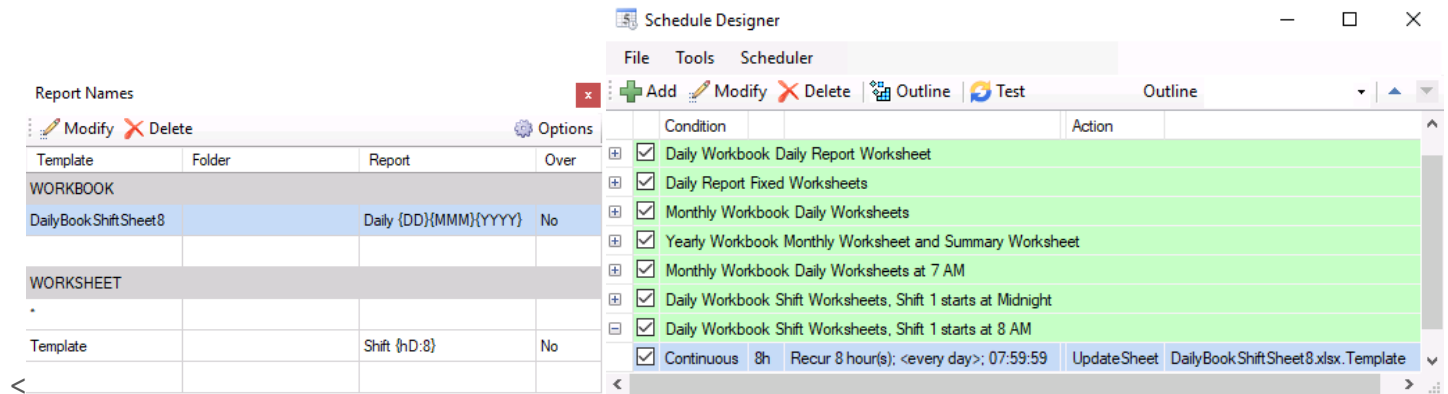


The key here is that the **Workbook Report Name** contains Name Types for the year, month and day to create a unique workbook for every day.

For the *Template* worksheet there needs to be a Name Type which resolves to 1 from midnight to 7:59:59 AM, 2 from 8 AM to 3:59:59 PM and 3 from 4 PM to 11:59:59 PM. If the Name Type $\{hd/8\}$ (hour of the day divided by 8), that would resolve to 0, 1 and 2. The $:$ operator is provided for 1 based division to resolve as 1, 2 and 3 respectively.

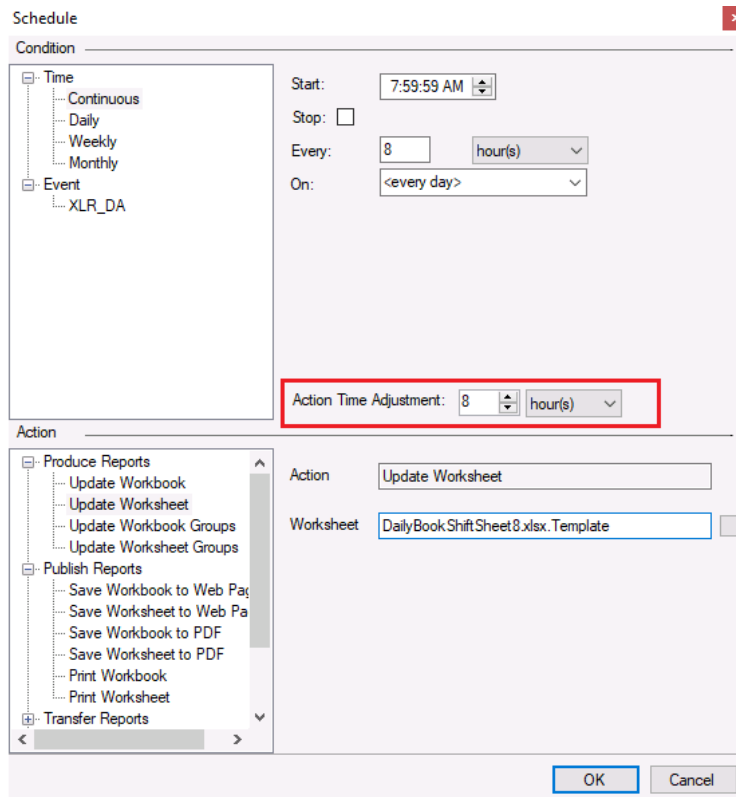
Continuous Report: Daily Workbook, Shift Worksheets, Shift 1 starts at 8AM

In this scenario, the template workbook contains a single worksheet for a shift report. There are three shifts per day: shift 1 from 8AM to 4PM, shift 2 from 4PM to midnight and shift 3 from midnight to 8AM the next day. A new report workbook is created every day containing report worksheets for each shift of that day.



The **Report Name** settings here are the same as the previous scenario.

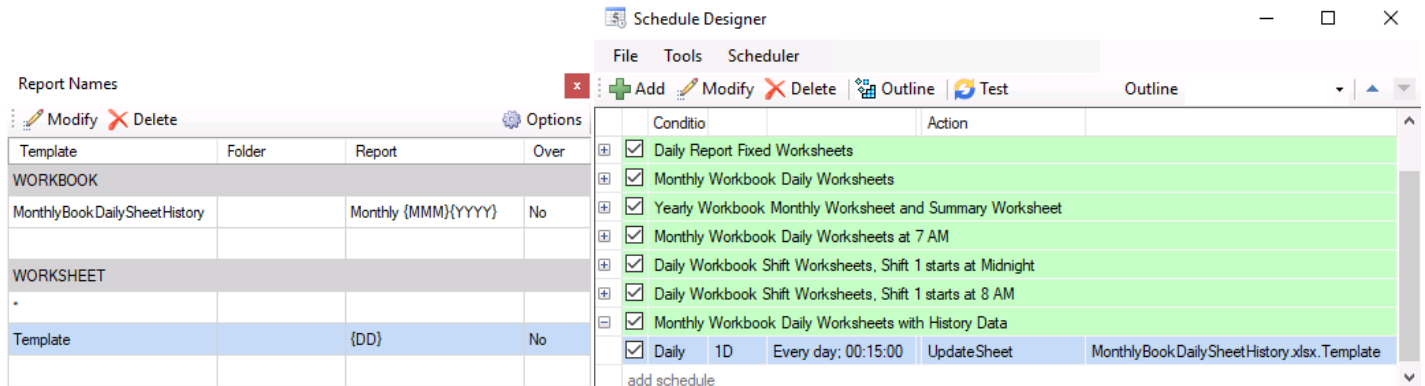
The key to this is in the schedule where the **Action Time Adjustment** is configured.



By setting **Action Time Adjustment** to 8 hours, whenever the action is triggered the current date and time is subtracted by 8 hours and the resultant date and time is used to resolve any Name Type used in **Report Names**.

Continuous Report: Monthly Workbook, Daily Worksheets with History Data

In this scenario, the template workbook contains a single worksheet for the daily report. Every month a new report workbook is generated and every day a new worksheet within that workbook is created and populated with the data for the daily report. Because the report contains historical data it cannot be populated until the next day to ensure all the historical data can be retrieved from the historian.



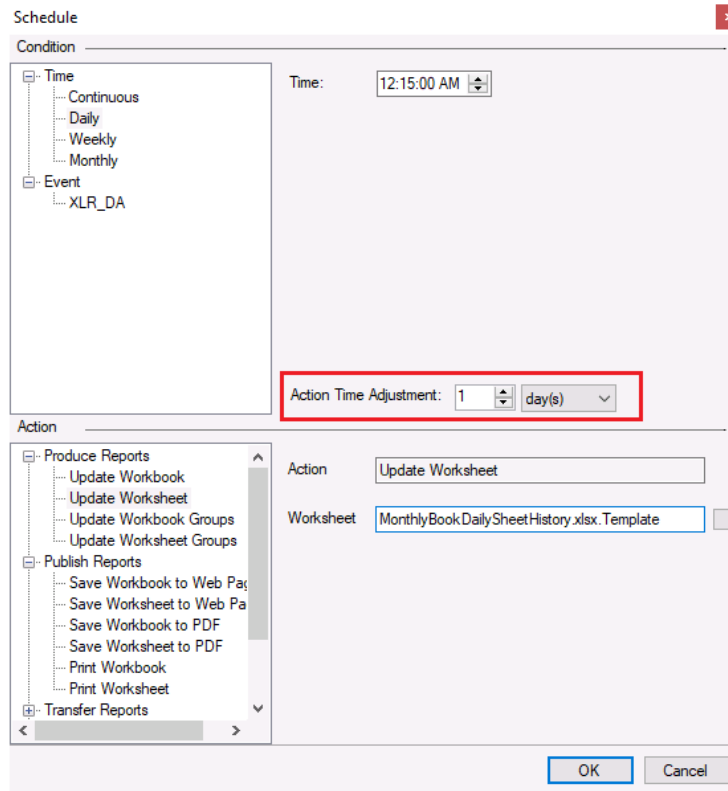
The screenshot shows the 'Schedule Designer' application. On the left, there is a 'Report Names' table with columns for Template, Folder, Report, and Over. The 'Template' row is highlighted. On the right, there is a list of scheduled tasks with columns for Condition and Action. The 'Monthly Workbook Daily Worksheets with History Data' task is selected, and its details are shown in the bottom right pane.

Template	Folder	Report	Over
WORKBOOK			
MonthlyBookDailySheetHistory		Monthly {MMM}{YYYY}	No
WORKSHEET			
Template		{DD}	No

Condition	Action
<input checked="" type="checkbox"/> Daily Report Fixed Worksheets	
<input checked="" type="checkbox"/> Monthly Workbook Daily Worksheets	
<input checked="" type="checkbox"/> Yearly Workbook Monthly Worksheet and Summary Worksheet	
<input checked="" type="checkbox"/> Monthly Workbook Daily Worksheets at 7 AM	
<input checked="" type="checkbox"/> Daily Workbook Shift Worksheets, Shift 1 starts at Midnight	
<input checked="" type="checkbox"/> Daily Workbook Shift Worksheets, Shift 1 starts at 8 AM	
<input checked="" type="checkbox"/> Monthly Workbook Daily Worksheets with History Data	
<input checked="" type="checkbox"/> Daily 1D Every day; 00:15:00	UpdateSheet MonthlyBookDailySheetHistory.xlsx.Template

There are two ways to configure the **Report Names** for this scenario to account for generating the report for the previous day. One would be to subtract 1 day from every Name Type used within **Report Names**, e.g., $\{MMM-1D\}$, $\{YYYY-1D\}$ and $\{DD-1D\}$. However, this means that in the data group to return data, the day offset also needs to be taken into account. Also, any time this report is manually run, the user has to enter a day beyond the day they actually want the report for.

It is easier to configure everything within the template as a report for the current day and just make the adjustment for the previous day in the schedule.



The screenshot shows the 'Schedule' dialog box. The 'Condition' section is set to 'Daily' at '12:15:00 AM'. The 'Action Time Adjustment' is set to '1 day(s)'. The 'Action' section is set to 'Update Worksheet' for the 'MonthlyBookDailySheetHistory.xlsx.Template' worksheet.

Condition: Time: 12:15:00 AM

Action Time Adjustment: 1 day(s)

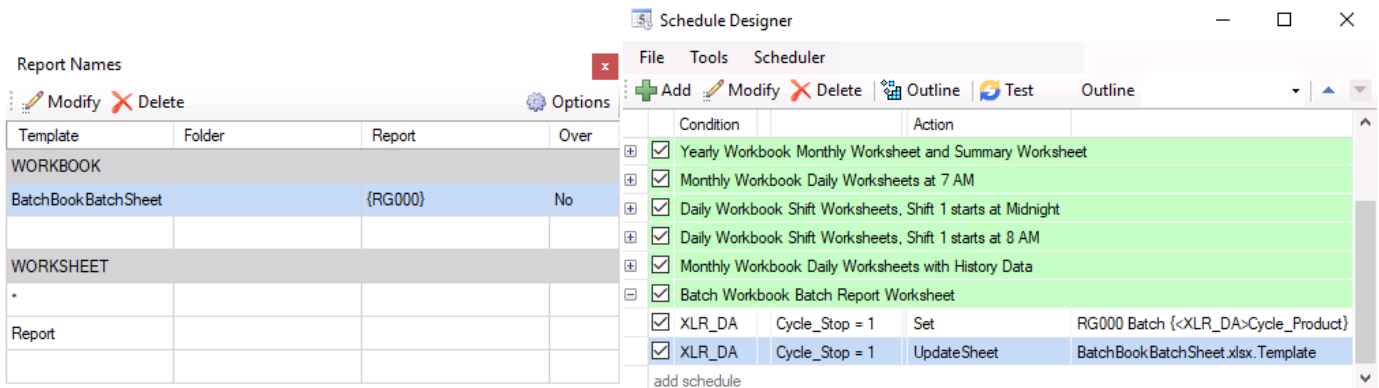
Action: Update Worksheet

Worksheet: MonthlyBookDailySheetHistory.xlsx.Template

The **Action Time Adjustment** must be set to push the date and time back to the previous day. If the action is triggered at $12:15\text{ AM}$ every day the minimum setting for **Action Time Adjustment** is 16 minutes . However, it is just as simple to set this to 1 day to ensure the date and time for the report is always the previous day.

Discrete Report: Batch Workbook, Batch Report Worksheet

In this scenario, the template workbook contains a single worksheet for the batch report. A new workbook is created every time a batch is complete, named after the batch, and the worksheet within that workbook is populated with the data for the batch.



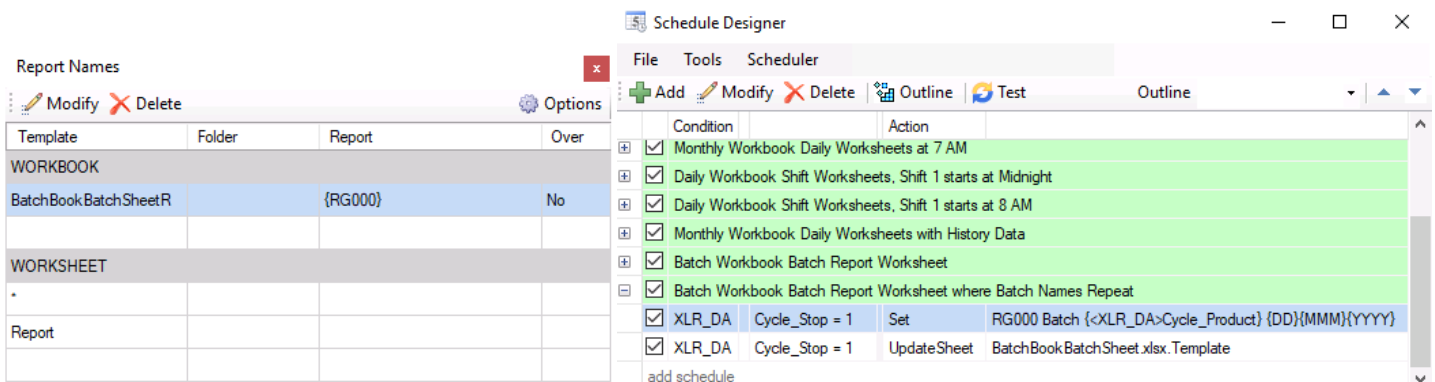
The **Workbook Report Name** is `{RG000}`, one of **XLReporter's** Register variables. In the schedule, this variable is set to a tag in the process which holds the name of the current batch.

Both the **Set** and **Update Worksheet** actions are scheduled to trigger on the same event. When multiple actions are triggered on the same event they are executed in the order they are listed in the schedule. This ensures that the **Set** action completes first so when the **Update Worksheet** action executes it creates a workbook named after the current batch.

In **Report Names**, notice that there are no **Workbook Report Names** configured. The *Report* worksheet in each batch workbook will contain the data for the batch.

Discrete Report: Batch Workbook, Batch Report Worksheet where Batch Names Repeat

In this scenario, the template workbook contains a single worksheet for the batch report. A new workbook is created every time a batch is complete, named after the batch, and the worksheet within that workbook is populated with the data for the batch. However, batch names repeat over time, but the same batch will never be run twice on the same day.



The **Report Names** and schedule for this scenario is very similar to the previous scenario with one exception. The **Set** action not only sets the Register variable to the batch name from the process but also incorporates the current year, month and day. If this was not added, once a batch name repeated, data would be overwritten in the existing batch report generated the first time the batch was run.

Discrete Report: Batch Workbook with Phase Worksheets

In this scenario, the template workbook contains multiple worksheets each of which is a report for a specific phase of the batch. A new workbook is created for every batch, named after the batch, and the phase worksheets within that workbook are populated with the data for each phase of the batch.

Template	Folder	Report	Over
WORKBOOK			
BatchBookPhaseSheet		{RG000}	No
WORKSHEET			
•			
Heating			
Loading			
Curing			
Cooling			

Condition	Action
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet	
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet where Batch Names Repeat	
<input checked="" type="checkbox"/> Batch Workbook with Phase Worksheets	
<input checked="" type="checkbox"/> XLR_DA Cycle_Start = 1	Set RG000 Batch {<XLR_DA>Cycle_Product}
<input checked="" type="checkbox"/> XLR_DA Cycle_ID = 1	UpdateSheet BatchBookPhaseSheet.xlsx.Heating
<input checked="" type="checkbox"/> XLR_DA Cycle_ID = 2	UpdateSheet BatchBookPhaseSheet.xlsx.Loading
<input checked="" type="checkbox"/> XLR_DA Cycle_ID = 3	UpdateSheet BatchBookPhaseSheet.xlsx.Curing
<input checked="" type="checkbox"/> XLR_DA Cycle_ID = 4	UpdateSheet BatchBookPhaseSheet.xlsx.Cooling

The **Workbook Report Name** is `{RG000}`, one of **XLReporter's** Register variables. In the schedule this variable is set to a tag in the process which holds the name of the current batch.

Notice that there are no **Workbook Report Names** configured. Every worksheet in each batch workbook will contain the data for the specific phase.

In the schedule, the **Set** action is triggered at the beginning of the batch. At the end of each phase an **Update Worksheet** action is triggered to update the specific phase worksheet in the report workbook.

Hybrid Report: Daily Workbook with Daily Event Worksheet

In this scenario, the template workbook contains a single worksheet for the daily report. Every day a new report workbook is generated and the worksheet within that workbook is populated with the data every time an event in the process is triggered.

Template	Folder	Report	Over
WORKBOOK			
DailyBookDailyEventSheet		Daily Event {DD}{MMM}{YYYY}	No
WORKSHEET			
•			
Report			

Condition	Action
<input checked="" type="checkbox"/> Daily Workbook Shift Worksheets, Shift 1 starts at Midnight	
<input checked="" type="checkbox"/> Daily Workbook Shift Worksheets, Shift 1 starts at 8 AM	
<input checked="" type="checkbox"/> Monthly Workbook Daily Worksheets with History Data	
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet	
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet where Batch Names Repeat	
<input checked="" type="checkbox"/> Batch Workbook with Phase Worksheets	
<input checked="" type="checkbox"/> Daily Workbook with Daily Event Worksheet	
<input checked="" type="checkbox"/> XLR_DA H2O_PUMP1_STATE = 1	UpdateSheet DailyBookDailyEventSheet.xlsx.Template

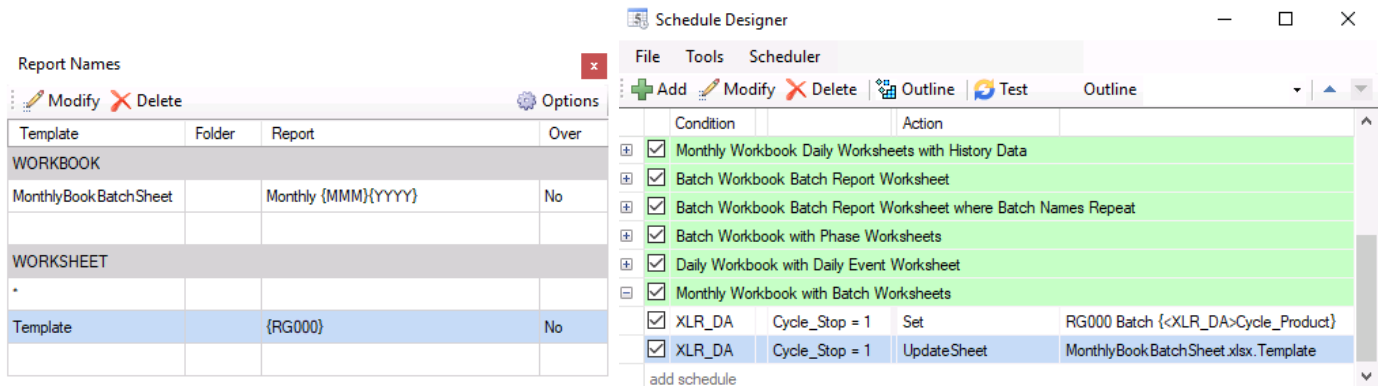
The key here is that the **Workbook Report Name** contains Name Types for the year, month and day to create a unique workbook for every day.

Notice that there are no **Workbook Report Names** configured. The *Report* worksheet in each daily workbook will contain the data for the day.

In the schedule, the **Update Worksheet** action is triggered based on an event in the process.

Hybrid Report: Monthly Workbook with Batch Worksheets

In this scenario, the template workbook contains a single worksheet for the batch report. Every month a new report workbook is generated and every time a batch is triggered in the process, a new worksheet within that workbook is created and populated with the data for the batch report.



The screenshot displays the 'Schedule Designer' application. On the left, the 'Report Names' table lists workbooks and worksheets. On the right, the 'Scheduler' pane shows a list of scheduled tasks with their conditions and actions.

Template	Folder	Report	Over
WORKBOOK			
MonthlyBookBatchSheet		Monthly {MMM}{YYYY}	No
WORKSHEET			
Template		{RG000}	No

Condition	Action
<input checked="" type="checkbox"/> Monthly Workbook Daily Worksheets with History Data	
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet	
<input checked="" type="checkbox"/> Batch Workbook Batch Report Worksheet where Batch Names Repeat	
<input checked="" type="checkbox"/> Batch Workbook with Phase Worksheets	
<input checked="" type="checkbox"/> Daily Workbook with Daily Event Worksheet	
<input checked="" type="checkbox"/> Monthly Workbook with Batch Worksheets	
<input checked="" type="checkbox"/> XLR_DA Cycle_Stop = 1 Set	RG000 Batch {<XLR_DA>Cycle_Product}
<input checked="" type="checkbox"/> XLR_DA Cycle_Stop = 1 UpdateSheet	MonthlyBookBatchSheet.xlsx.Template

The key here is that the **Workbook Report Name** contains Name Types for the year and month while for *Template* worksheet, the name is configured to use a Register variable.

In the schedule, the **Set** action sets the Register variable to the batch name in the process before the **UpdateWorksheet** action triggers the batch report.

Report Publishing

Up until now everything has been described in terms of report generation. From **XLReporter's Scheduler**, generated reports can be published in different formats including as web pages, encrypted PDF documents, hard coded print outs and also emailed and uploaded to FTP servers.

For each publish action, the **Workbook** and **Worksheet** parameter for the action should be the template workbook and worksheet. These actions follow the same rules as the **Update Workbook** and **Update Worksheet** actions. **Report Names** are read and resolved to determine which report workbook and worksheets to publish.