RVL

About

RVL stands for **Rapise Visual Language**. It is inspired by well known software testing methodologies *Keyword Driven Testing* and *Data Driven Testing*.

This section contains a review of current approaches and concepts to highlight the ideas behind RVL design. You don't need to read this section if you want to learn RVL. However you may need it if you want to understand how it compares to other approaches and why we believe it is not just yet another approach but the way forward to diminish struggling while building real live UI Automation.

Keyword Driven Testing

Keyword Driven Testing separates the documentation of test cases -including the data to use- from the prescription of the way the test cases are executed. As a result it separates the test creation process into two distinct stages: a design and development stage, and an execution stage.

A	B	C	D
.	*First Name*	*Last Name*	*Age*
Enter Patient	John	Smith	45
Enter Patient	Sarah	Connor	32

Keyword Driven Testing: Column *A* constains a *Keyword*, columns *B*, *C*, *D* provide parameters for a *Keyword*.

Data Driven Testing

Data Driven Testing is the creation of test scripts to run together with their related data sets in a framework. The framework provides re-usable test logic to reduce maintenance and improve test coverage. Input and result (test criteria) data values can be stored in one or more central data sources or databases, the actual format and organization can be implementation specific.

A	B	C
First Name	*Last Name*	*Age*
John	Smith	45
Sarah	Connor	32

Data Driven Testing: We have test input and expected output in data sources.

Gherkin / Cucumber

There are known approaches intended to make scripting more close to spoken languages.

This is a very wise approach improving test readability. The test case is described in Gherkin - business readable, domain specific language. It describes behavior without detailing how that behavior is implemented.

Essential part of this framework is implementation of Given-When-Then steps that should be done with one of the common programming languages. Here is the place where the need in scriping skills are still required.

Why RVL?

Initially Rapise has everything to build *Data Driven* and *Keyword Driven* test frameworks. Even without RVL.

It is possible do define *scenarios* or *keywords*, connect to *Spreadsheet* or *Database* and build the test set.

Framework based approaches require one to split data from test logic and maintain them separately. So: * When *AUT* or *SUT* changes (new theme, new widget, new layout) then test logic is updated and data stays the same * When test scenarios are enriched or updated then test logic is kept intact and only data sheets are updated.

The reality of this approach leads to some challenges. These challenges are common for all test frameworks mentioned here.

1. Design of test scripts require scripting and programming skills. That person is likely to be a programmer.

2. Design of good test data requires knowledge in target domain. For example, if you application is for Blood Bank then one should have some medical skills. If it is some device control app, then you should have engeneering knowledge about physical limitations of the device.

So in ideal world there are two persons working as a team: UI Automation scripting expert and target domain specialist.

In reality we see that due to real life limitations it is common that all scripting and test data is done by one person. It is either a programmer who gets familiar with target AUT domain or analyst who has some scripting skills.

Reasons for struggling

There are several reasons that make a learning curve longer and adoption harder.

Syntax Sugar

We found a reason why people get stuck while trying to implement a test case.

Most of programming languages including *JavaScript* were designed by people with mathematical background. So this statement appears clear and simple for a programmer:

```
Deposit('John', 'O\'Connor', 17.99);
```

Programmer easily reads this as:

```
Deposit $17.99 to John O'Connor
```

So what is the difference between these notations? We found that the first and most important difficulty lays in so called *syntactical sugar*. Symbols `' " ; , . ( ) [ ] { } & $ % # @` do have meaning for language notation however are not important for understainding the matter.

This is true even for programmers. When switching from similarly looking languages some differences easily cause frustration. For example, the same construct:

```
$a = "Number " + 1;
```

Means text concatenation in *JavaScript*, however the same is mathematical operation in *PHP*.

Comparison like:

```
if( value == "OK" )
```

Is good for *JavaScript* or *C#* world and leads `false` results in *Java*.

So even if we have programming skills it is still a problem to switch from one language to another and may produce potential issues.

Data Tables

With Keywword Driven and Data Driven approach we get a table that represents a sequence. Sequence of patients to proceed, sequence of user logins etc.

And sometimes we feel the lack of common debugging facilities: - run keyword for only one line, - start from specific row, - or stop before processing specific line.

So here we get to a point where the table should better be a part of the script rather than just external data source.

State of The Art

RVL reflects a common trend in programming languages where computational power and flexibility are sacrificed towards clarity and readability.

Some language is reduced to a reasonable subset in the sake of more concise and focused presentation. Just couple of examples.

Jade template engine simplifies writing HTML pages by clearing syntax sugar (`< > / %`) so HTML code:

```
<body> <p class="greeting">Hello, World!</p> </body>
```

Gets reduced to more textual view:

```
body p.greeting Hello, World!
```

Go language is promoted as *Go is expressive, concise, clean, and efficient.*. In fact its authors sacrificed many advanced features of common programming languages (classes, inheritance, templates) to get more clarity. This is extremely important because sophisticated features produce sophisticated problems that are hard to nail down. And if you deal with high-load distributed systems minor gain through use of unclear feature may lead to major unpredictable loss.

RVL Concepts

RVL's goal is to minimize the struggling.

1. We assume that one should have minimal care about the syntax sugar and syntax rules. This means that we must avoid braces, quotes or any special symbols `' " ; , . ( ) [ ] { } & $ % # @` and make it possible to maintain the script without them.

2. We want script to be close to *Keyword Driven* and *Data Driven* testing concept. So test data and test results should be representable as data tables. This reduces the struggling of attaching the data feed to a test set.

3. We still want to have a solid language. We seek for a balance between clarity and power of language. So we want the script to be implemented on the same language. Both keyword, scenarios and data feeds should be done in a same way. This means one RVL skill is requried for everything.

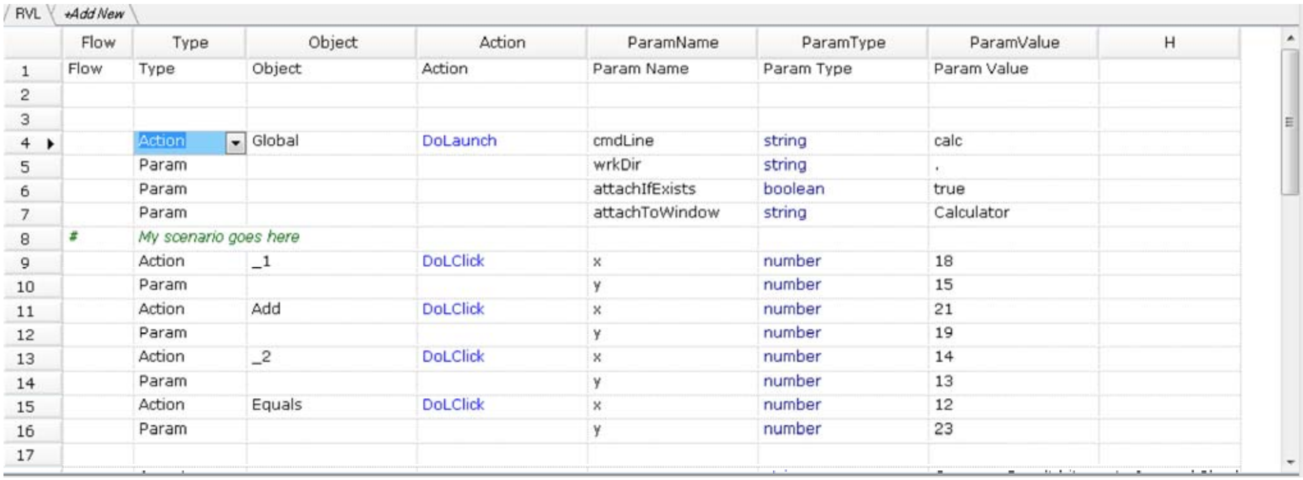
4. In many cases grids or tables are used to represent test data. So we want the script itself to be a grid. So all parts of it includeing data tables are debuggable as a part of the solid script.

5. When we think about working with table data the most common format that comes to our mind is XLS, XLSX or CSV. These formats are supported by powerful tools that make it easier to prepare data for feeding into the test set. So RVL is itself an .xls spreadsheet so its logic is expressed right there.

6. Even with Spreadsheet there is a question what may be entered into the particular cell. With RVL we have an editor where you start from left to right and each cell has limited number of options. So if you don't know language it will guide you.

Columns

RVL script is a spreadsheet containing set of 7 columns in fixed order:



	Flow	Type	Object	Action	ParamName	ParamType	ParamValue	H
1	Flow	Type	Object	Action	Param Name	Param Type	Param Value	
2								
3								
4		Action	Global	DoLaunch	cmdLine	string	calc	
5		Param			wrkDir	string	.	
6		Param			attachIfExists	boolean	true	
7		Param			attachToWindow	string	Calculator	
8	#	My scenario goes here						
9		Action	_1	DoLClick	x	number	18	
10		Param			y	number	15	
11		Action	Add	DoLClick	x	number	21	
12		Param			y	number	19	
13		Action	_2	DoLClick	x	number	14	
14		Param			y	number	13	
15		Action	Equals	DoLClick	x	number	12	
16		Param			y	number	23	
17								

Column View

- 1st *Flow* -- Control flow. This column dedicated to specifying structural information such blocks, Branches (If-Else), loops.

  Also it contains information about single row and multi row comments. Possible values are limited by the list:

- `\#` or `//` - single row comment

- `/*` - begin of multi row comment (comment is valid up to line starting with `*/`)

- `*/` - end of multi row comment started earlier from `/*`

- `If` - conditional branch. Row type must be `Condition`. The row may be followed with one or more `ElseIf` statements, zero or one `Else` statement and then should end with `End`.

- 2nd *Type* - Type of operation specified in this row. One of:

- `Action` - row defines an action. Action is a call for operation for one of the objects. Object is defined in the next column. See Actions.

- `Param` - signals that this row contains action parameter or condition parameter defined in last 3 columns (`ParamName`, `ParamType` and `ParamValue`).

- `Output` - this type of row must go after last Param for an action and defines a variable that should accept output value retured from the call to the Action.

- `Variable` - this row defines or assigns value to a local or global variable. See Variables.

- `Assert` - first row for the Assertion. See Assertions.

- `Condition`

- 3rd *Object* - Id of the object to be used for action. Rapise provides set of predefined global objects and objects recorded/learned from the AUT.

- 4th *Action* - One of the actions. `DoAction`, `DoClick`, `GetText` etc.

- 5th *ParamName* - see Params for more information on last 3 columns

- 6th *ParamType*

- 7th *ParamValue*

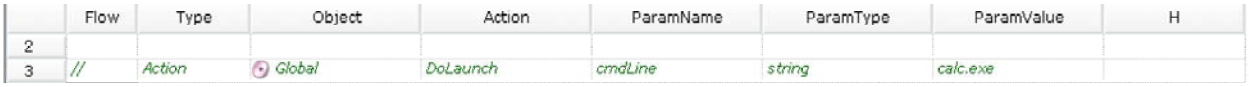
In addition to these columns there may be any number of other columns used for storing supplementary data, comments, calculations, thoughts etc. Additional columns may be utilized for script itself (i.e. contain expected values or reference data).

Comments

Single Row Comments

RVL has two types of single line comments depending on the purpose.

Sometimes comment is used to exclude line of code from execution.

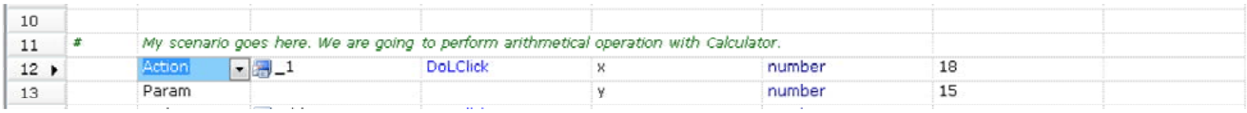


	Flow	Type	Object	Action	ParamName	ParamType	ParamValue	H
2								
3	//	Action	Global	DoLaunch	cmdLine	string	calc.exe	

There is a special type of single row comments intended to put long text comments into the document.

Single row comment is displayed as long text providing that: 1. Flow is set to `#` or `//` 2. Text is completely typed into the `Type` cell. 3. Other cells after `Type` are empty.

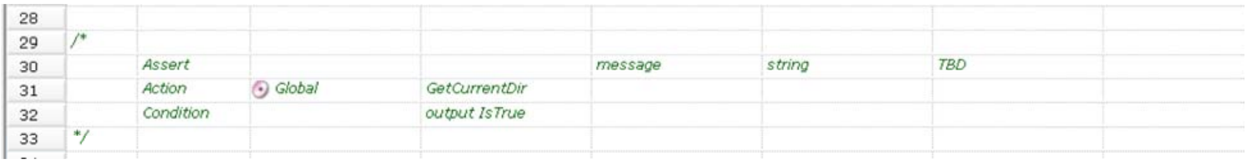
In such case the text is displayed through the whole line:



10							
11	#	My scenario goes here. We are going to perform arithmetical operation with Calculator.					
12		Action	_1	DoLClick	x	number	18
13		Param			y	number	15

Multiple Row Comments

Used to disable several rows of script:



28							
29	/*						
30		Assert			message	string	TBD
31		Action	Global	GetCurrentDir			
32		Condition		output IsTrue			
33	*/						

Conditions

Conditions used in `If` and `Assert` statements.

Types of Conditions

Condition accepts one or two Params.

1. There might be just one *Param*. Such condition is called *unary*, for example `param1 is true` or `output1 is true`.
2. There might be second *Param*. Such condition is called *binary*, for example `param1 == param2`.
3. Condition parameter may be either *Param* or *Action* output.
4. *Param* is some fixed *value*, *variable* or *expression*.

Binary condition with two *Params* named `param1` and `param2`:

...	*Type*	...	*Action*	*ParamName*	...
	Param			param1	
	Condition		*param1 == param2*		
	Param			param2	

Binary condition with *Action* and *Param* named `output1` and `param2`:

...	*Type*	*Object*	*Action*	*ParamName*	...
	Action	MyButton	GetText		
	Condition		*outpu1 == param2*		
	Param			param2	

Binary condition with two *Action*s named `output1` and `output2`:

...	*Type*	*Object*	*Action*	*ParamName*	...
	Action	MyButton1	GetText		
	Condition		*outpu1 != output2*		
	Action	MyButton2	GetText		

Unary condition with *Param* `param1`:

...	*Type*	...	*Action*	*ParamName*	...
	Param			param1	
	Condition		*param1 IsFalse*		

Unary condition with *Action* `output1`:

...	*Type*	*Object*	*Action*	*ParamName*	...
	Action	MyButton	GetEnabled		
	Condition		*outpu1 IsTrue*		

All Conditions

Unary conditions with *Param*

Caption	*Description*
`param1` IsTrue	Check if `param1` is true
`param1` IsFalse	Check if `param1` is false
`param1` IsNull	Check if `param1` is null
`param1` IsNotNull	Check if `param1` is NOT null
`param1` IsSet	Check if `param1` is NOT null, false, 0, empty string or undefined
`param1` IsNotSet	Check if `param1` is null, 0, false, empty string or undefined

Unary conditions with *Action*

Caption	*Description*
`output1` IsTrue	Check if `output1` is true
`output1` IsFalse	Check if `output1` is false
`output1` IsNull	Check if `output1` is null
`output1` IsNotNull	Check if `output1` is NOT null
`output1` IsSet	Check if `output1` is NOT null, false, 0, empty string or undefined
`output1` IsNotSet	Check if `output1` is null, 0, false, empty string or undefined

Binary conditions with *Param*s

Caption	*Description*
`param1` == `param2`	Check if `param1` equals to `param2`
`param1` != `param2`	Check if `param1` NOT equal to `param2`
`param1` > `param2`	Check if `param1` is more than `param2`
`param1` >= `param2`	Check if `param1` is more or equal to `param2`
`param1` <= `param2`	Check if `param1` is less or equal to `param2`
`param1` < `param2`	Check if `param1` is less than `param2`
`param1` contains `param2`	Check if `param1` contains `param2` as substring
CmpImage `param1`, `param2`	Compare 1st image and image represented by `param2`

Binary conditions with *Action* and *Param*

Caption	*Description*
`output1` == `param2`	Check if `output1` equals to `param2`
`output1` != `param2`	Check if `output1` NOT equal to `param2`
`output1` > `param2`	Check if `output1` is more than `param2`
`output1` >= `param2`	Check if `output1` is more or equal to `param2`
`output1` <= `param2`	Check if `output1` is less or equal to `param2`
`output1` < `param2`	Check if `output1` is less than `param2`
`output1` contains `param2`	Check if `output1` contains `param2` as substring
CmpImage `output1`, `param2`	Compare 1st image and image represented by `param2`

Binary conditions with *Action*s

Caption	*Description*
`output1` == `output2`	Check if `output1` equals to `output2`

`output1` != `output2`	Check if `output1` NOT equal to `output2`
`output1` > `output2`	Check if `output1` is more than `output2`
`output1` >= `output2`	Check if `output1` is more or equal to `output2`
`output1` <= `output2`	Check if `output1` is less or equal to `output2`
`output1` < `output2`	Check if `output1` is less than `output2`
`output1` contains `output2`	Check if `output1` contains `output2` as substring
CmpImage `output1`, `output2`	Compare 1st image and image represented by `output2`

And, *Or* Conditions

It is possible to make more complex conditions by using *And* and *Or* keyword in the *Flow* column.

Flow	***Type***	**...**	***Action***	***ParamName***	***ParamType***	***ParamValue***
If	Param			param1	*variable*	`Result1`
	Condition		*param1 IsFalse*			
And	Param			param1	*variable*	`Result2`
	Condition		*param1 IsTrue*			
...	...		...	...	...	...

This pice forms a condition checking that `Result1` is false AND `Result2` is true at the same time.

Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
If	Action	MyButton	GetEnabled			
Condition		*output1 IsFalse*				
Or	Param			param1	*variable*	`Result1`
Condition		*param1 IsTrue*				
...	...		...	...	...	...

This pice forms a condition checking that *MyButton* is Enabled OR `Result2` is true at the same time.

Examples

Condition is never used alone. You may find examples of conditions in chapters devoted to Assertions and If-Then-Else.

Actions

In RVL Action always refers to an operation performed with object.

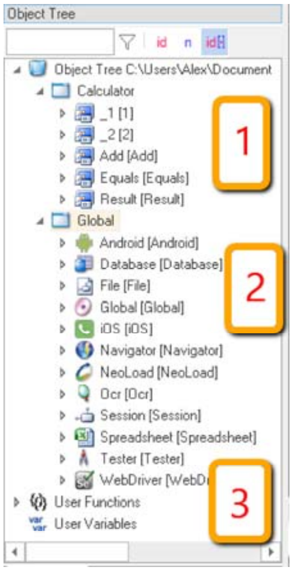
Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
	Action	MyButton	DoClick	x	number	5
	Param			y	number	7

If row type is `Action` then there must be *Object* and *Action* cells defined.

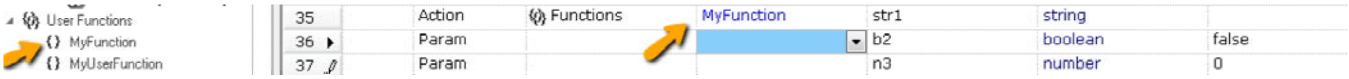
Note: In this example we call an operation that would look in JavaScript as follows:

```
SeS('MyButton').DoClick(5,7);
```

`Object` is an ID of learned or Global object. Available objects may be found in the `Object Tree`:

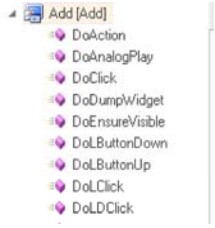


Object tree contains list of available objects, including: 1. *Local objects* (1) learned recorded or learned from the application under test. 2. *Global object*. Always available set of objects containing most common utility functions and operations. 3. *Functions*. Represent global JavaScript functions. Each time you define a global function in .user.js file it becomes available for calling from RVL with special object ID Functions.



35	Action	Functions	MyFunction	str1	string	
36	Param			b2	boolean	false
37	Param			n3	number	0

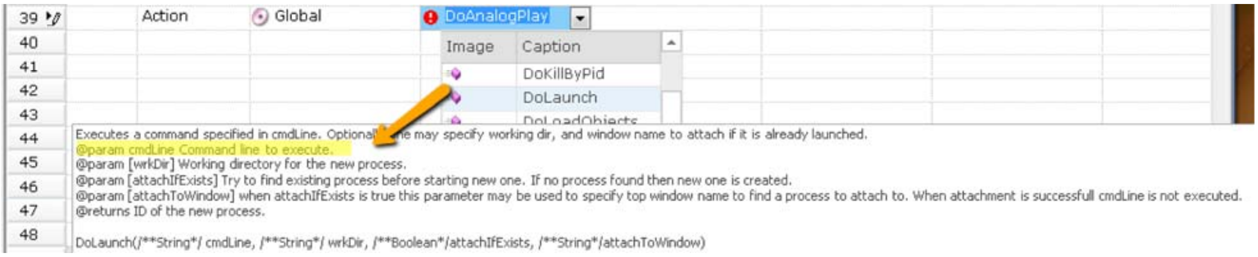
Each Object has its own set of actions. You may also see them in the object tree:



An *Action* may have any number of parameters. See Params for more info.

Editing Action

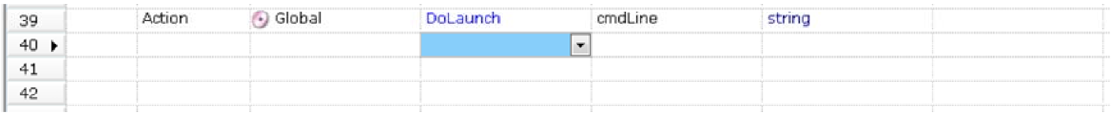
An Action may have both mandatory and optional params. When action is selected from the dropdown its params are displayed:



Executes a command specified in cmdLine. Optionally one may specify working dir, and window name to attach if it is already launched.
@param cmdLine Command line to execute.
@param [wrkDir] Working directory for the new process.
@param [attachIfExists] Try to find existing process before starting new one. If no process found then new one is created.
@param [attachToWindow] when attachIfExists is true this parameter may be used to specify top window name to find a process to attach to. When attachment is successfull cmdLine is not executed.
@returns ID of the new process.

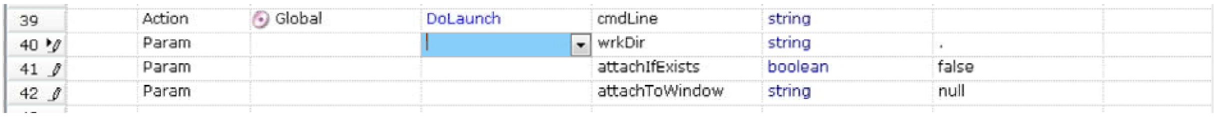
DoLaunch(/**String*/ cmdLine, /**String*/ wrkDir, /**Boolean*/attachIfExists, /**String*/attachToWindow)

By default RVL editor pre-fills only mandatory params for you when you select an action from the dropdown. In this example `DoLaunch` has one mandatory parameter `cmdLine` so here is what you get when you select it:



39	Action	Global	DoLaunch	cmdLine	string
40					
41					
42					

However the situation is differs if you hold the **Shift** key while choosing an Action from the dropdown:



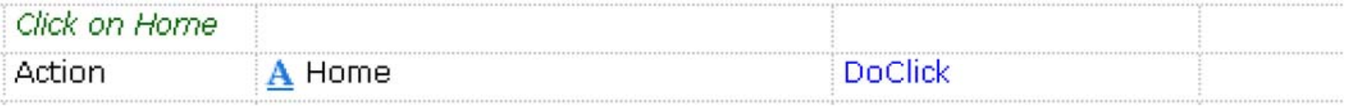
39	Action	Global	DoLaunch	cmdLine	string	
40	Param			wrkDir	string	.
41	Param			attachIfExists	boolean	false
42	Param			attachToWindow	string	null

You may see that all parameters are applied in this case.

- ***Note:*** if you you already have have the same action and select it with **Shift** key again, no optional params are applied. You need to clean the *Action* cell and re-select it with **Shift** if you want to achieve the desired effect.

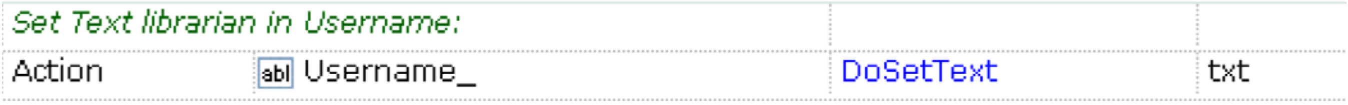
Examples

Action without parameters



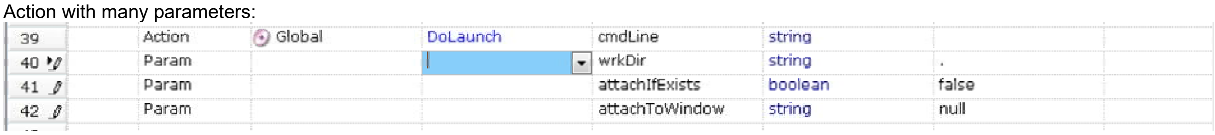
Click on Home			
Action	Home	DoClick	

Action with single parameter. In RVL each parameter takes one line with *Action*=`Param`. However for the 1st param there is an exception. It may occupy the same line as `Action` itself:



Set Text librarian in Username:			
Action	abl Username_	DoSetText	txt

Action with many parameters:



39		Action	Global	DoLaunch	cmdLine	string	
40		Param			wrkDir	string	.
41		Param			attachIfExists	boolean	false
42		Param			attachToWindow	string	null

Variables

In RVL, variables are useful for storing intermediate results as well as accessing and passing global values to external *JavaScript* functions.

Variables may be used in Params to Conditions and in Actions.

Declaring and Assigning

This line declares a variable without any values. Its value may be assigned later:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Variable			`MyVar1`		

This line declares and assigns value *5* to a variable `MyVar2`:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Variable			`MyVar2`	*number*	*5*

If the variable is declared earlier, then assignment just changes its value. If the variable is not yet declared, then assignment is actually a declaration with assignment.

Using

Any Params value may accept a *variable*:

...	*Type*	...	*ParamName*	*ParamType*	*ParamValue*
...	Param		text	*variable*	`MyVar1`

Any Params value may accept an *expression* using variables:

...	*Type*	...	*ParamName*	*ParamType*	*ParamValue*
...	Param		text	*expression*	`MyVar2 + 4`

Any Action may write its return value to a variable using the *Output* statement:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	Global	DoTrim	str	string	text to trim
	Output				variable	`MyVar1`

The Output value may then be used as a param value in actions, conditions, assertions and expressions.

Local Variables

By default declared variables are assumed to be local. Local variables may be used only within the current RVL script and not visible from other RVL scripts or *JavaScript* code.

Global Variables

You may have a *JavaScript* variable defined in the user *Functions* file (`*.user.js`), i.e.:

```
// Piece from MyTest1.user.js var globalVar = "Value";
```

Then in the RVL you may declare `globalVar` as global and access it (read or assign values). Declaring a variable as global is simple:

Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
	Variable		**Global**	`globalVar`		

Global variables are useful for exchanging and/or sharing data between different RVL scripts or between *RVL* and *JavaScript*.

Variable Actions

One may use an expression to change the value of a variable. Here are several common variable operations that may be used to modify variable values:

1. *Increment* is an operation where numeric value is increased by `1` or any other specified value. The variable must have a numeric value. Otherwise the result is `NaN`.

   If no param to *Increment* is specified then `1` is assumed:

Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
	Variable		**Increment**	`numVar`		

Otherwise it is any *value*:

Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
	Variable		**Increment**	`numVar`	`number`	*value*

2. *Decrement* is the same as increment but the value is subtracted from the variable.

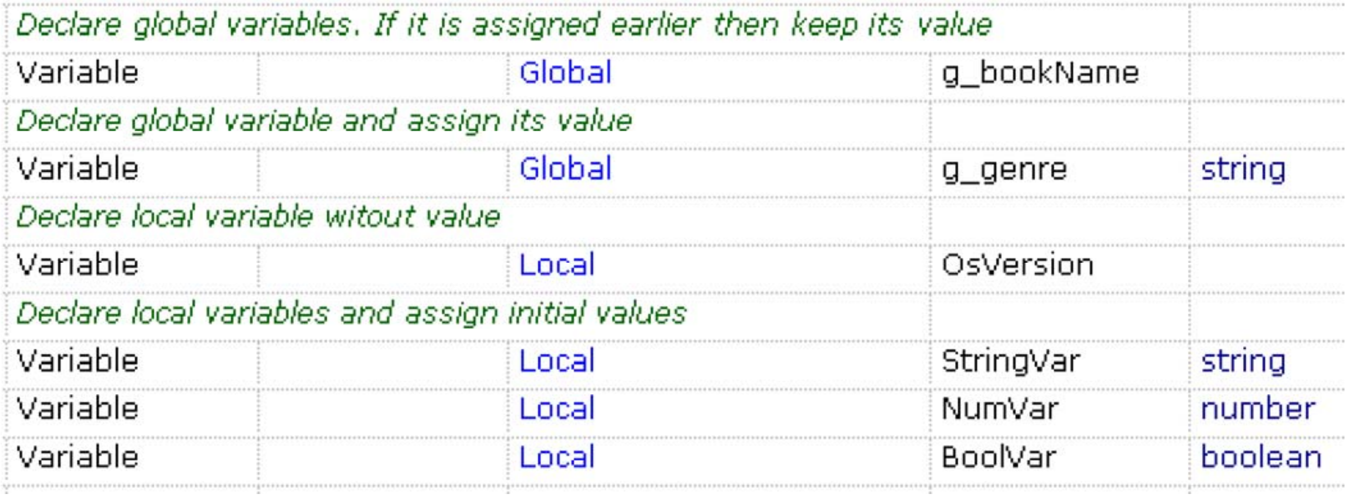
3. *Append* adds the value as text to the specified variable. This operation is useful for constructing text messages:

Flow	***Type***	***Object***	***Action***	***ParamName***	***ParamType***	***ParamValue***
	Variable		**Append**	`textVar`	`string`	Final value:
	Variable		**Append**	`textVar`	`variable`	`numVar`

In this example if `textVar` was empty and `numVar` had value `5` then the final value of `textVar` is the following text: `Final value: 5`

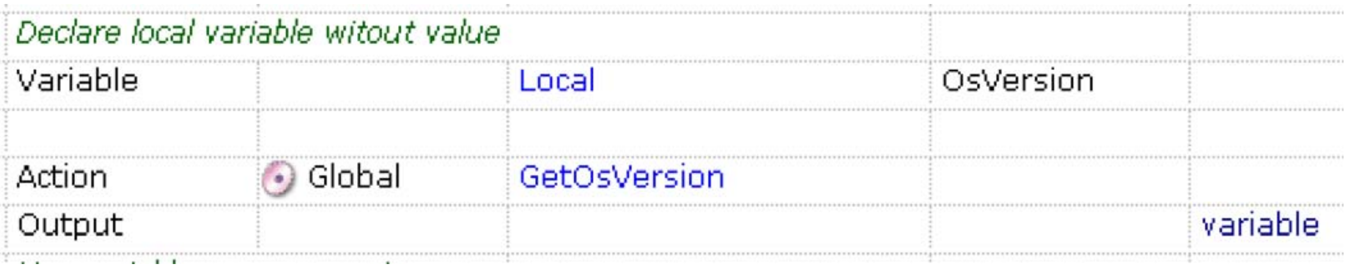
Examples

Variables may be declared as *Local* or *Global*. Declaration may or may not contain initial value



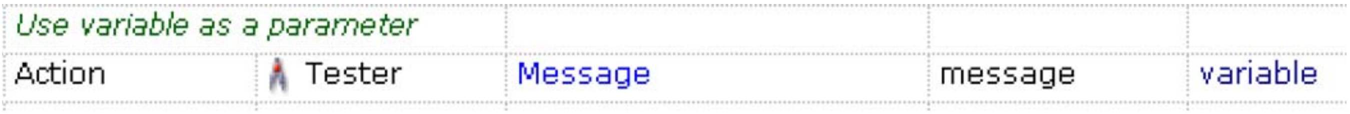
Declare global variables. If it is assigned earlier then keep its value				
Variable		Global	g_bookName	
Declare global variable and assign its value				
Variable		Global	g_genre	string
Declare local variable witout value				
Variable		Local	OsVersion	
Declare local variables and assign initial values				
Variable		Local	StringVar	string
Variable		Local	NumVar	number
Variable		Local	BoolVar	boolean

Variables may accept output from the *Action*:



Declare local variable witout value				
Variable		Local	OsVersion	
Action	Global	GetOsVersion		
Output				variable

Variables may be used as input to the *Action*:



Use variable as a parameter				
Action	Tester	Message	message	variable

Assertions

Assert is an essential operation for testing and validation. RVL provides special structure for it to make it more readable.

Assertion has 2 parts: 1st row is Assert containing assertion message and then goes Condition:

...	*Type*	...	*Action*	*ParamName*	...
	Assert			message	string
	Param			param1	
	Condition		*condition statement*		
	Param			param2	

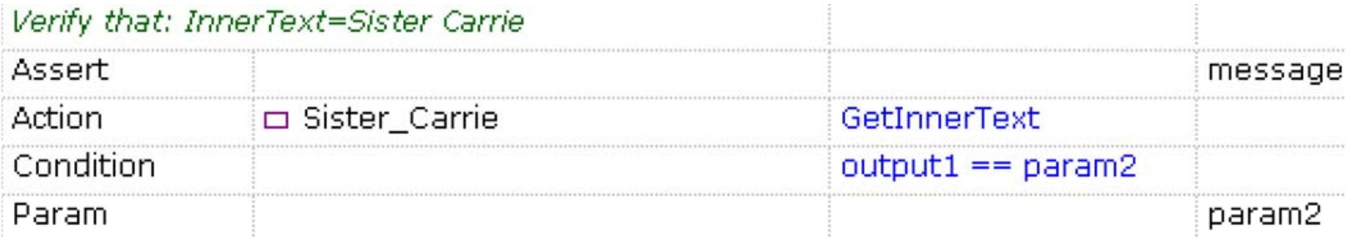
Assertion first line is always the same except the *Param Value*.

In RVL Action always refers to an operation performed with object.

...	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Assert			message	string	Assertion text to be displayed in the report
	Param			param1	string	Text1
	Condition		param1!=param2			
	Param			param2	string	Text2

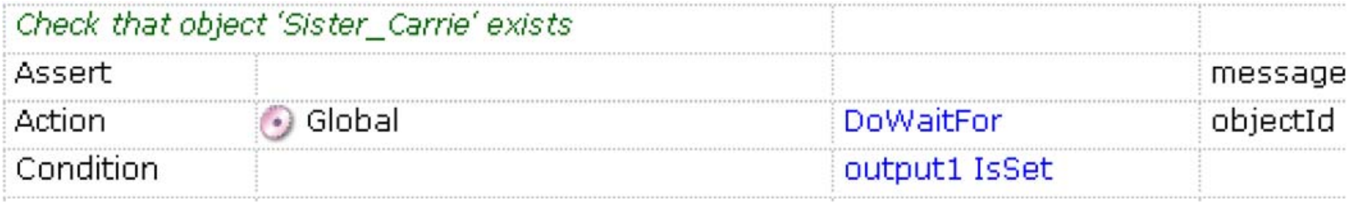
Examples

Compare object property *InnerText* with expected value:



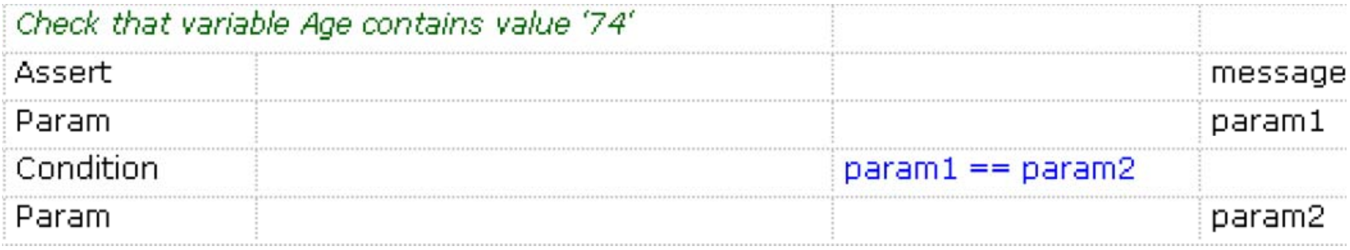
Verify that: InnerText=Sister Carrie			
Assert			message
Action	Sister_Carrie	GetInnerText	
Condition		output1 == param2	
Param			param2

Check if object exists on the screen:



Check that object 'Sister_Carrie' exists			
Assert			message
Action	Global	DoWaitFor	objectId
Condition		output1 IsSet	

Check if variable `Age` has value '74':



Check that variable Age contains value '74'			
Assert			message
Param			param1
Condition		param1 == param2	
Param			param2

If-Else

`If` using for branching statements in RVL.

Basic branch statement has 2 parts: 1st row is `If` flow with Condition:

If

Flow	Type	...	Action	ParamName	...
If	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	some	***actions***	***go***	***here***	
End					

Actions after `If` condition and up to `End` statement are executed when condition is truth.

If-Else

`If-Else` statement is similar to `If` with one extension. It contains an alternative `Else` section that is executed when `If` condition is false:

Flow	Type	...	Action	ParamName	...
If	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	some	***actions***	***go***	***here***	
Else					
	other	***actions***	***go***	***here***	
End					

If-ElseIf

`ElseIf` is a way to establish a chain of conditions. Each condition is evaluated with previous is false.

`If-Else` statement is similar to `If` with one extension. It contains an alternative `Else` section that is executed when `If` condition is false:

Flow	***Type***	...	***Action***	***ParamName***	...
If	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	some	***actions***	***go***	***here***	
ElseIf	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	other	***actions***	***go***	***here***	
End					

There may be many ElseIf` blocks:

Flow	***Type***	...	***Action***	***ParamName***	...
If	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	some	***actions***	***go***	***here***	
ElseIf	Param			param1	

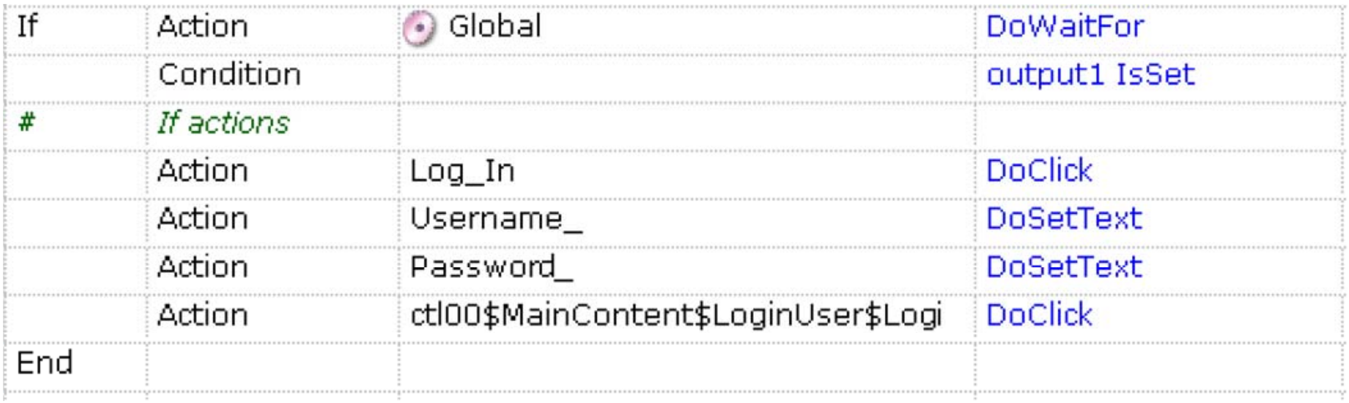
	Condition		*condition statement*		
	Param			param2	
	other	***actions***	***go***	***here***	
ElseIf	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	other	***actions***	***go***	***here***	
End					

And there might also be an `Else` block in the end:

Flow	***Type***	**...**	***Action***	***ParamName***	**...**
If	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	some	***actions***	***go***	***here***	
ElseIf	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	other	***actions***	***go***	***here***	
ElseIf	Param			param1	
	Condition		*condition statement*		
	Param			param2	
	other	***actions***	***go***	***here***	
Else					
	other	***actions***	***go***	***here***	
End					

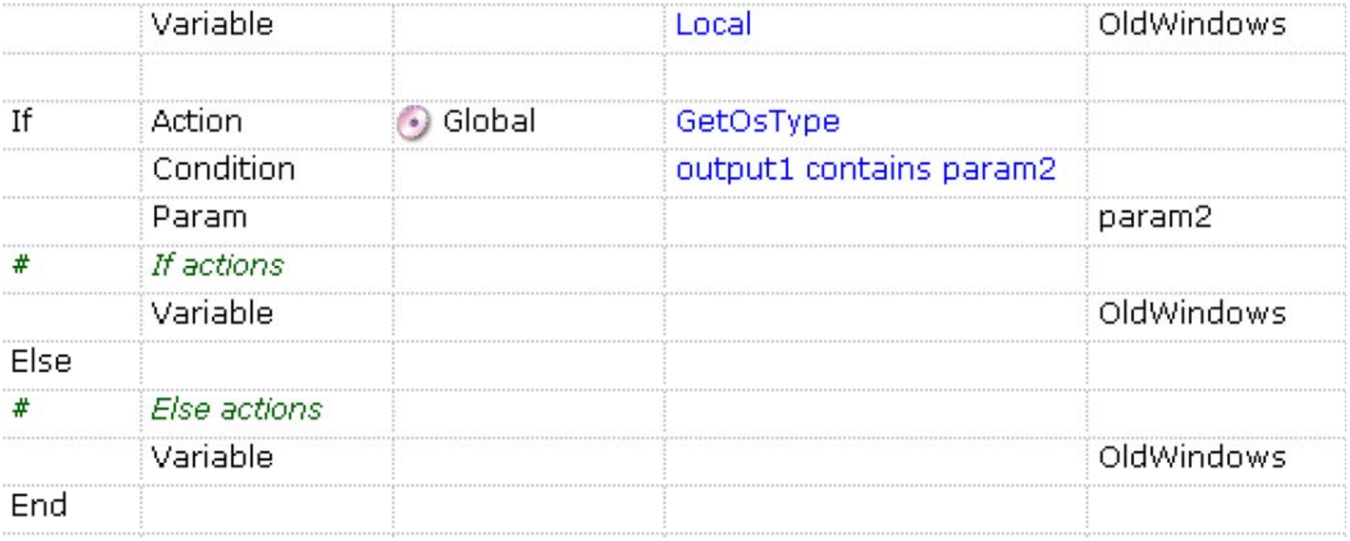
Examples

Check if `Log In` link available. If so, do login:



If	Action	● Global	DoWaitFor
	Condition		output1 IsSet
#	*If actions*		
	Action	Log_In	DoClick
	Action	Username_	DoSetText
	Action	Password_	DoSetText
	Action	ctl00$MainContent$LoginUser$Logi	DoClick
End			

Check if we use old version of OS and assign a variable `OldWindows` accordingly:



	Variable		Local	OldWindows
If	Action	Global	GetOsType	
	Condition		output1 contains param2	
	Param			param2
#	*If actions*			
	Variable			OldWindows
Else				
#	*Else actions*			
	Variable			OldWindows
End				

Parameters

The last 3 columns in the RVL table are used for passing parameters:

...	*ParamName*	*ParamType*	*ParamValue*
...	text	string	John Smith
...	x	number	5
...	y	number	7
...	forceEvent	boolean	true

- 5th column - *ParamName* - name of the parameter. This column's intention is readability and it does not affect execution. However it names input parameters and makes it easier to understand each provided input option.
- 6th column - *ParamType* - value type. This may be a basic scalar type (`number`, `string`, `boolean`, `object`) as well as one of the following additionals 'special' types:
-
  - `expression` - any valid JavaScript expression that may involve global variables and functions and local variables.
-
  - `variable` - the parameter value is read from a variable.
-
  - `objectid` - ID of one of the learned Objects.
- 7th column - *ParamValue* - a value that is acceptable for the specified *ParamType*. For `boolean` it is `true` or `false`. For `number` is is any floating point number (i.e. `3.14`). For `string`, any text without quotes or escape signs.

Param Rows

In RVL each parameter takes one row:

...	*Type*	...	*ParamName*	*ParamType*	*ParamValue*
...	Param		text	string	John Smith
...	Param		x	number	5
...	Param		y	number	7
...	Param		forceEvent	boolean	true

Param Arrays

Some methods accept arrays of values as input values. For example `Tester.Message` may take its 1st `message` parameter as an array and prints them combined. Making an array is easy, several consequent parameters having the same name are combined into an array, i.e.:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	Tester	Message	**message**	**string**	MyVar1 value:
	Param			**message**	**variable**	**MyVar1**
	Param			**message**	**string**	MyVar2 value:
	Param			**message**	**variable**	**MyVar2**

Should report a message like:

```
MyVar1 value: 25 MyVar2 value: 33
```

Mixed Rows

In some cases it is convenient to mix parameter cells with an *Action* or *Condition*.

For example, the 1st parameter of an *Action* may share the `Action` row:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	MyButton	DoClick	**x**	**number**	**5**
	Param			y	number	7

And this is equivalent to putting it in the next row:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	MyButton	DoClick			
	Param			**x**	**number**	**5**
	Param			y	number	7

Or `param2` of the condition may be on the same row:

...	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Param			param1	string	Text1
	Condition		param1!=param2	**param2**	**string**	**Text2**

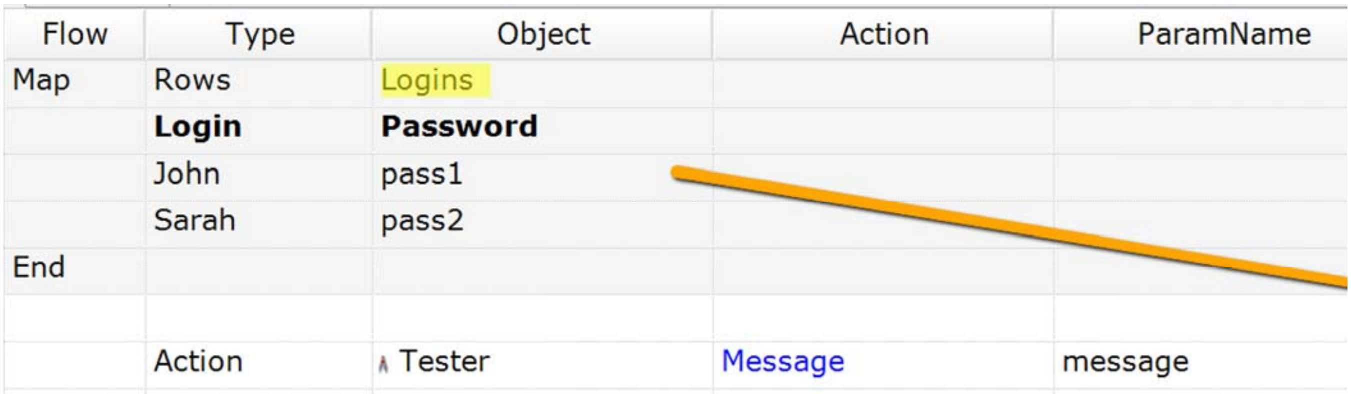
Which is equivalent to:

...	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Param			param1	string	Text1
	Condition		param1!=param2			
	Param			**param2**	**string**	**Text2**

This allows saving space while keeping same readability.

Map Params

If map is defined in the script it may be used directly as a parameter. *ParamType* should be set to Map Name and *ParamValue* is a column (or row) name:

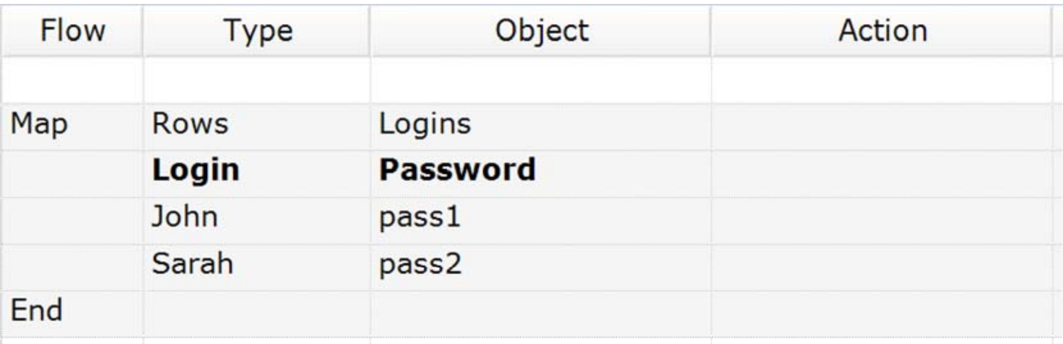


Flow	Type	Object	Action	ParamName
Map	Rows	Logins		
	Login	**Password**		
	John	pass1		
	Sarah	pass2		
End				
	Action	Tester	Message	message

Maps

A *Map* is designed to be an easy way to define tables of data. Items in the map may be accessed by name (if defined) or by index.

The indexed dimensions in the map may also be iterated by the [Loop][Loops.md] function, thus making it useful feature for Data-Driven Testing.



Flow	Type	Object	Action
Map	Rows	Logins	
	Login	**Password**	
	John	pass1	
	Sarah	pass2	
End			

An RVL script has at least 7 columns. However the *Map* may take as many columns as needed.

Map Definition

Typical declaration of map looks like:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Map	`MapType`	**MapName**				
...	...	...				
End						

Where `MapType` is either inplace: *Table*, *Rows*, *Columns*, or external: *Range* or *Database*.

In-place maps

In-place map data is defined right in the RVL script. In-place map rows may be selected using *This* flow or skipped with a Comment. So in-place maps serve as a part of the executable script.

- *Table*
- *Rows*
- *Columns*

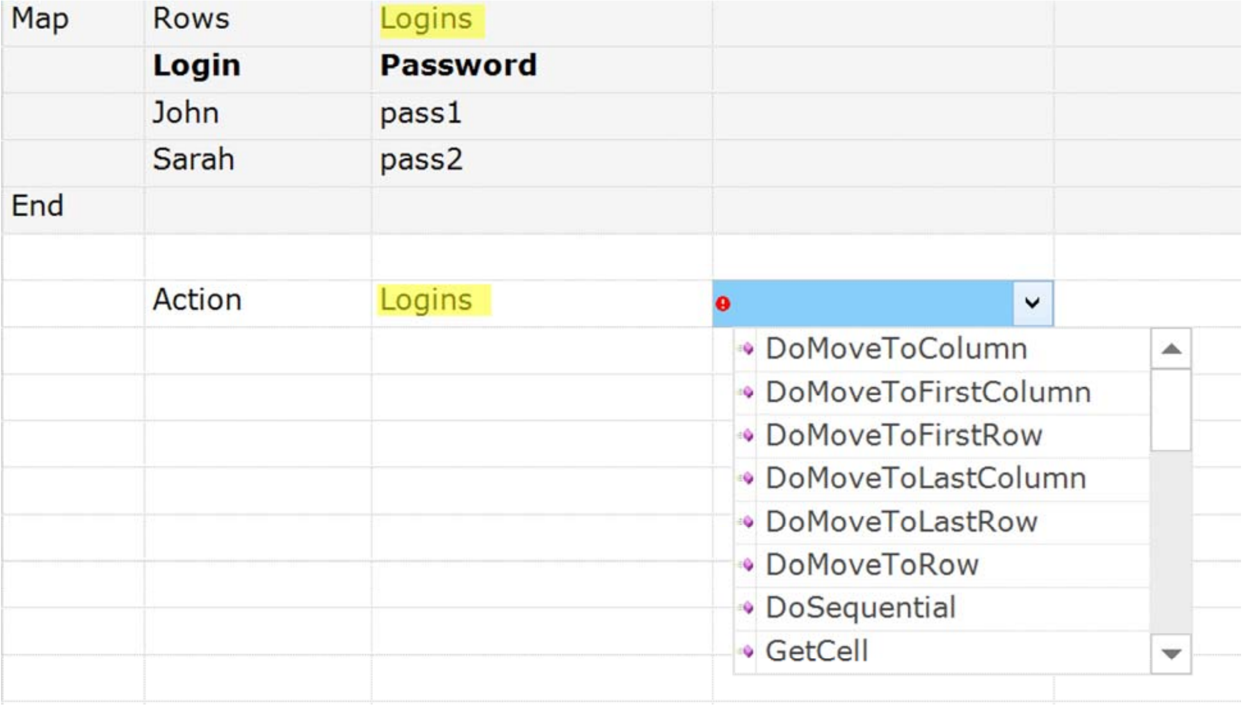
External maps:

- *Range*
- *Database*

External maps are defined in an external spreadsheet, file or a database.

Using Maps

Once map is defined it may be used as a regular Object.



Map	Rows	Logins	
	Login	**Password**	
	John	pass1	
	Sarah	pass2	
End			
	Action	Logins	

Reading in a Loop

See Loops part for `Map` type of loops.

Maps Types

Rows Map

A `Rows` Map is the most useful for data feeds. Each of the set of values is a row in a table that look like:

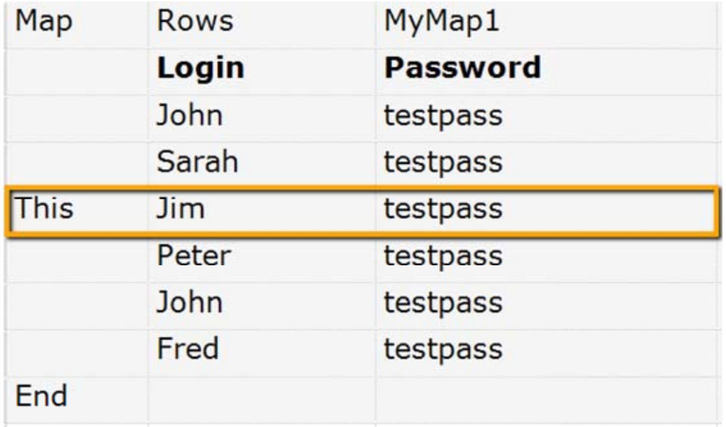
Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Map	`Rows`	***MapName***				
	Col1	**Col2**	**Col3**	**Col4**		
	val11	val12	val13	val14		
	...					
	...					
End						

`This` and comments are specific features of the `Rows` Map. For example, only the 2nd row of data will be executed in this case:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Map	`Rows`	***MapName***				
	Col1	**Col2**	**Col3**	**Col4**		
	...					
This	**...**					
	...					
End						

`Rows` are designed to be iterated in a Loop

In real example it looks like this:



Map	Rows	MyMap1
	Login	**Password**
	John	testpass
	Sarah	testpass
This	Jim	testpass
	Peter	testpass
	John	testpass
	Fred	testpass
End		

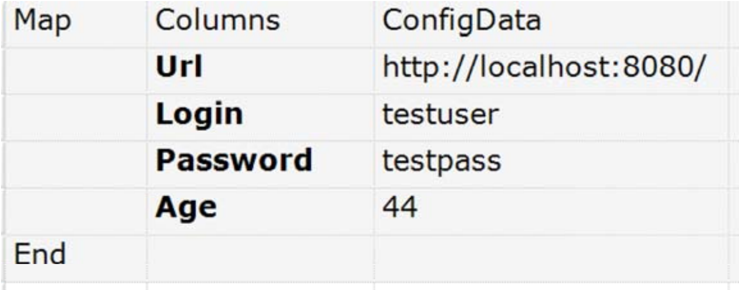
Comments may also be used to skip specific rows or row sets.

Columns Map

A `Columns` Map is a convenient way for representing data when you have many options combined in few sets.

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Map	`Columns`	***MapName***				
	Row1	...				
	Row2	...				
	Row3	...				
End						

The same may be represented as `Rows` but would require many columns and sometimes it is harder to read. So columns is ideal for storing configuration structures:



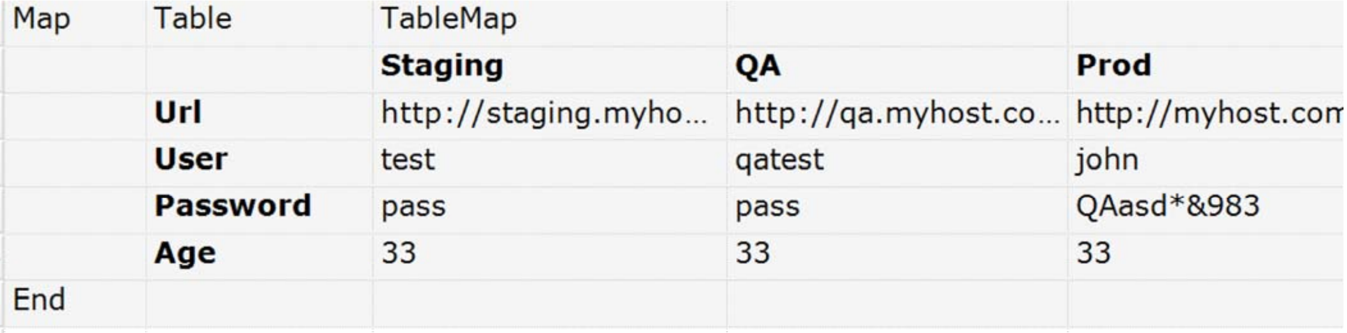
Map	Columns	ConfigData
	Url	http://localhost:8080/
	Login	testuser
	Password	testpass
	Age	44
End		

When a `Columns` Map is used in the Loop, then the iteration is performed through the columns and addresses the rows by name within the loop. I.e. the 1st iteration chooses 1st column, 2nd goes to 2nd column and so on.

Table Map

A Table map has both columns and rows named.

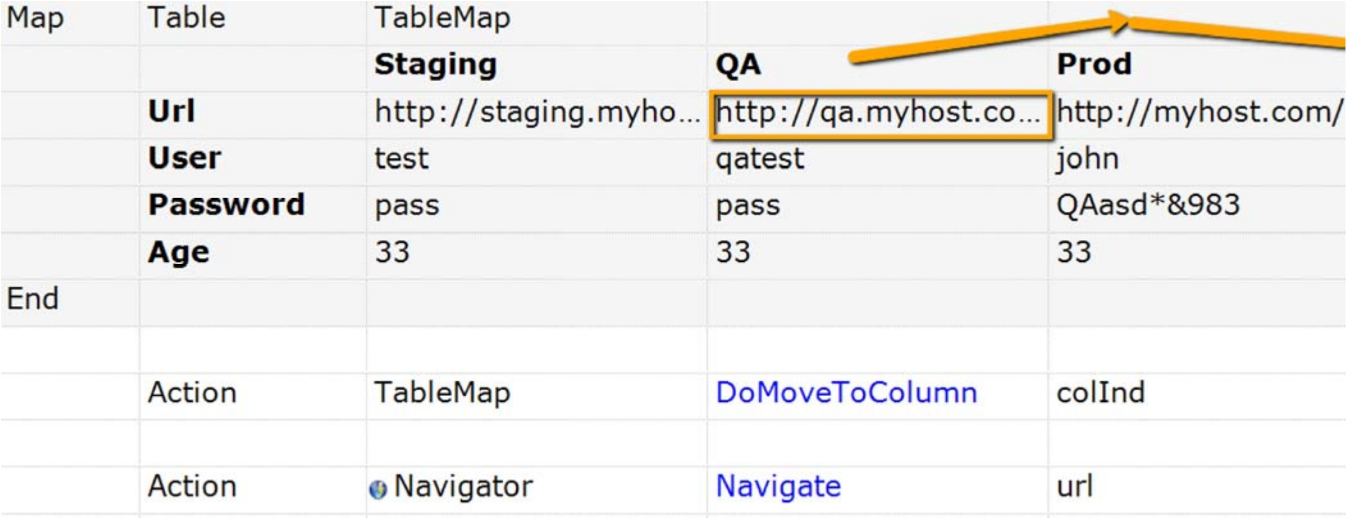
Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Map	`Table`	***MapName***				
		Col1	**Col2**	**Col3**	**Col4**	
	Row1	...				
	Row2	...				
	Row3	...				
End						



Map	Table	TableMap		
		Staging	**QA**	**Prod**
	Url	http://staging.myho...	http://qa.myhost.co...	http://myhost.com
	User	test	qatest	john
	Password	pass	pass	QAasd*&983
	Age	33	33	33
End				

When a `Table` Map is used in the Loop, then the iteration is performed through the columns and addresses the rows by name within the loop. I.e. 1st iteration chooses 1st column, 2nd goes to 2nd column and so on.

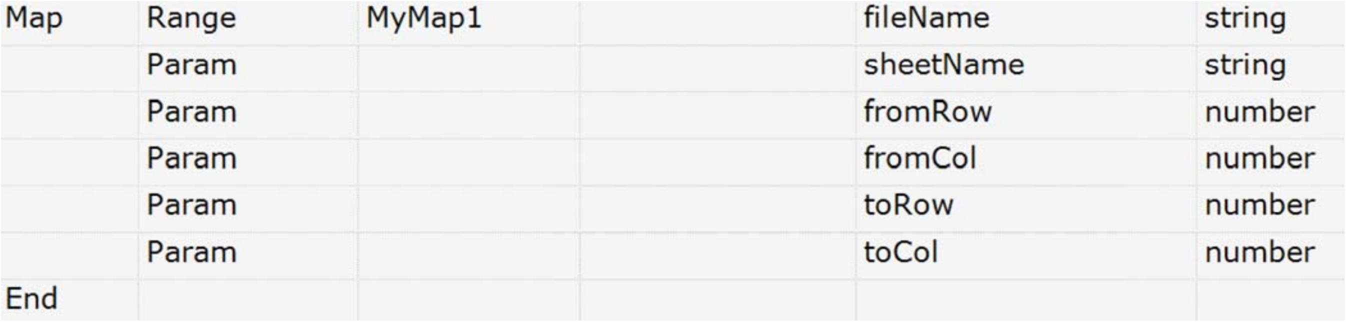
It is convenient to use a `Table` Map when you have several columns and many rows so it perfectly fits into the screen. For example you may have several alternative configuration sections and want to use them depending on the situation. In the example below we have several sites (Testing, QA, Prod) each having own Url, Login etc. So we want to quickly switch between sites when working with test.



Map	Table	TableMap		
		Staging	**QA**	**Prod**
	Url	http://staging.myho...	http://qa.myhost.co...	http://myhost.com/
	User	test	qatest	john
	Password	pass	pass	QAasd*&983
	Age	33	33	33
End				
	Action	TableMap	DoMoveToColumn	colInd
	Action	Navigator	Navigate	url

Range Map

`Range` map contains no in-place data, but defines a region in the external spreadsheet to read information from.



Map	Range	MyMap1		fileName	string
	Param			sheetName	string
	Param			fromRow	number
	Param			fromCol	number
	Param			toRow	number
	Param			toCol	number
End					

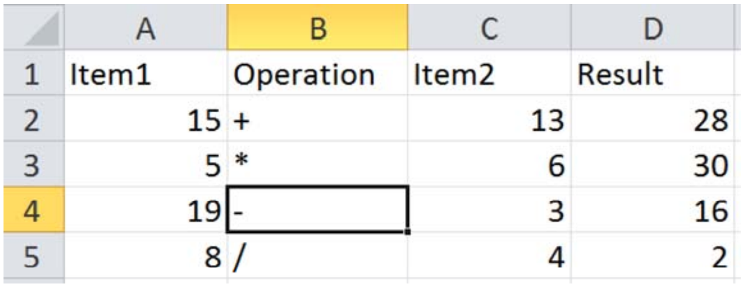
A `Range` map definition contains a number of required parameters:

- *fileName* Path to file containing data. It may point to .xls, .xlsx or .csv file. If when it is empty we assume that data is stored in the same .rvl.xls spreadsheet as the script.
- *sheetName* Excel Sheet name. May be empty for .csv spreadsheets.
- *fromRow* 0-based index of the first row containing data. Usually first row is assigned as a header containing column names.
- *fromCol* 0-based index of the first column containing data.
- *toRow* final row index. If set to -1 then final row is detected automatically (as last row containing some data in the 1st column)
- *toCol* final column index. If set to -1 then final column is detected automatically as last column containing data in the 1st row.

Also there is a hidden parameter:

- *hasColumnNames* boolean. By default it is `true` meaning that 1st rows is assumed to contain column names. Once it is `false` the columns will have no names and may only be accessed by 0-based index.

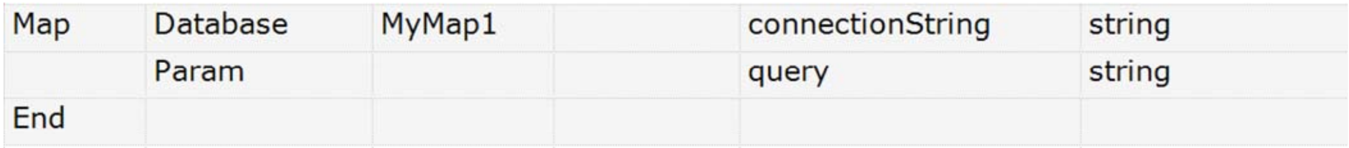
Data in the `Range` map is assumed to be similar to [`Rows`]map, but defined externally. Looping is done by rows. Typical external file containing data may look like that:



	A	B	C	D
1	Item1	Operation	Item2	Result
2	15	+	13	28
3	5	*	6	30
4	19	-	3	16
5	8	/	4	2

Database Map

A `Database` map contains no in-place data, but defines a connection to the database result set.



Map	Database	MyMap1		connectionString	string
	Param			query	string
End					

The `Database` map definition contains two parameters:

- *connectionString* ADO connection string.
- *query* usually it is an SQL query to execute.

connectionString parameter allows accessing wide variety of different database sources. You may learn ore here: https://docs.microsoft.com/en-us/sql/ado/reference/ado-api/connectionstring-property-ado.

Some samples of typical ADO connection string values:

Microsoft Access

```
Provider=MSDASQL; Driver={Microsoft Access Driver (*.mdb)}; DBQ=C:\path\filename.mdb;
```

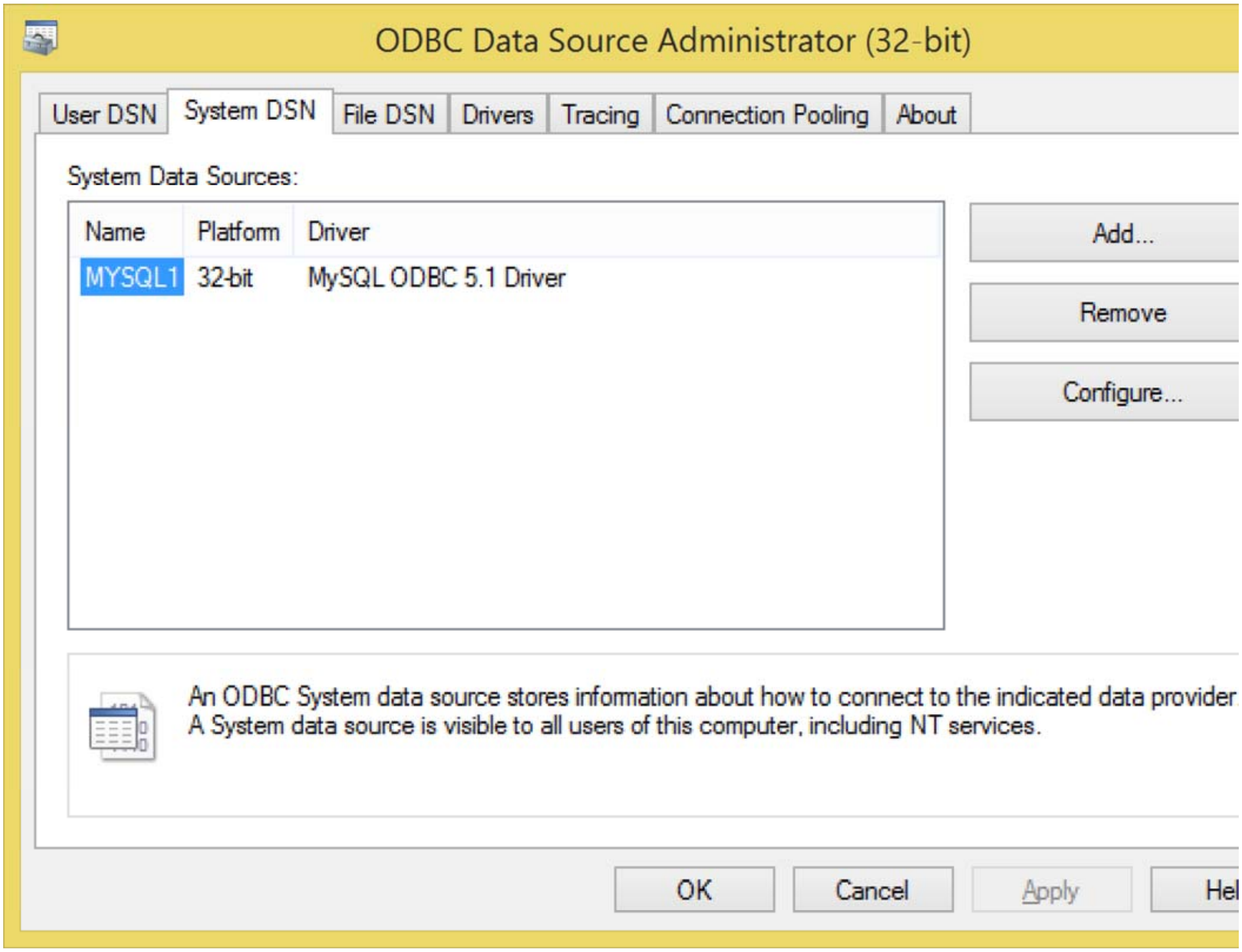
Microsoft Excel

```
Provider=MSDASQL; Driver={Microsoft Excel Driver (*.xls)}; DBQ=C:\path\filename.xls;
```

Microsoft Text

```
Provider=MSDASQL; Driver={Microsoft Text Driver (*.txt; *.csv)}; DBQ=C:\path\;
```

An example below refers to ODBC Data Source defined as follows:



System Data Sources:

Name	Platform	Driver
MYSQL1	32-bit	MySQL ODBC 5.1 Driver

An ODBC System data source stores information about how to connect to the indicated data provider
A System data source is visible to all users of this computer, including NT services.

Loops

Loops serve several needs in RVL:

1. Iterate through Maps to make data-driven testing easier.
2. Allows you to repeat a set of actions for a given number of iterations.
3. Lets you repeat a loop body while some Condition is satisfied.

Loop Map

A Map allows both reading script data from the table defined in the same script or from external data source such as spreadsheet, file or database. Once a Map is defined, the loop is the simplest way of traversing it.

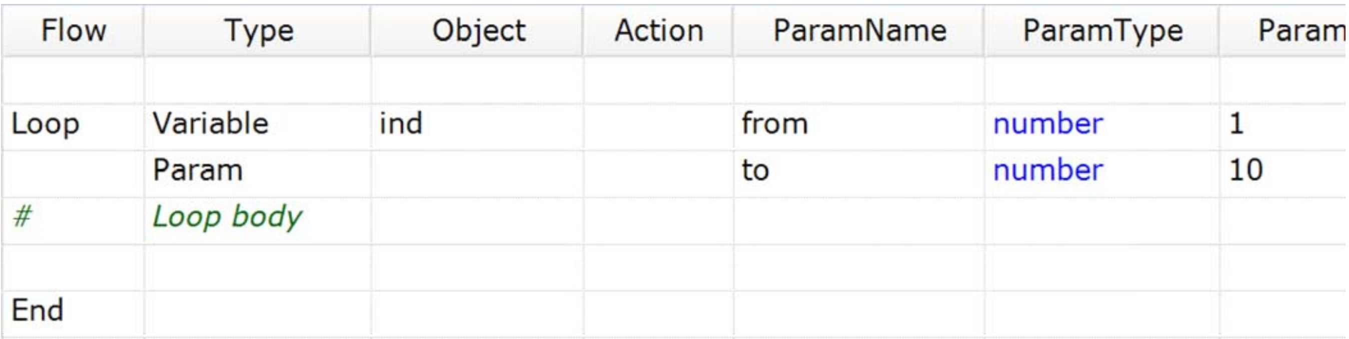
Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Loop	`Map`	*MapName*				
	...		...	...	...	...
End						

Where *MapName* should be name of the map declared earlier in the same script.

The loop goes through either the map rows or through the map columns depending on the type of map:

- For `Rows`, `Range` or `Database` type of Map, the loop goes through rows. I.e. 1st iteration points to 1st Row, then 2nd iteration points to 2nd row etc.
- For `Columns` and `Table` types of Map, the iteration goes through the columns.

Loop Variable



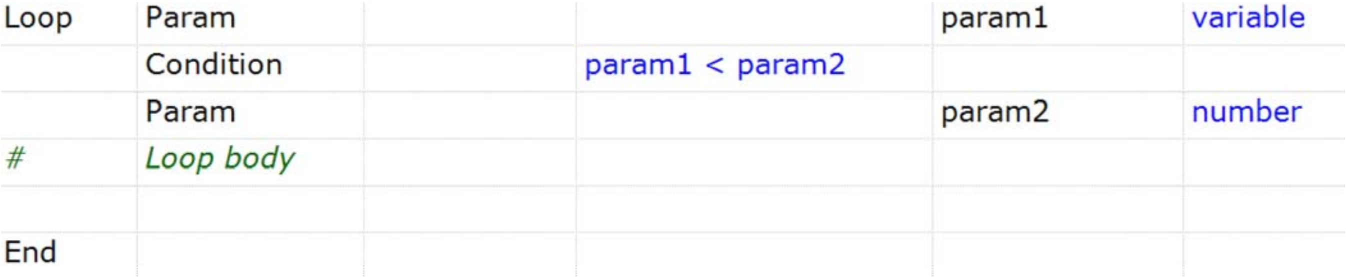
Flow	Type	Object	Action	ParamName	ParamType	Param
Loop	Variable	ind		from	number	1
	Param			to	number	10
#	Loop body					
End						

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
Loop	**Variable**	*VarName*		`from`	number	1
	Param			`to`	number	10
	...		...	...	...	...
End						

Where:

- *VarName* is an optional name of variable. It may be avoided if the goal is just to do specified number of iterations. If *VarName* is set, then the corresponding variable is assigned with the `from` value and incremented up to the `to` value throughout the loop. If *VarName* refers to an existing local or global variable then it is used, otherwise a local variable named *VarName* is created.
- *from* initial value of the loop variable
- *to* final value of the loop variable
- *step* optional, default is 1. Loop step to increment in each iteration.

Loop Condition



Loop	Param			param1	variable
	Condition		param1 < param2		
	Param			param2	number
#	Loop body				
End					

Loop repeats while condition is satisfied (i.e. `while(someCondition)`).

RVL Object

RVL Object

Some common tasks related to script execution, such as calling scripts, executing separate sheets, returning, exiting and bailing out is served by RVL.

Actions

DoPlayScript

`DoPlayScript(/**String*/scriptPath, /**String*/sheetName)`

Play RVL script using specified

- `scriptPath` {`/**string*/`}: Path to script
- `sheetName` {`/**string*/`}: Excel sheet containing the script

Exit

`Exit(/**String*/ message, /**Boolean*/isError)`

Break execution at the specified line

- `message` {`/**string*/`}: Exit message
- `isError` {`/**boolean*/`}: Specify 'false' if you want just exit without exit message

Return

`Return(/**String*/ message)`

Return from specified line. This method should be called from within RVL

- `message` {`/**string*/`}: Return message

DoPlaySheet

`DoPlaySheet(/**String*/sheetName)`

Run current script from specified sheet

- `sheetName` {`/**string*/`}: Sheet Name

LocatorOpts

`SetLocatorOpts(/**objectid*/objectid, {optname:optvalue,...})`

Set additional locator options for specified object. This is a way to modify various script parameters such as `locator`, `xpath`, `url` and thus find different objects.

- `objectid` {`/**objectid*/`}: Object ID

Example:

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	RVL	SetLocatorOpts	**objectid**	**objectid**	MyButton
	Param			**locator_param1**	**string**	**new value1**
	Param			**locator_param2**	**string**	**new value2**

All params going after `objectid` are optional and depend on specified object's locator.

If you want to reset all values to default value call this method with just `objectid` and no additional parameters.

FormatString

`FormatString(/**string*/fmtString, {optname:optvalue,...})`

Format string according to the specified template. Template may contain placeholder values enclosed in curly braces, i.e.: `My name is {name}`.

Flow	*Type*	*Object*	*Action*	*ParamName*	*ParamType*	*ParamValue*
	Action	RVL	FormatString	**fmtString**	**string**	`{first} plus {second} equals to {result}`
	Param			**first**	**string**	`one`
	Param			**second**	**string**	`five`
	Param			**result**	**string**	`6`

This Action should put string value `one plus five equals to 6` into the variable LastResult.

Properties

CurrentScriptPath

** `GetCurrentScriptPath()` **

Return path to currently executed .rvl.xls file

CurrentScriptSheet

** `GetCurrentScriptSheet()` **

Return sheet name of the currently executed .rvl.xls file

Map Object

Map Object

Represents an RVL Map object and all its operations. The same operations are used by the RVL runtime implicitly to read the cell value or iterate through the Map.

Actions

DoMoveToRow

`DoMoveToRow(/**Number*/ colInd)`

Moves to a given row.

`rowInd` Row index (or name) to set active.

DoSequential

`DoSequential()`

Advances to the next row in the range. The range is either set by SetRange or it is the default range that includes all rows on the sheet except first row which is considered to contain column names. When the end of the range is reached, DoSequential rewinds back to the first row in the range and returns 'false'.

Returns 'false' if being called when active row is the last row or the spreadsheet is not attached, 'true' - otherwise.

DoMoveToColumn

`DoMoveToColumn(/**Number|String*/colInd)`

Moves to a given column.

`colInd` Column index (or name) to set active.

DoMoveToFirstColumn

`DoMoveToFirstColumn()`

Moves to a first column in the map.

DoMoveToFirstRow

`DoMoveToFirstRow()`

Moves to a first row in the map.

DoMoveToLastColumn

`DoMoveToLastColumn()`

Moves to a last column in the map.

DoMoveToLastRow

`DoMoveToLastRow()`

Moves to a last row in the map.

Properties

Cell

** `GetCell(/**Number|String*/ columnId, /**Number*/ rowId)` **

Gets a cell value by its coordinates. It returns the current cell value after DoSequental or DoRandom if the parameters are not set.

`[columnId]` Column index or name. If not set ActiveColumn is used.

`[rowId]` Row index. If not set ActiveRow is used.

ColumnCell

** `GetColumnCell(/**Number*/ rowId)` **

Gets cell value by its coordinates. Returns current cell value after DoSequental. If not set ActiveColumn is used.

`[rowId]` Row index. If not set ActiveRow is used.

ColumnCount

** `GetColumnCount()` **

Gets columns count.

Returns Number of columns in the spreadsheet.

ColumnIndexByName

** `GetColumnIndexByName(/**String*/name)` **

Gets column name.

`name` Column name.

Returns column index if found, or -1.

ColumnName

** `GetColumnName(/**Number*/ ind)` **

Gets column name.

`ind` Column index.

Returns Name of column in the spreadsheet.

RowCount

** `GetRowCount()` **

Gets rows count.

Returns Number of rows in the spreadsheet.

RowIndexByName

** `GetRowIndexByName(/**String*/name)` **

Gets row name.

`name` Row name.

Returns row index if found, or -1.

CurrentRowIndex

** `GetCurrentRowIndex()` **

Get zero based current row index.

EOF

** `GetEOF()` **

Is current position is beyond the map boundaries range.

RowCell

** `GetRowCell(/**Number|String*/ columnId)` **

Gets cell value for current row. Returns current cell value after DoSequental. ActiveRow is used.

`[columnId]` Column index or name. If not set ActiveColumn is used.

RowName

** `GetRowName(/**Number*/ ind)` **

Gets row name.

`ind` Row index.

Returns Name of row in the map.

Value

** `GetValue(/**Number|String*/ rowOrColumnNameOrId)` **

Gets cell value by its name or id. Returns current cell value after DoSequental. If it is Rows or Table then the parameter needs to be a column name or index, and ActiveRow is used. If it is Columns then the parameter needs to be a row name or index, and ActiveRow is used.

`[rowOrColumnNameOrId]` Row or Column index or Name.