SIMATIC WinCC Unified
Tips and Tricks for Scripting (JavaScript)

SIMATIC WinCC Unified (Engineering),
SIMATIC WinCC Unified (Runtime)
SIMATIC HMI Unified Comfort Panels

https://support.industry.siemens.com/cs/ww/en/view/109758536

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1 Introduction

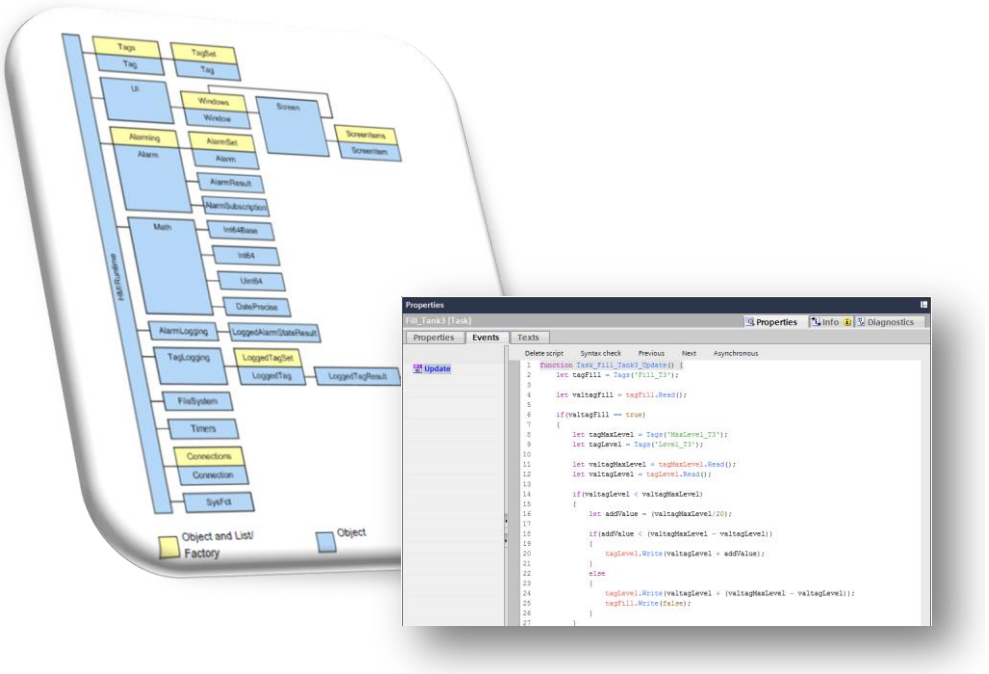
1.1 Overview

SIMATIC WinCC Unified uses JavaScript as a script language and therefore provides a modern script environment, which you can typically use to automate screens and objects.

The script environment maps individual elements of the system components via an object model, e.g. screen of the graphic runtime system. You reference this object model in your script languages, this allowing you to access different functions in an object-oriented approach.

The application example will show you how to use scripts in SIMATIC WinCC Unified. Selected examples will also serve to show you tips and tricks for manual scripting, which you can use in your application.

Figure 1-1



1.2 Components used

The following hardware and software components were used to create this application example:

Table 1-1

Components	Quantity	Item number	Comment
SIMATIC WinCC Unified V16 (Engineering)	1	6AV2153-....1-6...	-
SIMATIC WinCC Unified V16 (Runtime)	1	6AV2154-....1-6...	-
SIMATIC HMI Unified Comfort Panel MTP700	1	6AV2128-3GB36-0AX0	Alternatively, you can use any other SIMATIC HMI Unified Comfort Panel.

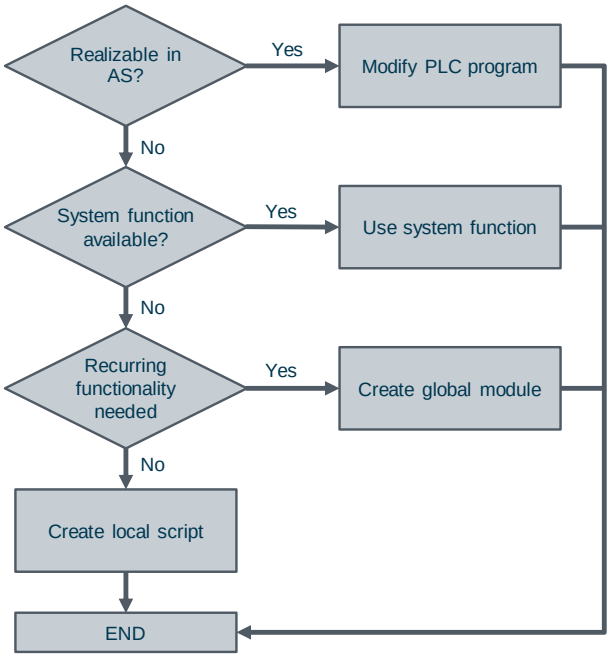
2 General

This chapter will familiarize you with general information surrounding the topic of scripting in WinCC Unified.

2.1 System function or script (a decision-making aid)

The chart below is a decision-making tool to help you determine when to use a system function, a global module or local scripts.

Figure 2-1



2.2 Trigger types

General information

There are various triggers to run a script in the runtime. Triggers are conditions. There are three different types of trigger in WinCC Unified:

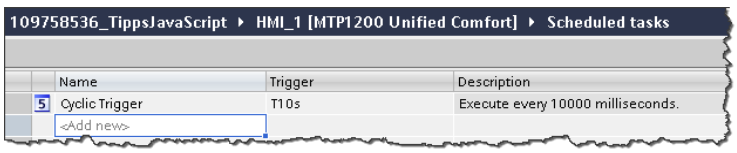
- Cyclic triggers
- Tag trigger
- Event-driven triggers

If no trigger is defined (e.g. in the task scheduler), the script is not run.

Cyclic triggers

Cyclical triggers are time-driven and are run repeatedly after a certain time, for example every 10 seconds.

Figure 2-2



Note

Please note that the cycle time heavily influences the performance of the project.

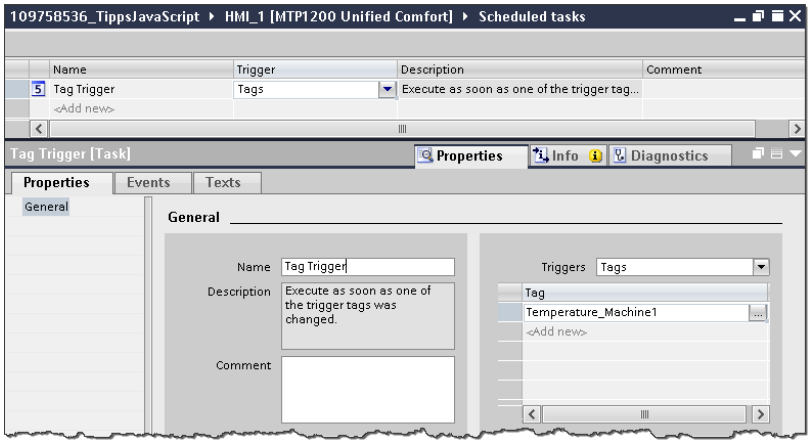
All actions from a screen must be completed within their cycle time. Apart from the runtimes of the actions, the times required for requesting the tag values and the reaction times of the automation systems must also be taken into consideration. You should only set trigger events with a cycle time of less than one second when rapidly changing variables must be queried.

Tag trigger

For a tag trigger, one or more tags must be specified, also known as the trigger tag.

Once the value of the trigger tag changes, the script is triggered and the function inside it is executed.

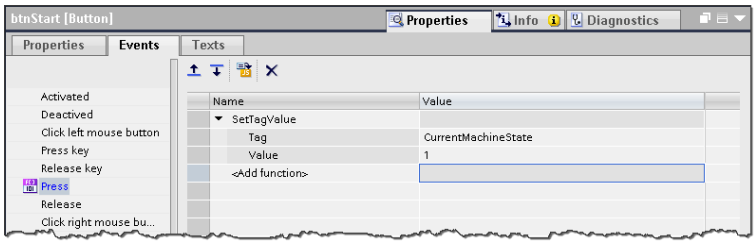
Figure 2-3



Event-driven triggers

For event-driven triggers, the script is always run when this event occurs. Events can be, for example, mouse clicks, keyboard operations or changes in focus.

Figure 2-4



2.3 Access properties of a screen object

Using JavaScript, you can address each screen object and modify its properties.

Example

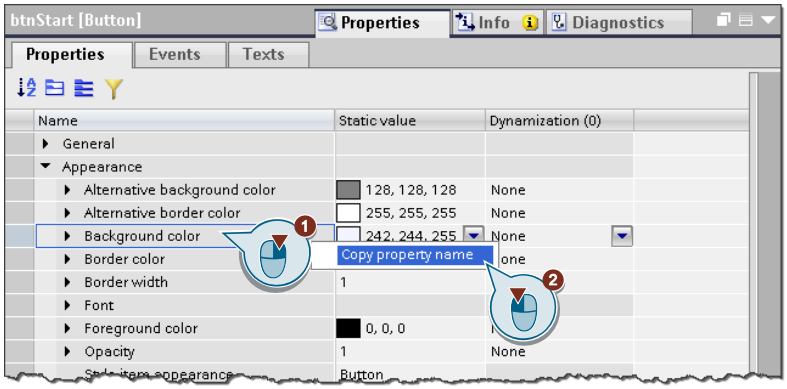
This example changes the background color of the object rectangle with the object name "Rectangle1" to yellow.

```
Screen.FindItem('Rectangle1').BackColor = 0xFFFFFF00;
```

Find name of the property

You can find the name of the property by right-clicking on the property (1) and then clicking "Copy property name" (2).

Figure 2-5



You can then paste the property name into the desired location with the keyboard command "CTRL + V".

Note Alternatively, you can find the properties listed in the manual "SIMATIC WinCC Engineering V16 - Runtime Unified" in the "Objects" chapter under the respective object:

https://support.industry.siemens.com/cs/ww/en/view/109773780/118272265099

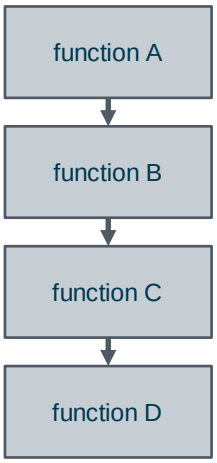
2.4 Difference between synchronous and asynchronous script calls

Synchronous/asynchronous script call is a distinction that applied for JavaScript in general.

Synchronous

In synchronous script calls, the functions in the script are executed in order. The next function only begins when the one before it is complete.

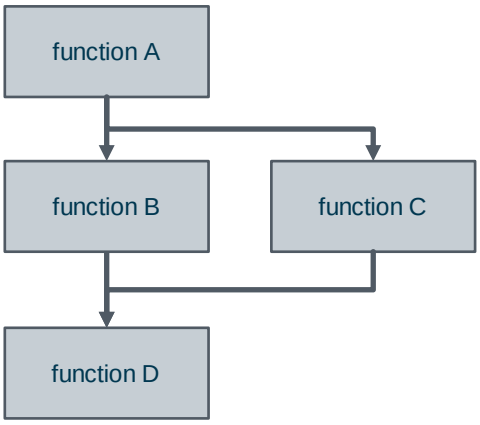
Figure 2-6, simplified representation of synchronous script sequence



Asynchronous

In contrast to the above, there are also asynchronous script calls. In this case, functions can be executed in parallel, thus allowing them to be processed more rapidly.

Figure 2-7, simplified representation of asynchronous script sequence



Typically, asynchronous script calls are used in the context of timers (e.g. "HMIRuntime.Timers.SetTimeout()"), access to network files, or time-intensive database queries.

When using asynchronous script calls, there are however other differences which affect how the script runs. For example, you can use the "await" operator to wait for the result of a function.

If you use multiple complex and therefore more time-intensive functions in a script (for example if you want to read two network files and establish a database connection), then it is recommended to use the Promise.all method.

Note

You can find more information about "await" and the Promise object in the "Mozilla Developer Network".

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Promise/then

Note You can find additional information about "Promise.all" in the "Mozilla Developer Network":

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Promise/all

2.5 Script threads

SIMATIC WinCC Unified processes the scripts in Node.js processes. In this context, a Node.js process is always single-threaded. This means that only one CPU core is available to run the code to process the script, meaning that only one script per process can be handled at a time.

In WinCC Unified itself, only two processes are available for script handling:

- one process for all scripts which are run by the user (all scripts in screens)
- and one process for all scripts which are running in the "Task Scheduler".

Both processes run on two separate CPU cores, thereby can working through scripts in parallel.

3 Configuring scripts

3.1 Configuring local scripts

Supported objects

You can configure scripts to the following points of use in SIMATIC WinCC Unified:

- Screens
- Screen objects
- Tasks

Depending on the object for which you configure the scripts, you can execute different functions.

Table 3-1

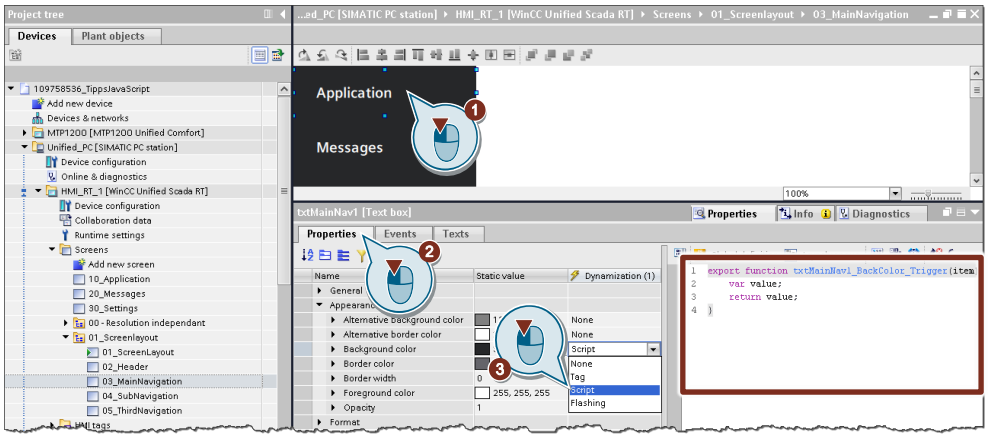
Execution context of the editor	Script context and referencing
"Scripts" Editor in the "Screens" Editor	Each process image has two independent scrip contexts: • Context for dynamizing properties (chapter 3.1.1) • Context for evaluating events (chapter 3.1.2) Both script contexts of a process image reference the same global modules. However, each context receives its own copy of the tags defined there.
"Scripts" Editor in the task planner	All tasks are assigned to a script context. Different jobs can access common global tags. All tasks reference all global modules of a target system (chapter 3.1.3).

3.1.1 Dynamizing object properties via scripts

You can dynamize the relevant properties of screen and screen objects via script, i.e. change the property for the runtime, e.g. change font color, show/hide visibility.

The following steps are required for dynamization by script:

1. Highlight the screen object on the screen.
2. Open the "Properties > Properties" tab of the screen object.
3. Change the property to be dynamized in the "Dynamization" column to "Script".



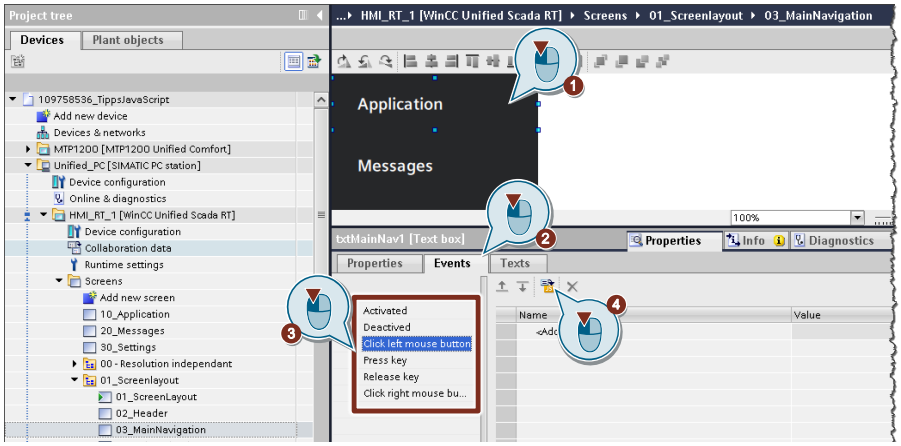
The Script Editor then opens in the Inspector window next to the object properties.

3.1.2 Calling up scripts via events

To execute certain functions in operation, e.g. invert a tag with a button or toggle the language, SIMATIC WinCC Unified provides the option of calling up scripts via events.

The following configuration steps are necessary to call up a script via an event at a screen object (e.g. a button):

1. Highlight the screen object on the screen.
2. Open the "Properties > Events" tab of the screen object.
3. Select the event that calls the script in the local navigation.
4. Now create a new script with the "Convert to script" button.

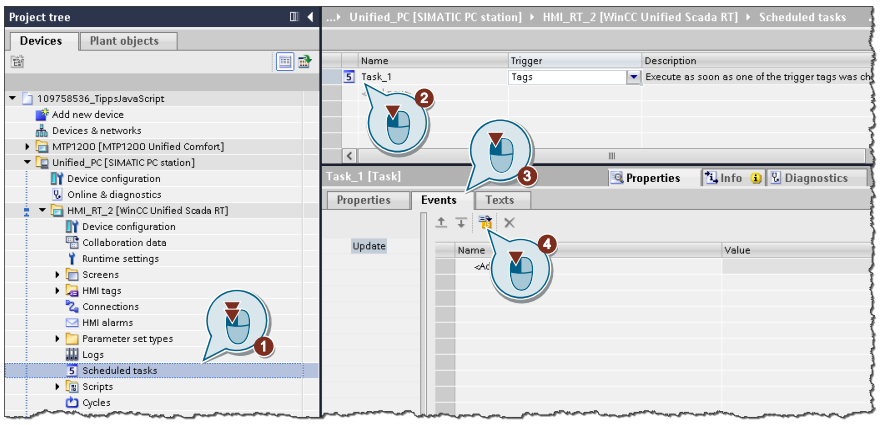


3.1.3 Calling scripts via Scheduled tasks

In addition to the "Events" at screen objects, you can also call up scripts in the "Scheduled tasks".

The following steps are required for this:

1. In the project tree, open the "Scheduled tasks".
2. Add a new task or highlight the existing task.
3. Open "Properties > Events".
4. Now create a new script with the "Convert to script" button.



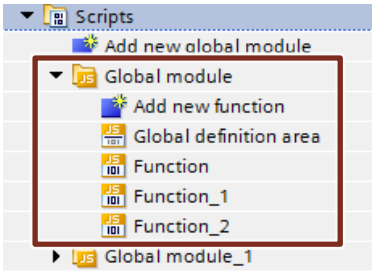
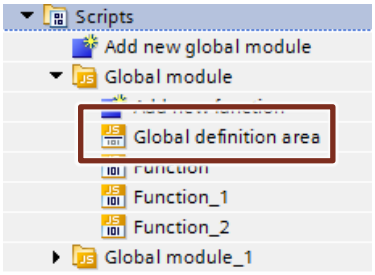
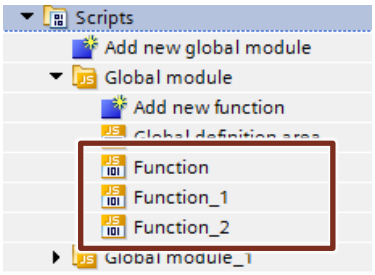
3.2 Configuring global script modules

With the version SIMATIC WinCC Unified V16.0 you have the possibility to use global modules in the script context. These are appropriate for:

- Creating functions that are not directly linked to an image object, an image, or a task and can therefore be used more than once.
- Triggering scripts cyclically in the background (e.g. task scheduler).

Term overview

Table 3-2

Designation	Description	Image
Global module	• Global modules are stored in the project tree under "Scripts". • Each global module contains its own definition area and one or more functions. • Global modules are very well suited for grouping functions.	
Global definition area	• In the definition area of a global module, you define local tags that you can access in all functions of the global module. • You can also use these tags in local scripts (such as image properties) using the Export/Import command.	
Global function	• Each global module can contain several functions. • You can define transfer parameters in a function, which you can then process in the script. • Each function has a return value. • You can also use the Import command to use functions in local scripts (e.g. image properties).	

Configuration

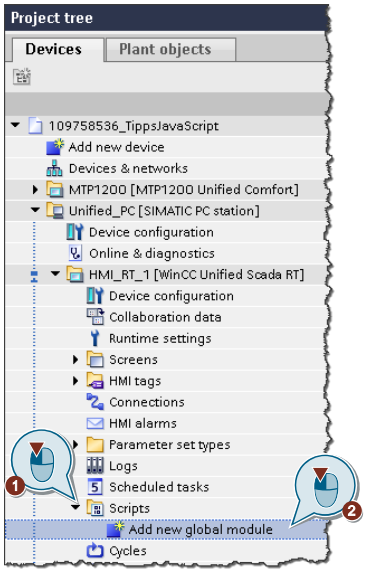
If you want to use global modules, the general configuration procedure is as follows:

1. Add a global module (chapter 3.2.1).
2. Create global definition area (chapter 3.2.2).
3. Edit global function (chapter 3.2.3).
4. Import and use content from global modules (chapter 3.2.4).

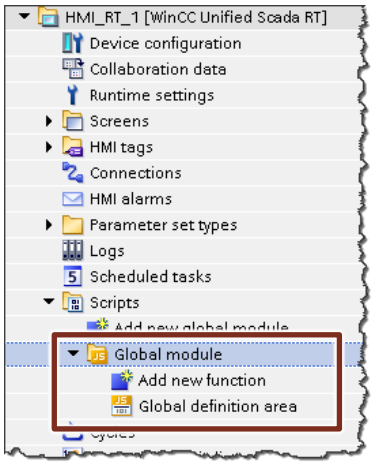
3.2.1 Add global module

To add a global module:

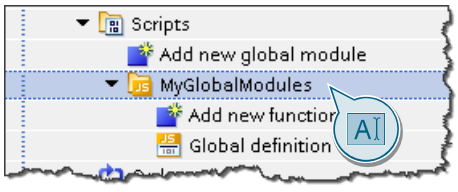
1. Open the "Scripts" folder in the project tree.
2. Click on "Add new global module".



A new folder "Global module" appears in the folder "Scripts". This already contains a "Global definition area".



3. If necessary, rename the folder "Global modules", e.g. to "MyGlobalModules".



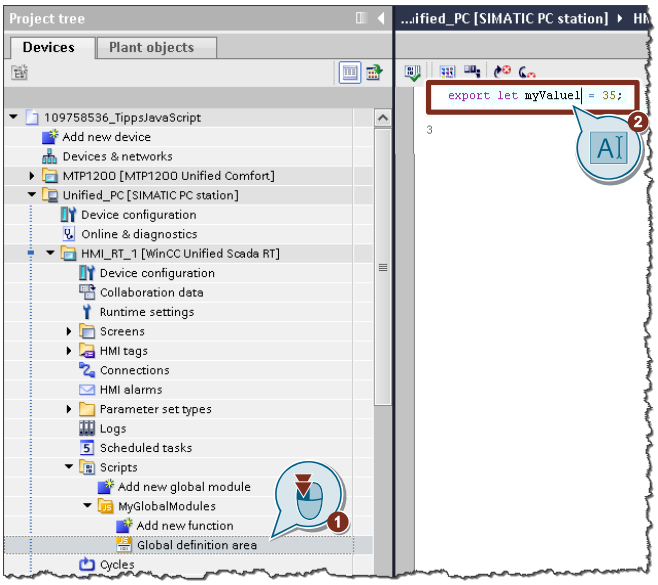
3.2.2 Creating a Global Definition Area

The definition area of a global module is used to access the same tag values in several functions of the same global module.

Configuration

1. Open the "Global definition area" folder by double-clicking on it.
2. Add the code below to the working area.

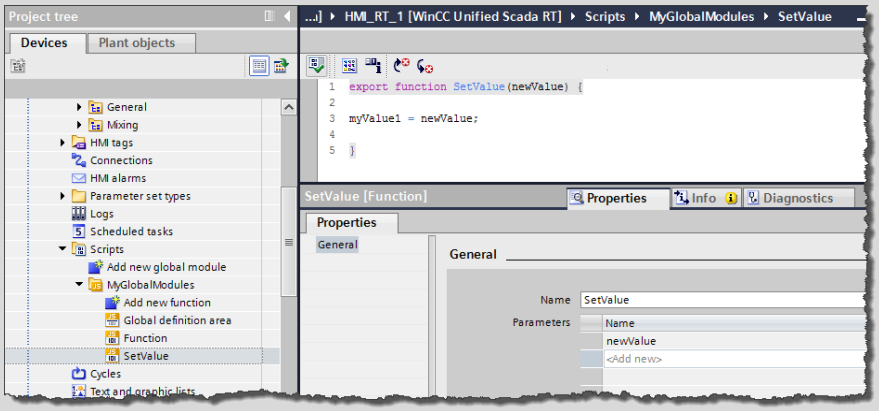
```
export let myValue1 = 35;
```



Note

The value of tags within a global module can only be changed via its functions. Other places of use (e.g. image properties) can only read these tags.

If you want to change the value of tags of a global module (here: "myValue1") from a local usage location, you have to call a script of the same global module (here: "SetValue") and enter the desired value via a parameter (here: "newValue").



3.2.3 Edit global functions

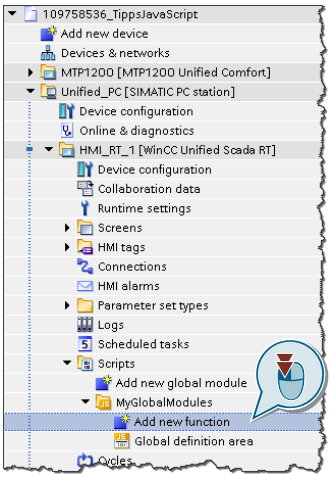
You edit global functions like the global definition area within a global module.

Example

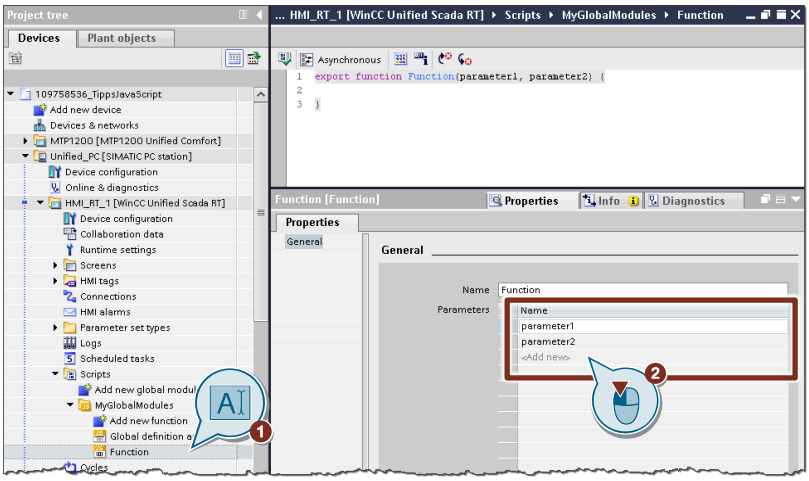
In this example, three values (a value from the global definition area and two transfer parameters) are to be added together in a function. The return value of the function should be the sum ("result") of the three values.

Configuration

1. Click on "Add new function" in the project tree in your Global Module "MyGlobalModules".



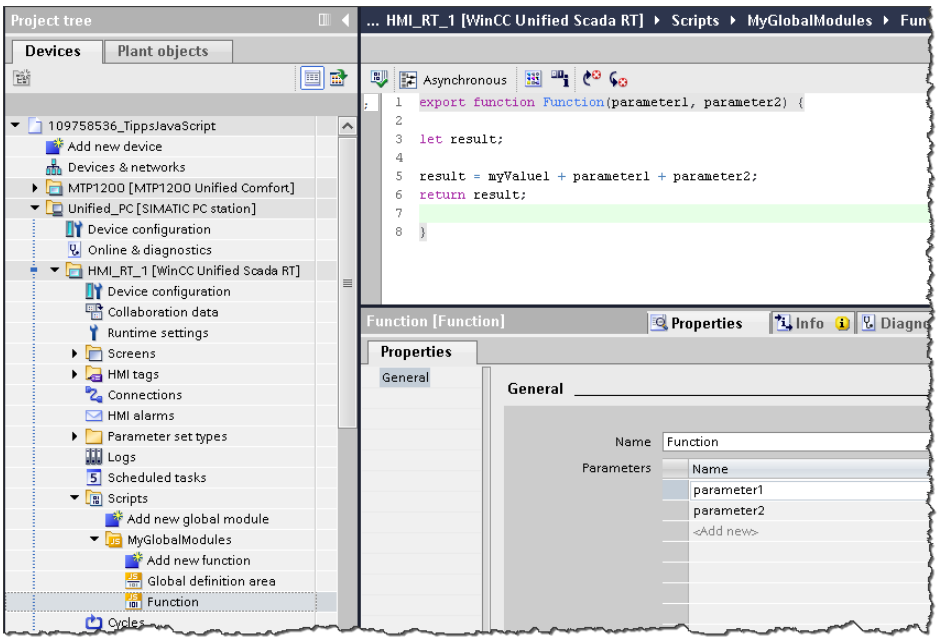
2. If necessary, change the name of the function (1) and the number of transfer parameters ("Parameters") in the properties (2).



3. Enter the following code in the function:

```
let result;

result = myValue1 + parameter1 + parameter2;
return result;
```

Note The tag "myValue1" has been defined in the global definition area (see chapter 3.2.2).



3.2.4 Import and use content from global modules

To be able to use the tags and functions of the global modules locally, you must first declare them with the import command in the global definition of the local script.

Requirement

In order to describe the import of the global module contents, the following elements were planned in advance:

- an image ("Screen_Script")
- a button "Button_1" and an I/O field in the image ("Screen_Script")
- an internal tag "ScriptResult" of the data type "Int".
- the I/O field is connected with the process tag "ScriptResult".

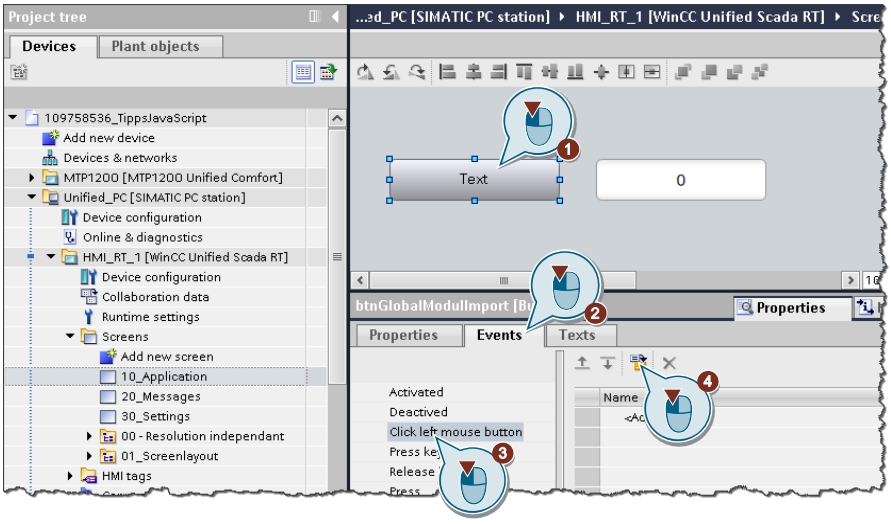
Example 1

In this example, the value of the tag "myValue1" (as defined in chapter 3.2.2), must be written from the global definition area of the global module "MyGlobalModul" into the internal tag "ScriptResult" when the button "Button_1" is pressed.

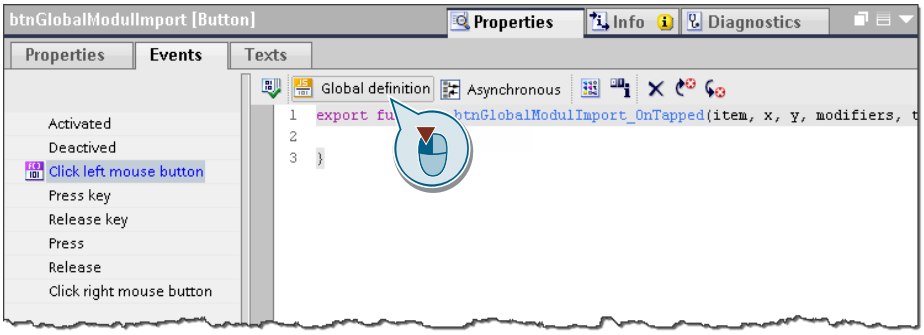
The value of the internal tag must then be output to the I/O field.

Configuration 1

1. Creating a script
   - Mark the button (1) in the "Screen_Script" image.
   - In the properties, open the "Events" tab (2).
   - In the navigation area, select the trigger "Click left mouse button" (3) and then click the button "Convert to script" (4).



2. In the local script editor menu, click Global definition.

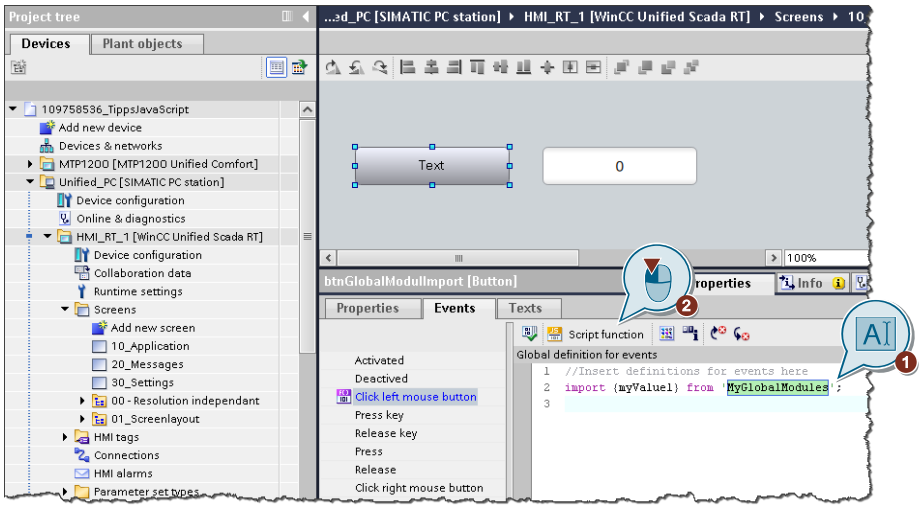


3. Import content from global definition area:

   - Insert the following code to import the tag "myValue1" from the global definition area of the global module (1).

```
import {myValue1} from 'MyGlobalModules';
```

   - Then click on "Script function" in the menu of the local script editor (2).



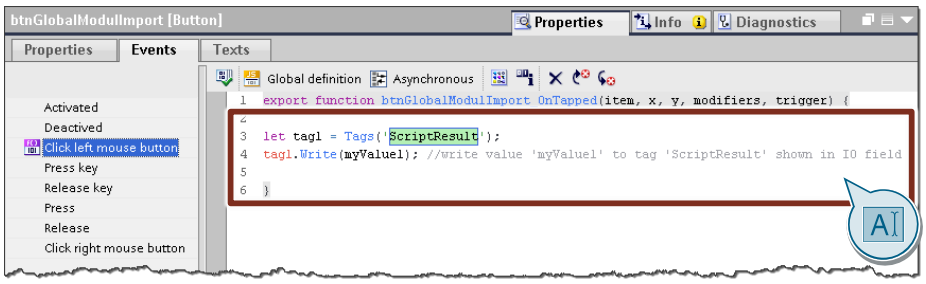
Note

Once you have imported the tag in the global definition area (for example, in the image properties), it is available in the entire image properties area of the same image.

To use the tag in the Events pane of the image, you must re-import the tag. You therefore have to declare the tag in the global definition area of the events.

4. Insert the following code in the script editor of the event:

```
let tag1 = Tags('ScriptResult');
tag1.Write(myValue1); //write value 'myValue1' to tag
'ScriptResult' shown in IO field
```



Note

Optionally, you can also use the script snippet "HMI Runtime > Tag > Write tag" to generate the code in the script editor.

Further information can be found in chapter 5.1.

5. Save your project.

Example 2

In the second example, the function "Function" of the global module "MyGlobalModul" is to be executed by pressing the button "Button_1".

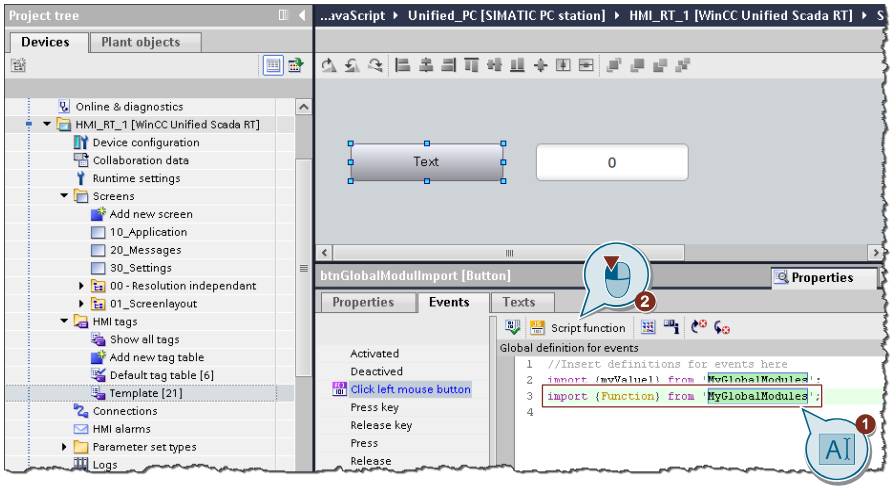
- The values 10 and 12 are to be passed to the function as transfer parameters.
- The return value of the function is then to be output as a trace message.

Configuration 2

1. Open the global definition area of the button "Button_1", as in step 1-3 with "Configuration 1" (page 19).
2. Import function from global module:
   - To additionally import the "Function" function, add the following code (2):

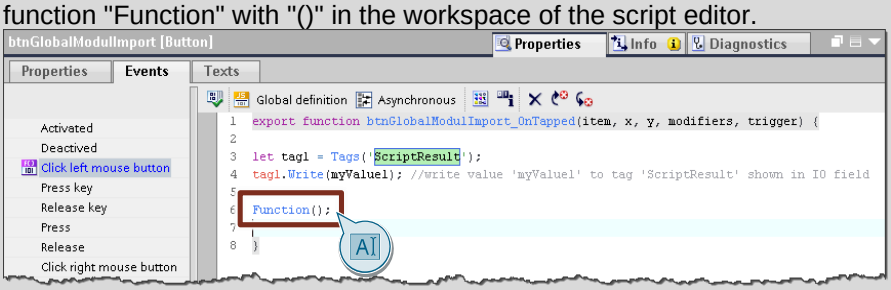
```
import {Function} from 'MyGlobalModules';
```

   - Then click on "Script function" in the menu of the local script editor (2).



Note

If you do not want to pass values to a function of a global module, call the function "Function" with "()" in the workspace of the script editor.



Note

You can also import tags from the global definition area and functions from the same global module in a single command:

```
import {myValue1; Function} from 'MyGlobalModules';
```

3. Transfer values
   - Define three additional tags in the local script of the button event as shown in the figure (1).

```
let myValueLocal1 = 10;
let myValueLocal2 = 12;
let resultFunction;
```

   - Assign the return value of the "Function" function to the "resultFunction" tag and pass the two tags ("myValueLocal1" and "myValueLocal2") (2).

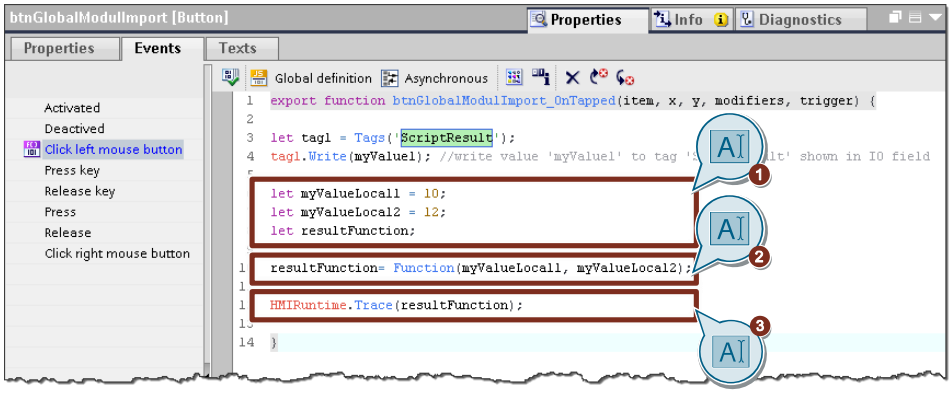
```
resultFunction = Function(myValueLocal1, myValueLocal2);
```

   - Output the value of the tag "resultFunction" as a trace message (3).

```
HMIRuntime.Trace(resultFunction);
```

Note Optionally, you can also use the script snippet "Trace" to generate the code for the trace message.

Further information to script snippets can be found in chapter 5.1.



Note If you have a large number of tags in the global definition area or functions in global modules, you can import them collectively with the following line of code:

```
import * as myGMs from 'MyGlobalModules';
```

You can call or use functions or tags from the global definition area of global modules as follows:

```
myGMs.Function();    //call function from global modul
myGMs.myValue1;      /*call tag from global definition area in
                     */global module
```

4 Tips and tricks for creating scripts (JavaScript in general)

4.1 Strings in JavaScript

In the following sections (chapters 4.1.1-4.1.3), selected examples will show you how to process strings.

Note Further information on working with strings and JavaScript is available at the following link:

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/String

4.1.1 Linking strings by script

If you wish to link several strings in a script, this is possible with the concatenation operator "+".

Example:

```
let Tag_01;
const Tag_Text_01 = 'Hello';
const Tag_Text_02 = 'my';
const Tag_Text_03 = 'world';

Tag_01 = Tag_Text_01 + Tag_Text_02 + Tag_Text_03;
// output Tag_01: 'Hellomyworld'
```

Note The Object.prototype.toString() function allows corresponding expressions to be converted to the "String" data type. This conversion before linking the strings allows you to avoid runtime errors.

You can find further information on the "*Object.prototype.toString()*" method at the following link:
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Object/toString

4.1.2 Adding spaces to linked strings

If you link strings together, it may occur that they are output as one coherent word. This can consequently make the meaning and readability more difficult.

To separate the individual strings from each other, you can add additional separators (e.g. spaces). These are added to the string in quotation marks (" ") and via concatenation operator (+).

Example

```
let Tag_01, Tag_Text_01, Tag_Text_02, Tag_Text_03;
Tag_01 = Tag_Text_01 + " " + Tag_Text_02 + " " + Tag_Text_03;
```

Note The number of "spaces" determines the spaces between the quotation marks " ".

Other options

Alternatively, so-called template strings can also be used. Back ticks (`) are used here instead of double or single quotation marks. The tags are then written with dollar sign and curly brackets "*${Variable}*".

Example

```
let Tag_01, Tag_Text_01, Tag_Text_02, Tag_Text_03;
Tag_01 = `${Tag_Text_01} ${Tag_Text_02} ${Tag_Text_03}`;
```

4.1.3 Determining the length of a string

You can use the `length` method to determine the length of a sting and further edit it accordingly.

Example

```
const Tag_Text_01 = 'Hello';
HMIRuntime.Trace(Tag_Text_01.length);      //output: 5
```

This can typically be necessary if a string must be further edited which exceeds a determined minimum length.

4.1.4 Finding a sub-section of a string

The `substring()` method provides the option of determining and further processing a certain part of a string. Both the beginning and the end position of the partial string are defined in brackets.

Example

```
let Tag_Text_01 = 'WinCCUnified';
HMIRuntime.Trace(Tag_Text_01.substring(0,5));    //output: 'WinCC'
```

As a potential application case, it is conceivable that only strings having a certain prefix would be processed further.

4.1.5 Turning a string into an array

The `split()` method uses the specified delimiter to split a string into child strings and returns them as an array.

Example

```
let TagText = 'SIMATIC_WinCC_Unified';  //define tag and assign text
let arrayOfString =[];                  //define array

arrayOfString = TagText.split('_');    //split string into array
```

```
// Trace output:: 'SIMATIC'
HMIRuntime.Trace(arrayOfString[0]);
```

This method can be applied if you have read a CSV file and then further edit the content of the individual columns separately.

4.2 Arrays in JavaScript

Arrays are a specific kind of data structure. This type of data structure helps when using scripts in SIMATIC WinCC Unified, among other things.

This chapter will show you some properties and methods which you can apply in connection with WinCC Unified.

Note For a complete overview of which properties and methods are supported by the array object, please refer to the Mozilla Developer Network at the following link:

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Array

4.2.1 Creating arrays and accessing array elements

Create array

Create an array in JavaScript by assigning multiple elements to the array name in brackets.

Example:

```
//Create array
let array = ['SIMATIC','WinCC','Unified'];

// TraceViewer output: "Trace Message Array SIMATIC,WinCC,Unified"
HMIRuntime.Trace("Trace Message Array: " + array);
```

Access an array element

If you wish to access a single array element, first enter the name of the arrays followed by the number of the array element that you want to access.

Example:

```
//TraceViewer output: "Trace Message 2. Array-Element: WinCC"
HMIRuntime.Trace("Trace Message 2. Array-Element: " + array[1]);
```

Determine the index of an array element

Using the `indexof()` method you can find which index the element first occurs at. If the element is not in the array, "-1" will be returned.

Example:

```
//Create array
let array = ['SIMATIC','WinCC','Unified'];

//define tag and assign index of WinCC to tag
let index = array.indexOf('WinCC');

// TraceViewer output: "Index of WinCC: 1"
HMIRuntime.Trace("Index of WinCC: " + index);
```

4.2.2 Extending and truncating arrays

Extend array

You can add one or more elements to the end of the array by using the `push()` method.

Example:

```
//Create array
let array = ['SIMATIC','WinCC','Unified'];

// Add 'V16' to Array
array.push('V16');

// TraceViewer output: "New Array: SIMATIC,WinCC,Unified,V16"
HMIRuntime.Trace("New Array: " + array);
```

Truncate array

The `pop()` method is the inverse of the `push()` method. It removes the last element of the array and returns it.

Example:

```
//Create array
let array = ['SIMATIC','WinCC','Unified'];

// TraceViewer output: "Unified"
HMIRuntime.Trace("Return value: " + array.pop());

// TraceViewer output: "New Array after pop(): SIMATIC,WinCC"
HMIRuntime.Trace("New Array after pop(): " + array);
```

4.2.3 Sorting arrays

To sort an array, you can use the `sort()` method. Is the reverse function to the `split()` method.

Example:

```
//Create array
let array = ['SIMATIC','WinCC','Unified'];

//Sort array
array.sort();

// TraceViewer output: "Sorted Array: SIMATIC,Unified,WinCC"
HMIRuntime.Trace("Sorted Array: " + array);
```

4.2.4 Turn arrays into strings

The `join()` method is the inverse function to the `split()` method (see chapter 4.1.5). It compounds individual array elements into a string and returns this as a value.

Example

```
//Create array and tag 'tagText' as string
let array = ['SIMATIC','WinCC','Unified'];
let tagText = '';

//convert array into string
tagText = arrayOfString.join('-');

// TraceViewer output: 'SIMATIC-WinCC-Unified'
HMIRuntime.Trace(tagText);
```

This method is useful when you assemble the contents of an array into a string and then export it to CSV.

4.3 Math object in JavaScript

The "Math" object in JavaScript enables you to perform mathematical operations on numbers. The following shows you how to:

- Add constants
- Round off tag values
- Find square root
- Use exponent function
- Generate random numbers
- Determine minimum/maximum values

Note Besides the general JavaScript Math objects there is also a Math object specific to SIMATIC WinCC Unified (see chapter 5.14).

4.3.1 Add constants

You can access various constants in JavaScript via the "Math" object. The "Math" provides corresponding properties for this.

Example:

In this example, the constant n is added.

```
let tag1 = Tags('HMI_Tag_PI');
tag1.Write(Math.PI);          //Write value '3.141592653589793...'
```

The table below also shows which constants you can access.

Table 4-1

Return value	Syntax
Euler's number	`(Math.E)`
Square root of "2"	`(Math.SQRT2)`
Square root of "0.5"	`(Math.SQRT1_2)`
Natural logarithm of "2"	`(Math.LN2)`
Natural logarithm of "10"	`(Math.LN10)`
Logarithm "e" to base "2"	`(Math.LOG2E)`
Logarithm "e" to base "10"	`(Math.LOG10E)`

4.3.2 Round off tag values

Depending on requirements, it may be necessary to round off values of a tag. The "Math" objects provides the method `round()` for this.

Example:

```
let tag1 = Tags('HMI_Tag_Round');
let tagValue1 = tag1.Read();        //Read value
tag1.Write(Math.round(tagValue1)); //round value e.g. 4.7 --> 5
```

4.3.3 Find square root

The `sqrt()` method the "Math" object finds the square root of a number in JavaScript.

Example:

```
let tag1 = Tags('HMI_Tag_SQRT');
let tagValue1 = tag1.Read();              //Read value e.g. 9
tag1.Write(Math.sqrt(tagValue1));         //square root of "9" --> 3
```

4.3.4 Use exponent function

You can also calculate exponential functions in the script with the "Math" object. The `pow()` method is available for this.

Within the brackets you can pass the base and exponent parameters, "*Math.pow(Base, Exponent)*".

Example:

```
let tag1 = Tags('HMI_Tag_Exponent');
let tagValue1 = tag1.Read();        //Read Value1(Exponent) e.g. 3

let tag2 = Tags('HMI_Tag_Base');
let tagValue2 = tag2.Read();        //Read Value2(Base) e.g. 2

tag2.Write(Math.pow(tagValue2, tagValue1));
// Math.pow(x, y) returns the value of x to the power of y:
// e.g. 2³ = 8
```

4.3.5 Generate random number

You can use the `random()` method of the "Math" object to generate random numbers between 0 and 1.

Example:

```
let tag1 = Tags('HMI_Tag_random');
tag1.Write(Math.random());          //write random value to tag12
```

4.3.6 Find minimum/maximum values

You can also determine the minimum and maximum values from a numerical sequence or multiple tags. You can use the `min()` and `max()` method of the "Math" object for this.

Example:

```
let tag1 = Tags('HMI_Tag_min');
let tag2 = Tags('HMI_Tag_max');

tag1.Write(Math.min(3,5,4,86,2));   //write min-value ("2") to tag1
tag2.Write(Math.max(3,5,4,86,2));   //write max-value ("86") to tag2
```

5 Tips and tricks for scripting (WinCC Unified specific)

5.1 Script snippets

To make scripting easier for you, SIMATIC WinCC Unified provides the option of adding frequently required code fragments, so-called snippets.

These code snippets can be used to add preformulated, task-specific code fragments, which usually only have to be modified or supplemented slightly.

Example:

```
let tag1 = Tags('MyTag1');
tag1.Write(1234);              //Write value '1234' to tag 'MyTag1'
```

Snippet types

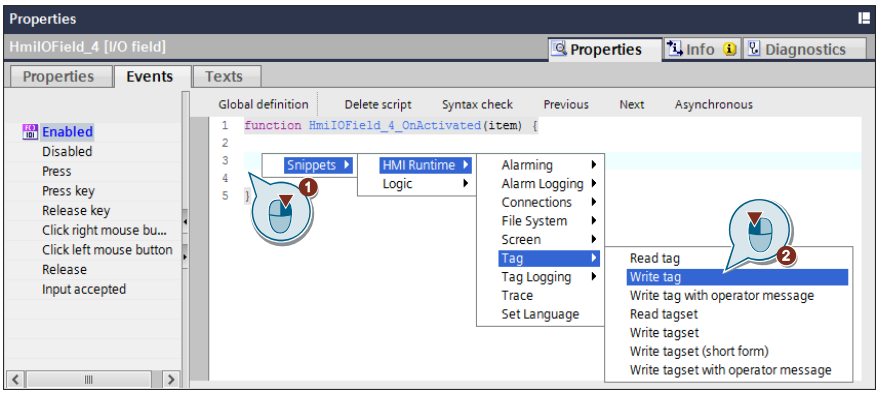
There are type types of snippets in SIMATIC WinCC Unified:

1. "HMI Runtime" - Contains snippets for accessing the object model
2. "Logic" - Contains snippets for branches or loops

Adding snippets

To add a snippet, right-click on the corresponding point in the Script Editor (1) and then select the corresponding snippet from the context menu (2).

Figure 5-1



5.2 Description of the "HMI Runtime" snippets

The following table gives you an overview of the "HMI Runtime" snippets and their meaning.

Table 5-1

Snippet			Description
HMI Runtime	**Alarming**	Alarm subscription	Displays a selection of active alarms
		CreateSystemInformation with monolingual Alarm text	Creates an alarm of the message class "SystemInformation" in the message archive with a monolingual message text.
		CreateSystemInformation with monolingual Alarm text and Parameter value	Creates an alarm of the message class "SystemInformation" in the message archive with the alarm text from the specified text list
		CreateSystemInformation with monolingual Alarm text and embedded Text List	Creates an alarm of the message class "SystemInformation" in the message archive with the alarm text and the message parameter from the specified text lists
	Alarm logging	Read log	Reads message archive
		Export alarm log as CSV	Exports message archive as CSV
	Connections	Set connection mode	Sets the connection mode
	Database access	Select Statement	**Select database entry**
		Create and Insert Statement	Create database entry and output TraceViewer message
	Data set	Screen DataSet	Generates and saves a data record within a screen which can be accessed from anywhere in the screen. If a screen change is made, the data are deleted.
		Session DataSet	Generates and saves a data record within a session (browser tab) for the logged-on user. The user can access the data within the session.
		Dataset with Database Connection	Creates a database connection and saves it in the session (browser tab).
	File System	Read text file	Reads text file.
		Read binary file (using Int32Array)	Reads the contents of a binary file from the file system (as an array in Int 32 format) [1)]
		Read binary file (using DataView)	Reads the contents of a binary file from the file system. (as DataView) [2)]
		Write text file	Writes text to a new file in the file system.
		Write binary file	Adds binary data to the end of a binary file (*.bin) in the file system.
		Append to text file	Adds text to the end of a text file in the file system.
		Append to binary file	Appends value to a binary file (*.bin).
		Create directory	Creates a new folder in the file system.
		Delete directory	Deletes a folder in the file system with all subfolders and data therein.
		Delete file	Deletes a file in the file system.
	Parameter set	Load Parameter Set from storage and write to PLC	Load parameter set from device storage and write to the PLC.

Snippet			Description
		Read Parameter Set from PLC and save to storage	Read parameter set from the PLC and store in the device storage.
	Plant model	Read PlantObject properties	Reads property of a plant object.
		Write PlantObject properties	Writes property of a plant object.
		Get parent of PlantObject	Finds higher-level plant object.
		Get child of PlantObject	Finds lower-level plant object.
		Get all PlantObjects of specific type	Finds all plant objects of a certain type.
	Screen	Change base screen	Changes base screen.
		Change screen in screen window of current screen	Changes the screen in screen window which is in the screen being displayed.
		Change screen item property in current screen	Changes property of a screen object which is in the current screen.
		Open faceplate in popup	Opens faceplate as a popup screen.
	Tag	Read tag	Reads tag.
		Write tag	Writes tag.
		Write tag with operator message	Writes tag with message to each tag to the user.
		Read tagset	Reads tagset.
		Write tagset	Writes tagset.
		Write tagset (short form)	Writes tagset (short form).
		Write tagset with operator message	Writes tagset with message to the user.
		Linear scaling	Scale tag value linearly.
		Inverse linear scaling	Inverted tag scaling.
	Tag logging	Read log	Reads tag log.
		Export tag log as CSV	Exports tag archive as CSV.
		Add Comment to log tag	Adds comment to logged tag.
		Correct logged tag values	Corrects logged tag value.
	Trace		Create TraceViewer messages
	Set language		Set language (ID)

[1] More information about "Int32Array" can be found at:
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Int32Array

[2] You can find additional information on the "DataView" view at:
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/DataView

5.3 Performance-optimized configuration

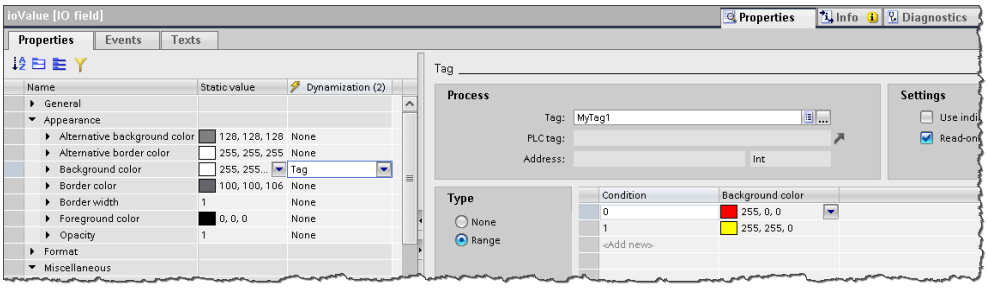
If you want to focus on performance-optimized configuration in your WinCC Unified project, then it is best to observe a few rules.

5.3.1 Prefer system dialogs

Always use the system functions and dialogs provided by TIA Portal before you create a script. The functions that are implemented on the system side are optimized for performance and thus place less of a load on your project's performance.

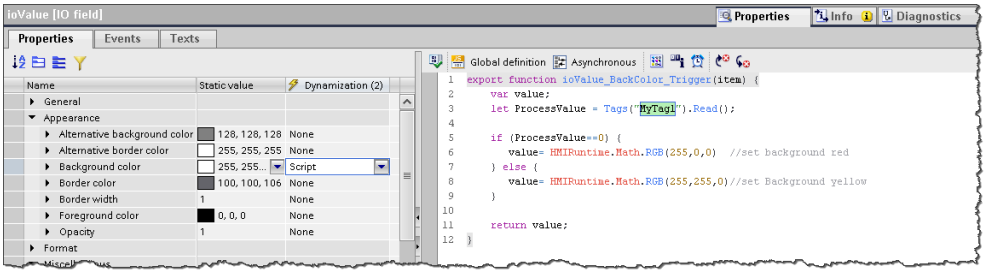
Recommended

Figure 5-2



Not recommended

Figure 5-3



5.3.2 Read multiple tags with TagSet

If you wish to read multiple tag values in a script, it is recommended to employ the "TagSet" object. You can use the code snippet "HMI Runtime > Tag > Read tagset" for this purpose.

Reading multiple tag values with the TagSet object also increases the script performance and thus places less of a load on your project.

Recommended

```
//Read values via TagSet
let ts = Tags.CreateTagSet(["MyTag1", "MyTag2"]);
ts.Read();
```

Not recommended

```
//Read values single
let tag1 = Tags("MyTag1");
let tagValue1 = tag1.Read();

let tag2 = Tags("MyTag2");
let tagValue2 = tag2.Read();
```

5.3.3 Avoid cyclic scripts

As far as possible, avoid scripts with cyclic triggers, as this burdens the performance of the whole project.

If you nevertheless need cyclic scripts and the use case permits it (e.g. when synchronizing data or for data exchange with databases), the configure the scripts in the Task Scheduler. The Task Scheduler runs in a separate process in the background and places less load on your project than if you had configured the scripts in the screen.

5.3.4 Establish database connections once

If you wish to access the same database multiple times in your WinCC Unified runtime, it is recommended to connect to the database once and save within the session.

To do this, use the code snipper "HMI Runtime > Data set > Dataset with Database Connection" (see also chapter 5.2).

In the case of repeat database access, this way you can access the connection faster and you will not need to establish the connection again, which saves resources in your project.

Note

While doing so, make sure that the connection is only available for the logged-on user within a session (browser tab).

If the user changes or the session is ended, the saved database connection is also lost.

5.4 Screens and screen objects

5.4.1 Finding objects in screen windows with object paths

Depending on the application case, it may occur that several screen windows are nested within one another. The `FindItem()` method can be used to reference objects within the screen window and change their properties dynamically.

Absolute and relative object paths

In the `FindItem()` method, the object path of the object to be changed is expressed as an argument. This can be specified both relatively and absolutely.

- **Relative object path**

  The relative object path is indicated based on the screen in which the script is called up. The following table shows the required syntax for relative path specification.

  Table 5-2

Prefixes	Description
".."	References the superordinate screen window (Parent) from the viewpoint of the current screen window
"."	References the own screen window (Self)
""	Without prefix, a screen object of the current screen window is referenced

- **Absolute object path**

  The absolute object path is indicated based on the "RootScreenWindow". The following table shows the required syntax for absolute path specification.

  Table 5-3

Prefixes	Description
"/"	References a screen window on the highest level, followed by its name **Note** The "RootScreenWindow" does not have a name in the SIMATIC WinCC Unified V16, therefore two slashes can follow one another.
"~"	References the screen window on the highest level in the own window screen object hierarchy.

Note The object path consists of the name of screen windows (Screen Windows) and screen objects (Screen Items). Corresponding to the hierarchical arrangement, the names are joined via a slash ("/"). Screens (Screens) and their names are not used in the formulation.

Supported objects

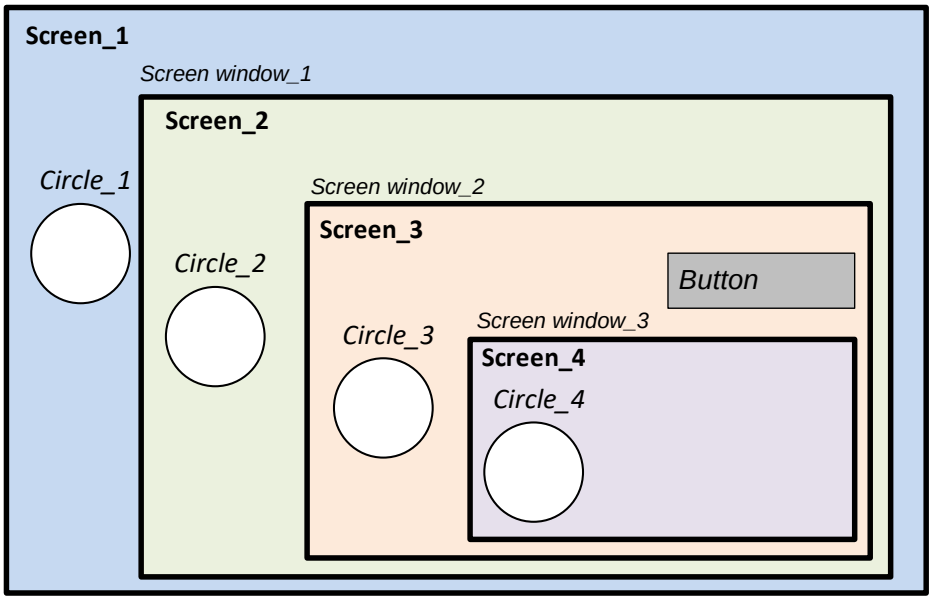
The method is supported by the following objects:

- "UI" (user interface of the graphic runtime system)
- "Screen" (screen in runtime)

Note Only "Window" objects (screen windows) have the property "Path", which returns the absolute path to the "Window" in the total runtime.

Example

In the example, the color of the circle (Circle_1 - Circle_4) over the button "Button" should be changed to yellow. Several screen windows ("Screen windows") are used here, these thus representing a window screen object hierarchy.



"FindItem()" with relative object paths

In this example, the color must be changed with the `FindItem()` method and specification of relative object paths.

```
//Change Background Color of 'Circle_3'
Screen.FindItem('Circle_3').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_2'
Screen.FindItem('../Circle_2').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_1'
Screen.FindItem('../../Circle_1').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_4'
Screen.FindItem('./Screen window_3/Circle_4').BackColor =
0xFFFFFF00;
```

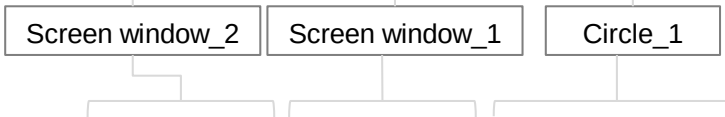
As an alternative to the `FindItem()` method, you can use the "ParentScreen" property to navigate to screens that are located in the screen hierarchy over the screen with the script execution.

```
//Change Background Color of 'Circle_2'
Screen.ParentScreen.Items('Circle_2').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_1'
Screen.ParentScreen.ParentScreen.Items('Circle_1').BackColor =
0xFFFFFF00;
```

Screens that are located under the screen with the script execution in the window screen object hierarchy cannot be referenced via "ParentScreen".

The relative object path is therefore composed as follows based on the button:

```
Screen.FindItem('../../Circle_1').BackColor = 0xFFFFFF00;
```




```
Screen.ParentScreen.ParentScreen.Items('Circle_1').BackColor =
0xFFFFFF00;
```

Further examples for indicating relative object paths:

Table 5-4

Object path	Description
`'ItemX'`	Object ItemX in same screen
`'./ItemX'`	Object ItemX in same screen
`'./ScreenWindow1/ItemY'`	Object ItemY from the child screen window "ScreenWindow1"
`'../ScreenWindow1/ItemY'`	Object ItemY from the neighboring screen window "ScreenWindow1"
`'../ItemZ'`	Object ItemZ from the superordinate screen window **Note** Only functions if the script is called up from a screen window.

"FindItem()" with absolute object paths

The description below also changes the color of the circles, but the `FindItem()` method is used with absolute object paths.

```
//Change Background Color of 'Circle_3'
UI.FindItem('Circle_3').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_2'
UI.FindItem('~/Screen window_1/Circle_2').BackColor = 0xFFFFFF00;

//Change Background Color of 'Circle_1'
UI.FindItem('~/Screen window_1/Screen window_2/Circle_1'). BackColor
= 0xFFFFFF00;

//Change Background Color of 'Circle_4'
UI.FindItem('~/Screen window_1/Screen window_2/Screen window_3/
Circle_4').BackColor = 0xFFFFFF00;
```

The absolute object path is therefore composed as follows based on the button "Button":

```
UI.FindItem('~/Screen window_1/Screen window_2/Circle_3').BackColor=
0xFFFFFF00;
```

RootScreenWindow | Screen window_1 | Screen window_2 | Circle_3

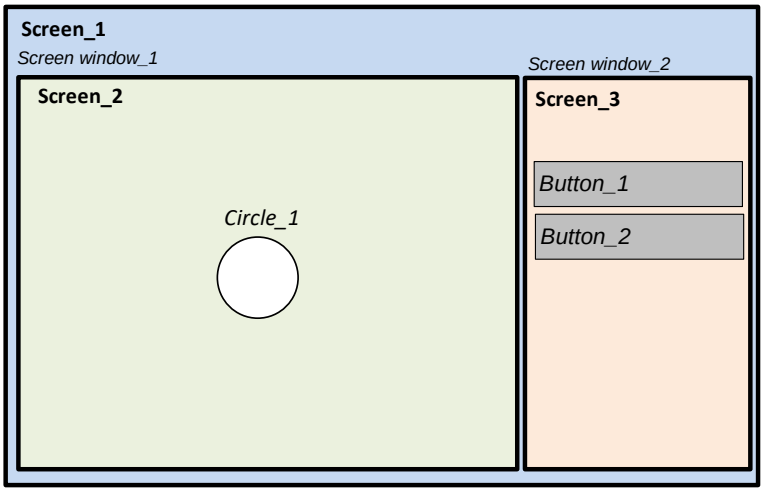
Further examples for specifying absolute object paths:

Table 5-5

Syntax	Description
`'~/ItemX'`	ItemX of the highest screen currently visible ("Screen")
`'//ItemX'`	ItemX of the highest screen currently visible ("Screen")

5.4.2 Screen change across multiple screen windows

Oftentimes screen layouts are used which resemble the figure below.



In this case, two screen windows are placed side-by-side in the screen "Screen_1". The screen window "Screen window_2" in turn contains two buttons with the following functions:

- Button "Button_1" should show the screen "Screen_2" in the screen window "Screen window_1".
- Button "Button_2" should change the color of the circle "Circle_1" to yellow in the displayed screen "Screen_2".

Solution with "FindItem()" and relative object paths

Below you will find the JavaScript code for the specified example along with the `FindItem()` method and relative object paths.

```
//Press "Button_1" to change Screen of 'Screen window_1'
Screen.FindItem('../Screen window_1').Screen = 'Screen_2';

// Press "Button_2" to change background color of 'Circle_1' in
'Screen window_1'
Screen.FindItem('../ Screen window_1/Circle_1').BackColor =
0xFFFFFF00;
```

Solution with "FindItem()" and absolute object paths

The following JavaScript code also shows you the solution with the `FindItem()` method, but this time by specifying the absolute object paths.

```
//Press "Button_1" to change Screen of 'Screen window_1'
UI.FindItem('~/Screen window_1').Screen = 'Screen_2';

// Press "Button_2" to change background color of 'Circle_1' in
'Screen window_1'
UI.FindItem('~/ Screen window_1/Circle_1').BackColor = 0xFFFFFF00;
```

5.4.3 Displaying screens as pop-ups

In WinCC Unified, pop-up screens are created in the same manner as normal process screens and called up on the screen as "PopupScreenWindow".

This chapter will show you how to open and close screens using the script system functions "OpenScreenInPopup" and "ClosePopup". Please refer to chapter 5.5 on how to open faceplates as pop-ups.

Note

For further information, refer to the "System manual - SIMATIC WinCC WinCC Engineering V16 - Runtime Unified" at:

"OpenScreenInPopup" system functions
https://support.industry.siemens.com/cs/ww/en/view/109773780/129018860555

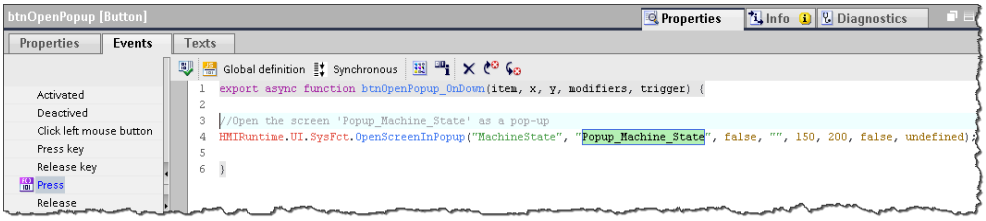
"ClosePopup" system functions:
https://support.industry.siemens.com/cs/ww/en/view/109773780/129018870155

Open screen as pop-up with a script

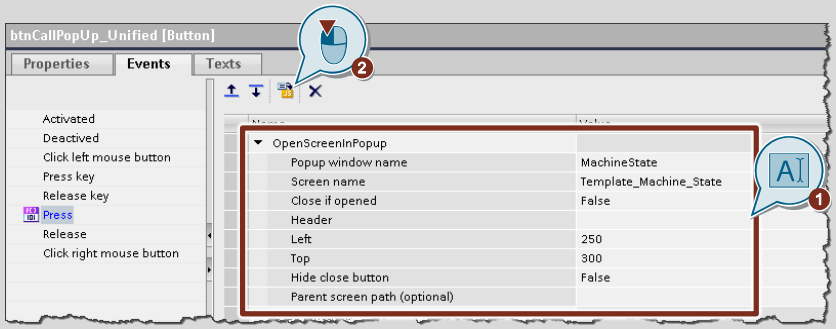
In order to open the process screen "Popup_Machine_State" as a pop-up via a script, enter the following JavaScript code:

```
//Open the screen 'Popup_Machine_State' as a pop-up
HMIRuntime.UI.SysFct.OpenScreenInPopup("MachineState",
"Popup_Machine_State", false, "", 150, 200, false, undefined);
```

Figure 5-4



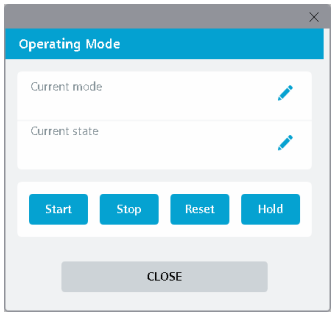
Note Optionally, you can also use the system function "OpenScreenInPopup" and then convert it to JavaScript.



Showing pop-up screen in runtime

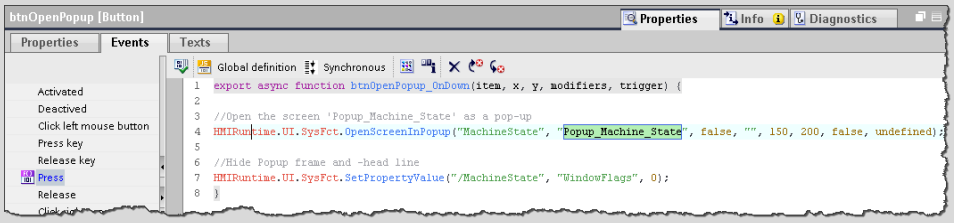
The screen appears as a pop-up in the runtime. By default, each "PopupScreenWindow" has a gray border and a header.

Figure 5-5, pop-up in the runtime



Note If you want to show the "PopupScreenWindow" without a frame or header, you must set the properties of "Window settings" to "0" using the system function "SetPropertyValue".

```
HMIRuntime.UI.SysFct.SetPropertyValue("/MachineState", "WindowFlags", 0);
```



The parameter for "Popup window path" is composed of the "/" (reference to the user's window) and the name of the pop-up window that you specify when opening the pop-up with "OpenScreenInPopup" (see also chapter 5.4.1).

Note For further information on "Popup window path" and the "SetPropertyValue" system function, refer to the "System manual - SIMATIC WinCC WinCC Engineering V16 - Runtime Unified" at:

"SetPropertyValue" system functions:
https://support.industry.siemens.com/cs/ww/en/view/109773780/122556599563

"PopupScreenWindow" object:
https://support.industry.siemens.com/cs/ww/en/view/109773780/118460062347

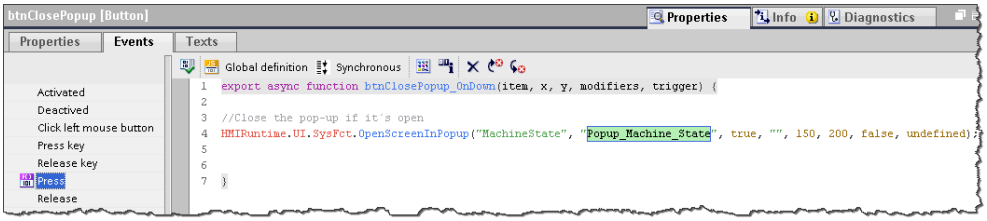
Close pop-up externally

In order to close the pop-up via script (i.e. via a button that is not part of the pop-up), you can use the system function "OpenScreenInPopup".

However, you must set the function's "toggleOpen" parameter to "True".

```
//Close the popup if it´s open
HMIRuntime.UI.SysFct.OpenScreenInPopup("MachineState",
"Popup_Machine_State", true, "", 150, 200, false, undefined);
```

Figure 5-6



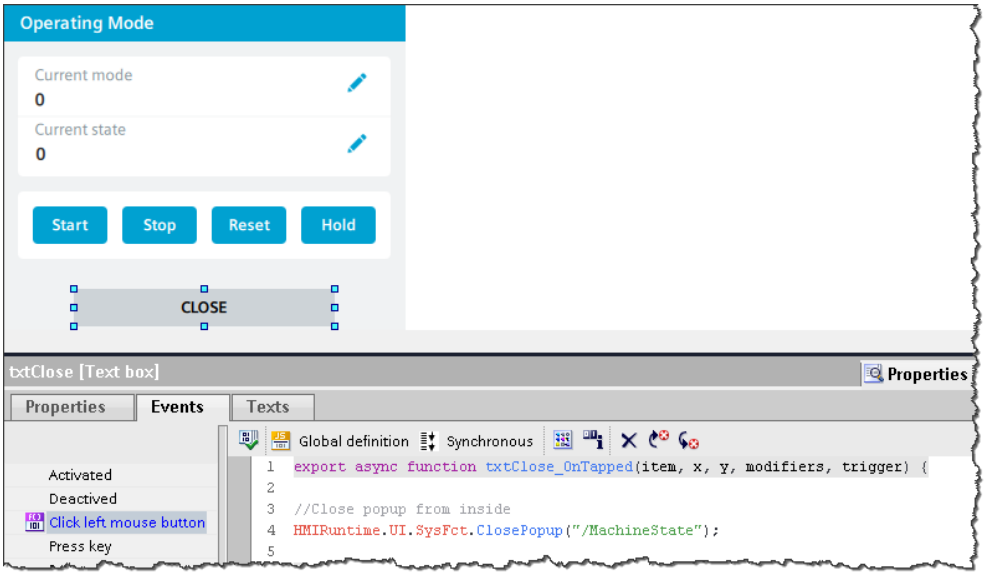
Close pop-up internally

If the pop-up is open and you want to close it via a configured button (in the figure, the "CLOSE" button), you can implement this with the system function "ClosePopup".

For the parameter, specify the path of the pop-up window.

```
//Close popup from inside
HMIRuntime.UI.SysFct.ClosePopup("/MachineState");
```

Figure 5-7



5.4.4 Determining the screen name

Determining the screen name

To determine the name of a screen, you can output this with the following code line as a message in TraceViewer.

```
HMIRuntime.Trace(Screen.Name);
```

Consecutively numbered screen names

If you name the screens correspondingly, e.g. Screen_01, Screen_02, you can extract the number from the screen name using the `split()` method.

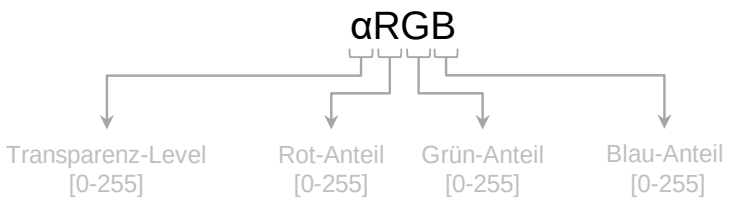
```
// screen name = "Screen_01"
HMIRuntime.Trace(Screen.Name.split('_')[1]);
```

For a screen name "Screen_01" in TraceViewer, "01" is output as a message.

5.4.5 Change colors

SIMATIC WinCC Unified lets you change colors (e.g. background color, text color, frame color) of objects via JavaScript.

The color that you assigned to the object is made up as follows:



Both the transparency value as well as the RGB value are indicated as a separate value in hexadecimal form in the script.

```
//αRGB – α opacity[0-255] Red[0-255] Green[0-255] Blue[0-255];
Screen.Items('Rectangle1').BackColor = 0xFF00FF00;
```

Note If you want to specify the RGB value instead of the hexadecimal value, you can realize this with the "RGB" method of the WinCC Unified "Math" object.

```
HMIRuntime.Math.RGB(0,255,0);
```

Note If you specify less than eight digits instead of the color code, the missing digits are treated as "0" and added at the beginning.

For ex.: 0xFF00FF → 0x**00**FF00FF

The can lead to the color being displayed as transparent, as the transparency level is "00".

5.4.6 Counting screen objects and finding screen object names

In this chapter you will find code examples for how to count screen objects and output their names.

Counting screen objects

The following example will output the number of screen objects in the TraceViewer which are configured in the current screen.

Note If a screen object has been switched to invisible, it will still be counted as a configured screen object.

Example

```
// amount of all screen items on the screen:
const items = Screen.Items;
HMIRuntime.Trace(items.Count);
```

Outputting names of the screen objects

The example below outputs each screen object name in a separate trace message in the TraceViewer.

Example

```
// names of all screen items on the screen:
for(let i in Screen.Items) {
  HMIRuntime.Trace(Screen.Items(Number(i)).Name);
}
```

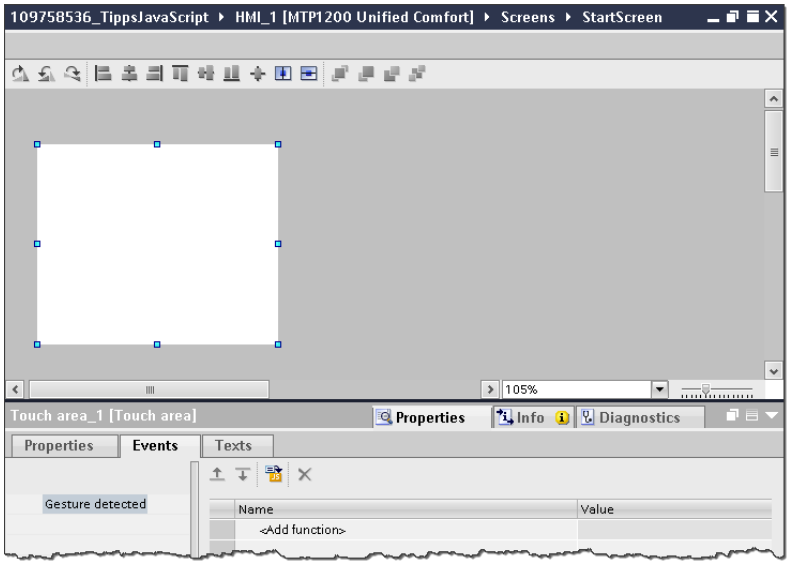

5.4.7 Read out touch area direction

The screen object "Touch area" recognizes so-called swipe gestures in the runtime. Therefore, if you swipe over the configured area in the runtime, it will be detected and you can execute an action.

Direction-independent action (default setting)

By default, the screen object has the event "Gesture detected". In this setting, any arbitrary direction is detected and the configured action will be carried out.

Figure 5-8

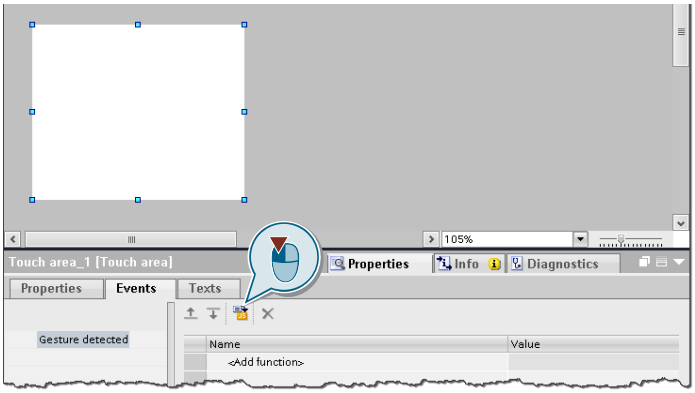


Direction-dependent action

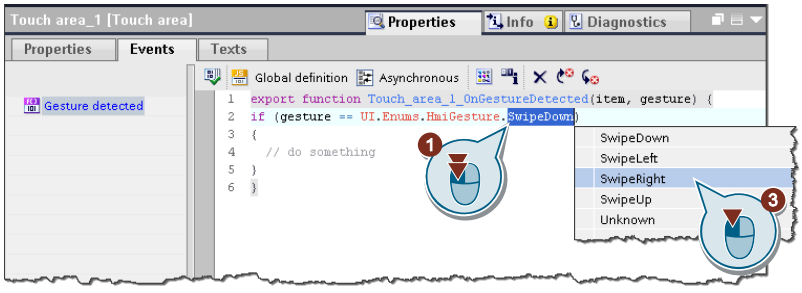
However, if you want different actions to be run depending on the direction of the swipe, you can implement this using JavaScript.

1. Click on the button to go to the "Script editor".

   Figure 5-9



2. Select direction
   - Double-click in the If instruction to select the "SwipeDown" area (1).
   - Then press the key combination "CTRL + Space" (2).
   - Then select the direction from the dropdown menu that will be recognized as a swipe gesture to run the action (3).



Note As an alternative, you can also select the direction of the gesture via the object model.

e.g. `UI.Enums.HmiGesture.SwipRight;`

Note For each touch area, you can add more If instructions and thereby define actions for all the other directions.

5.5 Interconnect faceplate via script

Faceplates can be configured centrally in TIA Portal; you can later re-use them with various process tags.

Overview

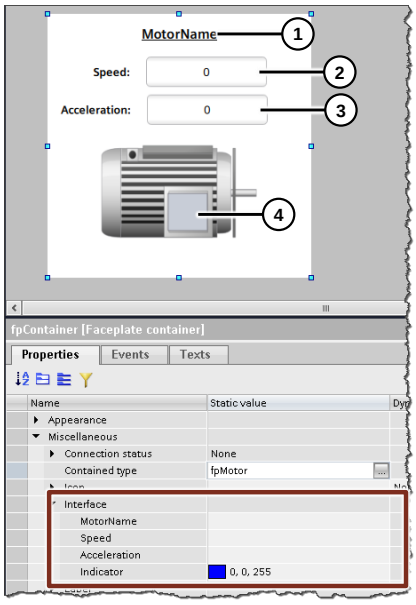
This chapter describes how you can:

- open a faceplate as a pop-up and interconnect via script → see chapter 5.5.1
- configure a faceplate in the screen and modify the interconnection in the runtime → see chapter 5.5.2
- open a faceplate from a faceplate → see chapter 5.5.3

Example

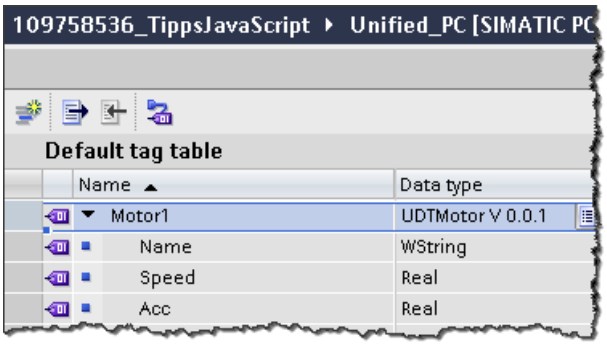
For a better understanding, the interconnection will be explained below using the example of the "fpMotor" faceplate. This contains:

- three tag interfaces ("MotorName" (1), "Speed" (2) and "Acceleration" (3)) and
- a properties interface ("Indicator" (4)).



This faceplate should be launched as a pop-up and interconnected with the UDT "UDTMotor".

Figure 5-10, "UDTMotor"

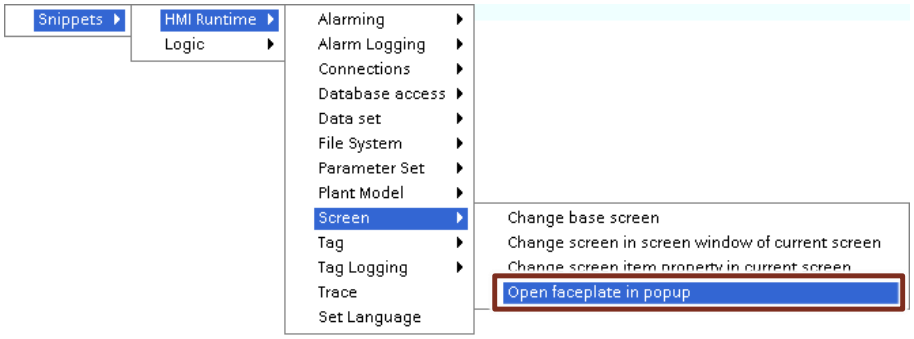


5.5.1 Open faceplate as a pop-up

In this example, the intention is to open the faceplate "fpMotor" as a pop-up via a button and; the interface must be interconnected accordingly.

Code snippet

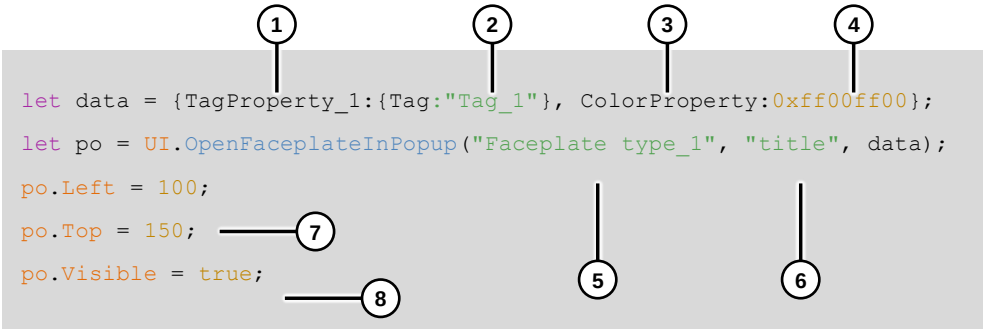
The snippet "Open faceplate in popup" will help you open the faceplates.




```
let data = {TagProperty_1:{Tag:"Tag_1"}, ColorProperty:0xff00ff00};
let po = UI.OpenFaceplateInPopup("Faceplate type_1", "title", data);
po.Left = 100;
po.Top = 150;
po.Visible = true;
```

The interface of the faceplate is composed of the following parts:

1. the interface tag name of the faceplate
2. the tag name of the HMI tag to be passed
3. the name of the interface property
4. the value, which is passed, of the property
5. the faceplate name
6. the title of the pop-up window
7. the position of the pop-up window
8. the visibility of the pop-up window



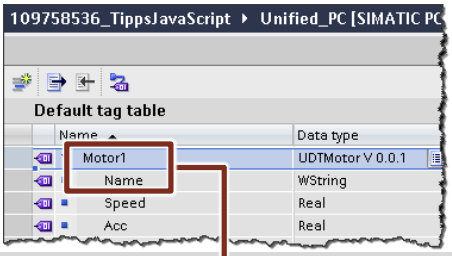
Note

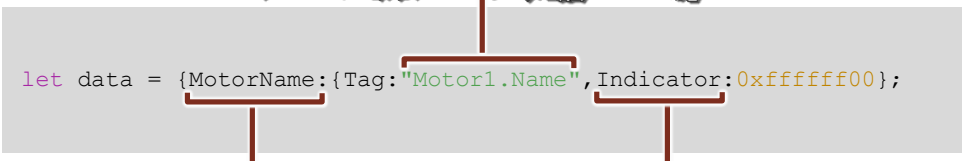
You can find further information about the interface parameters and the optional parameters "parentScreen" and "Visibility" in the manual under the method "OpenFaceplateInPopup":

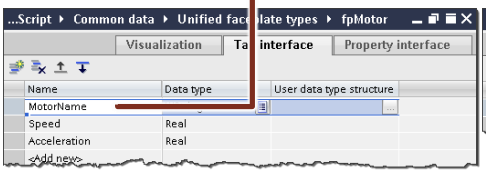
https://support.industry.siemens.com/cs/ww/en/view/109773780/125791208843

The following interconnection is the result from the "fpMotor" example and the "UDTMotor" to be interconnected:

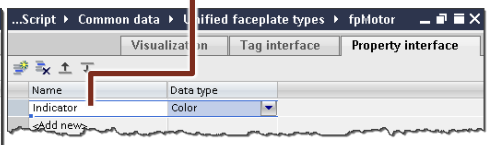
HMI tag table







Tag interface, faceplate "fpMotor"



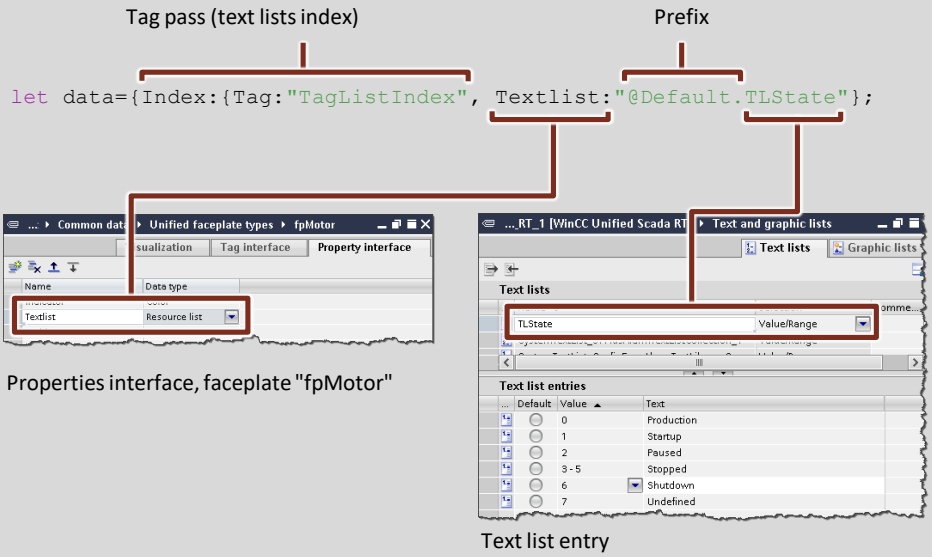
Properties interface, faceplate "fpMotor"

Note

If you pass a text list via the tag interface, you will also need another tag pass in order to pass the value (index) of the text list.

The pass parameters for a text/graphic list are themselves composed of the following two pieces of information:

- Name of the properties interface (here, "Textlist")
- Prefix ("@Default.") + name of the text list (here: "TLState")



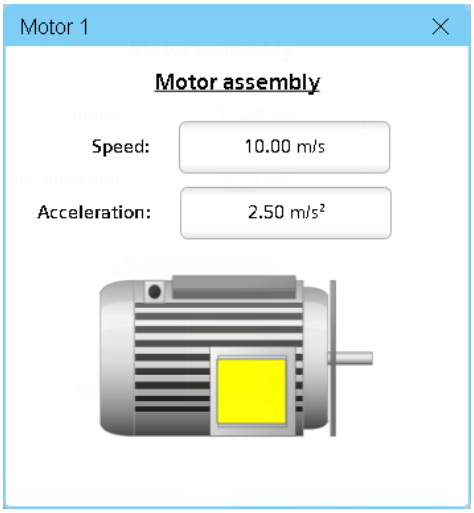
Result

The following overview shows the fully configured code snippet.

```
let data={MotorName:{Tag:"Motor1.Name"},Speed:{Tag:"Motor1.Speed"},
Acceleration:{Tag:"Motor1.Acc"},Indicator:0xffffff00};
let po = UI.OpenFaceplateInPopup("fpMotor", "Motor 1", data);
po.Left = 100;
po.Top = 150;
po.Visible = true;
```

Once the button has been pressed in the runtime, the faceplate will appear as a pop-up along with the data that was passed.

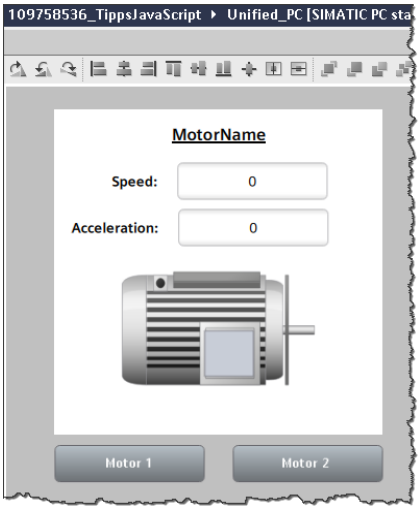
Figure 5-11



5.5.2 Modifying faceplate interconnection in the screen

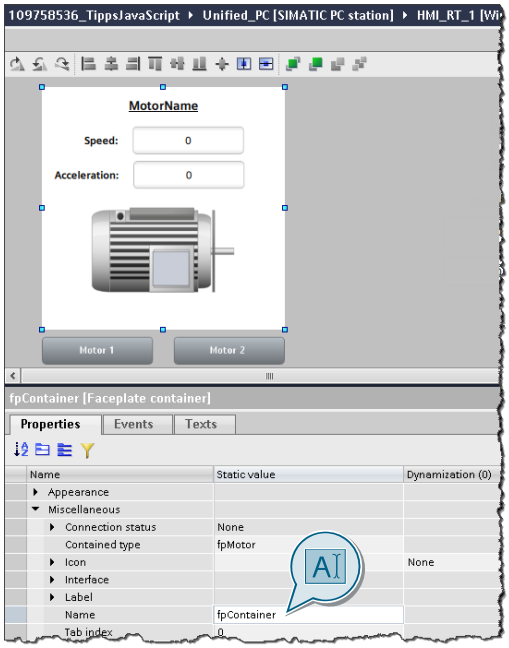
In the second use case, the intent is to configure the faceplate "fpMotor" in the screen. Using two buttons, the interface in the runtime must be switched from UDT Motor 1 to UDT Motor 2.

Figure 5-12



Configuration

1. To do this, first place the faceplate "fpMotor" in the screen by dragging and dropping.
2. Name the automatically generated faceplate container as "fpContainer".



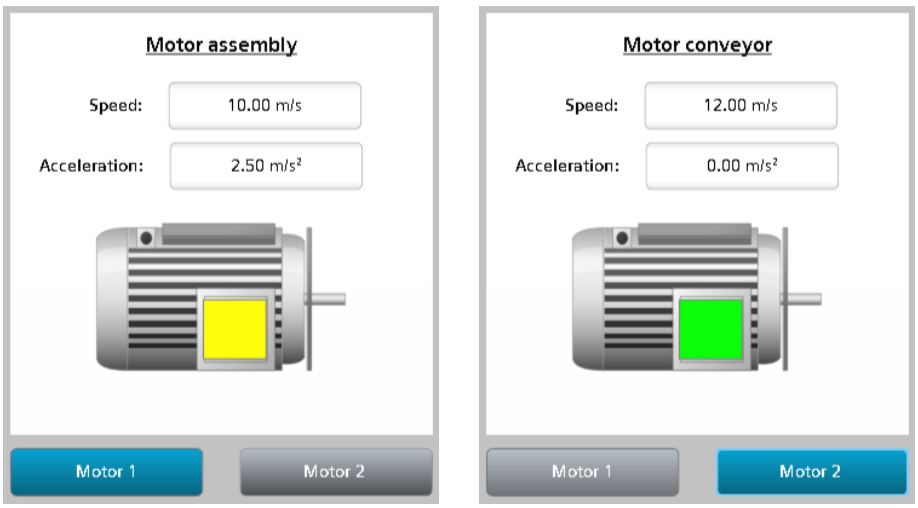
3. Add the button for Motor 1 with the following script.

```
Screen.Items("fpContainer").Properties.MotorName.Tag = "Motor1.Name";
Screen.Items("fpContainer").Properties.Speed.Tag = "Motor1.Speed";
Screen.Items("fpContainer").Properties.Acceleration.Tag = "Motor1.Acc";
Screen.Items("fpContainer").Properties.Indicator = 0xff00ff08;
```

4. Then repeat Step 3 and replace "Motor1" with "Motor2".

Result in the runtime

Figure 5-13



5.5.3 Opening a faceplate from a faceplate

In WinCC Unified you also have the ability to open a second faceplate from an already opened faceplate.

Code snippet

To achieve this, you also have the option within a faceplate of opening a second faceplate by using the snippet "Open faceplate in popup".

Figure 5-14


```
let po = Faceplate.OpenFaceplateInPopup("Faceplate type_1", "title",
true, false);
po.Left = 100;
po.Top = 150;
po.Visible = true;
```

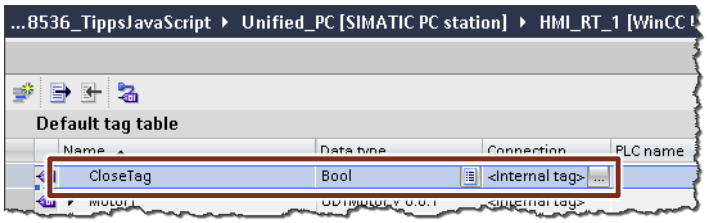
Note If you launch or open a second faceplate (e.g. "Faceplate_2") from the current faceplate (e.g. "Faceplate_1"), the linked interface tags will be passed automatically to the faceplate that is being opened ("Faceplate_2"). No additional configuration steps are necessary.

5.5.4 Closing a faceplate

This chapter will show you how you can close a faceplate by pressing a button in the faceplate.

Add HMI tag

In the first step, add an HMI tag "CloseTag" of data type "Bool".

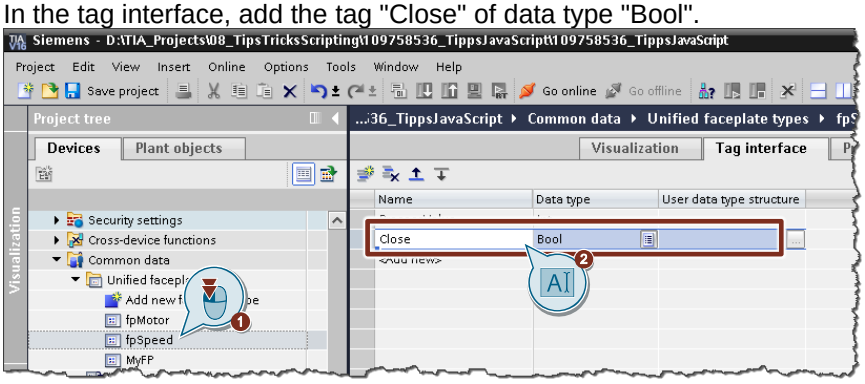


Note If you have multiple faceplates that you wish to close in this way, you can also create an "Array of Bool" with the number of faceplates that you want to close.

Modify faceplate

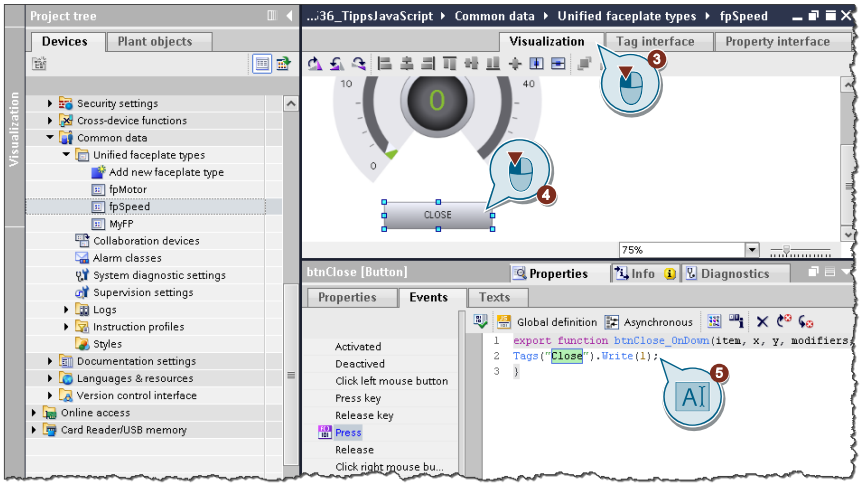
1. Open the faceplate that you wish to close with a configured button, in this example, "fpSpeed".

2. In the tag interface, add the tag "Close" of data type "Bool".



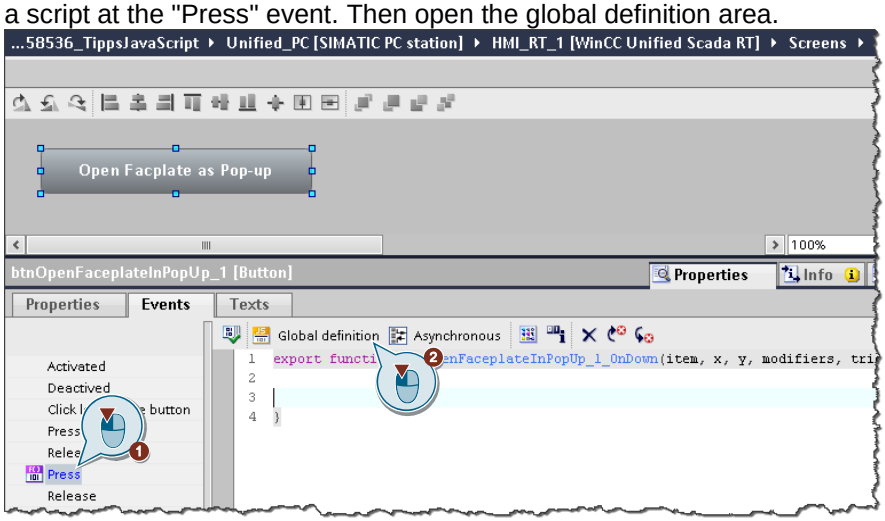
3. Then switch to the visualization of the faceplate.
4. Configure a button.
5. Use the following code at the "Press" event.

```
Tags("Close").Write(1);
```



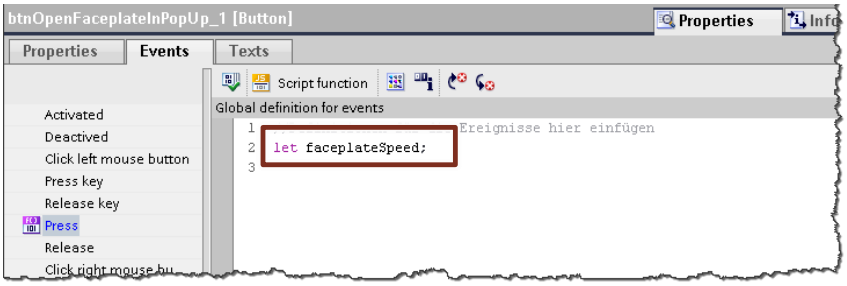
Modify faceplate call at the button

1. Select the button which will be used to open the faceplate "fpSpeed", and add a script at the "Press" event. Then open the global definition area.

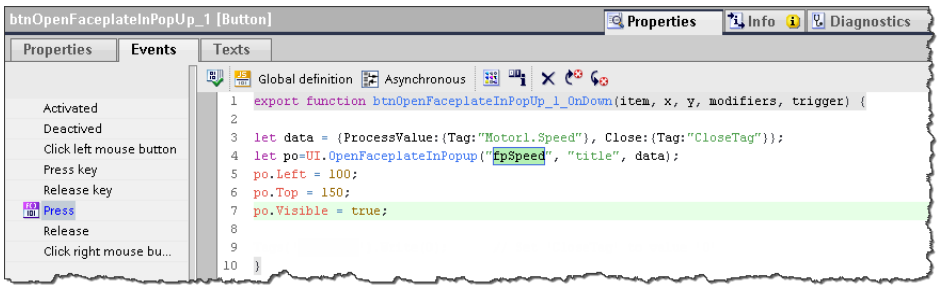


2. Add the following code to the definition area and then switch back to the script function.

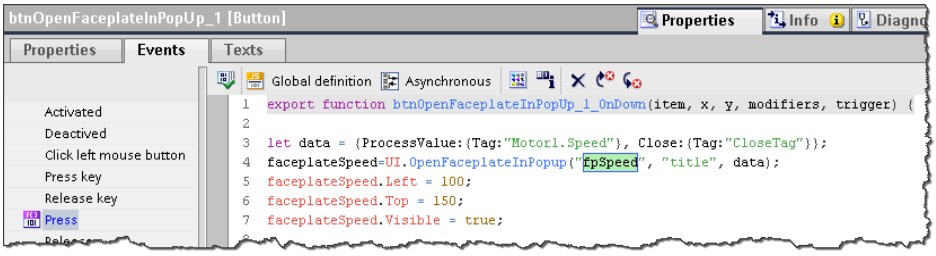
```
let faceplateSpeed;
```



3. Add the snippet "Open faceplate in popup" and link the two interfaces (see also chapter 5.5.1), as follows:
   - "ProcessValue" with "Motor1.Speed"
   - "Close" with "CloseTag"

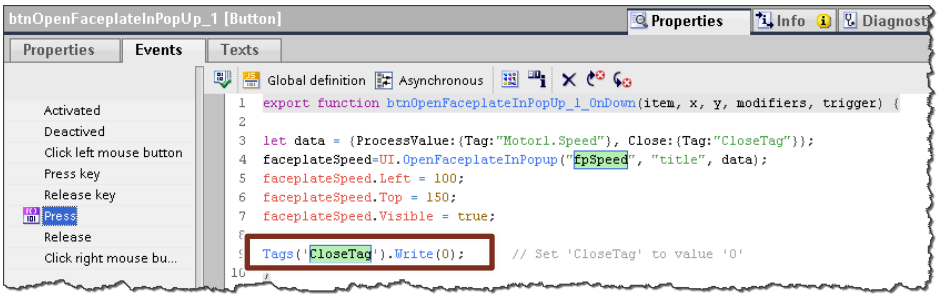


4. Then replace "po" with "faceplateSpeed" (from the global definition area) and remove the "let" in line 4.



5. Finally, add the following code in order to reset the "CloseTag".

```
Tags("CloseTag").Write(0);
```

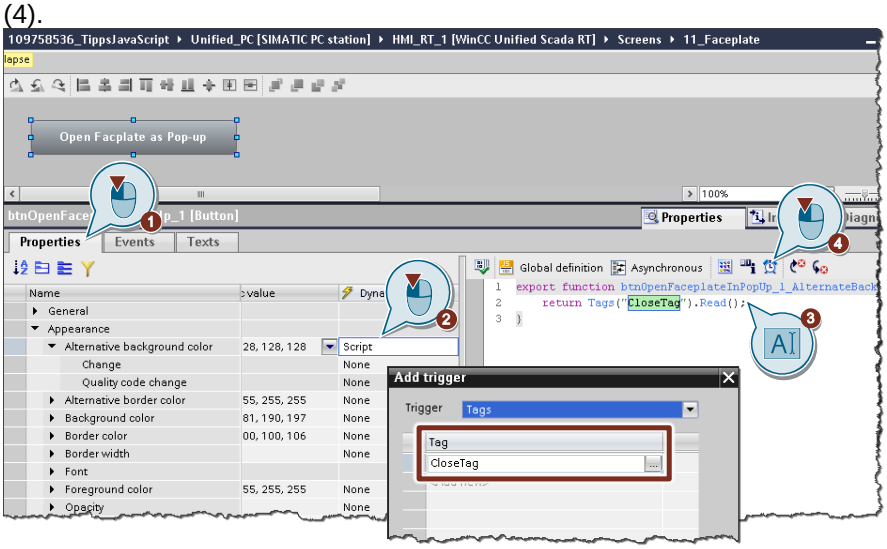


Close faceplate when tag value "CloseTag" is set

1. query "CloseTag"
   - Switch to the "Properties" of the button (1).
   - As dynamization, select "Script" for the property "Alternative background color" (2).
   - Enter the following code (3).

```
return Tags("CloseTag").Read();
```

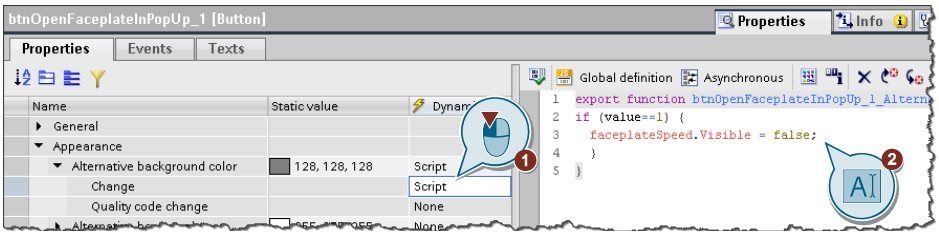
   - For the trigger for the script, select "Tags" and select the tag "CloseTags" (4).



Note In the place of the property "Alternative background color" you can also dynamize a different unused property.

2. Close faceplate
   - In the next step, for the property "Alternative background color", add "Script" as dynamization for "Change" (1).
   - Paste in the following code.

```
if (value==1)  {
  faceplateSpeed.Visible = false;
  }
```



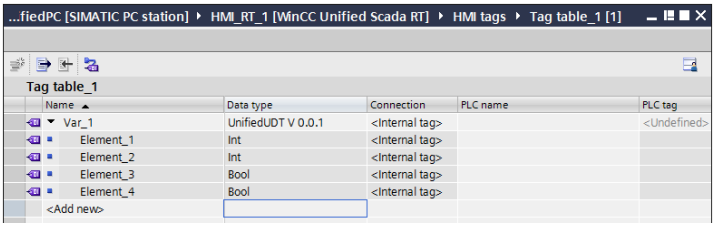
3. Save the changes and start the runtime.

5.6 Tags and UDTs

5.6.1 Access to HMI UDT elements

SIMATIC WinCC Unified lets you use HMI UDTs in tag tables. You can also access the individual elements of the UDT via JavaScript with the keyword "Tags".

Figure 5-15



To be able to access the individual elements of the HMI_UDTs, the indication in JavaScript is made with a prefix (name of the UDT and separation point, e.g. "Let_1.") and suffix (name of the element, e.g. "Element_1").

Example:

```
// read value of "Element_1" in UDT "Let_1"
let tag1 = Tags('Let_1.Element_1').Read()
```

Note This applies to the instances of the library type HMI-UDT that were created in the project. The library type cannot be accessed directly.

5.6.2 Loop breakers

You can add scripts to internal tags which will be executed when a value changes. Infinite loops can easily occur in the process, as shown by the example in the following table.

Example:

Table 5-6

Tag	Data type	Goal of the exercise Script function after value changes
"Tag_1"	Internal tag	Increment tag "Tag_2" by 2
"Tag_2"	Internal tag	Increment tag "Tag_1" by 2

If there are loops, SIMATIC WinCC Unified will detect and interrupt them.

5.6.3 Using client-internal tags via data set

In WinCC Unified V16, you are not yet able to declare tags as "Client internal tags". This means that if you modify the tag value at a client, it will also be modified on the server.

As an alternative solution, you can use the "DataSet" object (for more on this, see the description of the DataSet snippet in chapter 5.2). There are two different types here:

- "DataSet" local to the session (browser tab)
- "DataSet" local to the screen

You can find the complete code for both variants at the end of this chapter.

Restriction

The following constraints apply when using DataSets:

- Only simple types (Numbers, Strings, Bools) can be saved. JavaScript objects or classes cannot be saved.
- Triggers on changes are not possible.

Code for session-local "DataSet"

```
/* Use the session local Dataset to store any kind of data (numbers,
strings, Booleans, structs …) within a session of a browsertab
(dataset is kept after changing basescreen, but deleted after
logout/login).*/

const ui = HMIRuntime.UI;
ui.DataSet.Add('UI_Tag_1',123);
ui.DataSet.Add('UI_Tag_2',1234);

for(let Index in ui.DataSet)
 {
  HMIRuntime.Trace("Key = " + ui.DataSet[Index].Name + " Value =" +
  ui.DataSet[Index].Value);
 }

for(let Data of ui.DataSet)
 {
  HMIRuntime.Trace("Key = " +Data.Name + " Value =" + Data.Value);
 }

if(ui.DataSet.Exists('UI_Tag_2'))
 {
  ui.DataSet.Remove('UI_Tag_2');
  HMIRuntime.Trace('UI_Tag_2 Removed');
 }

ui.DataSet.Clear();
```

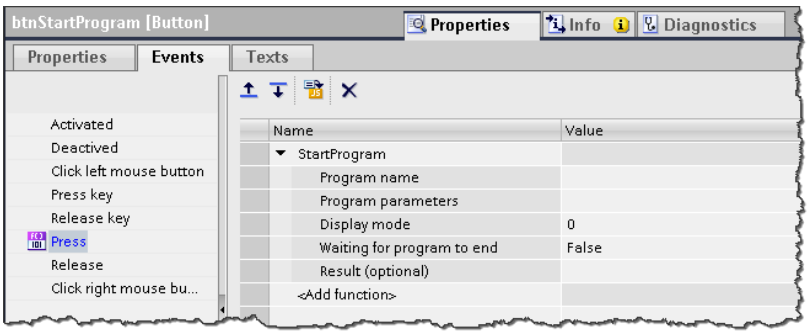
Code for screen-local "DataSet"

```
/*Use the screen local Dataset to store any kind of data (numbers,
strings, booleans, structs …) within a screen session (dataset is
deleted after changing basescreen).*/
const screen = Screen;
screen.DataSet.Add('Screen_Tag_1',123);
screen.DataSet.Add('Screen_Tag_2',1234);

for(let Index in screen.DataSet)
 {
  HMIRuntime.Trace("Key = " + screen.DataSet[Index].Name + " Value
  =" + screen.DataSet[Index].Value);
 }

for(let Data of screen.DataSet)
 {
  HMIRuntime.Trace("Key = " + Data.Name + " Value =" + Data.Value);
 }

if(screen.DataSet.Exists('Screen_Tag_2'))
 {
  screen.DataSet.Remove('Screen_Tag_2');
  HMIRuntime.Trace('Screen_Tag_2 Removed');
 }

screen.DataSet.Clear();
```

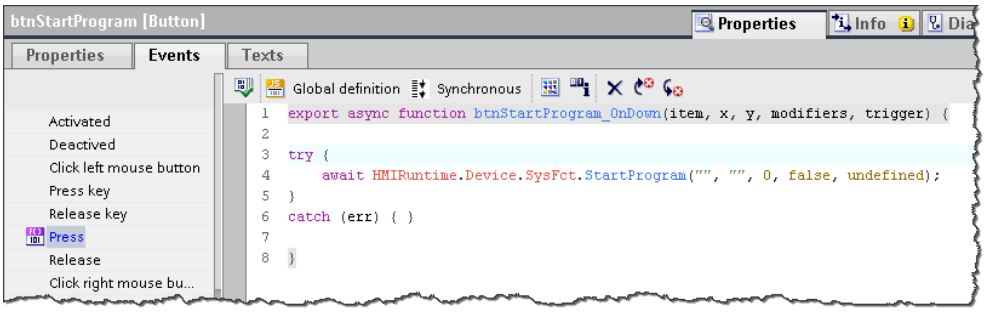
5.7 Starting programs from the runtime

You can start programs from the runtime by using the function "StartProgram". You can employ both of the following methods to do this:

- "StartProgram" via the system function



- "StartProgram" via script



Note General information on the "StartProgram" function can be found in the system manual "SIMATIC WinCC Engineering V16 - Runtime Unified" in the chapter entitled "StartProgram".

https://support.industry.siemens.com/cs/ww/en/view/109773780/123798098187

The functional scope of "StartProgram" differs, however, between the PC runtime and the runtime on the Unified Comfort Panel.

5.7.1 StartProgram in the Unified PC runtime

If you execute the "StartProgram" function in the WinCC Unified PC Runtime, then the system function itself can only be used to start programs that have no user interface.

If you want to start programs with user interfaces, you can only do so with the runtime Open Development Kit (ODK) or Open Pipe.

Note Additional information about the runtime ODK can be found in the "Documentation" folder in the WinCC Unified installation folder:

C:\Program Files\Siemens\Automation\WinCCUnified\Documentation

5.7.2 StartProgram in the Unified Comfort Panel

You can start programs that have user interfaces on the Unified Comfort Panel using the "StartProgram" function. In this manner, you can typically launch the pre-installed programs (such as Doc Viewer, PDF Viewer).

Program name

The following table shows you what you have to enter at the "Program name" parameter for which program.

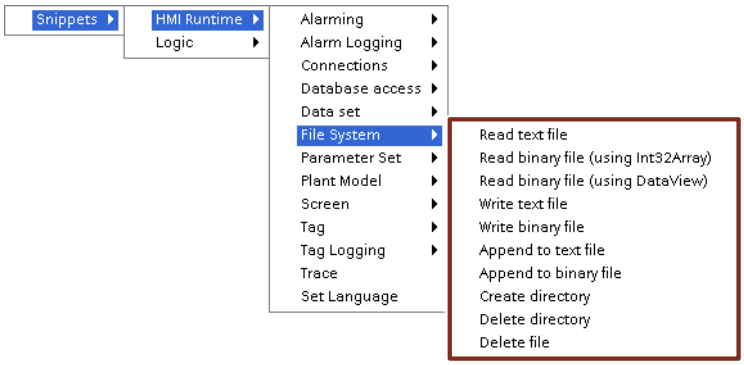
Table 5-7

Program to be launched	Input string for the parameter "Program name"
Doc Viewer	/opt/siemens/App_Restriction/runLibreoffice.sh
Email client	/opt/siemens/App_Restriction/runEvolution.sh
File Browser	/opt/siemens/App_Restriction/runThunar.sh
Media Player	/opt/siemens/App_Restriction/runVLC.sh
PDF Viewer	/opt/siemens/App_Restriction/runOkular.sh
Web Browser	/opt/siemens/App_Restriction/runChromium.sh

5.8 File handling

You can also access your computer's file system with WinCC Unified. There are snippets in "HMI Runtime > File system" which can help you do this.

Figure 5-16



Note All scripts are executed on the server in SIMATIC WinCC Unified.
When working with the file system (Snippet "File System"), you can only access files on the server and not on the file system of the client on which the script was triggered.

5.8.1 Create folder

Using the snippet "HMIRuntime > File System > Create Directory", you can create a folder including subfolder in an already existing folder.

Creating folders on Unified PC

Based on the example of the snippet, the folder "mydatadir" is created in the folder "C:\Users\Public" along with the subfolder "mysubdir". Once the folder has been created, a trace message will be output.

```
HMIRuntime.FileSystem.CreateDirectory("C:\\Users\\Public\\mydatadir\
\mysubdir").then(
  function() {
    HMIRuntime.Trace("Directory successfully created");
});
```

Note When specifying the directory, pay attention to the double backslash ("\\") between the individual folders.

If you want to create a folder under "C:\\...", this may be rejected due to missing access permissions.

Creating folder on Unified Comfort Panel

If you want to create a folder on your Unified Comfort Panel, you must change the specified path to suit the Linux operating system.

```
HMIRuntime.FileSystem.CreateDirectory("/home/industrial/mydatadir/
mysubdir").then(
  function() {
```

```
    HMIRuntime.Trace("Directory successfully created");
});
```

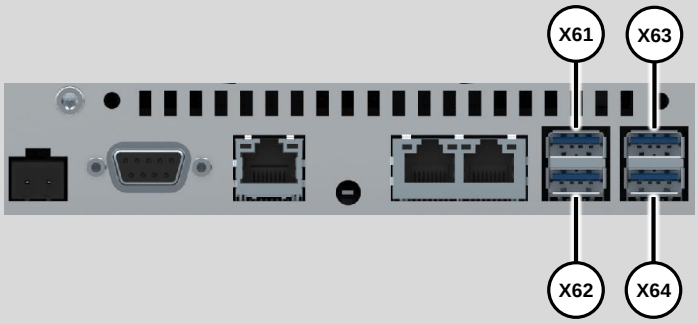
Note In your Unified Comfort Panel, you only have permission to create folders and files in the directory "/home/industrial/".

However, you can also directly access external storage devices (USB drive or SD card) and create a folder there.

To do so, you must specify the path as follows:

```
SD card: "media/simatic/X51/…"
USB:      "media/simatic/X61/…"
```

Note The specified path for USB drives depends on which USB port the USB drive is connected to. The overview below explains the difference between the ports.



5.8.2 Write values to a file and create file

Using the method "WriteFile", you can create a file, "textfile.txt", in the specified path (here, "C:\Users\Public\"). "Process value" is then written to this location.

Finally, one more message is output in TraceViewer as to whether the write job was successful or if an error occurred.

```
HMIRuntime.FileSystem.WriteFile("C:\\Users\\Public\\textfile.txt",
"Process value: ", "utf8").then(
function() {
  HMIRuntime.Trace("Write file finished successfully");
}).catch(function(errorCode) {
  HMIRuntime.Trace("Write failed errorcode=" + errorCode);
});
```

Note You can find further information in the system manual "SIMATIC WinCC WinCC Engineering V16 - Runtime Unified" in the chapter entitled "'WriteFile" method (FileSystem.WriteFile)':

https://support.industry.siemens.com/cs/ww/en/view/109773780/127923054859

Adding values to an existing file

If a file has already been created, you can add values to the end of the file with the method "AppendFile".

Example

```
HMIRuntime.FileSystem.AppendFile("C:\\Users\\Public\\textfile.txt",
"Added Process value: ", "utf8").then(
  function() {
    HMIRuntime.Trace("Write file finished successfully");
});
```

If you previously read the tag value, you can then add it to the text file in a similar manner.

Example

```
//Read process value
let tag1 = Tags("MyTag1").Read();

//Append process value to text file
HMIRuntime.FileSystem.AppendFile("C:\\Users\\Public\\textfile.txt",
"Added Process value: " + tag1 + "\n", "utf8").then(
  function() {
    HMIRuntime.Trace("Write file finished successfully");
});
```

Note Start a new line with the command "\n". More commands can be found at the following link:

https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/String

5.8.3 Read values from a file

You can also read values from a text file with the "ReadFile" method.

In this example, the content of the file "textfile.txt" in the directory "C:\Users\Puplic" is read and then output in TraceViewer and in the text field "Textbox".

Example

```
HMIRuntime.FileSystem.ReadFile("C:\\Users\\Public\\textfile.txt",
"utf8").then(
  function(text) {
    HMIRuntime.Trace("Text=" + text);
    Screen.Items('Textbox').Text = text;
});
```

Note For security reasons, reading the contents of an entire folder is not supported.

Read binary file

You can read a binary file (".bin") in WinCC Unified with the method "ReadFileBinary". The type of file to be read is divided into the following two classes:

- Int32Array
  More information about "Int32Array" can be found at:
  https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Int32Array
- DataView
  You can find additional information on the "DataView" view at:
  https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/DataView

Note General information and a code example of how you can read binary data can be found in the system manual "SIMATIC WinCC Engineering V16 - Runtime Unified" in the chapter:

Method "ReadFileBinary"
https://support.industry.siemens.com/cs/ww/en/view/109773780/127923043595

"Reading and writing binary files"
https://support.industry.siemens.com/cs/ww/en/view/109773780/113420906507

5.9 Configuring time delays in a script

You can configure time delays in a script by using the "Timer" object.

Note

For further information, refer to the system manual "SIMATIC WinCC Engineering V16 - Runtime Unified" in the chapter entitled "'Timers" object':

https://support.industry.siemens.com/cs/ww/en/view/109773780/118449156491

An example of the implementation of timers in WinCC Unified is the operation of setting a signal while a button is pressed.

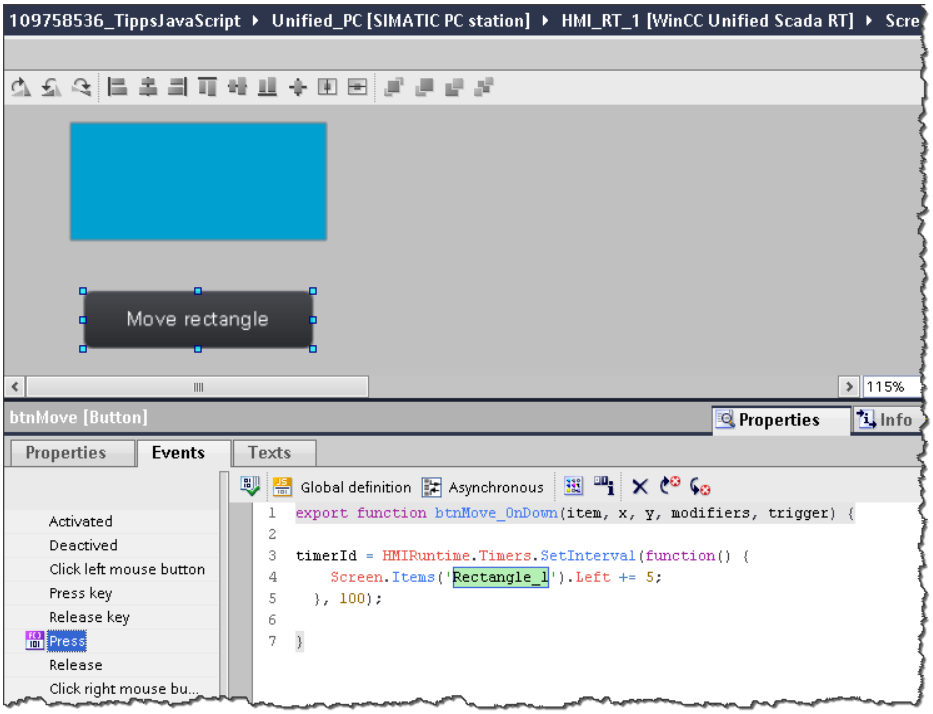
Example

In the following example, a button called "btnMove" is supposed to be pressed. As long as the button is held down, a rectangle "Rectangle_1" should move horizontally.

To do this, proceed as follows:

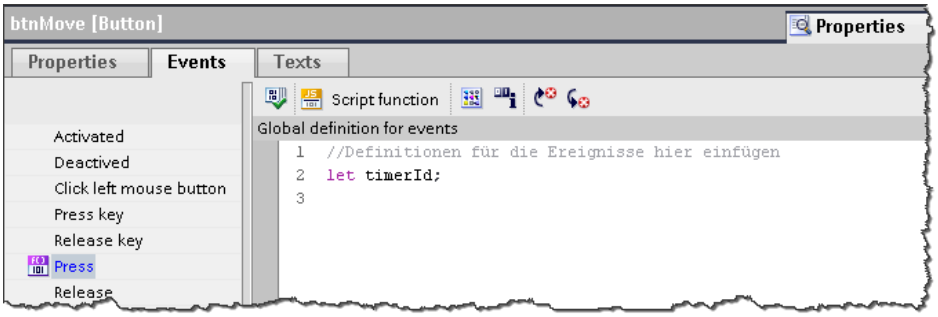
1. Add the following script to the button at the "Press" event:

```
timerId = HMIRuntime.Timers.SetInterval(function() {
   Screen.Items('Rectangle_1').Left += 5;
  }, 100);
```



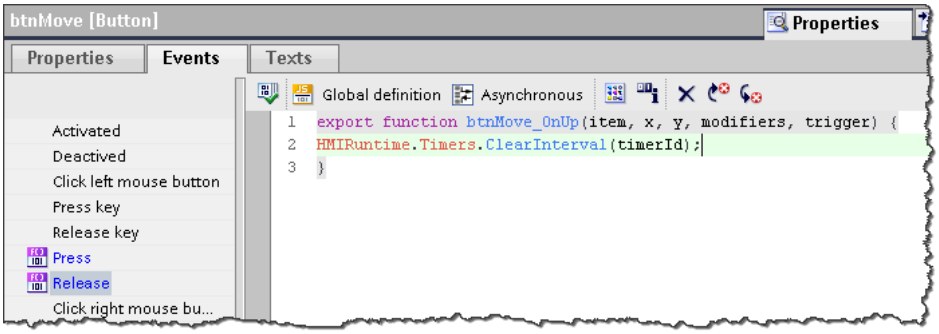
2. Then add the following code line to the global definition area:

```
// Global definition area
let timerId;
```



3. In the last step, add the following script to the same button at the "Release" event:

```
HMIRuntime.Timers.ClearInterval(timerId);
```



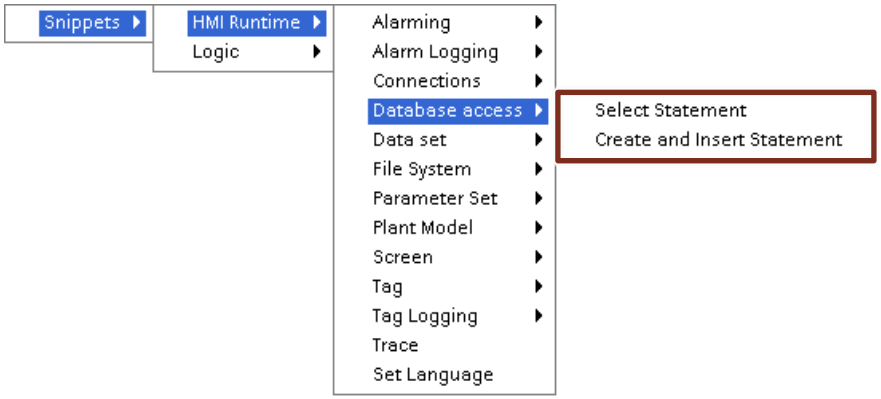
Note Make sure not to configure the scripts at the "Press key" or "Release key" events, because these triggers are not executed during touch operation

5.10 Configuring access to databases

SIMATIC WinCC Unified gives you the ability to connect with databases and exchange data.

Two snippets will help you do this.

Figure 5-17



For how to access your SQL or SQLite database from WinCC Unified, please refer to the FAQ "How do you access an SQLite / Microsoft SQL database via the WinCC Unified PC Runtime?" (expected to be available 09/2020).

https://support.industry.siemens.com/cs/ww/en/view/109781074

CAUTION	**Under no circumstances should you make manual changes to the database from WinCC Unified, otherwise inconsistencies can occur and you will have to completely reinstall your system.**

5.11 Configuring access to internet resources

For security reasons, access to internet resources (e.g. REST API, Json files) via JavaScript is not supported from the runtime.

If you still want to share data from the WinCC Unified runtime with other applications, you have access to the runtime ODK functions or OpenPipe.

Note

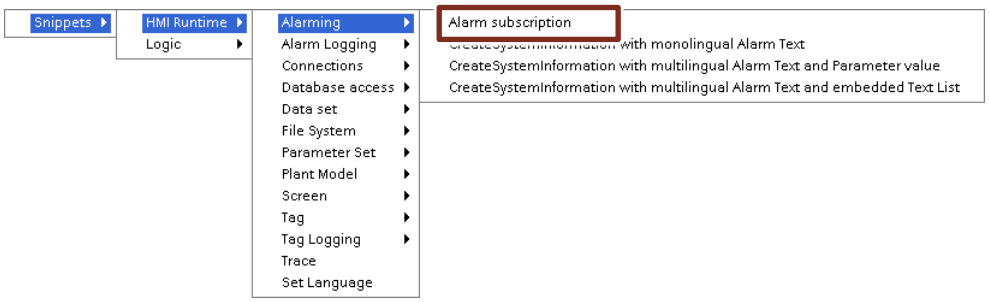
Further information is available in:

- the chapter "Runtime API" in the system manual - "SIMATIC WinCC Engineering V16 - Runtime Unified":
  https://support.industry.siemens.com/cs/ww/en/view/109773780/129370904843
- in the operating manual - "SIMATIC HMI WinCC Unified Open Pipe"
  https://support.industry.siemens.com/cs/ww/en/view/109778823

5.12 Filtering alarms and messages

In WinCC Unified, you can output a selection of pending messages via the "Alarm subscription". The snippet of the same name will help you do this.

Figure 5-18



Using the "Filter" property, you can specify filter criteria to filter the active alarms, in this example the alarm class Warning.

Example

```
//Snippet "HMI Runtime > Alarming > Alarm subscription"
let subs = HMIRuntime.Alarming.CreateSubscription();
subs.Filter = "AlarmClassName=\"Warning\"";
subs.Language = 1033;
subs.OnAlarm = function(Errorcode, SystemNames, ResultSet) {
  for (let index in ResultSet)
  {
    HMIRuntime.Trace("Alarm Name_" + (index+1) + " = " +
    ResultSet[index].Name);
    HMIRuntime.Trace(" Alarm State_" + (index+1) + "= " +
    ResultSet[index].State);
  }
};
subs.Start();
```

Note Further information about the object "Alarm subscription" can be found in the system manual "SIMATIC WinCC WinCC Engineering V16 - Runtime Unified" in the chapter 'Object "AlarmSubscription"':

https://support.industry.siemens.com/cs/ww/en/view/109773780/117251940875

Note You can find more options for filtering alarms and messages in the application example "Filtering messages and alarms in SIMATIC WinCC Unified".

https://support.industry.siemens.com/cs/ww/en/view/109760056

5.13 Switching runtime language

You can configure a language change in SIMATIC WinCC Unified in two different ways as follows:

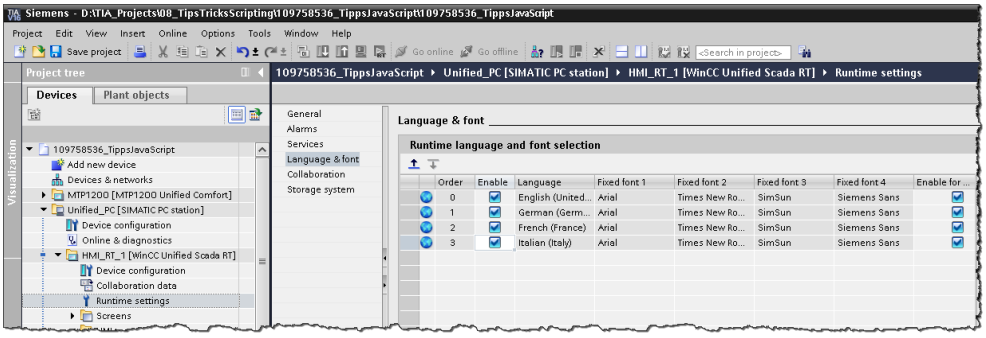
- with the system function "ToggleLanguage"
- with the snippet "Set Language"

Changing language with the system function

Use the system function "ToggleLanguage" to switch between languages which are configured in the runtime settings.

Note The "ToggleLanguage" function is also available as the system function "UmschalteSprache" in German.

Figure 5-19



Languages will be switched in the order in which they are configured in the runtime settings in the "Order" column.

Setting the language with the snippet

You can set the runtime language with the snippet "HMIRuntime > Language > Set Language". In the process you will enter a decimal ID for the respective language in the script editor.

Note The snippet is also available as a system function, "SetLanguage" ("SetzeSprache" in German).

The table below contains a selection of languages with the associated language ID.

Table 5-8

Language	Language/region tag	Decimal language ID
German	de_DE	1031
English	en_US	1033
French	fr_FR	1036
Spanish	es_ES	3082
Italian	it_IT	1040
Chinese	zh-CN	2052

Note Further language IDs are available at the following link:

https://msdn.microsoft.com/en-US/library/windows/hardware/dn898488(v=vs.85).aspx

5.14 "Math" object

By default, JavaScript does not allow editing of 64-bit data types. To operate on these data types anyway WinCC Unified has the "Math" object.

The "Math" area has the following objects, properties and methods:

- "Int64" (property and object)
- "Int64Base" (property and object)
- "Uint64" (property and object)
- "DatePrecise" (property and object) → see also chapter 5.15.3
- "RGB" (method) → see also chapter 5.4.5
- "RGBWeb" (method)

Note Further information about the "Math" object and the associated properties and methods can be found in the system manual "SIMATIC WinCC Engineering V16 - Runtime Unified":

https://support.industry.siemens.com/cs/ww/en/view/109773780/118272981259

5.15 Configuring date and time

5.15.1 Working with local date/time

The JavaScript "Date" object allows you to work with date and time in SIMATIC WinCC Unified.

To crate a new object of the type Date, use "new Date ()".

Example:

```
let myDate = new Date();     // create a Date object
let localTime, localDate, localDateTime;

//get local date and time to script internal tag
localDateTime = myDate.toLocaleString();

//get local date to script internal tag
localDate = myDate.toLocaleDateString ();

//get local time to script internal tag
localTime = myDate.toLocaleTimeString();
```

Note You can also indicate the two arguments "locales" and "options" to the "Date" object. You can find further information on the toLocaleDateString() method and arguments at the following link:

https://developer.mozilla.org/de/docs/Web/JavaScript/Reference/Global_Objects/Date/toLocaleDateString

5.15.2 Editing user-defined date/time

You can also assign an individual date to the "Date" object. For this, enter the time in brackets when creating the date object.

Your can express the argument for the date and time indication as a string here, in the following format.

- new Date ("Day month year hour:second:millisecond")

Example:

```
let myDate = new Date("02 03 2016 1:10"); // create a Date object
let strTime, strDate;

//write date (20.03.2016) to script internal tag
strDate = myDate.toLocaleDateString ();

//write time (1:10:00 AM) to script internal tag
strTime = myDate.toLocaleTimeString();
```

Alternatively, you can express the arguments for the date and time indication separately.

- new Date (year, month, day, hour, second, millisecond)

Example:

```
let myDate = new Date(2016,2,20,1,10);
// create the date object 20.03.2016 1:10:00 GMT
```

Note When indicating the month, note that the entry comprises 0 to 11. This results in:

- 0 = January
- 1 = February
  …
- 11 = December

Note If you only indicate year, month and day, the open time indications (hour, minute…) are completed with 0.

Besides the options described here, there are further options for expressing the date object argument.

5.15.3 Working with time stamps on a nanosecond basis

If you need a time stamp down to the nanosecond, then you can implement this with the object "DatePrecise".

This object represents a highly granular time stamp with a resolution of 100 ns as a 64-bit integer value. This is particularly useful when logging data. Furthermore, the SIMATIC controllers (e.g. S7-1516) also work on a nanosecond time basis, whereby a consistent time basis can be established.

The object also contains methods for converting between various time stamp formats.

Note Further information about the "DatePrecise" object and the associated properties and methods can be found in the system manual "SIMATIC WinCC Engineering V16 - Runtime Unified":

https://support.industry.siemens.com/cs/ww/en/view/109773780/118277966603

5.16 Script diagnostics

5.16.1 "Alert()" notification window

The `alert()` method is available in JavaScript in order to output message in a notice window. This is usually used for script diagnostics.

However, this function is not available in SIMATIC WinCC Unified for security reasons. The following scenarios show by way of example what effects the `alert()` method could have:

- The "Alert" notice window appears on top of operating elements and thus prevents rapid operation of the system.
- The "Alert" notice window blocks the script and thus prevents further execution of the script.

Alternative RTIL TraceViewer

To nevertheless output messages and check the correct execution of scrips, you can create entries in the RTIL TraceViewer.

The following chapter shows you how to compose a message by script in the RTIL TraceViewer.

5.16.2 Diagnostics via RTIL TraceViewer

To quickly rectify errors that have occurred in the configuration and scripts, effective diagnostics are required. The TraceViewer for SIMATIC WinCC Unified provides a diagnostic option for this.

The following description shows you how to create an entry in TraceViewer with corresponding notice text.

Creating a message by script

If you wish to output a message via TraceViewer in the script, you need to enter the following as syntax:

```
HMIRuntime.Trace('This is the text for the TraceViewer!');
```

If you wish to output the process value of a tag in addition to the notice text, this must first be read.

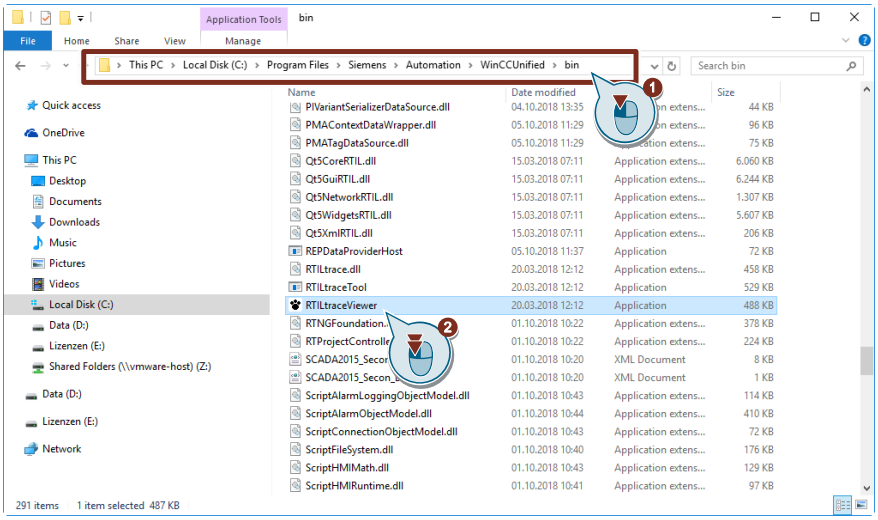
Example:

```
let tag1 = Tags('MyTag1');
let tagValue1 = tag1.Read();    //read value of 'MyTag1' e.g. 9.87

// create TraceViewer notification: 'value of MyTag1:  9.87'
HMIRuntime.Trace('value of MyTag1: ' + tagValue1);
```

Note If you use the snippet for reading a tag, a TraceViewer notice will be included.

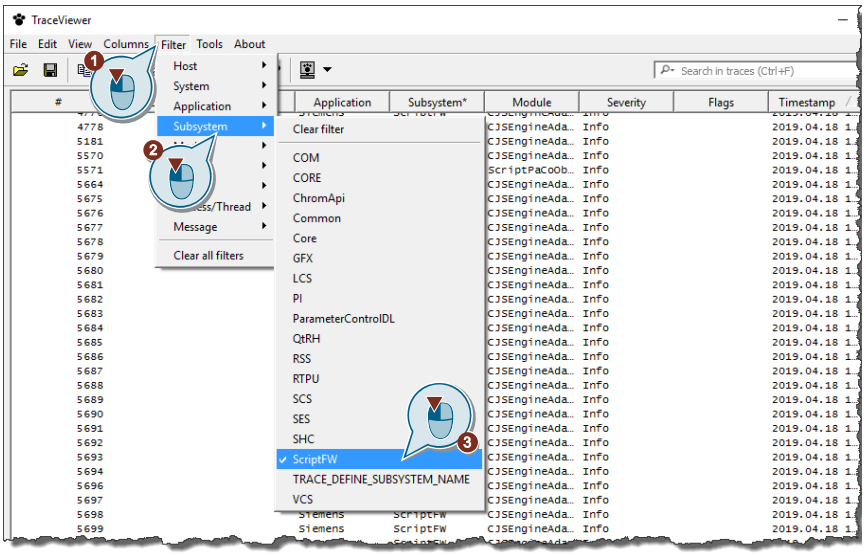
Opening TraceViewer

1. Open "Windows-Explorer" ("File Explorer").
2. Open TraceViewer
   - Open the path "C:/Program Files/Siemens/Automation/WinCCUnified/bin" (1).
   - Then double-click the application "RTILtraceViewer" to open the TraceViewer.



TraceViewer is opened.

3. Filter according to messages
   - Open the "Filter" menu (1) in the TraceViewer menu bar.
   - Then open the category "Subsystem" (2).
   - Select the ScriptFW module (3).



Only messages that you have created by script will now be displayed in TraceViewer.

Note Trace messages must be present in order to configure a filter.

Note You can also integrate TraceViewer into TIA Portal as an external application and thus access it more quickly. Consult the chapter entitled "Integrate RTIL Trace Viewer as an external application" in the manual "SIMATIC WinCC Engineering V16 – Runtime Unified" for how to integrate TraceViewer.

https://support.industry.siemens.com/cs/ww/en/view/109773780/112955745419

TraceViewer and Unified Comfort Panel

If you have deployed a SIMATIC HMI Unified Comfort Panel, you can similarly use the RTIL TraceViewer. To do so, activate the "Trace forwarder" function in the Unified Comfort Panel.

Further information on this topic can be found in the FAQ "How do you use the Trace Viewer with the Unified Comfort Panel?"

https://support.industry.siemens.com/cs/ww/en/view/109777593

5.16.3 Debugging scripts in Chrome

As an additional diagnostic option (e.g. setting break points), you can use the WinCC Unified script debugger together with the "Chrome" browser.

Additional information is available in the FAQ "How do you use the Script Debugger with WinCC Unified and the Chrome browser?"

https://support.industry.siemens.com/cs/ww/en/view/109779192

Script debugger for Unified Comfort Panel

The script debugger function is available to you only for the WinCC Unified runtime on a PC station.

In order to also use the script debugger function for the Unified Comfort Panel, you must simulate your Unified Comfort Panel project on a PC station.

5.16.4 Plan for responses in case of error

Using the "try...catch" instruction, you can program an instruction (*try*) and the associated response (*catch*) to be executed in case of an error.

Note You can find further information on the "try...catch" instruction at the following link:

https://developer.mozilla.org/en/docs/Web/JavaScript/Reference/Statements/try...catch

Snippet

In WinCC Unified, you can insert the "try...catch" and the "try...catch...finally" instruction into your code with the respective snippets. You can find them under "Snippets > Logic > try…catch" or "Snippets > Logic > try…catch…finally".

6 Useful information

You can find further general information on JavaScript on the following websites, among others:

- Mozilla Developer Network
  https://developer.mozilla.org/en/docs/Web/JavaScript
- Introduction to JavaScript (SelfHTML)
  https://wiki.selfhtml.org/wiki/JavaScript
- JavaScript collection (German resource)
  http://www.jswelt.de/index.php
- JavaScript Tutorial
  https://javascript.info/

7 Appendix

7.1 Service and support

Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos – all information is accessible with just a few mouse clicks: **Error! Hyperlink reference not valid.**

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts. Please send queries to Technical Support via Web form:
www.siemens.com/industry/supportrequest

SITRAIN – Training for Industry

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:
www.siemens.com/sitrain

Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contracts

You can find detailed information on our range of services in the service catalog web page:
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Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for Apple iOS, Android and Windows Phone:
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7.2 Links and literature

Table 7-1

No.	Subject
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to the article page of the application example https://support.industry.siemens.com/cs/ww/en/view/109758536
\3\	System manual "SIMATIC WinCC Engineering V16 - Runtime Unified" https://support.industry.siemens.com/cs/ww/en/view/109773780/117557346059
\4\	Working with strings in JavaScript https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Object/toString
\5\	Operating manual "SIMATIC HMI WinCC Unified Open Pipe" https://support.industry.siemens.com/cs/ww/en/view/109778823

7.3 Change documentation

Table 7-2

Version	Date	Change
V1.0	09/2018	First version
V2.0	05/2019	• Description added to global modules • Update to WinCC Unified V15.1 • Small spelling corrections
V3.0	09/2020	• Update to WinCC Unified V16 • Expanded use cases