Using RPE with Design Room ONE

This document describes how Rational Publishing Engine (RPE) can be used to create reports that contain data that is available on a Design Room ONE server. The document contains two parts:

1. A tutorial that describes the creation of a few sample reports which illustrate usage of the most common reporting APIs provided by Design Room ONE.
2. A reference manual describing all reporting APIs provided by Design Room ONE.

If you already are familiar with using RPE you can skip the tutorial and go directly to the API reference.

Contents

Tutorial

This tutorial assumes you have RPE Document Studio 2.1.1 installed. Using a different version of RPE will most likely also work, but you may notice small differences compared to the described steps and screen shots.

> **Hint!** You can find all sample reports created in this tutorial in the `samples` folder next to this document (in `<dr-server-install-folder>\DR_ReleaseManagement\doc\reporting_with_rpe\samples`). You can either create the sample reports yourself from scratch when reading through the tutorial, or you can just open the samples and learn by inspecting them.

Although you can test the sample reports on your own models, you may want to use the model "JKE Banking" which you find next to this document ((in `<dr-server-install-folder>\DR_ReleaseManagement\doc\reporting_with_rpe\JKE Banking`)). The tutorial assumes you have exported this model to a Design Room ONE server and called the design "DemoRPE".

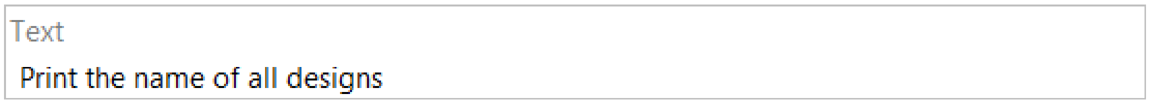
The first lesson assumes no previous experience from using RPE and is therefore rather detailed. Subsequent lessons build on the previous ones and will not go into the same level of detail.

Lesson 1: Print the names of all designs

Sample report: `DR_all_designs.dta`
Reporting APIs used: Designs

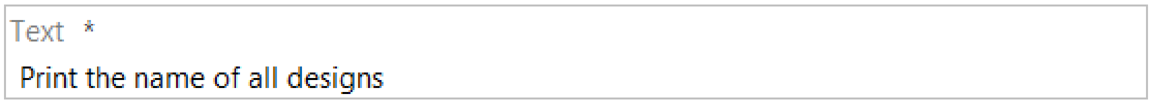
Let's start by the simplest possible report – a listing of all designs that are available on a Design Room ONE server.

1. Create a new document template (**New – Document Template**). Save it as "DR_all_designs.dta".
2. Build the document template by dragging and dropping items from the palette to the template editor. Start by a Text item for the header:



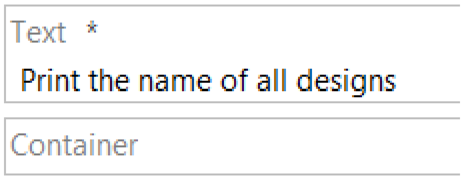
Print the name of all designs

3. Go to the **Font** tab in the **Properties** view and set the font size to 20. RPE indicates by an asterisk that custom styling has been applied to the item:



Print the name of all designs

4. Place a Container item under the Text item. Container items are used for extracting the data, that should go into the report, from Design Room ONE (and possibly also other tools).

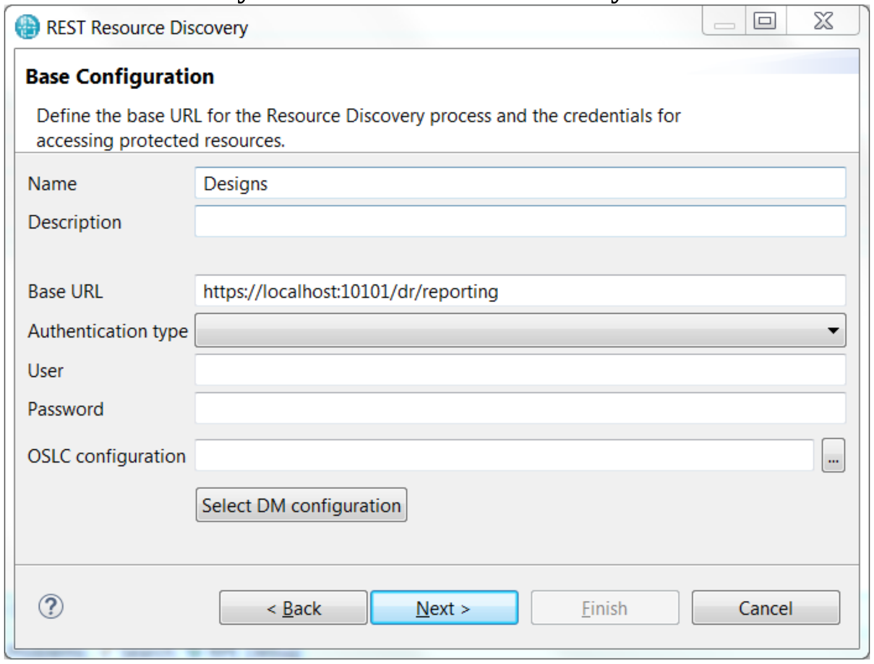


Text *

Print the name of all designs

Container

5. Next you need to specify from where the container should get its data. In RPE terminology this is called a data source. A convenient way to specify the data source is to use a wizard that is provided by RPE. Perform the command **Data – Schema Discovery – REST Schema Discovery**. Press **Next**.



REST Resource Discovery

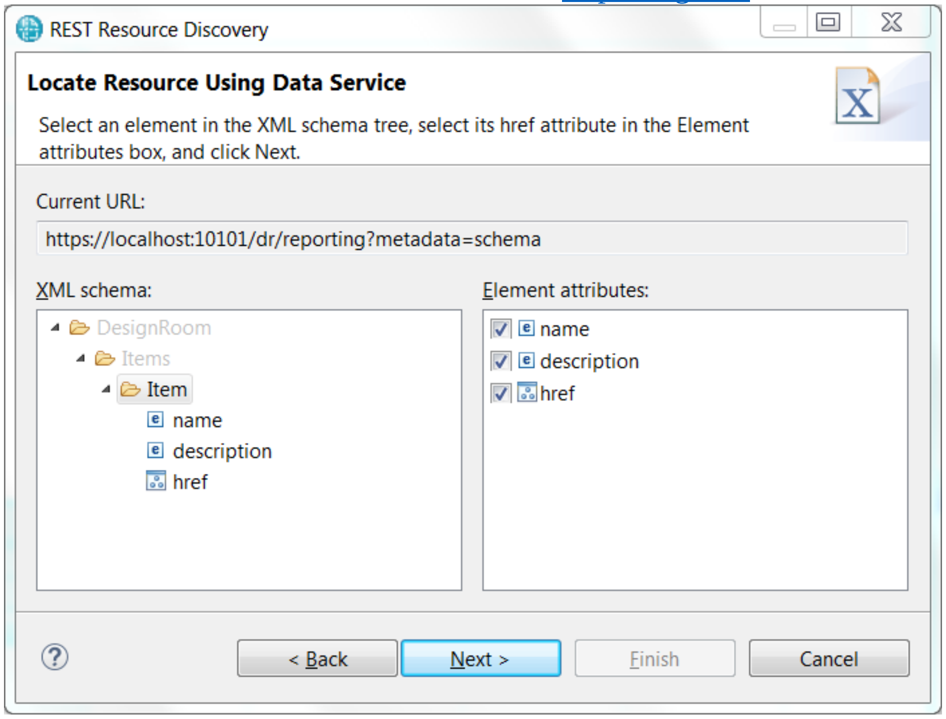
Base Configuration

Define the base URL for the Resource Discovery process and the credentials for accessing protected resources.

Name	Designs
Description	
Base URL	https://localhost:10101/dr/reporting
Authentication type	
User	
Password	
OSLC configuration	

The base reporting URL for Design Room ONE is https://<server>:<port>/dr/reporting (see Reporting API). From this URL you can interactively discover all other reporting URLs using the wizard.
Give the name “Designs” to this data source, but leave other fields empty (Design Room ONE does not require authentication for accessing the reporting APIs).

6. Press **Next**. You will see the schema of the Reporting API.



REST Resource Discovery

Locate Resource Using Data Service

Select an element in the XML schema tree, select its href attribute in the Element attributes box, and click Next.

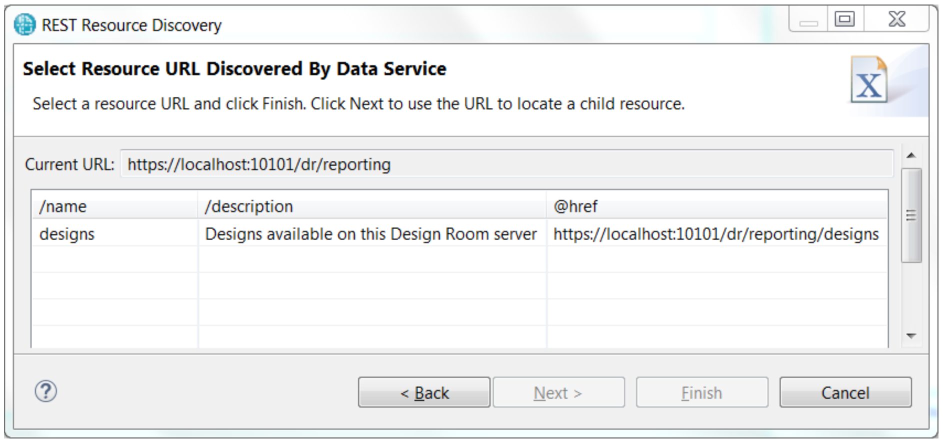
Current URL: https://localhost:10101/dr/reporting?metadata=schema

XML schema:
- DesignRoom
  - Items
    - Item
      - name
      - description
      - href

Element attributes:
- ✓ name
- ✓ description
- ✓ href

Select the Item element and mark all its attributes in the right pane.

7. Press **Next**. RPE will now invoke the Reporting API and show the result in a table.



REST Resource Discovery

Select Resource URL Discovered By Data Service

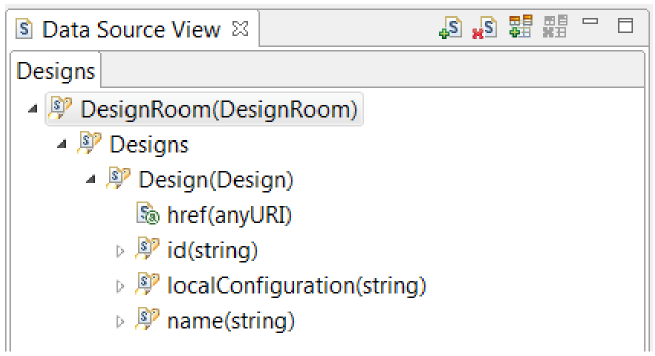
Select a resource URL and click Finish. Click Next to use the URL to locate a child resource.

Current URL: https://localhost:10101/dr/reporting

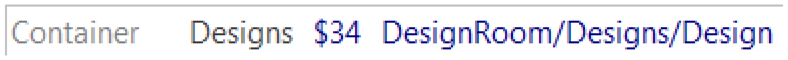
/name	/description	@href
designs	Designs available on this Design Room server	https://localhost:10101/dr/reporting/designs

Select the “designs” entry which references the Designs API.

8. Press **Finish**. A data source will be created for the Designs API. The data source appears in the **Data Source** view:



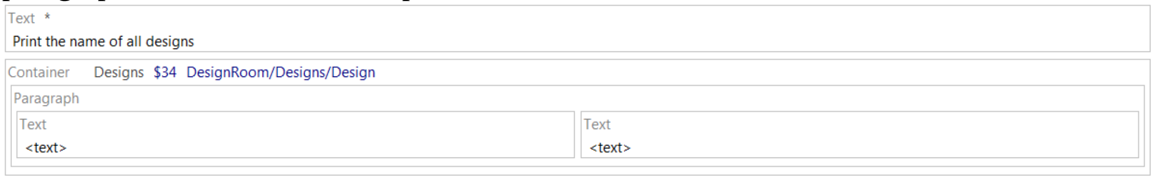
9. Now that we have a data source for getting all designs, we can bind it to the Container item we created previously. Select the Design element in the **Data Source** view, drag it to the document template and drop it on the Container item.



Container Designs $34 DesignRoom/Designs/Design

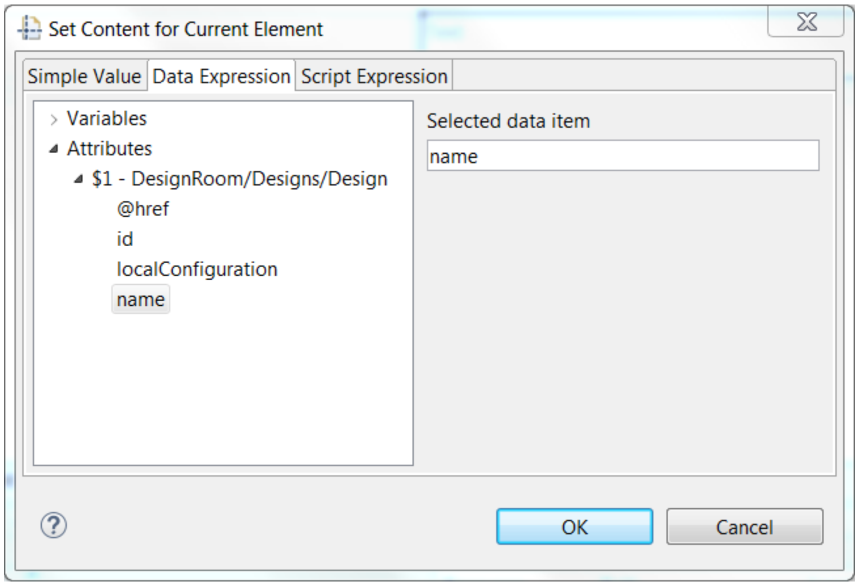
RPE shows that the container is bound to the "Designs" data source. It also shows that the element Design will be extracted from the data source. There is one such element for each design and the container will iterate over them all. The variable ($34 in the picture, but another number may be used in your case) is automatically assigned by RPE to let you refer to the extracted Design element within the container.

10. Create a Paragraph inside the container, and create two Text items inside the paragraph. Your document template should now look like this:



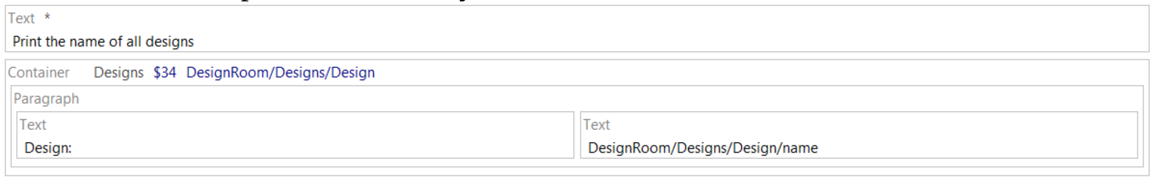
Text *
Print the name of all designs
Container Designs $34 DesignRoom/Designs/Design
Paragraph
Text
<text>
Text
<text>

11. Double-click on the first Text item and enter the text: "Design: " as a simple value. This static text will be printed once for each design. Double-click on the second Text item and select the design name as its value. You find it in the **Data Expression** tab under **Attributes**:

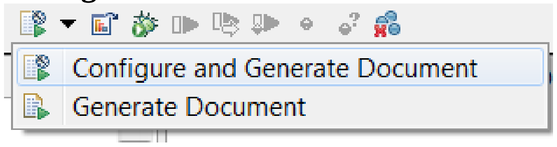


Alternatively you can drag the “name” attribute from the **Data Source** view and drop it onto the Text item.

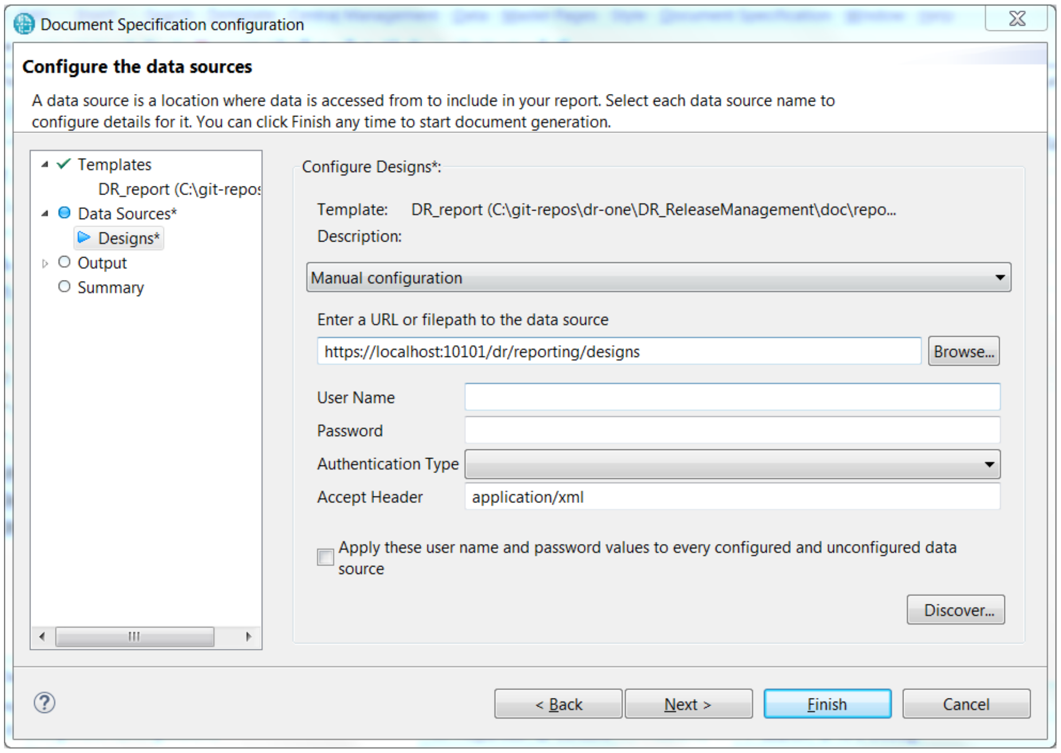
12. The document template is now ready and should look like this:


Text *
Print the name of all designs
Container Designs $34 DesignRoom/Designs/Design
Paragraph
Text
Design:
Text
DesignRoom/Designs/Design/name

13. Now it’s time to test the template by generating a report. Perform the command **Configure and Generate Document** from the toolbar.



14. In the wizard that appears you need to enter the URL for all data sources that are used by the template. Enter the URL for the Designs API:


Document Specification configuration

Configure the data sources

A data source is a location where data is accessed from to include in your report. Select each data source name to configure details for it. You can click Finish any time to start document generation.

- Templates
  - DR_report (C:\git-repos
- Data Sources*
  - Designs*
- Output
- Summary

Configure Designs*:

Template: DR_report (C:\git-repos\dr-one\DR_ReleaseManagement\doc\repo...

Description:

Manual configuration

Enter a URL or filepath to the data source

https://localhost:10101/dr/reporting/designs

User Name

Password

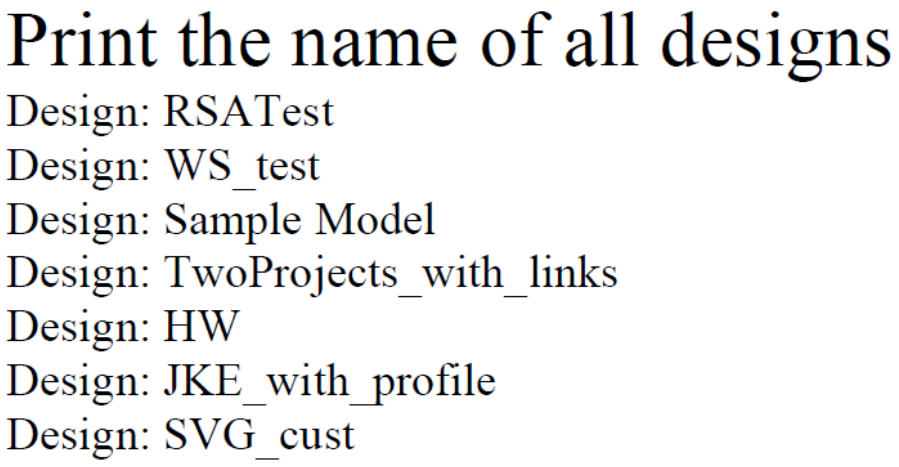
Authentication Type

Accept Header: application/xml

☐ Apply these user name and password values to every configured and unconfigured data source

Note that RPE does not save the information you enter in this dialog with the document template, so if you close the template and open it again later you have to re-enter this information before you can generate the report.

15. Press **Finish** to generate the report. It should look something like this (with different design names of course):


Print the name of all designs

Design: RSATest

Design: WS_test

Design: Sample Model

Design: TwoProjects_with_links

Design: HW

Design: JKE_with_profile

Design: SVG_cust

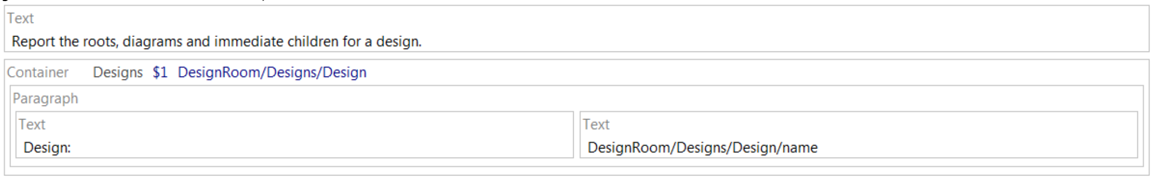
Lesson 2: Print the root elements of a design, its diagrams and children

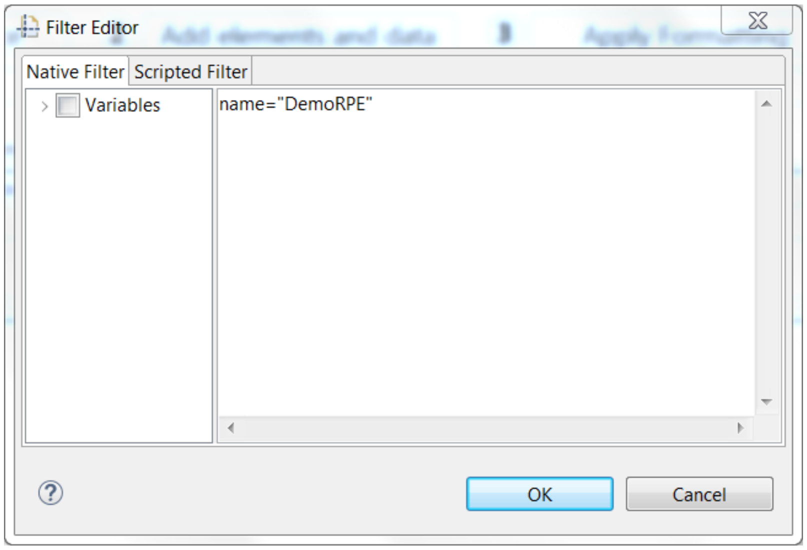
Sample report: `DR_roots_children_diagrams.dta`

Reporting APIs used: Designs, Model Roots, Children, Diagrams

Here we will create a report which extracts information for one particular design. The root (i.e. top-level) model elements of the design will be printed, and for each such element its diagrams and immediate children will also be printed.

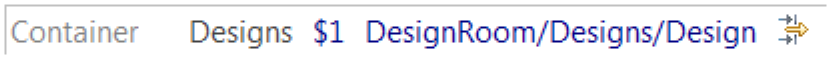
In lesson 1 you learnt how to use the palette for creating a document template and the REST Resource Discovery wizard for creating data sources. In this lesson you will learn about external variables, native filtering, dynamic data source configuration and images.

1. Start by creating this template (either from scratch or by modifying the template you built in lesson 1):

Text
Report the roots, diagrams and immediate children for a design.
Container Designs $1 DesignRoom/Designs/Design
Paragraph
Text
Design:
Text
DesignRoom/Designs/Design/name

   Refer to lesson 1 if you forgot the steps to create the Designs data source.
   If you generate a report for this template you will see that it looks exactly like the one we built in lesson 1, where the names of all designs are printed.
2. Since we only want to include one specific design in this report, we apply a filter to the container so that only the design we are interested in gets returned by its API call. Select the container, go to the **Data** tab in the **Properties** view and click on the button next to the **Filter** field. In the **Native Filter** tab enter the filter condition `name="DemoRPE"`:


name="DemoRPE"

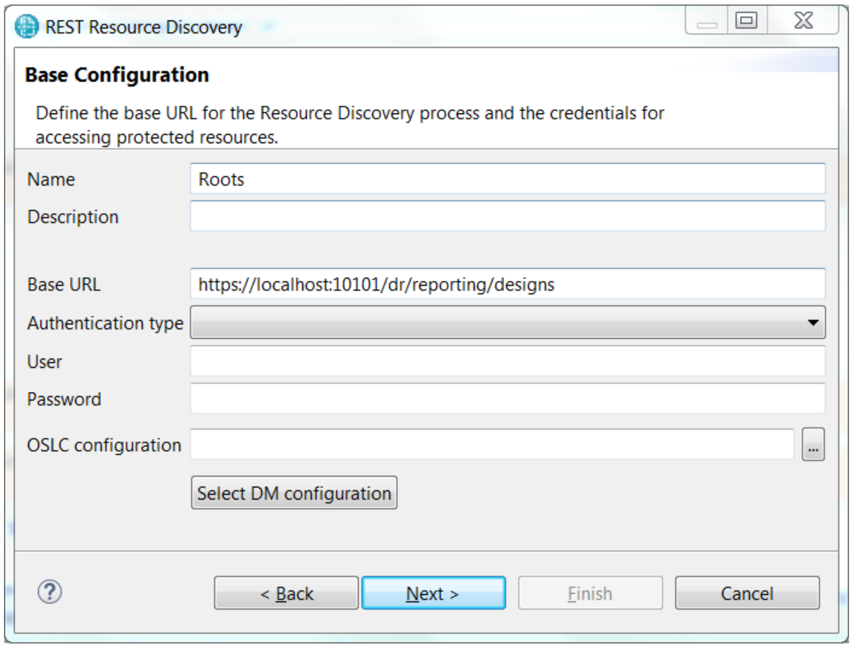
   A native filter is passed as a parameter in the API call to Design Room ONE, and only the items that match the filter will be returned. RPE also supports scripted filters. In this case all items are returned from the API call, but are then filtered by RPE by means of a JavaScript expression. Native filters are much more efficient than scripted filters since they can drastically limit the amount of data RPE needs to traverse. For optimal report generation performance you should therefore use native filters whenever possible. Design Room ONE supports native filtering for most of its APIs, but not everywhere and the native filtering conditions are more limited than scripted filters where the full power of a programming language (JavaScript) can be used for defining the filter.
3. Press **OK** to apply the filter. A filter icon on the container shows that a filter is applied:


Container Designs $1 DesignRoom/Designs/Design

If you now run report generation for the template you will see that only the design called "DemoRPE" will get included in the report.

4. Create another data source "Roots" using the REST Resource Discovery wizard.

> **Hint!** You don't need to start the REST Resource Discovery wizard from the base reporting URL each time. Once you learn the URLs of the various reporting APIs provided by Design Room ONE you can type them directly into the wizard to skip clicking through so many wizard pages before reaching the URL you want to create a data source for. In the picture below the discovery starts at the `/dr/reporting/designs` API to skip the first few wizard pages.

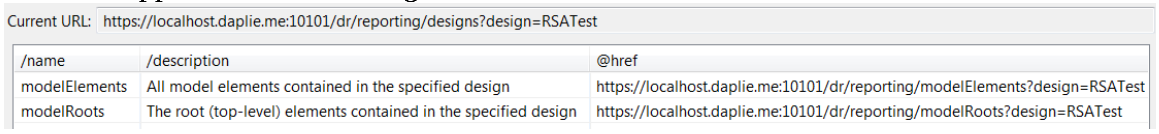


Define the base URL for the Resource Discovery process and the credentials for accessing protected resources.

Name	Roots
Description	
Base URL	https://localhost:10101/dr/reporting/designs
Authentication type	
User	
Password	
OSLC configuration	

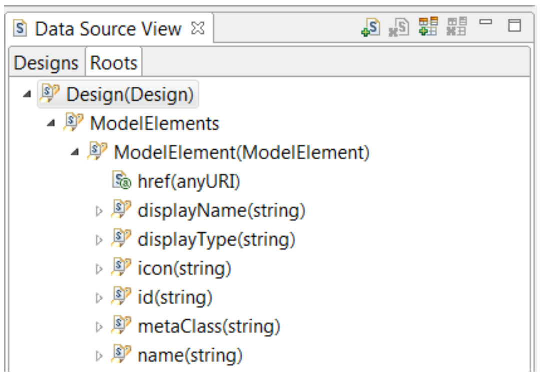
Select DM configuration

Click **Next**. Select all attributes for the Design element and press **Next** again. All designs will be listed in the table. Select any of them and press **Next**. Then select all attributes for the Item element and press **Next** again. You will now see the list of APIs supported on each design:

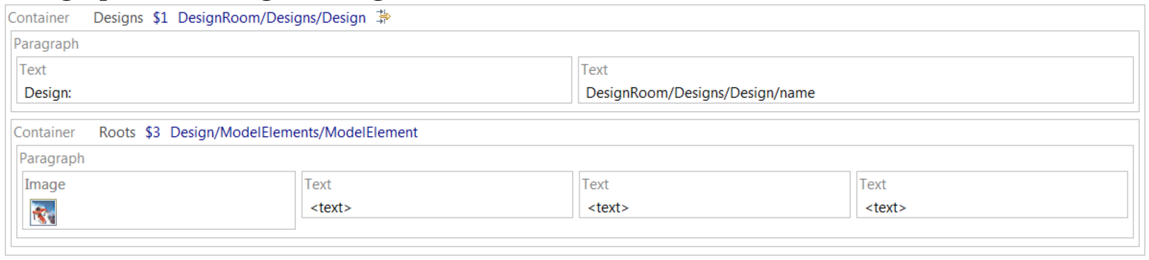

Current URL: https://localhost.daplie.me:10101/dr/reporting/designs?design=RSATest

/name	/description	@href
modelElements	All model elements contained in the specified design	https://localhost.daplie.me:10101/dr/reporting/modelElements?design=RSATest
modelRoots	The root (top-level) elements contained in the specified design	https://localhost.daplie.me:10101/dr/reporting/modelRoots?design=RSATest

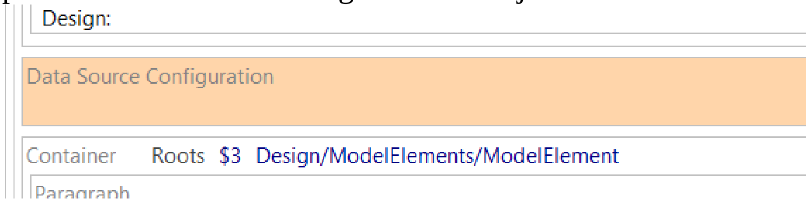
Select "modelRoots" and press **Finish**. A data source bound to the ModelRoots API will be created.


Data Source View
Designs | Roots
- Design(Design)
  - ModelElements
    - ModelElement(ModelElement)
      - href(anyURI)
      - displayName(string)
      - displayType(string)
      - icon(string)
      - id(string)
      - metaClass(string)
      - name(string)

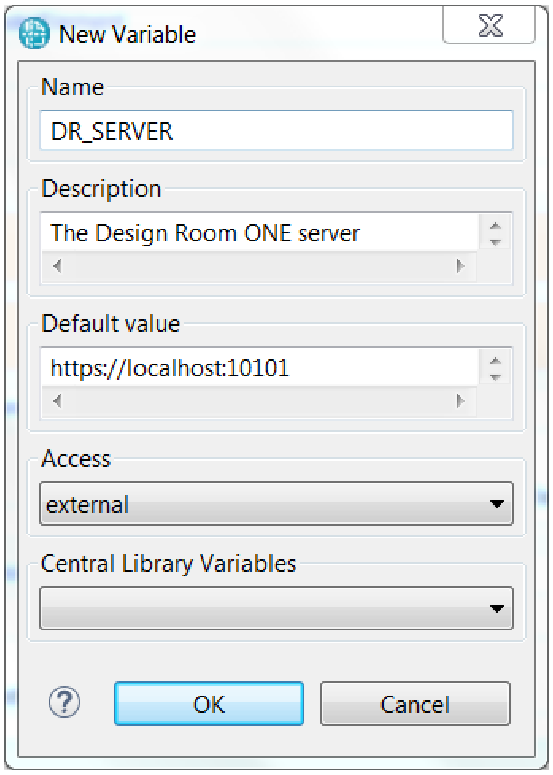
5. Create a Roots container, **<u>nested</u>** within the Designs container, and create a Paragraph containing an Image and three Text items:


Container Designs $1 DesignRoom/Designs/Design
Paragraph
Text: Design:
Text: DesignRoom/Designs/Design/name
Container Roots $3 Design/ModelElements/ModelElement
Paragraph
Image
Text: <text>
Text: <text>
Text: <text>

6. Contrary to the Designs data source, the Roots data source must be dynamic. That is, rather than configuring it once when generating the report, it must be configured once for each design (since the design is a parameter in the URL that is bound to this data source). To configure the Roots data source dynamically, place a Data Source Configuration item just before the Roots container:


Design:
Data Source Configuration
Container Roots $3 Design/ModelElements/ModelElement
Paragraph

7. Select the Data Source Configuration. Go to the **Data** tab in the **Properties** view and set the **Target data source** to Roots. This specifies a dynamic data source, and a new properties tab **Dynamic configuration** appears (you need to deselect the Data Source Configuration and select it again). In this tab, the **URI** field specifies the URI of the data source. We will use a script expression for setting this URI. To avoid hard coding the URL of the Design Room ONE server in each data source configuration URI, we should first define a variable which we can reference from the URI.
8. Create a variable by right-clicking on the **Variables** item in the **Outline** view. Select **Insert – New Variable** in the context menu and create a variable `DR_SERVER` like this:


New Variable

Name: DR_SERVER

Description: The Design Room ONE server

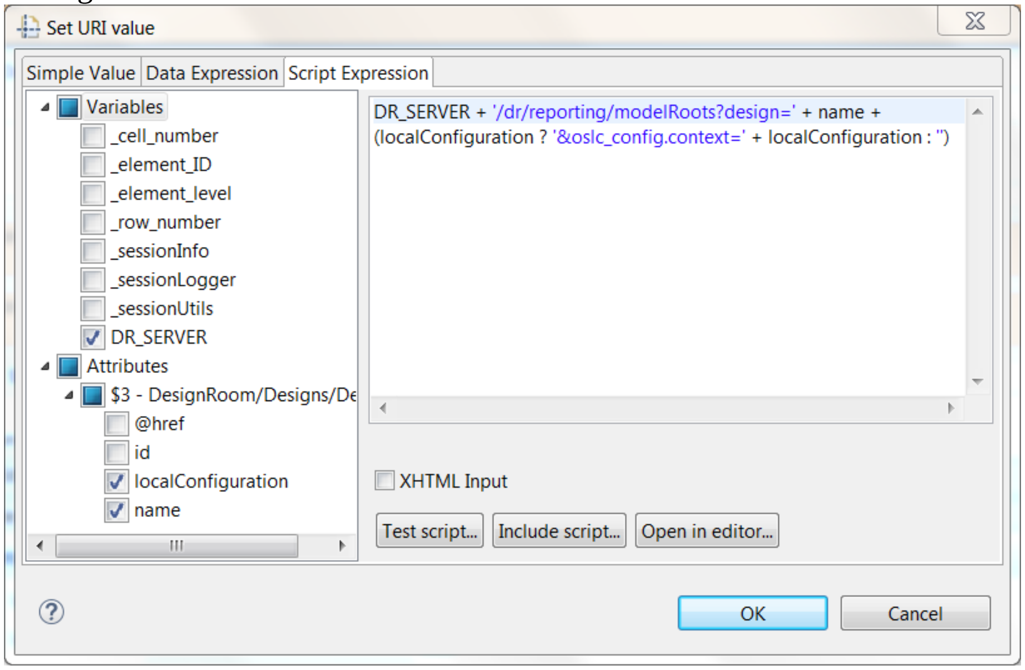
Default value: https://localhost:10101

Access: external

Central Library Variables:

The variable is external which means that it should be set when generating the report. However, by specifying a default value we only need to set it if we want to use data from a non-default Design Room ONE server.

9. Now we can write the script expression for the URI property of the Data Source Configuration:


Set URI value

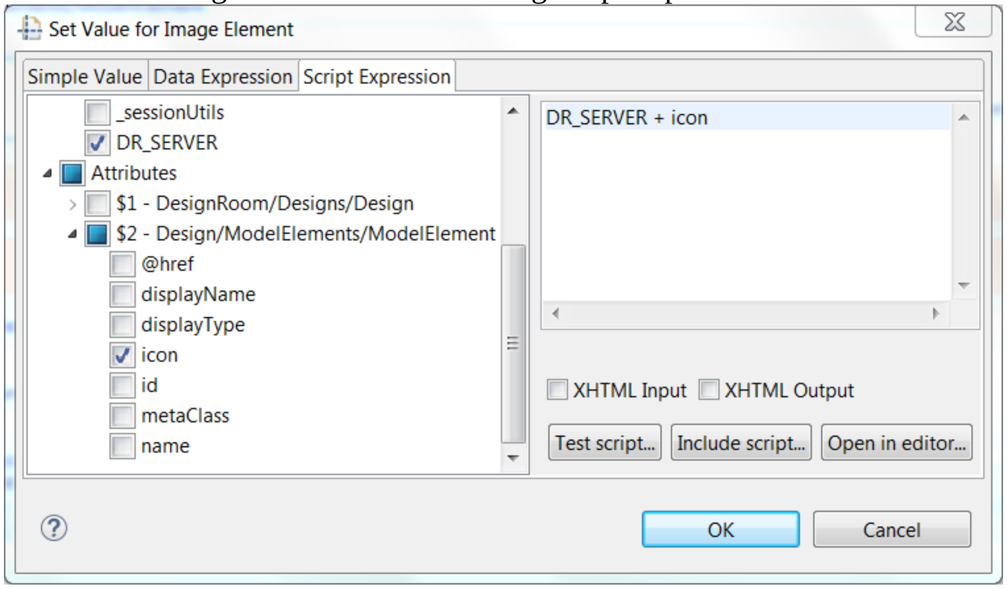
- Variables
  - _cell_number
  - _element_ID
  - _element_level
  - _row_number
  - _sessionInfo
  - _sessionLogger
  - _sessionUtils
  - ✓ DR_SERVER
- Attributes
  - $3 - DesignRoom/Designs/De
    - @href
    - id
    - ✓ localConfiguration
    - ✓ name

```
DR_SERVER + '/dr/reporting/modelRoots?design=' + name +
(localConfiguration ? '&oslc_config.context=' + localConfiguration : '')
```

XHTML Input

Note that you must mark the variables and attributes, that are referenced by the script expression, in the left pane. In this case we reference the DR_SERVER variable and the `name` and `localConfiguration` attributes of the Design element. Note that the `localConfiguration` attribute is only available if you have chosen to export the local configuration information with the design. If this attribute is present we must set the `oslc_config.context` parameter in the request for the root elements, to ensure that the correct version of the design will be used. As a general rule, always set the `oslc_config.context` parameter like this in all requests where a design name is included.

10. Enter data for the three Text items. In the first one drag and drop the attribute `metaClass` from the Roots data source. During report generation it will expand to the name of the meta class of the root model element (typically “Package”). In the second Text item type the simple value “ : “ to be used as separator. In the third Text item drag and drop the attribute `name` from the Roots data source which will expand to the name of the root element. Note that when you drop an attribute on a Text item you should select “Use as value” in the Select Context dialog that appears.
11. Set the content URL of the Image to fetch the icon for the root element. Double-click on the Image and enter the following script expression:

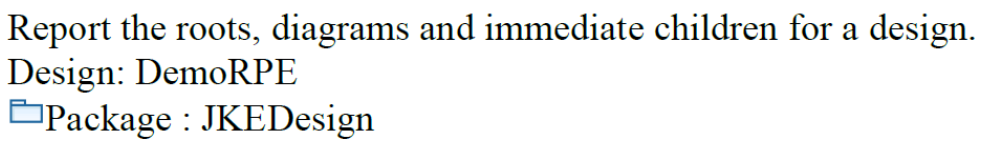


```
DR_SERVER + icon
```

The `icon` attribute from the ModelElement element contains the path to the icon of the model element, so we just need to append that to the `DR_SERVER` variable to obtain the full URL of the icon.

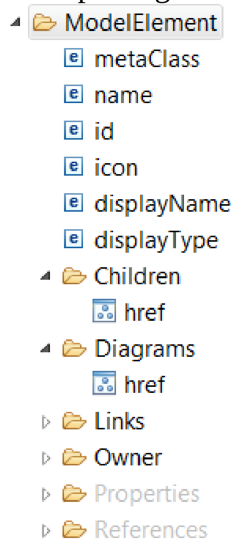
Hint! You can drag and drop the variables and attributes from the left pane into the script expression to avoid typos.

12. Now is a good time to save and test your template. You should avoid too many modifications in a template before trying it out, to simplify troubleshooting in case something does not work as expected. The generated report should look like this:

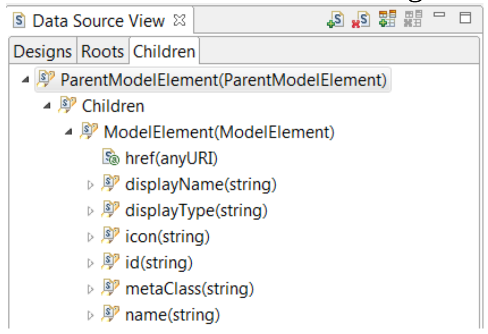

Report the roots, diagrams and immediate children for a design.
Design: DemoRPE
Package : JKEDesign

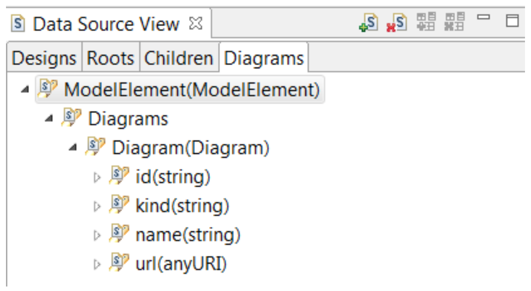
Note that even if the Roots data source is dynamic you need to specify a value for it when generating the report. You can use any string (but it must be a URL) since the data source is dynamic. For example, you can use the string https://dynamic_data_source.

13. To include the diagrams and children elements of the root elements into the report we need to create two new data sources. Use the REST Schema Discovery wizard to add these. Start the wizard on the URL https://localhost:10101/dr/reporting/modelRoots?design=DemoRPE to save some clicking. On the third wizard page you get the list of root elements (only one for the DemoRPE design). Select it and proceed to the fourth wizard page which lists the reporting APIs available for a model element:


```
ModelElement
    metaClass
    name
    id
    icon
    displayName
    displayType
    Children
        href
    Diagrams
        href
    Links
    Owner
    Properties
    References
```

Create a data source Children bound to the URL stored in the `href` attribute of the Children element, and another data source Diagrams bound to the URL stored in the `href` attribute of the Diagrams element:


```
Data Source View
Designs | Roots | Children
ParentModelElement(ParentModelElement)
    Children
        ModelElement(ModelElement)
            href(anyURI)
            displayName(string)
            displayType(string)
            icon(string)
            id(string)
            metaClass(string)
            name(string)
```

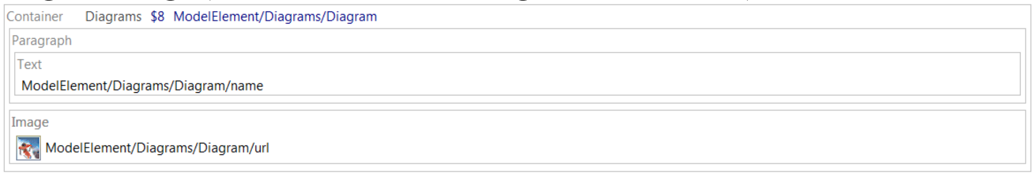

```
Data Source View
Designs | Roots | Children | Diagrams
ModelElement(ModelElement)
    Diagrams
        Diagram(Diagram)
            id(string)
            kind(string)
            name(string)
            url(anyURI)
```

14. Add a container for each of these two data sources. Place them next to each other inside the Roots container. Use two Data Source Configuration items to configure them dynamically using the following scripts:

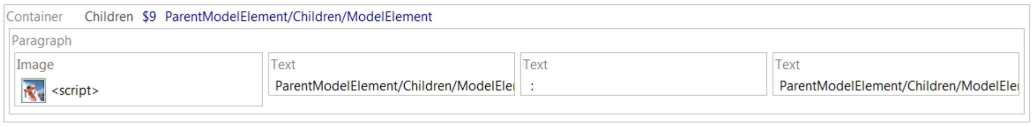
- Set the URI of the Diagrams data source to:
  `DR_SERVER + '/dr/reporting/diagrams?design=' + name + (localConfiguration ? '&oslc_config.context=' + localConfiguration : '') + '&elementId=' + id`
- Set the URI of the Children data source to:
  `DR_SERVER + '/dr/reporting/children?design=' + name + (localConfiguration ? '&oslc_config.context=' + localConfiguration : '') + '&elementId=' + id`

where `name` and `localConfiguration` is the name and local configuration of the design, and `id` is the id of the root element.

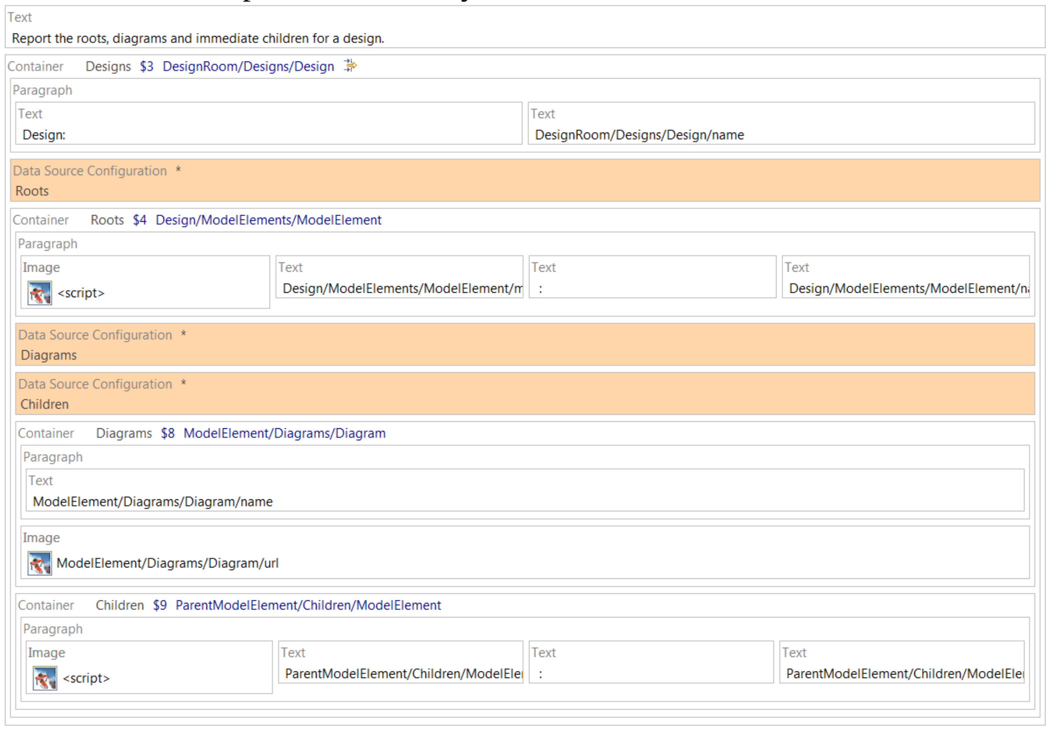
15. In the Diagrams container add a Text item to show the name of the diagram (attribute `name` of the Diagrams data source) and an Image item to show the diagram image (attribute `url` of the Diagrams data source):


Container Diagrams $8 ModelElement/Diagrams/Diagram
Paragraph
Text
ModelElement/Diagrams/Diagram/name
Image
ModelElement/Diagrams/Diagram/url

16. In the Children container add an Image and three Text items in the same way as you did for the root element. In the script expression for the Image URL make sure you reference the icon of the child element and not the icon of the root element.


Container Children $9 ParentModelElement/Children/ModelElement
Paragraph
Image
<script>
Text
ParentModelElement/Children/ModelEle
Text
:
Text
ParentModelElement/Children/ModelEle

17. The document template is now ready. It should look like this:


Text
Report the roots, diagrams and immediate children for a design.
Container Designs $3 DesignRoom/Designs/Design
Paragraph
Text Design:
Text DesignRoom/Designs/Design/name
Data Source Configuration *
Roots
Container Roots $4 Design/ModelElements/ModelElement
Paragraph
Image <script>
Text Design/ModelElements/ModelElement/m
Text :
Text Design/ModelElements/ModelElement/n
Data Source Configuration *
Diagrams
Data Source Configuration *
Children
Container Diagrams $8 ModelElement/Diagrams/Diagram
Paragraph
Text ModelElement/Diagrams/Diagram/name
Image ModelElement/Diagrams/Diagram/url
Container Children $9 ParentModelElement/Children/ModelElement
Paragraph
Image <script>
Text ParentModelElement/Children/ModelEle
Text :
Text ParentModelElement/Children/ModelEle

The generated report should now contain the diagrams for the root elements, as well as icon, meta class and name for all its immediate children.

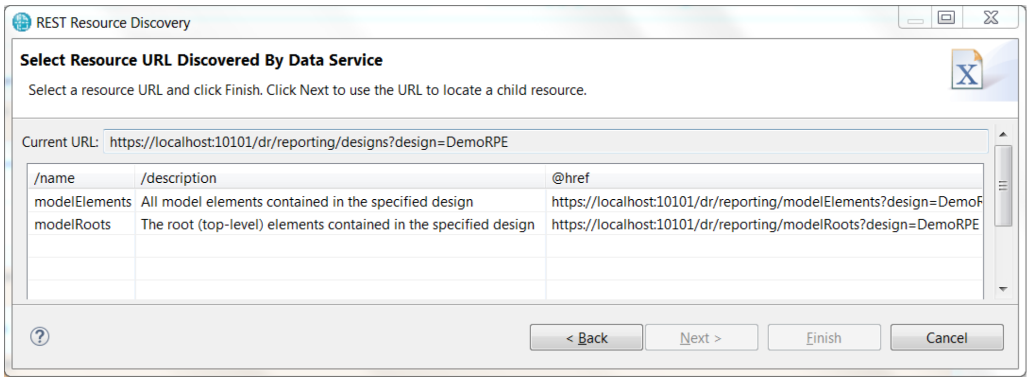
Lesson 3: Print all classes in a design, and the operations they contain

Sample report: `DR_classes_operations.dta`
Reporting APIs used: Model Elements, Children, Element

Here we will create a report which extracts information for one particular design. In the previous lesson we used native filtering on the Designs API to find the design to generate the report for. In this lesson we will instead specify the design using an external variable.

We will use the Model Elements API with native filtering to find all classes in the design. We will sort the classes alphabetically and print some information about each of them, such as the operations they contain. You will learn how to use the Element API to extract information about a particular model element. You will also learn how to use internal variables, hyperlinks, sorting and scripted filters.

1. Start by creating two external variables: DESIGN (to hold the name of the design to report on) and DR_SERVER (same as in previous lesson).
2. Create the data sources we need for this lesson. Use the REST Resource Discovery wizard and start on the URL https://localhost:10101/dr/reporting/designs?design=DemoRPE. Create a ModelElements data source for the 'modelElements' entry on the second wizard page.


REST Resource Discovery

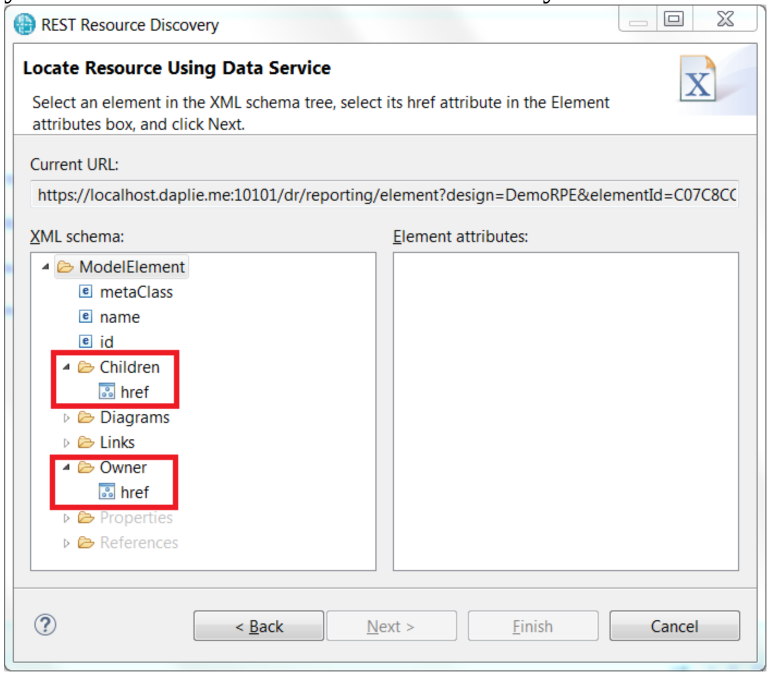
Select Resource URL Discovered By Data Service

Select a resource URL and click Finish. Click Next to use the URL to locate a child resource.

Current URL: https://localhost:10101/dr/reporting/designs?design=DemoRPE

/name	/description	@href
modelElements	All model elements contained in the specified design	https://localhost:10101/dr/reporting/modelElements?design=DemoF
modelRoots	The root (top-level) elements contained in the specified design	https://localhost:10101/dr/reporting/modelRoots?design=DemoRPE

Then restart the wizard and click further until you reach the ModelElement schema where you can create a data source Children. On this same wizard page you also see an Owner element for which you can create a data source Element.


REST Resource Discovery

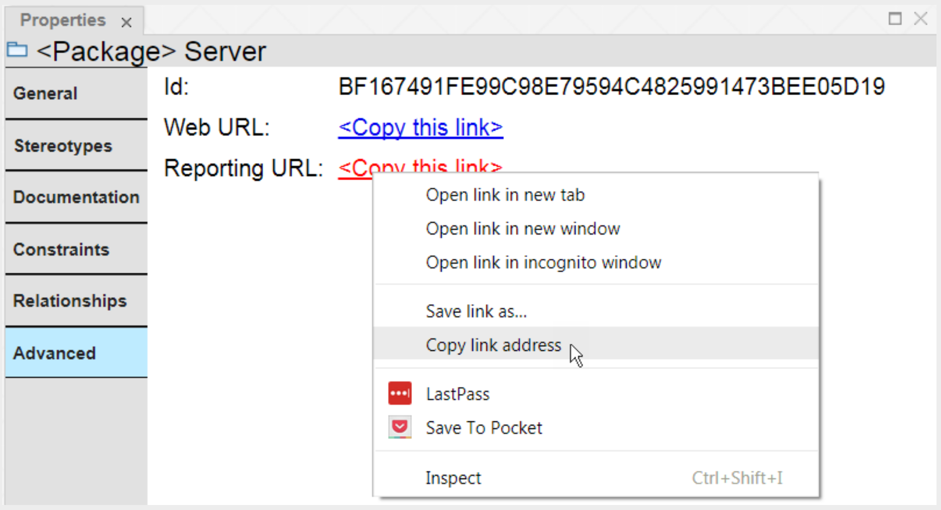
Locate Resource Using Data Service

Select an element in the XML schema tree, select its href attribute in the Element attributes box, and click Next.

Current URL:
https://localhost.daplie.me:10101/dr/reporting/element?design=DemoRPE&elementId=C07C8CC

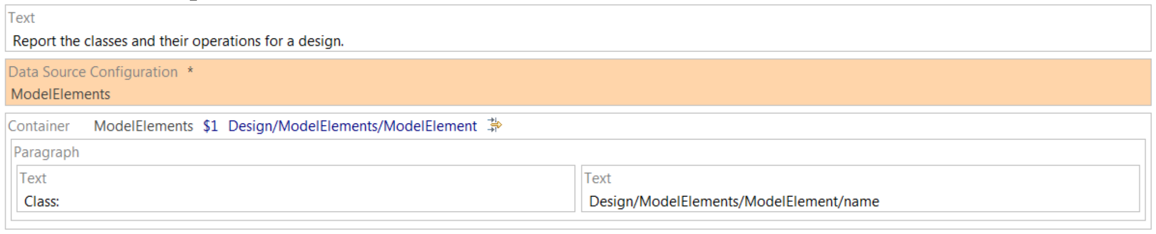
Note that when the wizard lists all model elements in the design (before you reach the page shown above) you must select an element that has both an owner and some children. For example, do not select a root element as in that case no owner will be present, and the wizard will not let you create a data source for the Element API.

Hint! A quick way to start the REST Resource Discovery wizard directly on the page that shows the schema for the Element API is to locate an element in the Design Room ONE web application. Select it in the Explorer view and open the Advanced tab in the Properties view. There you will find the reporting URL for the element. You can copy the URL and paste it into the REST Resource Discovery wizard:



Id: BF167491FE99C98E79594C4825991473BEE05D19
Web URL: <Copy this link>
Reporting URL: <Copy this link>

3. Create the template shown below:



Text
Report the classes and their operations for a design.

Data Source Configuration *
ModelElements

Container ModelElements $1 Design/ModelElements/ModelElement

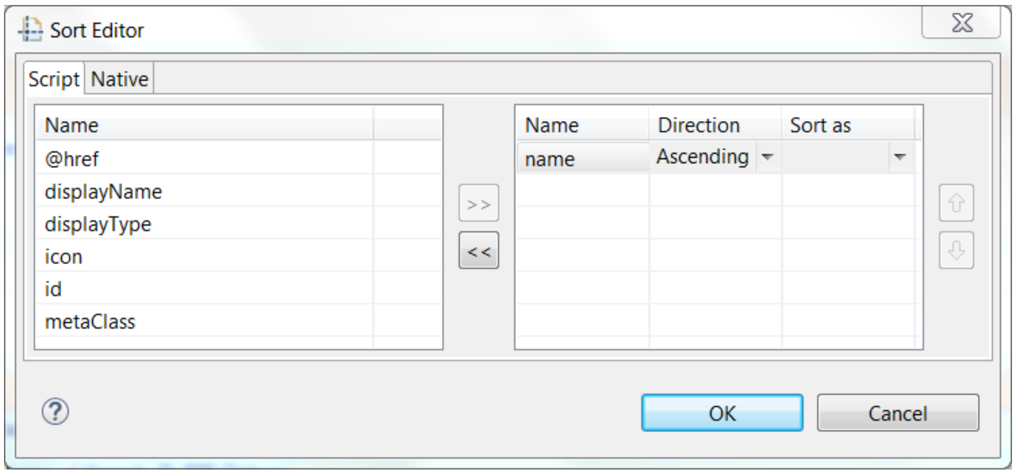
Paragraph

Text
Class:

Text
Design/ModelElements/ModelElement/name

Configure the data source configuration using the script expression
`DR_SERVER + '/dr/reporting/modelElements?design=' + DESIGN`
Here we have assumed that the design specified by the `DESIGN` variable has been exported without any local configuration information. To support also designs with local configurations we would have to add the setting of the `oslc_config.context` parameter as described in the previous lesson.
Finally also set a native filter for the container like this
`metaClass=Class`

4. If we would generate a report now (try it if you like) we would get a listing of all classes in the design. The classes will appear in a seemingly random order. We can make the list sorted by selecting the container, and in the **Data** tab of the **Properties** view click on the button next to the **Sort** field. Just as for filtering, sorting can either be native (performed by Design Room ONE) or scripted (performed by RPE). Currently Design Room ONE does not support native sorting so you have to use the somewhat slower scripted alternative. Add the name attribute to the right table to sort the classes by their names.

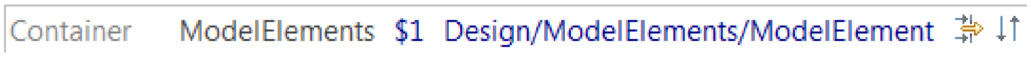

Sort Editor

Script | Native

Name
@href
displayName
displayType
icon
id
metaClass

Name	Direction	Sort as
name	Ascending	

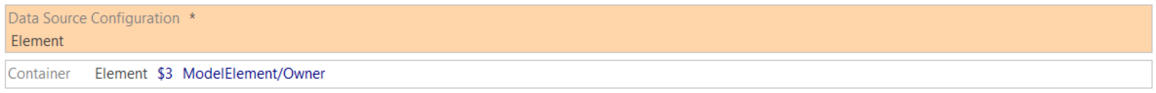
RPE shows an icon on the container to indicate that the elements will be sorted:


Container ModelElements $1 Design/ModelElements/ModelElement

5. Now run report generation for the template. You need to enter a value for the DESIGN variable (in the Document Specification Configuration dialog) since we did not give it a default value. Set it for example to “DemoRPE”. You also need to specify URLs for the three data sources we have. Since all these data sources are dynamic (i.e. will be configured dynamically while the report generation runs) you can enter any URL for them. For example, you can use https://dynamic_data_source to show that the data sources are dynamic.
The generated report should look like this:

   Report the classes and their operations for a design.
   Class: Account
   Class: Inner
   Class: MyClass
   Class: Organization
   Class: Outer
   Class: Transaction
   Class: User
   Class: YourClass

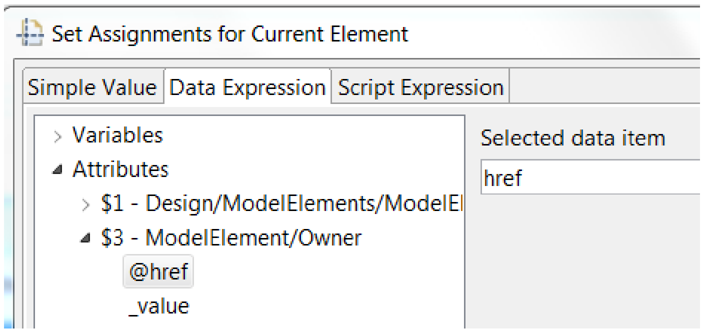
6. Next let’s extract the owner element for each of the classes and add a hyperlink to it in the report. We use the Element data source for getting this data. Add this inside the container:


Data Source Configuration *
Element
Container Element $3 ModelElement/Owner

Configure the data source using the script expression
`DR_SERVER + '/dr/reporting/element?design=' + DESIGN + '&elementId=' + id`
where `id` refers to the id of the current model element. Once again we have omitted setting the `oslc_config.context` parameter, but to support designs with local configurations you would have to set it.

The nested container extracts the owner of the model element. Previously we have only used containers for extracting a list of items, to let the container iterate over them, but containers can also be used to extract a single item like the owner element.

7. The Owner element extracted by the Element container has an `href` attribute which contains the URL of the owner element. To extract information about the owner element, such as its name, we need to query that URL. However, the URL we get is the Element API which is also used by the parent container. You must be careful when reconfiguring a data source whose elements you are currently iterating over. Changing the URL of the data source inside the container typically affects the iteration, which often is undesired. To solve this problem, we create an internal variable OWNER_HREF and assign the value of the `href` attribute to it in the Element container. You do the assignment by selecting the container and then in the **General** tab in the **Properties** view click on the button next to the **Assignment** field. Click the **Add** button in the dialog and select the OWNER_HREF variable in the list that appears. Set the value of the variable to the `href` attribute of the Owner element.



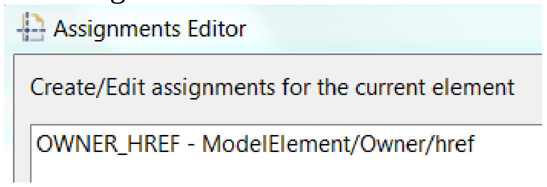
Set Assignments for Current Element

Simple Value | Data Expression | Script Expression

- Variables
- Attributes
  - $1 - Design/ModelElements/ModelEl
  - $3 - ModelElement/Owner
    - @href
    - _value

Selected data item: href

The assignment should look like this:

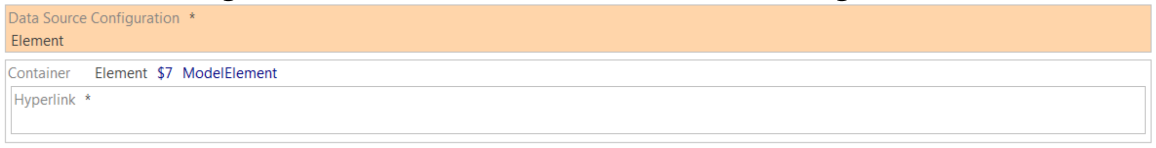


Assignments Editor

Create/Edit assignments for the current element

OWNER_HREF - ModelElement/Owner/href

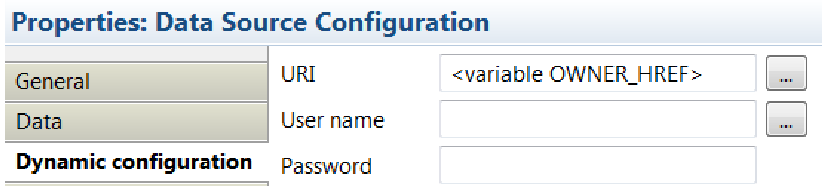
8. Now we can reconfigure the Element data source <u>after</u> the container that extracts the owner element to avoid unwanted side effects. Note that another benefit with this is that the template gets fewer levels of container nesting.
Add the following items after the container with the variable assignment:



Data Source Configuration *
Element

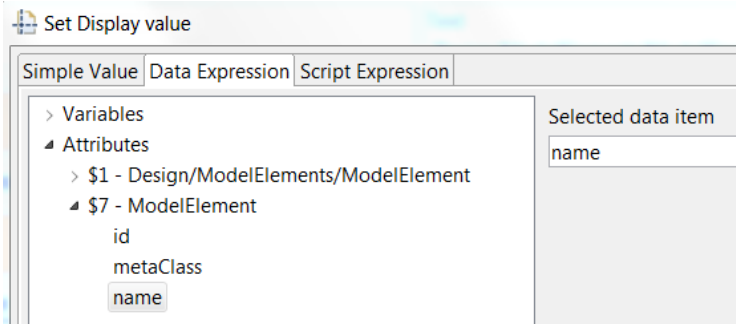
Container Element $7 ModelElement
Hyperlink *

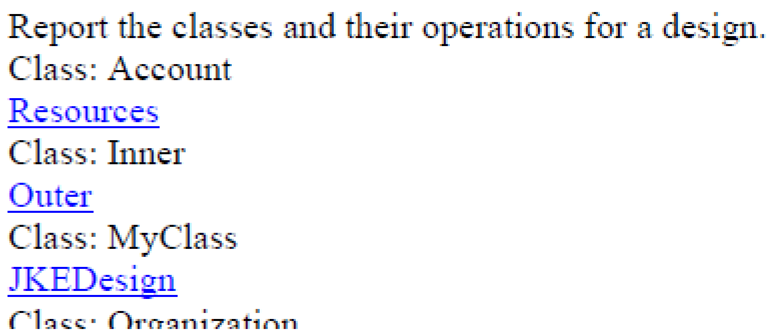
Configure the Element data source using a data expression that references the OWNER_HREF variable:

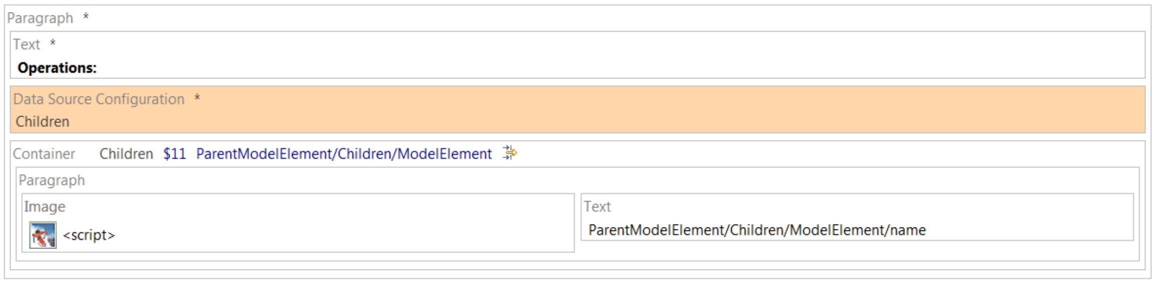


Properties: Data Source Configuration

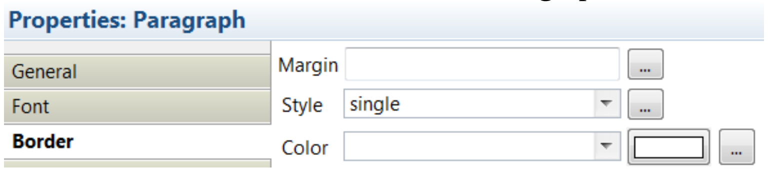
General	URI	<variable OWNER_HREF>
Data	User name	
Dynamic configuration	Password	

9. Set-up the hyperlink using the **Properties** view. In the **Content** tab click the button in the bottom right corner and enter this script expression
   `DR_SERVER + '/dr/web?design=' + DESIGN + '&id=' + id + '&type=model'`
   where `id` references the id of the owner element ($7 in the picture above). The constructed URL opens the Design Room ONE web application and navigates to the owner element. To support designs with local configurations we would also need to set the `oslc_config.context` parameter as mentioned previously.
   Then go to the **Specific** tab and click the button next to the **Display** field. Enter a data expression that references the name of the model element:
   

   To make the hyperlink look like a hyperlink we also need to apply some formatting. In the **Font** tab set blue font color and click the underline button.
10. Now run report generation again. You should see a hyperlink after each class that links to the owner of the class.
   
   Report the classes and their operations for a design.
   Class: Account
   Resources
   Class: Inner
   Outer
   Class: MyClass
   JKEDesign
   Class: Organization

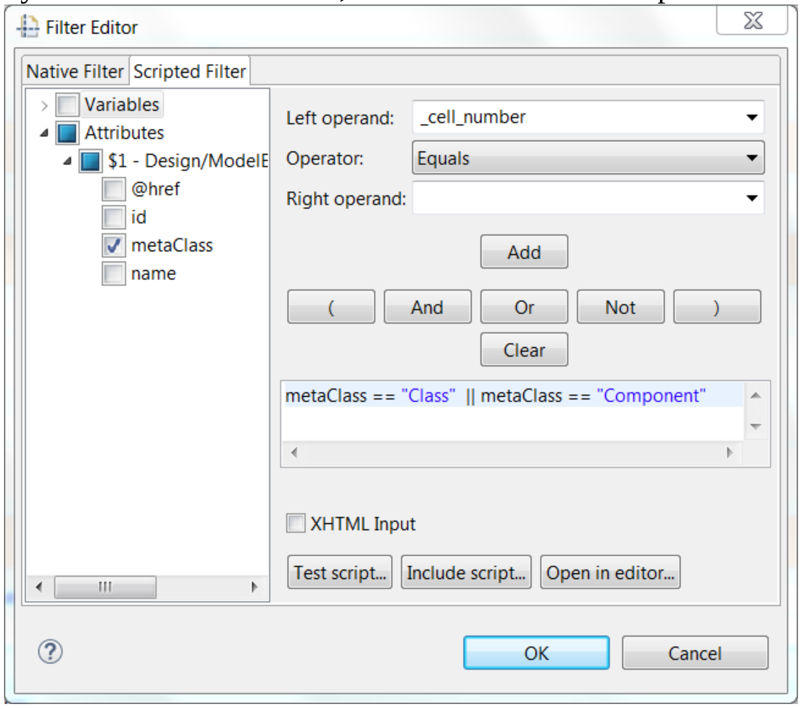
   If you click on the link, Design Room ONE will open the design and navigate to the owner element.
11. Now let's add the operations of each class. Operations are child elements of their class, so we use the Children data source for getting them. Add the below items at the end of the outermost container:
   
   Paragraph *
   Text *
   Operations:
   Data Source Configuration *
   Children
   Container Children $11 ParentModelElement/Children/ModelElement
   Paragraph
   Image
   <script>
   Text
   ParentModelElement/Children/ModelElement/name

Configure the Children data source using the following script expression:
`DR_SERVER + '/dr/reporting/children?design=' + DESIGN + '&elementId=' + id`
To support designs with local configurations we would also need to set the `oslc_config.context` parameter as mentioned previously.
Set-up the content of the Image using this script expression:
`DR_SERVER + icon`
where `icon` references the icon attribute of the child element.
To only get the operations, and not all other children, set up a native filter on the Children container like this:
`metaClass=Operation`
Finally apply a little formatting to make the report look nicer. Let the first Text item have bold font and its container Paragraph a border:



Margin:
Style: single
Color:

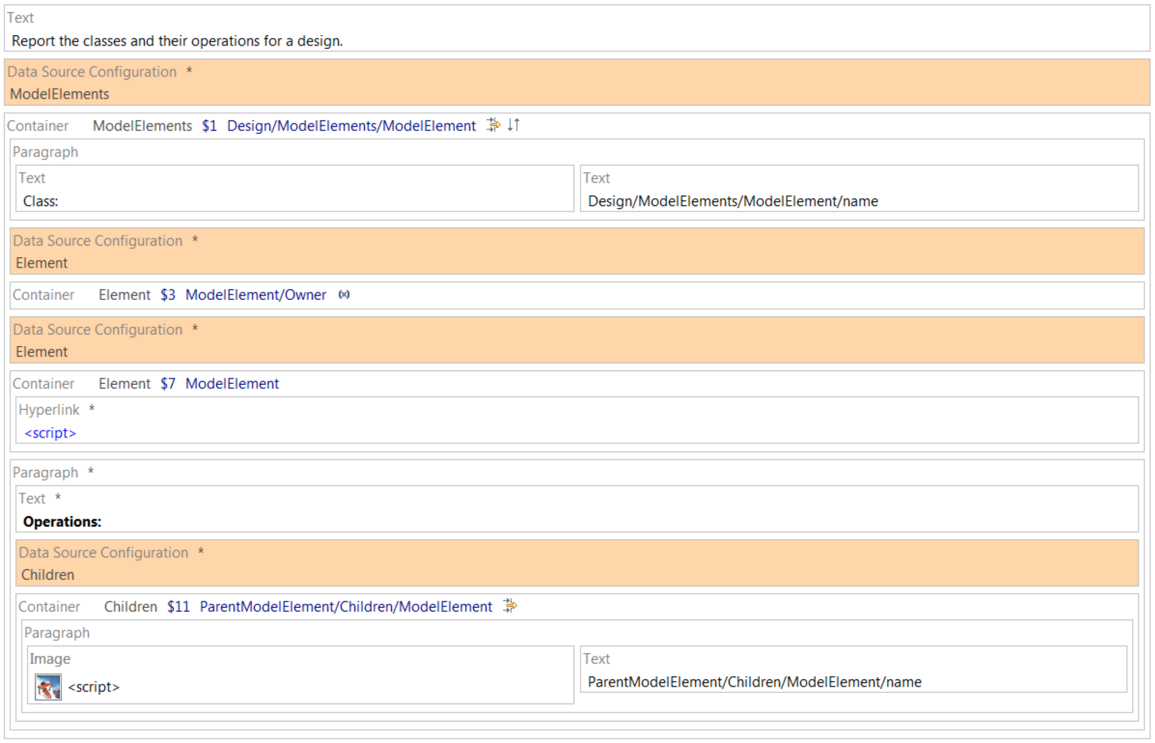
12. In the DemoRPE design few of the classes have any operations. However, there are several components in that design which contain operations. Therefore let’s modify the filter of the outermost container so that it fetches both classes and components. This is an example of filtering that currently cannot be accomplished by means of a native filter, so we need to use a script filter instead:



Left operand: _cell_number
Operator: Equals
Right operand:

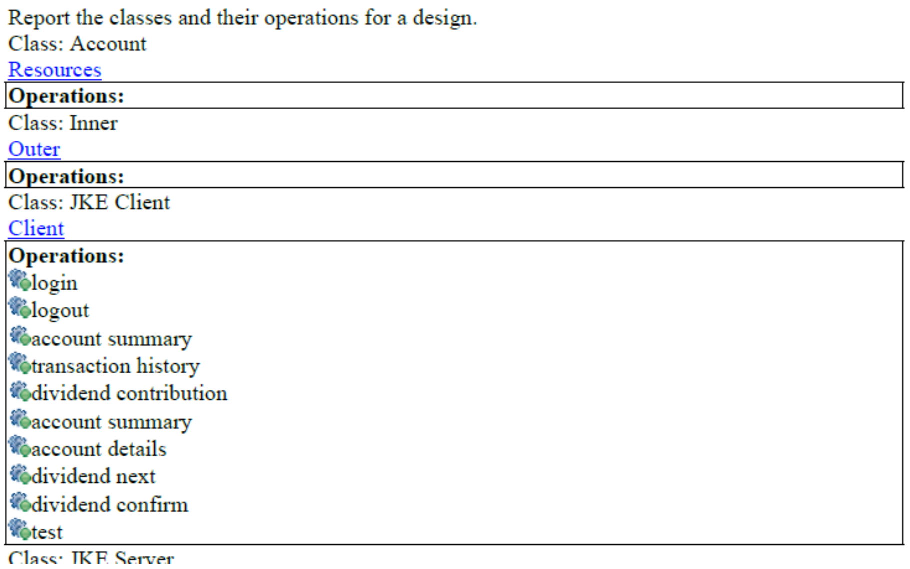
```
metaClass == "Class" || metaClass == "Component"
```

13. Our template is now ready. The completed template looks like this:



Text
Report the classes and their operations for a design.
Data Source Configuration *
ModelElements
Container ModelElements $1 Design/ModelElements/ModelElement
Paragraph
Text
Class:
Text
Design/ModelElements/ModelElement/name
Data Source Configuration *
Element
Container Element $3 ModelElement/Owner
Data Source Configuration *
Element
Container Element $7 ModelElement
Hyperlink *
<script>
Paragraph *
Text *
Operations:
Data Source Configuration *
Children
Container Children $11 ParentModelElement/Children/ModelElement
Paragraph
Image
<script>
Text
ParentModelElement/Children/ModelElement/name

Generate a report. It should look like this:



Report the classes and their operations for a design.
Class: Account
Resources
Operations:
Class: Inner
Outer
Operations:
Class: JKE Client
Client
Operations:
login
logout
account summary
transaction history
dividend contribution
account summary
account details
dividend next
dividend confirm
test
Class: JKE Server

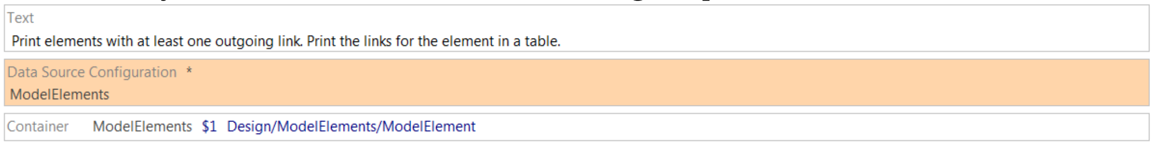
Lesson 4: Print elements with DOORS links and data about the linked requirements

Sample report: `DR_links_requirements.dta`
Reporting APIs used: Model Elements, Element, Links

Here we will create a report which extracts all elements in a particular design for which there is at least one outgoing link to a requirement in DOORS NG. The links are printed in a table below the element.

In this lesson you will learn about the Links API, tables, conditions and how to create a report that contains data from multiple tools (in this case Design Room ONE and DOORS NG).

1. Start by creating data sources for the ModelElements and Element APIs as in the previous lesson. Also create the external variables DR_SERVER and DESIGN in the same way as before. Then create the following template:

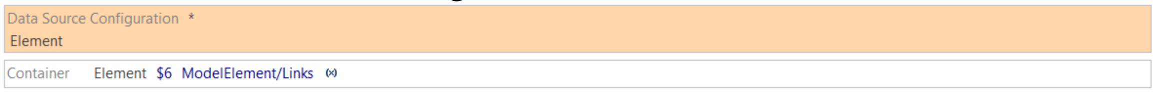
   

   Text
   Print elements with at least one outgoing link. Print the links for the element in a table.

   Data Source Configuration *
   ModelElements

   Container ModelElements $1 Design/ModelElements/ModelElement

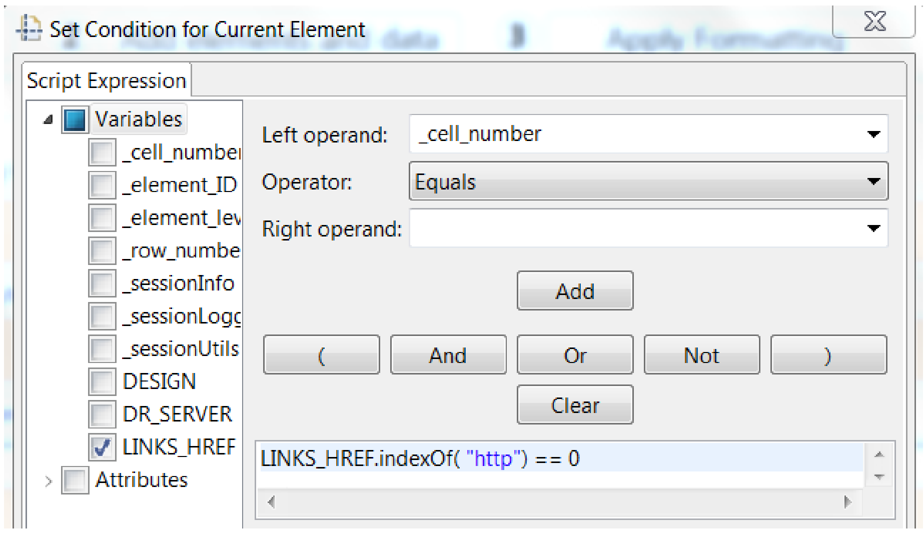
   The ModelElements data source is configured using the following script expression:
   `DR_SERVER + '/dr/reporting/modelElements?design=' + DESIGN`
   Note that in this case we don't apply a filter on the container since we want to iterate over all model elements in the design. This is because it is possible to link any model element to a requirement.
   Also note that for simplicity we have assumed that the design specified by the `DESIGN` variable does not have any local configurations. If it does, you would need to also set the `oslc_config.context` parameter as described in previous lessons.
2. Just as we did in the previous lesson we use the Element data source and an internal variable for extracting the `href` attribute of the Links element that is contained in the ModelElement element. Let's call this variable LINKS_HREF and add a container where it is assigned.

   Data Source Configuration *
   Element

   Container Element $6 ModelElement/Links

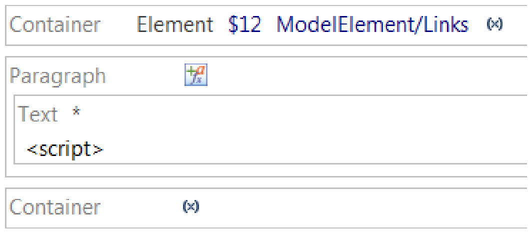
   The Element data source should be configured using this script expression:
   ```
   DR_SERVER + '/dr/reporting/element?design=' + DESIGN +
   '&elementId=' + id
   ```
   To support designs with local configurations also set-up the `oslc_config.context` parameter.
3. Add a Paragraph item after the container. It will print the element and its links. However, we only want to print the element if it has at least one link. We can accomplish this by defining a condition for the paragraph. In the **General** tab of the **Properties** view click on the button next to the **Condition** field. Enter a script expression that checks if the LINKS_HREF variable is set to a URL:



Left operand: _cell_number
Operator: Equals
Right operand:

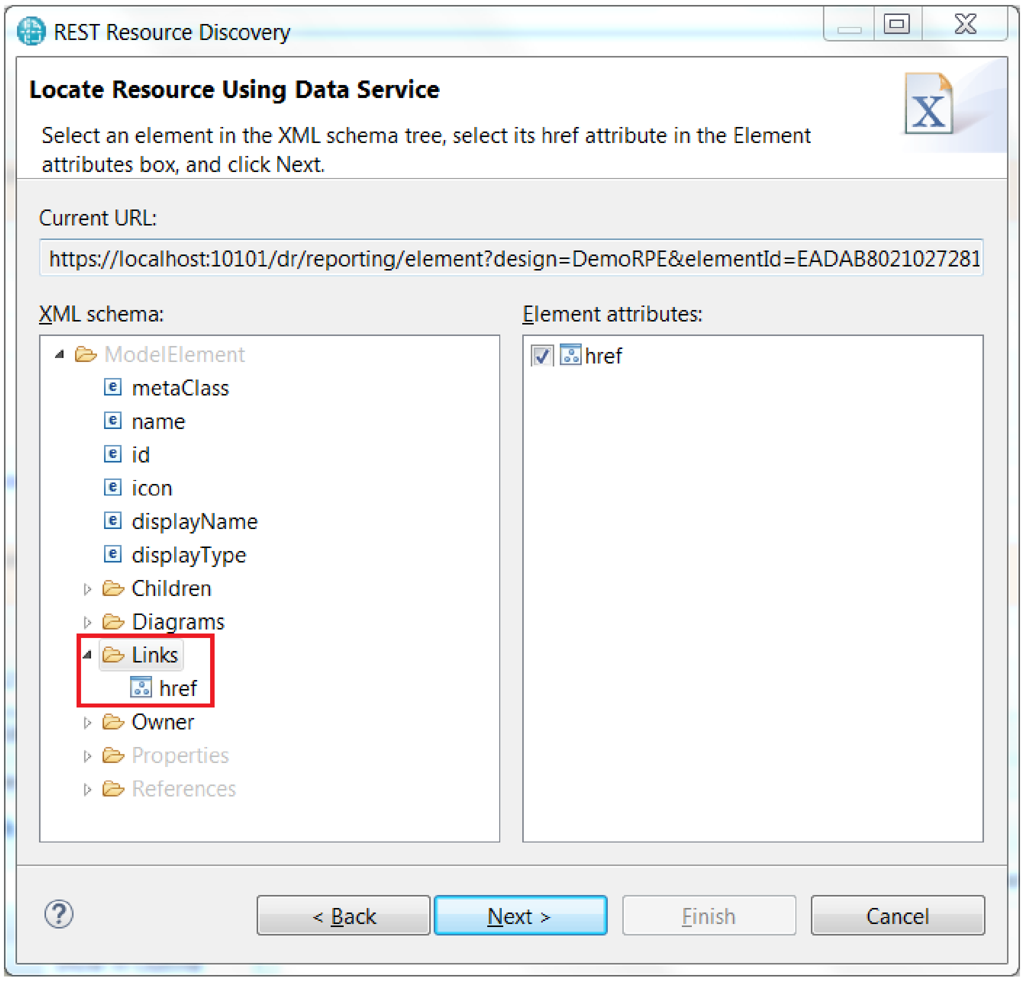
```
LINKS_HREF.indexOf( "http") == 0
```

We utilize here the fact that for an element that does not have any links the Links element will not be present and hence the LINKS_HREF variable will not be assigned a value by the container. If, on the other hand, there is at least one link, the LINKS_HREF variable will be assigned the URL of the Links API which we expect should start with the string “http”.
We also need to remember to assign a new string (that does not start with “http”) to the LINKS_HREF variable after the paragraph. This is needed so that the condition for the paragraph gets correctly interpreted for each element in the model. We can use another container for that, and add an assignment to it (for example assigning the simple value “nolink” to LINKS_HREF.
Finally, add a Text item inside the paragraph with the following script expression:
```
'The ' + metaClass + ' "' + name + '" has the following
links:'
```
The paragraph and its surrounding containers should look like this:



Note the icon on the paragraph that shows that it has an attached condition. It will only be included in the report for elements where the condition is fulfilled.

4. Inside the paragraph we can now use LINKS_HREF to configure a data source for getting all links for the model element. Create this Links data source using the wizard:


REST Resource Discovery

Locate Resource Using Data Service

Select an element in the XML schema tree, select its href attribute in the Element attributes box, and click Next.

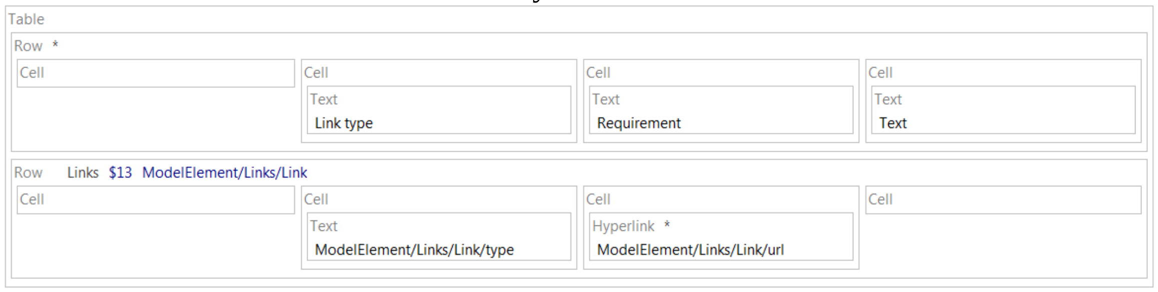
Current URL:

https://localhost:10101/dr/reporting/element?design=DemoRPE&elementId=EADAB8021027281

Note that you need to select an element that contains at least one link to be able to create the Links data source with the wizard.
Then add a Data Source Configuration inside the paragraph and set its target data source to the Links data source you just created. Set the URI of the data source to the LINKS_HREF variable.

5. Now it’s time to add the table where the requirement links will be printed. Add a table with two rows and four columns. The first row is for the table header. Create four cells in it with static texts in each of them except the first one. Use the **Properties** view to set a gray background color for the row (the field **Row background color** in the tab **Color**) and white font color (the field **Color** in the **Font** tab).
Connect the second row to the Links data source by dragging and dropping the Link element from the **Data Source** view to the row. This means that one table row will be created for each link.
Add a Text item in the second column cell for showing the type of the link. Add a hyperlink in the third column cell for showing a hyperlink to the requirement. Use the label of the link as the display text of the hyperlink, and use the link URL as hyperlink content.

The table should look like this when ready:

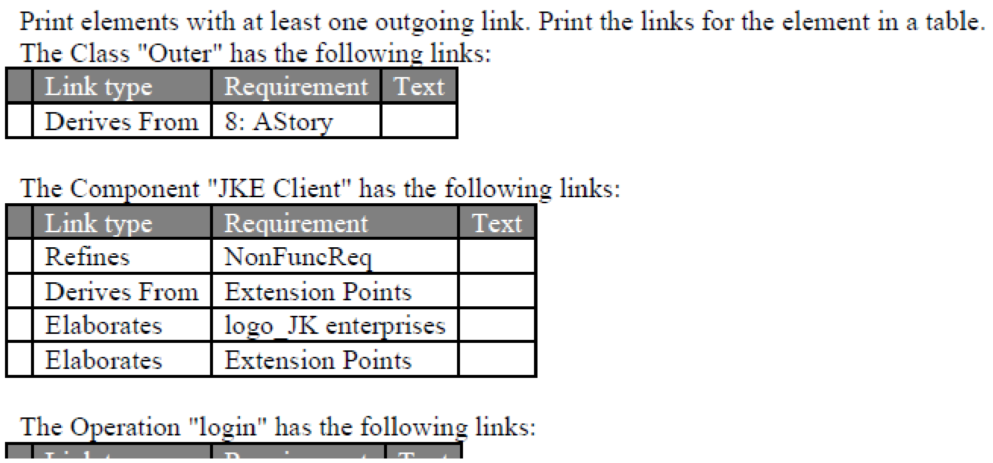


Table

Row *			
Cell	Cell Text Link type	Cell Text Requirement	Cell Text Text

Row Links $13 ModelElement/Links/Link			
Cell	Cell Text ModelElement/Links/Link/type	Cell Hyperlink * ModelElement/Links/Link/url	Cell

6. Now test the template by generating a report for it. It should look something like this:



Print elements with at least one outgoing link. Print the links for the element in a table.

The Class "Outer" has the following links:

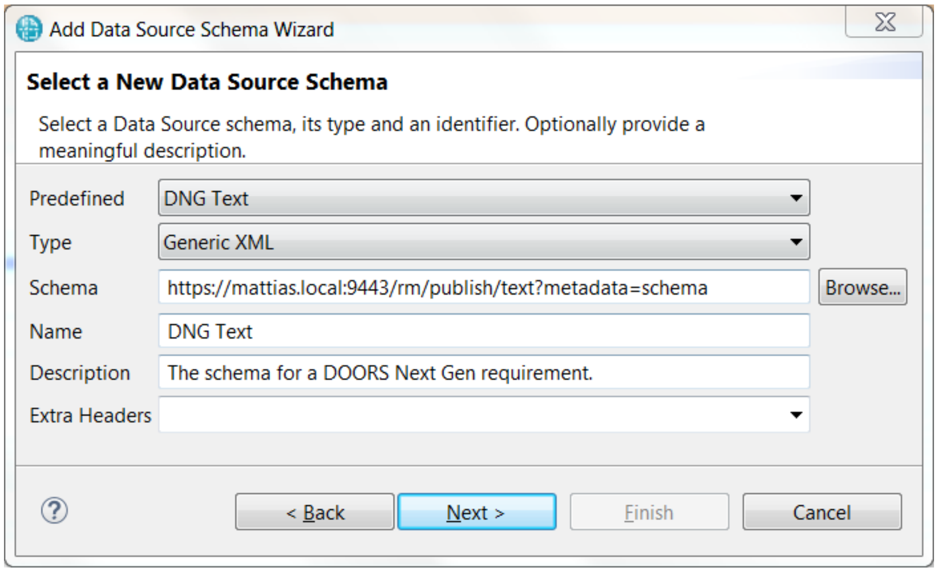
	Link type	Requirement	Text
	Derives From	8: AStory	

The Component "JKE Client" has the following links:

	Link type	Requirement	Text
	Refines	NonFuncReq	
	Derives From	Extension Points	
	Elaborates	logo_JK enterprises	
	Elaborates	Extension Points	

The Operation "login" has the following links:

7. So far all data in the report originates from Design Room ONE. However, one of the strengths with RPE is its ability to pull data from multiple tools into the same report. We will now add some data about each requirement that can be found in DOORS NG. In the first table column we will print the requirement number and in the last table column we will print the description text of the requirement.
As you may have guessed, the first step is to create a data source for getting the requirement data from DOORS NG. RPE provides predefined data sources for DOORS NG, and you therefore don't have to use the REST Schema Discovery wizard that you have used previously. Instead you can create the data source by means of the command **Data – Add Data Source**. Set **Predefined** to “DNG Text” and replace the server name and port in the **Schema** field.

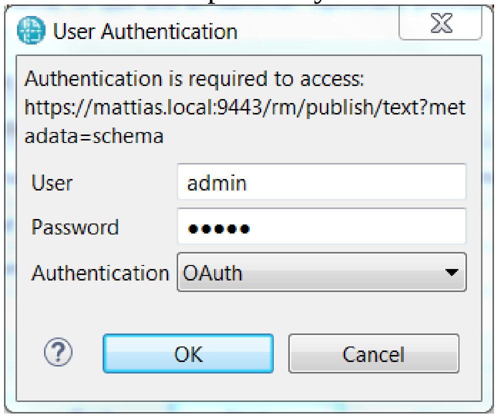

Add Data Source Schema Wizard

Select a New Data Source Schema

Select a Data Source schema, its type and an identifier. Optionally provide a meaningful description.

Predefined	DNG Text
Type	Generic XML
Schema	https://mattias.local:9443/rm/publish/text?metadata=schema
Name	DNG Text
Description	The schema for a DOORS Next Gen requirement.
Extra Headers	

Click **Next** and provide your user authentication to DOORS NG.

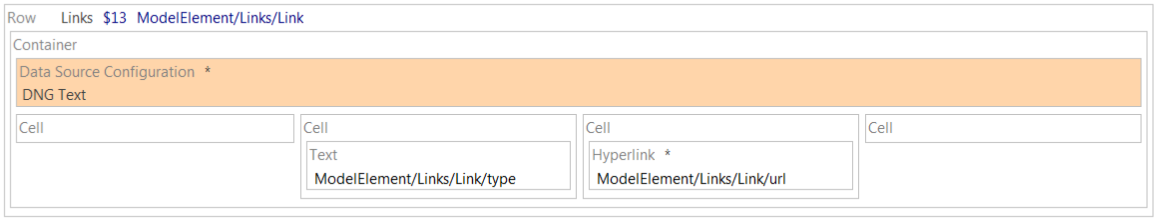

User Authentication

Authentication is required to access: https://mattias.local:9443/rm/publish/text?metadata=schema

User	admin
Password	●●●●●
Authentication	OAuth

Finish the wizard, and you should see the “DNG Text” data source appear in the **Data Source** view.

8. We now need to add a Data Source Configuration item in order to configure the DOORS NG data source. The configuration needs to take place once for each row in the table since we need to fetch data about each requirement. Unfortunately RPE does not allow you to place the Data Source Configuration item directly in the Row item, so you need to use a Container in which the Data Source Configuration item can be placed. Create the Container item and move all cells of the row into it. Then create the Data Source Configuration for the “DNG Text” data source.


Row Links $13 ModelElement/Links/Link

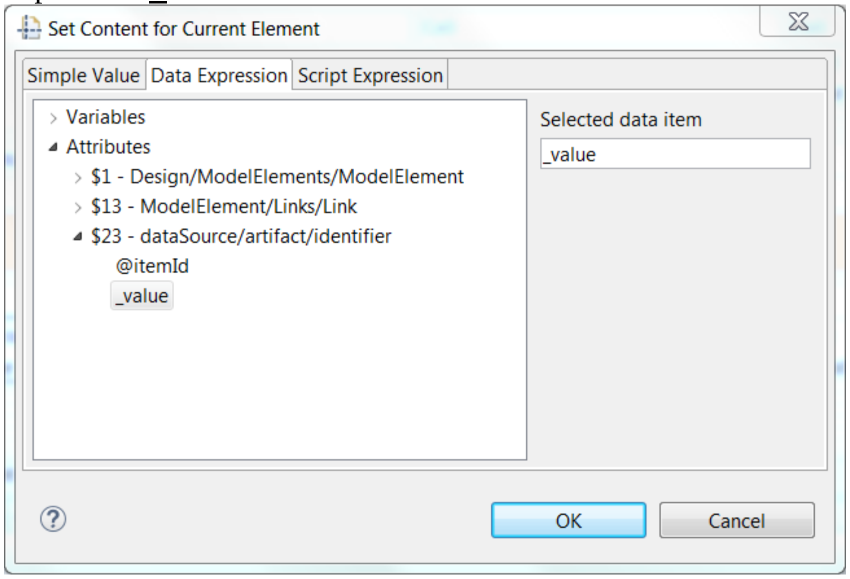
Container

Data Source Configuration *
DNG Text

Cell	Cell	Cell	Cell
	Text ModelElement/Links/Link/type	Hyperlink * ModelElement/Links/Link/url	

The “DNG Text” data source should be configured using the following script:
`url.replace("/resources/", "/publish/text?resourceURI=")`
where `url` references the URL of the Link element.

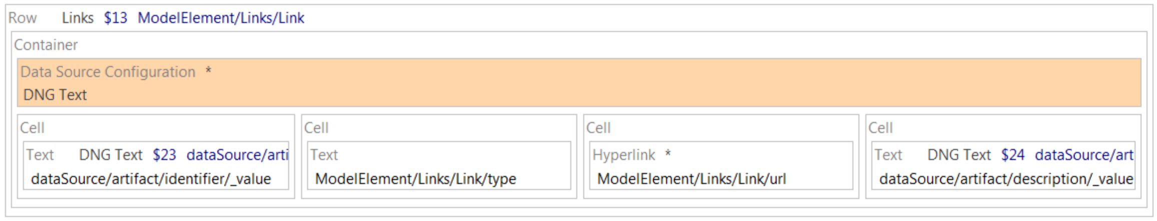
9. Add Text items to the first and last cells in the row. In the **Data Source** view find the element **dataSource – artifact – identifier** of the "DNG Text" data source which holds the requirement number. Drag and drop it onto the Text item of the first cell. Select the Text item and click on the **Content** tab in the **Properties** view. Click the button in the bottom right corner and set the content to the data expression `_value` of the "identifier" element.


Set Content for Current Element
Simple Value
Data Expression
Script Expression
Variables
Attributes
$1 - Design/ModelElements/ModelElement
$13 - ModelElement/Links/Link
$23 - dataSource/artifact/identifier
@itemId
_value
OK
Cancel

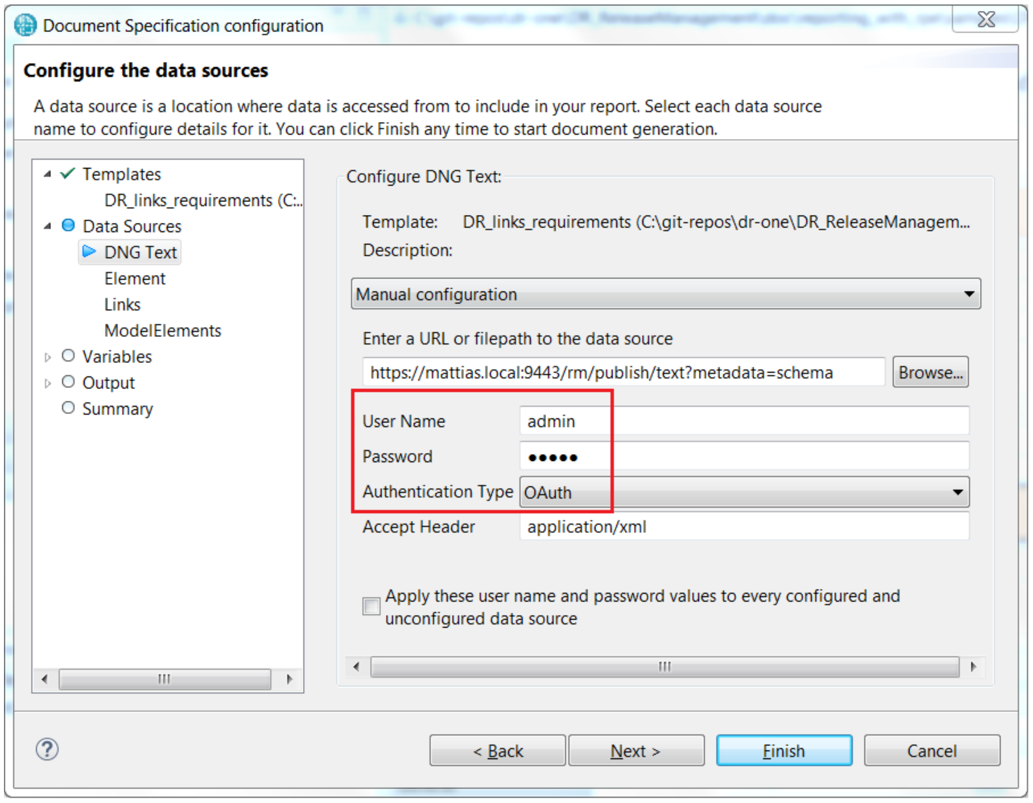
Selected data item: _value

Repeat the same procedure for the last cell of the row, but this time use the data source element **dataSource – artifact – description**.

The row should now look like this:


Row Links $13 ModelElement/Links/Link
Container
Data Source Configuration *
DNG Text
Cell
Text DNG Text $23 dataSource/arti
dataSource/artifact/identifier/_value
Cell
Text
ModelElement/Links/Link/type
Cell
Hyperlink *
ModelElement/Links/Link/url
Cell
Text DNG Text $24 dataSource/art
dataSource/artifact/description/_value

10. The template is now ready, but before you can generate a report you need to configure the document specification to provide the authentication information needed by the "DNG Text" data source:


Document Specification configuration

Configure the data sources

A data source is a location where data is accessed from to include in your report. Select each data source name to configure details for it. You can click Finish any time to start document generation.

- Templates
  - DR_links_requirements (C:...
- Data Sources
  - DNG Text
  - Element
  - Links
  - ModelElements
- Variables
- Output
- Summary

Configure DNG Text:

Template: DR_links_requirements (C:\git-repos\dr-one\DR_ReleaseManagem...

Description:

Manual configuration

Enter a URL or filepath to the data source

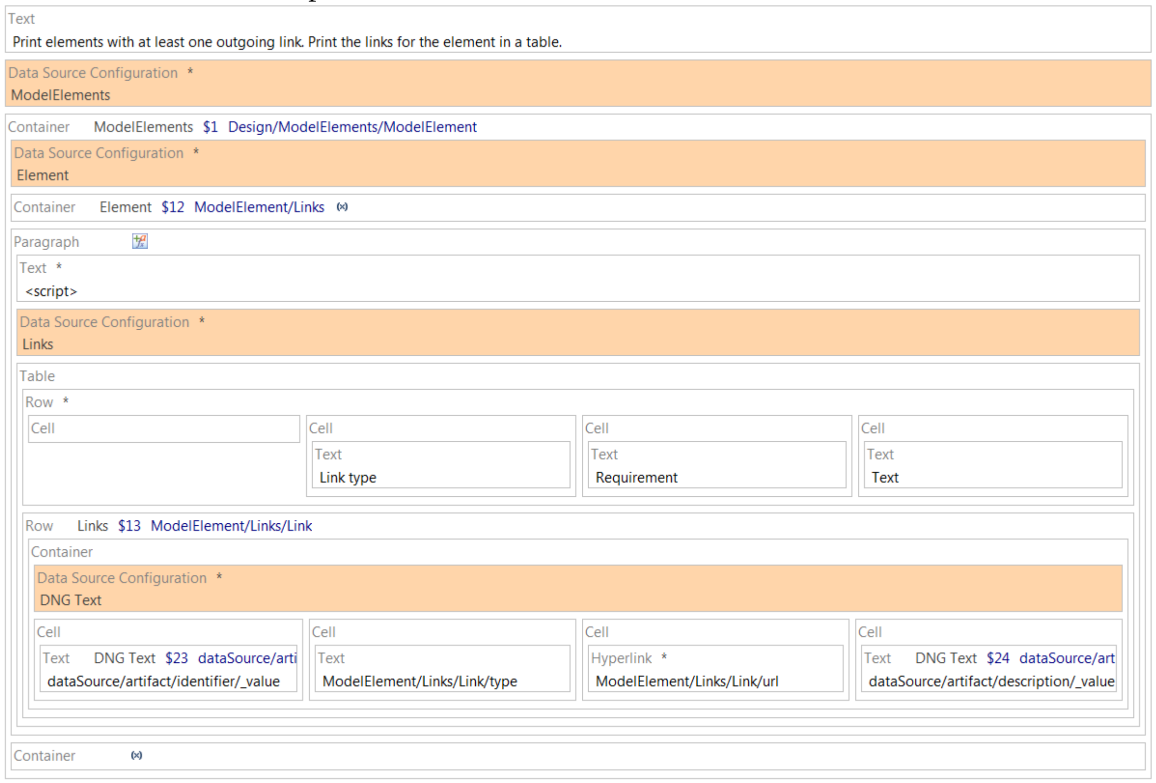
https://mattias.local:9443/rm/publish/text?metadata=schema

User Name	admin
Password	●●●●●
Authentication Type	OAuth
Accept Header	application/xml

Apply these user name and password values to every configured and unconfigured data source

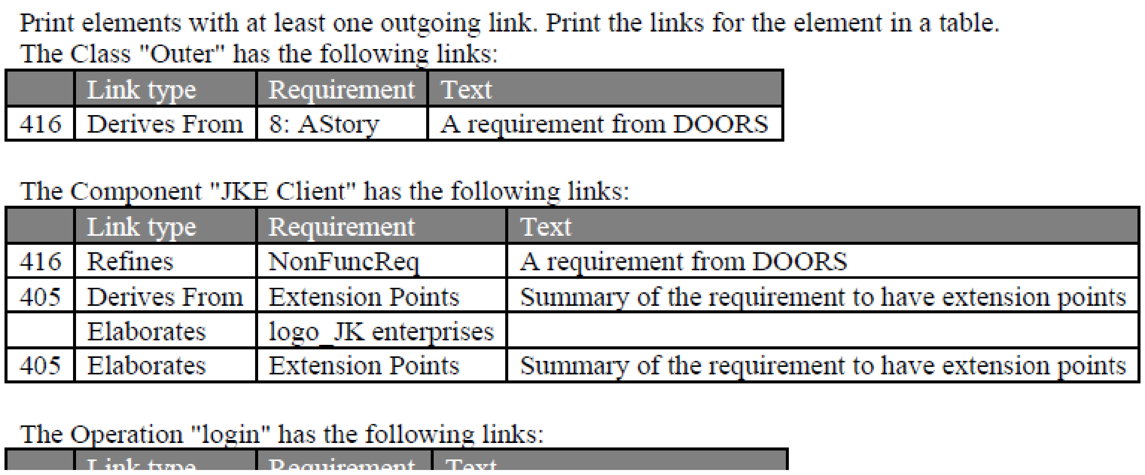
Also note that if you generate this report for the “DemoRPE” design that is provided in the Design Room ONE installation, you first need to update the model in RSAD so that the requirement links point at your DOORS NG server. Then export the updated model to Design Room ONE and set the DESIGN variable to the name of the exported design.

11. The final document template looks like this:



```
Text
Print elements with at least one outgoing link. Print the links for the element in a table.
Data Source Configuration *
ModelElements
Container    ModelElements  $1  Design/ModelElements/ModelElement
  Data Source Configuration *
  Element
  Container    Element  $12  ModelElement/Links  (x)
  Paragraph
    Text *
    <script>
    Data Source Configuration *
    Links
    Table
      Row *
        Cell
        Cell
          Text
          Link type
        Cell
          Text
          Requirement
        Cell
          Text
          Text
      Row    Links  $13  ModelElement/Links/Link
        Container
          Data Source Configuration *
          DNG Text
          Cell
            Text    DNG Text  $23  dataSource/arti
            dataSource/artifact/identifier/_value
          Cell
            Text
            ModelElement/Links/Link/type
          Cell
            Hyperlink *
            ModelElement/Links/Link/url
          Cell
            Text    DNG Text  $24  dataSource/art
            dataSource/artifact/description/_value
  Container    (x)
```

And here is what the final report looks like:



Print elements with at least one outgoing link. Print the links for the element in a table.

The Class "Outer" has the following links:

	Link type	Requirement	Text
416	Derives From	8: AStory	A requirement from DOORS

The Component "JKE Client" has the following links:

	Link type	Requirement	Text
416	Refines	NonFuncReq	A requirement from DOORS
405	Derives From	Extension Points	Summary of the requirement to have extension points
	Elaborates	logo_JK enterprises	
405	Elaborates	Extension Points	Summary of the requirement to have extension points

The Operation "login" has the following links:

	Link type	Requirement	Text

Reporting API Reference

Design Room ONE provides several REST APIs designed for reporting with RPE. These APIs all return the data in XML format. If you pass the query parameter `metadata=schema` you will get the schema for the returned XML. The REST Schema Discovery wizard in RPE uses this query parameter to let you interactively browse the available reporting APIs. All reporting APIs are discoverable using this wizard from the root reporting URL: `/dr/reporting`

Reporting

URL: `/dr/reporting`

This is the root reporting API from which all other APIs can be discovered. It provides a list of Item elements that describe available reporting APIs. The Item elements have the following nested elements:

- `name`
  The name of the reporting API.
- `description`
  A brief description of what the reporting API does.
- `href`
  The URL of the reporting API.

The following items are currently returned:

- `designs`
  Represents the Designs API.

This reporting API does not support native filtering.

Designs

URL: `/dr/reporting/designs`

Retrieves all designs that are present on a Design Room ONE server. Each design is represented by a Design element with the following nested elements:

- `name`
  The name of the design.
- `id`
  A unique identifier of the design. This id is not often used since the name of the design also is unique within the same Design Room ONE server.
- `localConfiguration`
  The name of the design's local configuration. If the design does not have a local configuration the element is an empty string.
- `href`
  A URL that describes which reporting APIs that are provided by the design. This URL is on the form `/dr/reporting/designs?design=<name>`, where `<name>` is the name of the design. If the design has a local configuration it is specified using an `oslc_config.context` parameter:

`/dr/reporting/designs?design=<name>&oslc_config.context=<localConfigurationName>`
The `href` URL returns a list of Item elements with the same attributes as for the Reporting API. The following items are currently returned:
  - `modelElements`
    Represents the Model Elements API.
  - `modelRoots`
    Represents the Model Roots API.

This reporting API supports native filtering. For example, you can use filtering to obtain a design with a specific name.

Model Roots

URL: `/dr/reporting/modelRoots?design=<name>`

Retrieves the root (i.e. top-level) elements of a design.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

Each root element is represented by a ModelElement element with the following nested elements:

- `metaClass`
  The meta class of the model element.
- `id`
  The unique identifier of the model element.
- `name`
  The name of the model element. Note that although most model elements have a name, some don't. The name is an empty string if the model element does not have a name.
- `icon`
  A URL that describes the icon of the model element. This URL is on the form `/dr/api/icons/<iconID>`, where `<iconID>` is the unique id of the icon.
- `displayName`
  The string used when displaying the model element in the user interface. For example, this string is used as the label of the model element's node in the Explorer view.
- `displayType`
  The string used when displaying the type (i.e. meta class) of the model element in the user interface.
- `href`
  A URL that describes the model element. This URL is on the form `/dr/reporting/element?design=<name>&elementId=<id>`, where `<name>` is the name of the design and `<id>` is the id of the model element. See the Element API for more information.

If the design has a local configuration it is specified using an `oslc_config.context` parameter: `/dr/reporting/element?design=<name>&oslc_config.context=<localConfigurationName>&elementId=<id>`

This reporting API supports native filtering. For example, you can use filtering to obtain a root element with a specific name.

Model Elements

URL: `/dr/reporting/modelElements?design=<name>`

Retrieves all elements of a design. Each element is represented by a ModelElement element with the same nested elements as described in the Model Roots API.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

This reporting API supports native filtering. For example, you can use filtering to obtain all model elements with a specific meta class (for example to retrieve all classes in a design).

Children

URL: `/dr/reporting/children?design=<name>&elementId=<id>`

Retrieves all immediate children of a model element.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

Each child element is represented by a ModelElement element with the same nested elements as described in the Model Roots API. Note that only model elements are returned by this API. Other elements contained in a model element, such as diagrams or links, are obtained by specific APIs.

This reporting API supports native filtering. For example, you can use filtering to obtain all children with a specific meta class (for example to retrieve all operations of a class).

Diagrams

URL: `/dr/reporting/diagrams?design=<name>&elementId=<id>`

Retrieves all diagrams of a model element.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

Each diagram is represented by a Diagram element with the following nested elements:

- `kind`
  The kind of diagram (such as Freeform, Sequence etc.).
- `id`
  The unique identifier of the diagram.
- `name`
  The name of the diagram.
- `description`
  The description of the diagram. This element is not present if the diagram does not have a description.
- `url`
  The URL from which the diagram image can be obtained. The URL returns the diagram image as SVG which you can use in a report by means of an Image item.

This reporting API supports native filtering. For example, you can use filtering to obtain all diagrams of a specific kind.

Links

URL: `/dr/reporting/links?design=<name>&elementId=<id>`

Retrieves all outgoing OSLC links stored on a model element.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

Each link is represented by a Link element with the following nested elements:

- `type`
  The type of link as defined by the OSLC standard (such as Refines, Derives From etc.)
- `label`
  The label of the link. This is usually the name of the target of the link, for example the name of a linked requirement.
- `linktypedef`
  The URL that defines the link type. Each type of link has a URL that defines it.
- `url`
  The URL of the target of the link. For example, this could be the URL of a requirement in DOORS NG.
- `projectarea`
  In case the target of the link is stored in a Jazz CLM product, this specifies the Jazz project area where it is located.
- `server`
  The URL of the server that hosts the target of the link.

This reporting API supports native filtering. For example, you can use filtering to obtain all links of a specific type.

Element

URL: `/dr/reporting/element?design=<name>&elementId=<id>`

Retrieves information about a model element.

If the design has a local configuration the `oslc_config.context` parameter must also be provided to specify the local configuration name.

The obtained information is represented by a ModelElement element with the following nested elements:

- `metaClass`
  The meta class of the model element.
- `name`
  The name of the model element. The name is an empty string if the model element does not have a name.
- `id`
  The unique identifier of the model element.
- `icon`
  A URL that describes the icon of the model element. This URL is on the form `/dr/api/icons/<iconID>`, where `<iconID>` is the unique id of the icon.
- `displayName`
  The string used when displaying the model element in the user interface. For example, this string is used as the label of the model element's node in the Explorer view.
- `displayType`
  The string used when displaying the type (i.e. meta class) of the model element in the user interface.
- `Owner`
  The owner of the model element. This element has an attribute `href` which specifies the URL for getting information about the owner element using the Element API. The Owner element is not present if the model element is a root element (i.e. does not have an owner).
- `Children`
  The immediate children of the model element. This element has an attribute `href` which specifies the URL for getting the children using the Children API. The Children element is not present if the model element does not have any children.
- `Diagrams`
  The diagrams contained in the model element. This element has an attribute `href` which specifies the URL for getting the diagrams using the Diagrams API. The Diagrams element is not present if the model element does not have any diagrams.
- `Links`
  The outgoing links stored on the model element. This element has an attribute `href` which specifies the URL for getting the links using the Links API. The Links element is not present if the model element does not have any links.

- `Properties`
  All properties of the model element are represented by means of Property elements located in the Properties collection. Each Property element has the following nested elements:
  - `name`
    The name of the property.
  - `value`
    The value of the property.
- `References`
  All references of the model element are represented by means of Reference elements located in the References collection. Each Reference element has the following nested elements:
  - `name`
    The name of the reference.
  - `Target`
    An element that represents the target of the reference, i.e. the element to which the reference is bound. The Target element has an attribute `href` which specifies the URL for getting information about the target element using the Element API. The Target element is not present if the reference is unbound. Some references may have multiple target elements (so called multi-references). In this case there will be one Target element for each target element of the reference.

This reporting API does not support native filtering.