Viz Arc Script Guide

Version 2.2

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- **Real-Time Scanning:** Keep it enabled, but exclude any performance-sensitive operations involving Vizrt-specific folders, files, and processes. For example:
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  - C:\ProgramData\[Product Name]
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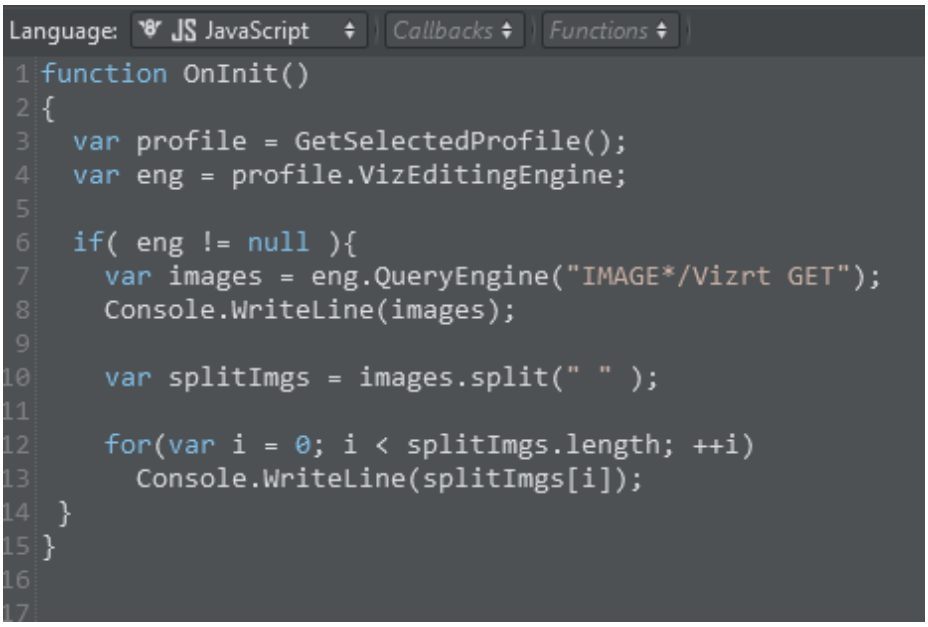
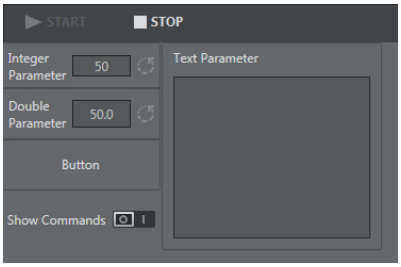
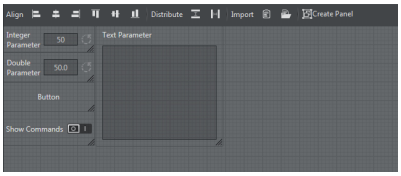
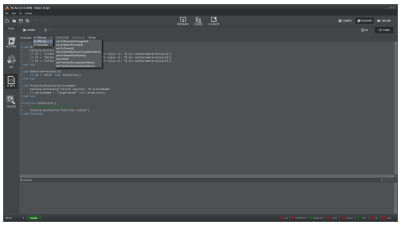
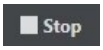
1 Introduction to Viz Arc Script Guide

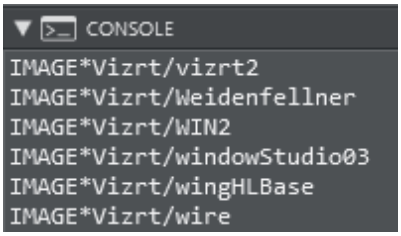
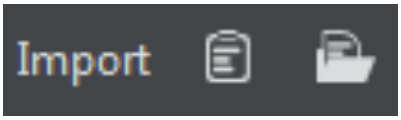
2 View

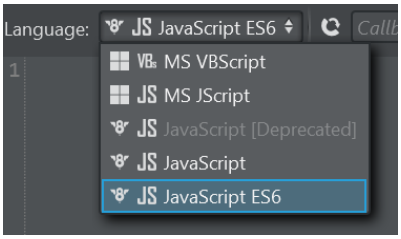
In Script View, you can write your own custom script in JavaScript language through Google's **V8** or Microsoft's **JScript** (ECMAScript3) or in **VBScript** language, as in the following example:



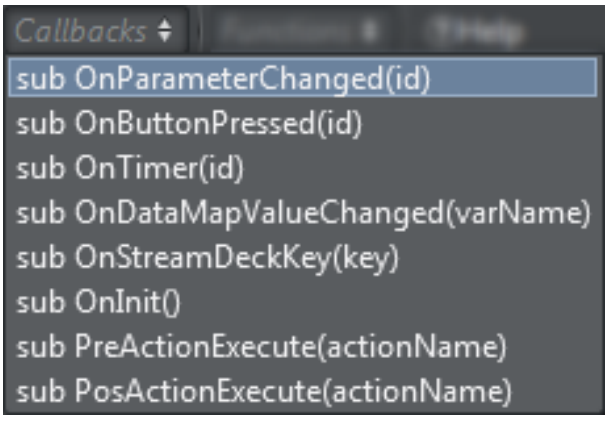
It's possible to create custom forms and components, such as text boxes and buttons.

	To run the script, select the **Start** button  on the top left of the window.
	Form Design can be edited by selecting the **UI** button UNKNOWN ATTACHMENT. Every element can be selected and moved, aligned and distributed on the main form. To go back to code editing, select the **CODE** button.
	To edit a script, press the **Stop** button  on the top of the script main window.

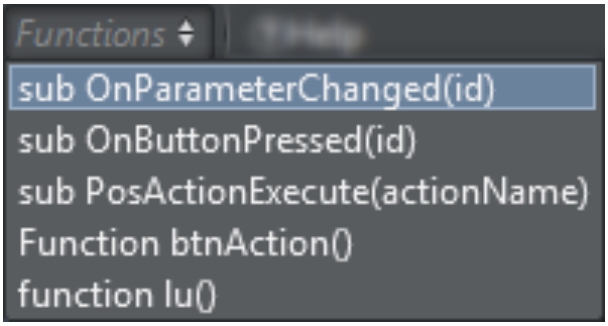
	Console logs and debugs are displayed in the **CONSOLE** pane.
	Import code internally from the clipboard or an external text file in the script pane.

	Use the **Language** menu to select a scripting language.
	• MS VBScript Microsoft Visual Basic Scripting language)
	• MS JScript Microsoft implementation of the ECMA 262 JavaScript
	• JavaScript Google's open source high-performance V8 JavaScript
	  • Using CommonJS syntax to import modules (using **require**).
	• JavaScript ES6 Google's open source high-performance V8 JavaScript
	  • Using ES Modules syntax to import modules (using **import**)
	It is recommended to use **JavaScript ES6** language when possible.

In edit mode, **Script Callbacks** can be selected from the list and added:



You can locate a custom function by selecting it from the **Functions** list:



See Also

- Scripting Classes

3 Properties

3.1 Action

All Actions in the project can be accessed and modified via scripting. Use the **GetAction** function to get a reference to the action:

- BaseAction **GetAction**(string actionName)

> ⚠ **Note:** It's possible for a project to contain multiple actions that have the same name. If that is the case for your project, the first Action created with a name is returned. Make sure to use unique names when accessing actions through scripting.

Every Action type has these generic properties:

Action type	Description
string **Name**	The title of the action.
string **Description**	By default this is the type of action (for example, "Key", "Chroma", "Image" etc.). When assigned to a TransformationAction and visible on the SET view, this field is used as a tooltip when the mouse hovers over the element.
int **ExecutionDelay**	Expressed in milliseconds, minimum delay is `0` (default), maximum delay is `10000` (10 seconds).

Every Action type has these generic methods:

- void **Execute():** Executes the action.
- void **Preview():** Executes the action on the preview channel.
- void **QueryState():** Queries the current state of the action from the **Editing Engine**. For example, if the action is a transformation action, it retrieves the current transformation from the editing engine's scene tree and updates the UI accordingly.

The example below shows how to set the alpha value to 75% of an Alpha Action called *AlphaText* and execute the action from scripting:

3.1.1 Sample

```
var alphaAction = GetAction("AlphaText");
alphaAction.Alpha = 75.0;
alphaAction.Execute();
```

There are specific properties/functions for each action type:

- Alpha
- Chroma
- Command

- ControlObject
- Director
- Group
- Image
- Light
- Key
- Material
- MSE
- Multizone Chroma Key
- NDI
- Omo
- PBR
- Phong
- Scene Loader
- Script
- Shared Memory
- Telemetrics
- Text
- Tracking Hub Command
- Transformation
- Utah Router
- Unreal Animation
- Unreal Blueprint
- Unreal Dispatcher
- Unreal Scene Loader
- Unreal Sequencer
- Unreal Text
- Vinten
- Virtual Studio
- Visibility
- Viz Camera
- Viz Clip
- Viz PBR Material

3.1.2 Alpha

Properties:

- double **Alpha**

3.1.3 Chroma

Properties:

- ChromaPrecisionContent **Precision**
    - double **hueAdjust**

- double **saturationAdjust**
- int **edgeBlur**
- double **despillScale**
- double **backingPlateR**
- double **backingPlateR**
- double **backingPlateR**
- double **yellowGain**
- double **cyanGain**
- int **denoiseRadius**
- int **denoiseSharpen**
- double **opacityPoint**
- doube **transparencyPoint**
- double **bgEdgeGain**
- double **bgSpillGain**
- double **bgLWBlur**
- double **colorEdgeGain**
- double **colorSpillGain**
- double **colorLightwrapR**
- double **colorLightwrapG**
- double **colorLightwrapB**
- bool **addShadows**
- double **innerShadows**
- double **shadowsGain**
- bool **addHighlights**
- double **innerHighlights**
- double **highlightsGain**
- double **masterLiftR**
- double **masterLiftG**
- double **masterLiftB**
- double **masterGammaR**
- double **masterGammaG**
- double **masterGammaB**
- double **masterGainR**
- double **masterGainG**
- double **masterGainB**
- double **masterSaturation**

Sample

```
var action = GetAction("Chroma");
// sample for setting some color Precision Keyer settings
action.Precision.hueAdjust = -1140;
action.Precision.saturationAdjust = 2.0;
```

3.1.4 Command

Properties:

- string **Command**

3.1.5 ControlObject

See Control Object Classes.

3.1.6 Director

Properties:

- string **DirectorType**
  - Possible values: START, STOP, CONTINUE, CONTINUE_REVERSE, PLAY_FROM, PLAY_FROM_REVERSE, FROM_TO, GO_TO, PAUSE

3.1.7 Group

This action has no additional public properties.

3.1.8 Image

Properties:

- string **Image**
  - Value should be a Graphic Hub path that starts with "IMAGE*"
- bool **IsBuiltin**
- string **Builtin**
  - Possible values: LIVE1, LIVE2, CLIP1, etc.
- double **PosX**
- double **PosY**
- double **RotX**
- double **RotY**
- double **RotZ**
- double **ScaX**
- double **ScaY**

The Image parameter can be assigned to a Graphic Hub path when the string starts with "IMAGE*"; when it starts with "http" it will be assumed to be a web link (or a Media Service link), otherwise it will be interpreted as a local file path, see the samples below:

Sample

```
var imageAction = GetAction("Image");
```

```
imageAction.Image = "IMAGE*/VizArc/arcLogo";
// or
imageAction.Image = "http://127.0.0.1:21099/serve/original/AR_03.jpg";
// or
imageAction.Image = "C:/Users/admin/Desktop/CAKE.jpg";
```

3.1.9 Light

Properties:

- string **LightType** [read only]
  - Possible values: NONE, SPOTLIGHT, DIRECTIONAL, AREA, POINT
- string **LightColor**
- double **LightIntensity**
- double **DiffuseIntensity**
- double **SpecularIntensity**
- double **LightRadius**
- double **OuterConeAngle**
- double **InnerConeAngle**
- int **LightLayer**
- double **DirectionalSpread**
- double **RadiosityMultiplier**

3.1.10 Key

Properties:

- bool **KeyEnabled**
- bool **CombineBackground**
- bool **DepthInfoOnly**
- bool **DrawKey**
- bool **DrawRGB**

3.1.11 Material

Properties:

- string **ColorHex** [#RRGGBB]
- string **Diffuse** [#RRGGBB]
- string **Emission** [#RRGGBB]
- string **Specular** [#RRGGBB]
- string **Ambient** [#RRGGBB]
- double **Alpha** [0…100]
- double **Shiniess** [0…100]
- bool **UseSimpleColor**

Functions:

- SetColorRBG(int r, int g, int b)

3.1.12 MSE

Properties:

- string **Page**
- string **DirectorType**
    - Possible values: TAKE, CONTINUE, TAKE_OUT

3.1.13 Multizone Chroma Key

Properties:

- string **ZoneName**
- double **Height**
- double **Altitude**
- double **Luminance**
- double **MinLuminance**
- double **MinGrad**
- double **MaxLuminance**
- double **MaxGrad**
- double **Blend**
- double **U**
- double **V**
- double **UVDiameter**
- double **UVGradient**
- bool **IsFullscreen**
- bool **PickLuma**
- bool **PickChroma**
- bool **PickInViz**

3.1.14 NDI

Properties:

- int **Preset**
    - Value must be between 0 and 99
- float **Velocity**
    - Value must be between 0 and 1

3.1.15 Omo

Properties:

- int **ElementIndex**
- bool **ShowUntil**

3.1.16 PBR

Properties:

- Modes
  - bool **IsPreload**
  - bool **IsGHMode**
- GH Mode
  - string **PhongMaterialAsset**
    - Value should be a Graphic Hub path that starts with "MATERIAL_DEFINITION*"
- Values Mode
  - Material Settings
    - string **ColorTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - |string **ColorTint**
    - bool **ColorIsSRGB**
    - string **EmissiveTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **EmissiveColor**
    - double **EmissiveIntensity**
    - string **NormalTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **RoughnessTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - double **RoughnessFactor**
    - string **MetallicTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - double **MetallicFactor**
    - string **AmbientOcclusionTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **HeightTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - double **HeightDepth**
    - string **EnvironmentTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - double **EnvironmentRotation**
  - Texture Settings
    - double **TillingU**
    - double **TillingV**
    - double **UvAngle**
    - double **UvScaleU**
    - double **UvScaleV**
    - double **UvOffsetU**
    - double **UvOffsetV**

3.1.17 Phong

Properties:

- Modes
  - bool **IsPreload**
  - bool **IsGHMode**
- GH Mode
  - string **PbrMaterialAsset**
    - Value should be a Graphic Hub path that starts with "MATERIAL_DEFINITION*"
- Values Mode
  - Material Settings
    - string **ColorTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - |string **ColorTint**
    - bool **ColorIsSRGB**
    - string **AmbientTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **AmbientColor**
      - For example: "#FF00A0"
    - double **AmbientIntensity**
    - string **DiffuseTexture**
    -
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **DiffuseColor**
      - For example: "#FF00A0"
    - double **DiffuseIntensity**
    - string **SpecularTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **SpecularColor**
      - For example: "#FF00A0"
    - double **SpecularIntensity**
    - string **EmissiveTexture**
      - Value should be a Graphic Hub path that starts with "IMAGE*"
    - string **EmissiveColor**
      - For example: "#FF00A0"
    - double **EmissiveIntensity**
    - double **Shininess**
    - bool **Lit**
      - Whether the material should be lit
  - Texture Settings
    - double **UvAngle**
    - double **UvScaleU**
    - double **UvScaleV**
    - double **UvOffsetU**

- double **UvOffsetV**

3.1.18 Scene Loader

Properties:

- bool **UseGUID**
- string **FrontUUID**
- string **MainUUID**
- string **BackUUID**
- string **GfxUUID**
- string **SubSceneUUID**
- bool **FrontClear**
- bool **MainClear**
- bool **BackClear**
- bool **GfxClear**
- bool **SubSceneClear**
- bool **FrontResetStage**
- bool **MainResetStage**
- bool **BackResetStage**
- bool **GfxResetStage**
- int **GfxLayerNumber** [0,…,17]
- bool **SubSceneResetStage**

3.1.19 Script

Functions:

- dynamic **GetParameterValue**(string name)
  - Returns the value of a Script UI element. The *name* is the name of the UI parameter as specified in the viz script by the **RegisterParameter*** function.
- bool **SetParameterValue**(string name, dynamic value)
  - Sets the value for a UI parameter. The *name* is the name of the UI parameter as specified in the viz script by the **RegisterParameter*** function. Returns true on success.

Example

```
// get the script action with the name "scriptA"
let action = GetAction("scriptA")

// set some parameter values
action.SetParameterValue("aDouble", 3.3)
action.SetParameterValue("aInteger", 2)
action.SetParameterValue("aString", "another string")
action.SetParameterValue("aMultiString", "another\\nmultistring")
action.SetParameterValue("aBool", false)
```

```
action.SetParameterValue("aImage", "c:/tmp/test.jpg")

// read the parameter values
Console.WriteLine("aDouble value is " + action.GetParameterValue("aDouble"))
```

3.1.20 Shared Memory

Functions:

- string[] **GetKeys**()
  Returns the list of keys present in the shared memory action.
- string[] **GetValues**()
  Returns the list of values present in the shared memory action.
- string[] **GetDestinations**()
  Returns the list of destinations present in the shared memory action.
- string **GetKeyValue**(string key)
  Returns the value of *key*. Returns null if *key* is not present int the shared memory action.
- string **GetKeyDesitnation**(string key)
  Returns the destination of *key*. Returns null if *key* is not present int the shared memory action.
- void **AddKeyValue** (string key, string value)
  Add *key/value* pair to the shared memory action.
- void **AddKeyValue** (string key, string value, string destination)
  Add *key/value* pair to the shared memory action and set it to *destination*.
- void **SetKeyValue** (string key, string value)
  Set a new *value* to to the *key* entry. Adds the pair if *key* is not present int shared memory action.
- void **SetKeyValue** (string key, string value, string destination)
  Set a new *value* to to the *key* entry and set it to *destination*. Adds the pair if *key* is not present int shared memory action.
- void **SetKeyDestination** (string key, string destination)
  Change the *destination* to the *key* entry.
- void **InsertKeyValue** (int index, string key, string value)
  Insert *key/value* pair to the shared memory action at position *index*.
- bool **Remove** (string key)
  Remove *key* from shared memory action.
- void **RemoveAt** (int index)
  Remove key at *index* position from shared memory action.

destination can be either "SYSTEM", "COMMUNICATION" or "DISTRIBUTED"

3.1.21 Telemetrics

Properties:

- int **Program**
- int **Scene**

3.1.22 Text

Properties:

- string **Text**

3.1.23 Tracking Hub Command

Properties:

- string **Command**

3.1.24 Transformation

Properties:

- double **PosX**
- double **PosY**
- double **PosZ**
- bool **PosEnabled**
- double **RotX**
- double **RotY**
- double **RotZ**
- bool **RotEnabled**
- double **ScaX**
- double **ScaY**
- double **ScaZ**
- bool **ScaEnabled**

3.1.25 Utah Router

Properties:

- int **Source**
- int **Desitnation**

3.1.26 Unreal Animation

Properties:

- string **AnimationMode**
    - Possible values: LOAD, CONTINUE, PAUSE
- bool **IsLooping**
- double **PlayRate**
- double **BlendTime**
- string **SelectedAnimation**

3.1.27 Unreal Blueprint

See Control Object Classes.

3.1.28 Unreal Dispatcher

This action has no additional public properties.

3.1.29 Unreal Scene Loader

- bool **GetStreamingLevelVisibility**(int index)
  - Returns true when the Streaming Level at position *index* is visible
- void **SetStreamingLevelVisibility**(int index, bool value)
  - Sets the Visibility to *value*, at position *index*.
- string[] **GetStreamingLevels**()
  - Returns the list of Streaming Levels present in the action.
- int **GetNumberOfStreamingLevels**()
  - Returns the number of Streaming Levels present in the action.

3.1.30 Unreal Sequencer

Properties:

- string **DirectorType**
  - Possible values: START, STOP, CONTINUE, START_REVERSE, CONTINUE_REVERSE, PLAY_FROM, PLAY_FROM_REVERSE, GO_TO, PAUSE
- int **LoopCount**
- double **PlayRate**

3.1.31 Unreal Text

Properties:

- string **Text**
- double **ScaleX**
- double **ScaleY**

3.1.32 Vinten

This action has no additional public properties.

3.1.33 Virtual Studio

Properties:

- int **SelectedSceneIndex**

- bool **SendPosition**
- string **SetName**
- double **PosX**
- double **PosY**
- double **PosZ**
- double **RotY**

3.1.34 Visibility

Properties:

- bool **Visibility**
- string **VisibilityMode**
    - Possible values: ON, OFF, ONOFF, DUAL_MODE

3.1.35 Viz Camera

Properties:

- int **SelectedCamera**
- bool **RemoteEnabled**
- bool **IsRemote**
- bool **AngleEnabled**
- double **Angle**
- bool **PosEnabled**
- double **PosX**
- double **PosY**
- double **PosZ**
- bool **DirEnabled**
- double **Pan**
- double **Tilt**
- double **Twist**

3.1.36 Viz Clip

Properties:

- string **ClipName**
- bool **IsLoader**
- string **ControlType**
    - possible values: **START, STOP, CONTINUE, PAUSE**
- string **SelectedClipChannel**
- bool **PlayOnLoad**
- bool **HasLoop**
- bool **ShouldQueue**

3.1.37 Viz PBR Material

Properties:

- bool **IsPreLoad**
- bool **IsGHMode**
- string **PbrMaterialAsset**
- string **ColorTexture**
- string **ColorTint**
    - For example: "#FF00A0"
- bool **ColorIsSRGB**
- string **EmissiveTexture**
- string **EmissiveColor**
    - For example: "#FF00A0"
- double **EmissiveIntensity**
- string **NormalTexture**
- string **RoughnessTexture**
- double **RoughnessFactor**
- string **MetallicTexture**
- double **MetallicFactor**
- string **AmbientOcclusionTexture**
- string **HeightTexture**
- double **HeightDepth**
- string **EnvironmentTexture**
- double **EnvironmentRotation**
- double **TillingU**
- double **TillingV**
- double **UvAngle**
- double **UvScaleU**
- double **UvScaleV**
- double **UvOffsetU**
- double **UvOffsetV**

4 Classes

4.1 Scripting

This section covers the following topics:

4.1.1 General

Viz Arc's scripting has many classes and types that are exposed and accessible via code. The script's main class is called **arc** and it exposes all the functions that are capable of interacting with the remaining parts of Viz Arc as well as many helper functions. All of **arc**'s functions can be accessed via scripting by calling them directly, since they are all exposed directly to the global script, or via the **arc** keyword.

The following samples and codes snippets are all written using the **V8 JavaScript** syntax:

Accessing Viz Arc Functions

```
// Getting a reference to an action called VersusTemplate
var versus = arc.GetAction("VersusTemplate")
var versus = GetAction("VersusTemplate")
```

Note: You can also find this section in Viz Arc by selecting the **Help** Help button in the script section when in edit mode.

4.1.2 Action

All actions in the current project can be accessed using the **GetAction** method, whose content can be manipulated. See Action Properties for more details.

- BaseAction **GetAction** (string actionNameOrGUID)
  - Returns the first action found with the name provided. When a valid GUID is provided as a string, it returns the action found with the provided GUID.
- BaseAction **GetAction** (string actionName, string tabName)
  - Returns the first action found with the name provided inside the action tab named tabName.
- BaseAction **GetActionByName** (string actionName)
  - Returns the first action found with the name provided.
- BaseAction **GetActionByName** (string actionName, string tabName)
  - Returns the first action found with the name provided inside the action tab named tabName.
- BaseAction **GetActionByUUID** (Guid actionUUID)
  - Returns the first action found with the provided GUID.
- BaseAction[] **GetSelectedActions** ( )
  - Returns an array containing all the actions that are selected on the action canvas
- BaseAction[] **GetActionsOfTab** (string tabName, string actionType = "ALL")
  - Returns an array with all the actions inside the tab named *tabName* of type equal to the one provided in *actionType* input. Default value ("ALL") includes all actions found.
- BaseAction[] **GetActions** (string actionType = "ALL")
  - Returns an array with all the actions of the entire project of type equal to the one provided in *actionType* input. Default value ("ALL") includes all actions.
- BaseAction **GetChildAction** (string nameOrUUID)
  - Returns an action within the group, and only works on Group Actions.

GetAction Example

```
// Getting a reference to an action explicitly by its name "VersusTemplate"
var versus = GetActionByName("VersusTemplate")

// Getting a reference using a GUID
```

```
var versus = GetAction("e87a8031-a86b-4997-a169-c6f791920449")

// Getting a reference to an action called VersusTemplate
var versus = GetAction("VersusTemplate")

// Getting all NDI actions
var nidActions = GetActions("NDI")

// get the action "PrecisionKeyer" within the "INITIALIZE" group action
var chromaAction = GetAction("INITIALIZE").GetChildAction("PrecisionKeyer")
```

4.1.3 Playlist

arc provides an alternative way of getting a BaseControlObject from a ControlObject/Blueprint action.

- void **ExecuteSelectedPlaylistRow** ( )
  - Executes the selected row on the playlist.
- void **ExecuteSelectedPlaylistRowAndNext** ( )
  - Executes the selected row on the playlist and changes selection to the next row.
- void **PreviewSelectedPlaylistRow** ( )
  - Previews the selected row on the playlist.
- BaseAction **GetSelectedPlaylistRowAction** ( )
  - Returns the action that's attached to the selected row on the playlist.
- void **SetSelectedPlaylistRow** (params string[] path)
  - Tries to find the row at path (path should contain a string per depth level) and makes it the selected row.
- void **PlayPlaylistByName** (string tabName)
  - Highlights the playlist with the name *tabName,* and plays it from the beginning.
- void **PlayPlaylistByIndex** (int tabIndex)
  - Highlights the playlist with 0-based index *tabIndex,* and plays it from the beginning.
- void **StopPlaylist** ( )
  - Stops the currently playing playlist.
- void **ChangePlaylistTab** (string tabName)
  - Selects and highlights the playlist with the name *tabName*.

Playlist Example

```
// Selects the row at "StatsDisplayGroup/AwayTeam/Show" and then previews and
executes it.
SetSelectedPlaylistRow("StatsDisplayGroup", "AwayTeam", "Show")
PreviewSelectedPlaylistRow()
ExecuteSelectedPlaylistRowAndNext()
```

4.1.4 Control Object

arc provides an alternative way of getting a BaseControlObject from a ControlObject/Blueprint action.

- BaseControlObject **GetControlObject** (ControlObjectAction action, string id)
  - Returns the control object with a specific ID from ControlObject action.

Getting a Specific ControlObject from a ControlObjectAction

```
// Get the ControlObject Action
var MatchDayAction = GetAction("MatchdayTable")
// Get Title ControlObject (ControlText) and change its value
GetControlObject(Co, "Title").Value = "Sunday Fixtures"


// Get the Blueprint Action
var HeadlineBp = GetAction("HeadlineBp")
// Get Title ControlObject (String Variable) and change its value
GetControlObject(HeadlineBp , "Title").Value = "Lorem Ipsum"
```

4.1.5 MIDI

Attached and configured MIDI devices can be used to receive MIDI events using the **OnMIDIEvent** callback. It's also possible to send MIDI events to an attached device using the following methods:

- bool **SendMIDIControlMessage** (string DeviceName, int Channel, int Number, int Value)
  - Sends a MIDI control message to a the device named DeviceName, using Channel, Number and Value.
- bool **SendMIDINoteMessage** (string DeviceName, bool On, int Channel, int Note, int Velocity)
  - Sends a MIDI note message to a the device named DeviceName, using Channel, Note and Velocity. The parameter **On** determines whether the event is a note on or note off event.

⚠ **Note:** Both of the methods above return true on successful completion and false if not successful.

MIDI Sample

```
Global.OnButtonPressed = function (id)
{
  SendMIDIControlMessage("Midi Fighter Twister", 1, 1, 127) // send control message
to Midi Fighter Twister on channel 1, number 1, value 127
  SendMIDINoteMessage("nanoPAD2", true, 1, 5, 100) // send note down event to
nanoPAD2 device
}

Global.OnMIDIEvent = function (midiEvent)
{
```

```
  // just print the midi event on the console
  Console.WriteLine("midi event |" + midiEvent.DeviceName + "| " +
midiEvent.EventType + "\n" + midiEvent.ToString())
}
```

4.1.6 Art-Net DMX

A sample on how to use the OnDMXEvent callback in a template or global script.

Art-Net Script Sample

```
Global.OnDMXEvent = function (dmxEvent)
{
  Console.WriteLine( "Universe " + dmxEvent.Universe + " first change at channel " +
dmxEvent.firstDiff )
  Console.WriteLine( "Channel 7 has changed: " + dmxEvent.HasChanged(7) )
  Console.WriteLine( "Channel 7 value is: " + dmxEvent.DMXData[7])
}
```

You can enable or disable the DMX signals using the following methods

- void **EnableDMX** ( )
  Enables callbacks of the connected Art-Net devices to be sent to connected actions and script callbacks.
- void **DisableDMX** ( )
  Disables callbacks of the connected Art-Net devices to be sent to connected actions and script callbacks.
- bool **IsDMXEnabled** ( )
  Returns whether the Art-Net callbacks are enabled.

4.1.7 MQTT

Message Queuing Telemetry Transport is supported through the possibility to instantiate a MQTT client and send/ receive messages

- ArcMqttClient **createMQTTClient** (string server, int port)Creates a MQTT client connected using server and port

The returned client ArcMqttClient supports the following methods

- void **Subscribe** (string topic, int qos = 1)
  Subscribes the client to the given topic with the specified quality of service (default 1).
- void **Unsubscribe** (string topic)
  Unsubscribes the client from the given topic.
- void **sendMessage** (string topic, string payload)
  Sends a message payloadto topic.
- void **Dispose** ( )
  Disconnects and deletes the client.

Whenever a message is received from a topic a client has subscribed to, the new data is set to the global DataMap using the topic as key and the payload as value. Payload data in JSON format is passed as a JSON object, anything else is passed as a string object.

MQTT Sample

```
var mqttClient

Global.OnInit = function ()
{
  mqttClient = createMQTTClient("localhost", 6548)
  mqttClient.Subscribe("hello/world/news")

  SubscribeDataMap("hello/world/news")
}

Global.OnDataMapValueChanged = function (varName)
{
  if( varName == "hello/world/news" )
    Console.WriteLine("breaking news alert: " + GetData(varName))
}
```

A sample server written in C# illustrating the server side code using the MQTTnet library.

MQTT Server Sample

```
using MQTTnet;
using MQTTnet.Extensions.ManagedClient;
using MQTTnet.Server;
using System;
using System.Threading;

namespace testmqtt
{
    class Program
    {
        static void Main(string[] args)
        {
            var optionsBuilder = new MqttServerOptionsBuilder()
             .WithConnectionBacklog(100)
             .WithDefaultEndpointPort(6548);

            var mqttServer = new MqttFactory().CreateMqttServer();
            mqttServer.StartAsync(optionsBuilder.Build());

            int i = 0;
            MqttApplicationMessage message = null;
            while (true)
            {
```

```
                message = new MqttApplicationMessageBuilder()
                        .WithTopic("hello/world/news")
                        .WithPayload("Temperatures below " + i + " !")
                        .WithExactlyOnceQoS()
                        .Build();

                mqttServer.PublishAsync(message);
                Thread.Sleep(1000);
                Console.WriteLine(i + "");
                i--;
            }
        }
    }
}
```

4.1.8 Object Tracker

The script exposes some useful functions that allows customization and remoting of the Object Tracker. For example, the **StopTracker** and **TakeOutTracker** function could be used to quickly remove tracking or On Air graphics.

- int **GetActiveTracker** ( )
    - Gets the currently active tracker index (starting from 1).
- int **SetActiveTracker** (int tracker)
    - Sets the currently active tracker index (starting from 1). Returns the active tracker index.
- void **TakeTracker** ( )
    - Takes tracker On Air all trackers.
- void **TakeOutTracker** ( )
    - Takes tracker Off Air all trackers.
- void **PreviewTracker** ( )
    - Previews all trackers.
- void **PreviewOutTracker** ( )
    - Removes all trackers from preview.
- void **StopTracker** ( )
    - Stops all trackers.
- void **StopTracker** (int index)
    - Stops the tracker with index (starting from 1).
- void **ResetPointerOffset**(int index)
    - Reset the pointer offset for tracker with index (starting from 1).

4.1.9 Viz Arena

The script exposes some useful functions concerning the **Viz Arena** integration.

- bool **DetectArenaCalibration** ( )
    - Redetects the camera calibration (same as the **D** shortcut in Viz Arena).
- bool **ClearArenaCalibration** ( )
    - Clears the camera calibration (same as the **BACKSPACE** shortcut in Viz Arena).

- bool **ClearArenaKeyer** ( )
  - Clears the Keyer mask (same as the **C** shortcut in Viz Arena).
- string[] **GetArenaCameraList** ( )
  - Returns a string-list of available cameras.
- string **GetCurrentArenaCamera** ( )
  - Returns the name of the current camera.
- int **GetCurrentArenaCameraIndex** ( )
  - Returns the zero based index of the current camera.
- bool **IsArenaConnected** ( )
  - Returns whether Viz Arena is running and connected to Viz Arc.

4.1.10 Parameter

All parameters are exposed to the global script and can be accessed via their unique ID.

arc provides an alternative way of getting them.

- BaseParameter **GetParameter** (string id)
  - Gets the parameter identified by the unique id that was input.

It's also possible to get and set a parameter's value directly from **arc**.

- dynamic **GetParameterValue** (string id)
  - Gets the value of the parameter identified by the unique id that was input. [dynamic] The returned value's type depends on the parameter type.
- void **SetParameterValue** (string id, dynamic value)
  - Sets the value of the parameter identified by the unique id that was input. [dynamic] Input variable value can be of any type, see parameters for valid types.

In case you don't want the callback function **OnParameterChanged** to be triggered when changing a value using SetParameterValue, you can use **SetParameterRawValue**. This method does not trigger any calls to **OnParameterChanged**.

- void **SetParameterRawValue** (string id, dynamic value)
  - Sets the value of the parameter identified by the unique id that was input. [dynamic] Input variable value can be of any type, see parameters for valid types.

Buttons are a special case in the sense that they don't hold a value, and therefore have a separate method for triggering their *click*.

- void **PushParameterButton** (string id)
  - Triggers a pressed event on the button identified by the unique id that was input.

> **Note:** Button presses trigger the global script's callback **OnButtonPressed.**

> **Note:** Parameter value changes trigger the global script's callback **OnParameterChanged.**

Parameter Examples

```
// Setting the value of a bool parameter (id = ShowHighlights) to false
// direct assigment
ShowHighlights.Value = false
// Get parameter via arc and then assign to Value
GetParameter("ShowHighlights").Value = false
// Set Parameter value via arc without interacting with the actual parameter
SetParameterValue("ShowHighlights", false)

// Getting the value of a bool parameter (id = ShowHighlights)
var highlightState = GetParameterValue("ShowHighlights")

// Push LoadFixtures button
PushParameterButton("LoadFixtures")
```

4.1.11 Channel

arc grants access to Viz Arc profiles. This is useful whenever more precise control is required for communicating with the Engines.

- ScriptingProfile **GetSelectedProfile** ( )
  - Returns the currently selected profile.
- int **GetChannelCount** ( )
  - Returns the number of channels on the currently selected profile.
- ScriptingChannel **GetChannel** (int index)
  - Returns the channel at the *index* position on the currently selected profile.
- ScriptingChannel **GetChannel** (string channelName)
  - Returns the channel named *channelName* on the currently selected profile.
- ScriptingChannel **GetPreviewChannel** ( )
  - Returns the preview channel of the currently selected profile.
- ScriptingChannel **GetProgramChannel** ( )
  - Returns the program channel of the currently selected profile.
- ScriptingChannel **GetSelectedChannel** ( )
  - In a template script it returns the currently selected channel of the Template Action.
    In the global script it returns the program channel of the currently selected profile.

Channel Handling Examples

```
// Clear main layer on all channels using GetChannelCount() and GetChannel(int)
for (var i = 0; i < GetChannelCount(); i++) {
  GetChannel(i).SendSingleCommand("RENDERER*MAIN_LAYER SET_OBJECT")
}

// Send message to VideoWallchannel via GetSelectedProfile () and GetChannel(string)
```

```
GetChannel("VideoWall").SendSingleCommand("RENDERER*MAIN_LAYER SET_OBJECT")
GetSelectedProfile().GetChannel("VideoWall").SendSingleCommand("RENDERER*MAIN_LAYER
SET_OBJECT")
```

4.1.12 Viz Engine/Unreal Engine Communication

arc provides quick access functions for sending messages to specific channels/Engines.

- void **SendSingleCommand** (string command, string channelName)
  - Sends *command* to all the Engines in the specified channel channelName.
- void **SendMultipleCommands** (string[] commands, string channelName)
  - Sends all the input *commands* to all the Engines in the specified channel *channelName*.
- string **GetFromEngine** (string command, string channelName)
  - Sends *command* to all the Engines in the specified channel *channelName*. Returns the answer to the sent *command*.
- string **GetFromVizEngine** (string command)
  - Sends command to the currently selected profile's Viz **editing Engine**. Returns the answer to the sent *command*.
- string **GetFromUnrealEngine** (string command)
  - Sends command to the currently selected profile's Unreal **editing Engine**. Returns the answer to the sent *command.*
- string **GetFromEngineAsync** (string command, string channelName, int timeout = -1)
  - Sends *command* to all the Engines in the specified channel *channelName*. Returns the answer to the sent *command*.
    If timeout is specified and larger than 0, the method times out after *timeout* milliseconds if it does not receive an answer within that time.
- string **GetFromEngineAsync** (string command, int timeout = -1)
  - Sends *command* to all the Engines in the specified selected channel of the template. Returns the answer to the sent *command*.
    If timeout is specified and larger than 0, the method times out after *timeout* milliseconds if it does not receive an answer within that time.
- string **GetFromVizEngineAsync** (string command)
  - Sends command to the currently selected profile's Viz **editing Engine**. Returns the answer to the sent *command*.
- string **GetFromUnrealEngineAsync** (string command)
  - Sends command to the currently selected profile's Unreal **editing Engine**. Returns the answer to the sent *command*.

Viz Engine Communication

```
// Get scene from parameter and set it to Viz Engine main layer
SendSingleCommand(GetParameterValue("MainSceneSelector"), "Main")

// Clear Main, Back and Front layers on channel
```

```
var CleanCommands = ["RENDERER*MAIN_LAYER SET_OBJECT", "RENDERER*BACK_LAYER
SET_OBJECT", "RENDERER*FRONT_LAYER SET_OBJECT"]
SendMultipleCommands(CleanCommands, "Viz")

// Query Viz channel and Viz editing engine for the currently loaded scene
GetFromEngine("SCENE SCENE*SCENE GET", "Viz")
GetFromVizEngine("SCENE SCENE*SCENE GET")
```

The **async** variants can be used only when using the JavaScript language and have the advantage that they do not lock up the UI.

Async Samples

```
Global.OnButtonPressed = async function (id)
{
    if( id == "getVersionButton" ){
        const answer = await GetFromEngineAsync("VERSION", "localviz")
        Console.WriteLine("Viz Version is: " + answer)
    }
}
```

Note: If you use **await**, the enclosing function needs to be **async**. You can add this attribute manually in case you use it within a Viz Arc callback.

4.1.13 Tracking Hub Command

arc provides quick access functions for sending messages to the configured Tracking Hub.

- void **SendSingleTHCommand** (string command)
  - Sends *command* to the Tracking Hub (if configured and connected).
- string **GetFromTH** (string command)
  - Sends *command* to the Tracking Hub (if configured and connected) and returns the answer.
- string **GetFromTHAsync** (string command)
  - The asynchronous version of **GetFromTH**.

4.1.14 SMM Handling

- void **SendToSMM** (string key, string value, bool doEscape)
  - Sends key-value pair to Shared Memory to the first channel of the current profile. *doEscape* specifies whether the value string is escaped.
- void **SendToSMM** (string key, string value, bool doEscape, string channel)
  - Sends key-value pair to Shared Memory to all Engines contains in *channel*. *doEscape* specifies whether the value string is escaped.
- void **SendToSMM** (string key, string value, bool doEscape, string channel, string destination)
  - Sends key-value pair to Shared Memory to all Engines contains in *channel*. *doEscape* specifies whether the value string is escaped.

- *destination* can be either SYSTEM, COMMUNICATION or DISTRIBUTED

The shared memory updates are sent to the UDP or TCP port configured on the target Viz Engine; if both are configured, it is sent to the UDP port. The Viz Communication Shared Memory map is therefore utilized. You can read more on Shared Memory configuration in the Profiles section in the *Viz Arc User Guide*.

SMM Example

```
// Send to Viz Channel SMM the variable "Target1" with the value from TargetState
SendToSMM("Target1", TargetState.Value, false, "Viz")

// Send to Viz Channel SMM the variable "Target2" with the value "Hello World!".
// The last parameter "DISTRIBUTED" indicates that the value will be propagated to
all engines connected to the same Graphic Hub
SendToSMM("Target2", "Hello World!", false, "Viz", "DISTRIBUTED")
```

4.1.15 GPI

The connected GPI state can be changed via the **arc** functionalities:

- void **SignalGpiChannel** (int channelIndex, bool signalHigh)
  - Signals set the GPI channel at *channelIndex* to either high or low.

The following snippet presents a function that loads a scene to the "Main" channel and signals the GPI:

GetAction Example

```
function LoadScene()
{
    // Get scene from parameter and set it to Viz Engine main layer
    SendSingleCommand(GetParameterValue("MainSceneSelector"), "Main")
    // Set gpi channel 2 to High
    SignalGpiChannel(2, true)
}
```

⚠ **Note:** GPI must be enabled on the config.

4.1.16 Viz Pilot

Viz Pilot data elements can be created from scripting using the method *CreatePilotDataElement*. There are two ways to invoke this method:

- async bool **CreatePilotDataElement** (BaseAction action, string name)
  - Creates a Viz Pilot data element of *action* and name *name*. The function returns true on success.
- The BaseAction method:
  - async bool **CreatePilotDataElement** (string name)

- Creates a Viz Pilot data element with name *name*. The function returns true on success.

```
Global.OnButtonPressed = async function (id)
{
    try{
      if( id == "createpilotButton" )
      {
          // use global method
          await CreatePilotDataElement(GetAction("loadSceneA"), "LoadSceneA")
          // use method defined on the BaseAction itself
          await
GetAction("loadSceneA").CreatePilotDataElement("LoadSceneA_fromAction")
      }
    }catch(ex)
    {
        // error handle
        Console.WriteLine("ex " + ex + " " + ex.stack)
    }
}
```

4.1.17 Timer

- void **CreateTimer** (string id)
  - Creates a timer that can be accessed via its unique *id*.
- void **CreateTimer** (string id, int ms)
  - Starts a timer that can be accessed via its unique *id* and has a tick interval of *ms*.
- void **StartTimer** (string id, int ms)
  - Gets the timer identified by *id*, sets the tick interval to *ms* and starts it.
- void **StopTimer** (string id)
  - Gets the timer identified by *id* and stops it.

The following example creates a timer on the OnInit callback, makes use of two buttons to start/stop the timer and writes to the console whenever the timer ticks:

Timer Example

```
// Timer id
var heartBeatTimerId = "HeartBeat"

Global.OnInit = function ()
{
  // Create timer with id heartBeatTimerId
  CreateTimer(heartBeatTimerId)
}

Global.OnButtonPressed = function (id)
{
```

```
  if(id == "TimerStart")
    StartTimer(heartBeatTimerId, 1000)
  else if(id == "TimerStop")
    StopTimer(heartBeatTimerId)
}

// Script callback for timer ticks
Global.OnTimer = function (id)
{
  Console.WriteLine("Timer Tick " + id)
}
```

Note: Whenever a timer ticks the global script's callback **OnTimer** is called.

4.1.18 setTimeout

An alternative way to delay a certain action, is to use the built-in awaitable function *setTimeout*. It allows to call a function after a certain amount of time.

```
Global.OnButtonPressed = async function (id)
{
    if( id == "testButton" )
        await setTimeout(doSomething, 3000) // call doSomething after 3 seconds
}

function doSomething()
{
    Console.WriteLine("we are in doSomething")
    SetData("timedate", Date().toString()) // set some data on the DataMap
}
```

In the example above, the method *doSomething* gets called after waiting for three seconds. It is important to use the **await** keyword before **setTimeout**. The await keyword can only be used in methods declared as **async**. Add the async keyword on the Viz Arc callbacks, as seen above with *Global.OnButtonPressed = async function (id)*.

4.1.19 StreamDeck

Any connected StreamDeck that is configured to be used exclusively with **arc**, can have its buttons customized using one of the following methods:

- void **SetStreamdeckKey** (int key, string label, int fontSize)
  - Baseline version, sets streamdeck key at *key index* image to a black square with *label* text of *fontSize* size.
- void **SetStreamdeckKey** (int key, string label, int fontSize, string imageFullPath)
  - Same as the baseline version but instead of a black block it sets a local image (at *imageFullPath*) as background. *imageFullPath* can be either a local file system path or a Graphic Hub path.
- void **SetStreamdeckKey** (int key, string label, int fontSize, int r, int g, int b)
  - Same as the baseline version but instead of black it uses an RGB color as background.

- void **SetStreamdeckKey** (int key, string label, int fontSize, int r, int g, int b, string imageName)
    - Same as baseline version using background color *r, g, b* and *imageName* on top of the background color (in case the image contains an alpha channel).
- void **SetStreamdeckKey** (int key, string label, int fontSize, string horAlignment, string vertAlignment, string textAlignment, int r, int g, int b, string imageName)
    - Same as the previous version, where text is *horAlignment* aligned horizontally, vertically by *vertAlignment* and the text itself is centerd through *textAlignment.*
        - hor*Alignment* can be either "Left", "Center" or "Right"
        - vert*Alignment* can be either "Top", "Center" or "Bottom"
        - *textAlignment* can be either "Left", "Center" or "Right"

Any key can have its contents cleared with the following method:

- void **ClearStreamdeckKey** (int key)
    - Clears the content of the Streamdeck key at key *index*

StreamDeck Key Configuration Example

```
function SetupStreamDeck()
{
    // Key 0: Black background, size 20 "Clear" text
    SetStreamdeckKey(0, "Clear", 20)
    // Key 1: Image background, size 20 "Load AR" text
    SetStreamdeckKey(1, "Load AR", 20, "D:/Soccer/Images/ARThumbnail.png")
    // Key 2: Blue background, size 20 "Continue" text
    SetStreamdeckKey(2, "Continue", 20, 0, 0, 255)
    // Key 3: Gray background, using headshot from Graphic Hub (image may contain an
alpha channel)
    SetStreamdeckKey(3, " ", 20, 100, 100, 100, "IMAGE*/Default/MasterImages/
headshot_0123")
   // Key 4: Gray background, using headshot from Graphic Hub (image may contain an
alpha channel), Text "John Doe" is top left aligned
    SetStreamdeckKey(4, "John Doe", 20, "Left", "Top", "Left", 100, 100, 100,
"IMAGE*/Default/MasterImages/headshot_0123")
}

Global.OnInit = function () {
    // Clean first 3 keys
    ClearStreamdeckKey(0)
    ClearStreamdeckKey(1)
    ClearStreamdeckKey(2)

    SetupStreamDeck()
}
```

Another sample that prints some useful information using the **external StreamDeck plugin**.

```
function printSDEvenyInfo(sdEvent)
{
```

```
    // print all the available information for a StreamDeck event
    Console.WriteLine("StreamDeck Event Info:")
    Console.WriteLine("Event Type:   " + sdEvent.EventType)
    Console.WriteLine("Device Index: " + sdEvent.DeviceIndex)
    Console.WriteLine("Device ID:    " + sdEvent.Id )
    Console.WriteLine("Column:       " + sdEvent.XKey )
    Console.WriteLine("Row:          " + sdEvent.YKey )
    Console.WriteLine("Payload:      " + sdEvent.Payload )

    // if it's a dial or touch event print additional info
    // for StreamDeck + devices only
    if( sdEvent.hasOwnProperty("Ticks") )
        Console.WriteLine("Ticks:        " + sdEvent.Ticks )
    if( sdEvent.hasOwnProperty("TapPosX") )
        Console.WriteLine("TapPosX:      " + sdEvent.TapPosX )
    if( sdEvent.hasOwnProperty("TapPosY") )
        Console.WriteLine("TapPosY:      " + sdEvent.TapPosY )
}

Global.OnStreamDeckTouchTap = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
Global.OnStreamDeckDialRotate = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
Global.OnStreamDeckDialDown = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
Global.OnStreamDeckDialUp = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
Global.OnStreamDeckKeyDown = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
Global.OnStreamDeckKeyUp = function (sdEvent)
{
    printSDEvenyInfo(sdEvent)
}
```

4.1.20 Graphic Hub REST

arc provides some methods that allow to retrieve information about the current Graphic Hub REST server in use. It is meant to help using the Graphic Hub REST interface directly.

- string **GetGHHost** ( )
  - Returns the Graphic Hub REST host name (for example, *localhost or 10.81.44.71*).
- string **GetGHPort** ( )

    - Returns the Graphic Hub REST port (for example, `19398`).
- string **GetGHConnectionString** ( )
    - Returns the complete connection string based on the configured Host and Port (for example, *http://localhost:*`19398`).
- string **GetGHUser** ( )
    - Returns the Graphic Hub REST user name (for example, *Guest* or *Admin*).
- string **GetGHAuthenticationValue** ( )
    - Returns the base64 authentication string which is a combination of the user name and password (for example, *QWRtaW46Vml6RGI=*).
- bool **ImportArchive** (string path)
    - Import a via archive through the REST service. Beware that all assets in the via override the content's of the Graphic Hub. Returns true on success and false on failure.
- async Task<bool> **ImportArchiveAsync** (string path)
    - Async version of the above method.

Below is a code sample that fetches all the image names of a given Graphic Hub path using the **GetGHConnectionString** and **GetGHAuthenticationValue** functions.

Sample

```
function getFolderId( path )
{
    let folderId = ""
    let request = new XMLHttpRequest()

    request.onreadystatechange = function() {
        if (request.readyState == 4 && request.status == 200 ) {
            //Console.WriteLine("respones: " + request.responseText)

            xmlDoc = new XmlDocument()
            xmlDoc.LoadXml(request.responseText)
            //Console.WriteLine("nodes " + xmlDoc.ChildNodes.Count)

            // create namespace manager
            nsmgr = new XmlNamespaceManager(xmlDoc.NameTable)
            // add namespace
            nsmgr.AddNamespace("x", "http://www.w3.org/2005/Atom")

            // search for x:model
            root = xmlDoc.DocumentElement
            folderId=root.SelectSingleNode("/x:feed/x:entry/x:id",
nsmgr).InnerXml.split(':')[2]
            Console.WriteLine("folder id " + folderId)
        }
    }
    request.open("GET", GetGHConnectionString()+"/translator/?path="+path, true)
    request.setRequestHeader("Authorization", "Basic " + GetGHAuthenticationValue())
    request.send();
```

```
    // fetch the images using the folder uuid
    GetImagesOfFolder(folderId)
}

function GetImagesOfFolder(folderId)
{
    let request = new XMLHttpRequest()

    request.onreadystatechange = function() {
        if (request.readyState == 4 && request.status == 200 ) {
            //Console.WriteLine("respones: " + request.responseText)

            xmlDoc = new XmlDocument()
            xmlDoc.LoadXml(request.responseText)
            //Console.WriteLine("nodes " + xmlDoc.ChildNodes.Count)

            // create namespace manager
            nsmgr = new XmlNamespaceManager(xmlDoc.NameTable)
            // add namespace
            nsmgr.AddNamespace("x", "http://www.w3.org/2005/Atom")

            // search for nodes 'entry'
            root = xmlDoc.DocumentElement
            imageNodes=root.SelectNodes("/x:feed/x:entry", nsmgr)
            //Console.WriteLine("nodes " + imageNodes.Count)

            let imageList = []

            for( node of imageNodes )
            {
                Console.WriteLine("image " + node.SelectSingleNode("./x:title",
nsmgr).InnerXml)
                imageList.push(node.SelectSingleNode("./x:title", nsmgr).InnerXml)
            }
            // set the dropdown
            // imagesDD.SetItems(imageList)
            }
    }
    request.open("GET", GetGHConnectionString()+"/files/" + folderId + "/?
term=IMAGE", true)
    request.setRequestHeader("Authorization", "Basic " + GetGHAuthenticationValue())
    request.send()
}
```

Other functions relative to the Graphic Hub:

- async Task<string[]> **GetImages**(path)
    - returns a string list of images in the Graphic Hub.

```
async function fetchImages(path)
{
```

```
    Console.WriteLine("fetching images in " + path)

    const results =  await GetImages(path).then(results =>
    {
        dropdown_0.SetItems(results)
    })
}

Global.OnButtonPressed = function (id)
{
    if( id == "button_0" )
    {
        dropdown_0.Clear()
        fetchImages("sports/soccer/headshots")
    }
}
```

The above code snippet populates a dropdown with the image names contained in the Graphic Hub path *sport/soccer/headshots*.

4.1.21 DataMap

arc provides a simple interface (get and set) for interacting with Viz Arc's DataMap:

- dynamic **GetData** (string varName)
  - Returns the value belonging to the variable named *varName.* [dynamic] Returned value depends on what was set to *varName*.
- void **SetData** (string varName, dynamic value)
  - Inserts (or overwrites if varName already exists) t*he key:value* pair into Viz Arc's DataMap. [dynamic] Input *value* can be of any type.
- bool **HasData** (string varName)
  - Returns true if varName exists in the DataMap.
- void **SubscribeDataMap** (string variableName)
  - Subscribes to a specific key (Empty string subscribes to all changes). The subbed variables feedback triggers the script callback "OnDataMapValueChanged".
- void **UnsubscribeDataMap** (string variableName)
  - Unsubscribes from a specific key (Empty string unsubscribes to all changes).
- string[] **GetDataKeys** ( )
  - Returns a complete list of all DataMap key entries.

DataMap Example

```
Global.OnInit = function ()
{
  // make sure OnDataMapValueChanged is called when "someData" changes
  SubscribeDataMap("someData")

  // use blank string to subscrive to all DataMap changes
```

```
  //SubscribeDataMap("")

  // create a timer that triggers every second
  CreateTimer("aTimer")
  StartTimer("aTimer", 1000)
}

// Callback for DataMap changes
Global.OnDataMapValueChanged = function (varName)
{
  if(varName == "someData")
    UpdateSomeData(GetData(varName))
}

function UpdateSomeData( theData )
{
  // do something here
  Console.WriteLine( "new data " + theData )
}

Global.OnTimer = function (id)
{
  // generate some fresh data using the current time for testing
  // such that OnDataMapValueChanged gets called
  if( id == "aTimer" )
    SetData("someData", Date.now())
}

function printDataMap()
{
  var keys = GetDataKeys()

  for( k of keys )
    Console.WriteLine(k + " = " + GetData(k) )
}
```

⚠ **Note:** Whenever a DataMap variable changes the global script's callback **OnDataMapValueChanged** is called.

4.1.22 NDI

arc provides an interface to handle metadata feedback from NDI sources.

- string[] **GetNDISourceList** ( )
  - Returns an array with all the names of the available NDI sources.
- string[] **GetNDIPTZSourceList** ( )
  - Returns an array with all the names of the available NDI sources with PTZ control capabilities.
- void **SubscribeNdiSourceMetadata** (string source)

    - Subscribes to the metadata feedback on the NDI source identified by the provided source input. The feedback is sent to the datamap with key equal to the source name.
- void **UnsubscribeNdiSourceMetadata** (string source)
    - Unsubscribes the NDI feedback.
- bool **SendNDIMetadata** (string name, string XMLString)
    - Sends a **XMLString** to a source identified by **name**. Returns true on success, false otherwise.

DataMap Example

```
Global.OnInit = function ()
{
  // Get a list of available NDI sources (can take some time to update)
  var sources = GetNDISourceList()

  // subscribe to metadata changes on a ndi stream
  SubscribeNdiSourceMetadata("NEWTEKPTZ (Channel 1)")

  // metadata will be written into the DataMap, so register to the DataMap changes
also
  SubscribeDataMap("NEWTEKPTZ (Channel 1)")
}

Global.OnDataMapValueChanged = function (varName)
{
  Console.WriteLine(varName + " changed")
  // NDI metadata is typically in xml format
  Console.WriteLine(GetData(varName).ToString())
}

Global.OnParameterChanged = function (id)
{
  if( id == "sendMetadata")
  {
    SendNDIMetadata("NEWTEKPTZ (Channel 1)", "<?xml version='1.0' encoding='UTF-8'?
><camera_control><command group_id='0' parameter_id='3' value='0.43'></
camera_control>")
  }
}
```

4.1.23 File Handling

- string **ReadTextFile** (string filename, string encoding = "UTF8")
    - Returns a *encoding* encoded string containing the whole content of the text file.
- bool **WriteTextFile** (string FullPath, string data, string encoding = "UTF8")
    - Writes a file at *FullPath* with its content equal to the encoded input *data*.

Valid encodings: "UTF8" , "ASCII", "BigEndianUnicode", "Default" [System defined encoding], "UTF32", "UTF7"

File Handling Example

```
// Get the StartList file content from the directory defined by the Directory
parameter "WorkingDir"
ReadTextFile( WorkingDir.Value + "\\StartList.json")

// Write the results to the directory defined by the Directory parameter "WorkingDir"
WriteTextFile( WorkingDir.Value + "\\RaceResults.json", results)
```

4.1.24 Logging

- bool **AddLog** (string fileName, string content)
  - Appends *content* to *fileName*, and returns true on success, false otherwise.
    If the file *fileName* does not exist, it is created.

```
// register data map changes somewhere (e.g. SubscribeDataMap(""))
Global.OnDataMapValueChanged = function (varName)
{
    AddLog("c:/tmp/templateLog.txt", "getting data " + varName + " = " +
GetData(varName))
}
```

The produced log file content contains entries as the example below:

```
2025/07/08 19:20:34.1389|getting data TIMECODE = 02:55:59:43
```

4.1.25 JSON

- dynamic **ParseJson** (string data)
  - Deserializes the input *data* and returns a JSON object if successful.

On the returned JSON object you can access the members directly using their name. Use the "ToString()" method on any of the objects to convert them to strings.

```
var json = ParseJson("{time: '1994-11-05T13:15:30Z', title: 'Viz Arc', subtitle:
'Vizrt', messageId: 1}")
Console.WriteLine("the whole json " + json.ToString())
Console.WriteLine("the title is " + json.title.ToString())
```

When using the V8 Scripting Engine the built-in **JSON.parse** and **JSON.stringify** methods can be used

```
var json = JSON.parse('{"time": "1994-11-05T13:15:30Z", "title": "Viz Arc",
"subtitle": "Vizrt", "messageId": 1}')
Console.WriteLine("the whole json " + JSON.stringify(json))
Console.WriteLine("the title is " + json.title)
```

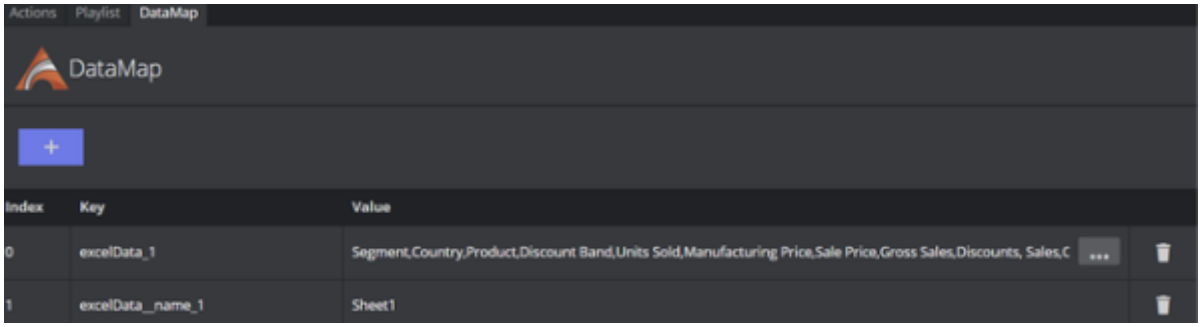
4.1.26 Excel

- string **convertXLSToCSV** (string excelFilePath, string csvOutputFile, string separator = "\t", int worksheetNumber = 1)
    - Converts an existing *.xls* file *excelFilePath* to a comma separated CSV file *csvOutputFile* usign *separator* (default tab separator) and using worksheet number *worksheetNumber* (1 default being the first worksheet in the Excel file).
    - On successful conversion the function returns the CSV output as a string.
- string **convertXLSToCSVString** (string excelFilePath, string separator = "\t", int worksheetNumber = 1)
    - Converts an existing *.xls* file *excelFilePath* to a comma separated CSV string using *separator* (default tab separator) and using worksheet number *worksheetNumber* (1 default being the first worksheet in the Excel file).
    - On successful conversion the function returns the CSV output as a stirng.
- void **convertXLSToCSVDataMap** (string excelFilePath, string dataMapPrefix, string separator = "\t", int fromSheet = 1, int toSheet = -1)
    - Converts an existing *.xls* file *excelFilePath* to a comma separated CSV file *csvOutputFile* usign *separator* (default tab separator) and using an optional range of worksheets. When *toSheet* is -1 it converts all worksheets. The resulting worksheets are written into the **DataMap** using the specified prefix in *dataMapPrefix.* The name of the worksheet is written to the DataMap key *dataMapPrefix<name>_<index>*.

```
let separator = ";"
// convert excel to CSV file, use ; as separator and read the second sheet
convertXLSToCSV("c:/tmp/ExcelData.xlsx", "c:/tmp/ExcelData.csv", separator, 2)
// read the whole csv file into a string
var fileContent = ReadTextFile("c:/tmp/ExcelData.csv")
var EntryArr = fileContent.split("\n")

// First line is for the headers, ignore it
for(i = 0; i < EntryArr.length; i++)
{
    // split the row
    var spl = EntryArr[i].split(separator)
    if( spl.length <= 1 )
        continue;

    Console.WriteLine("row " + i + ":")

    // print colums one by one separated by a whitespace
    for( entry of spl )
        Console.Write( entry.trim() + " " )
```

```
    Console.WriteLine("")
}

// another writing all worksheets to the DataMap, use separator ","
convertXLSToCSVDataMap("c:/tmp/ExcelData.xlsx", "excelData_", ",")
```

How the resulting **DataMap** might look like after calling *convertXLSToCSVDataMap* when the excel file contains just one worksheet.



4.1.27 Callbacks

- **OnParameterChanged** (string parameterID)
  - Called whenever a parameter (except button and table) changes. *parameterID* is the ID of the parameter that triggered the callback.
- **OnButtonPressed** (string buttonName)
  - Called when a parameter button is pressed. *buttonName* is the ID of the button that triggered the callback.
- **OnMiddleButtonPressed** (string buttonName)
  - Called when a button is pressed with the middle mouse button. *buttonName* is the ID of the button that triggered the callback.
- **OnRightButtonPressed** (string buttonName)
  - Called when a button is pressed with the middle mouse button. *buttonName* is the ID of the button that triggered the callback.
- **OnTimer** (string timerID)
  - Called when a timer ticks (completes a cycle). *timerID* is the ID of the timer that triggered the callback.
- **OnDataMapValueChanged** (string varName)
  - Called whenever a DataMap variable changes. *varName* is the ID of the variable that was changed.
- **OnStreamDeckKey** (string key)
  - Called whenever a StreamDeck button is pressed. *key* indicates the index of the pressed button.
  - This callback is used in conjunction with the internal Stream Deck integration

The following StreamDeck callbacks are used with the external Stream Deck integration:

- **OnStreamDeckKeyUp** (sdEvent)
  - Called whenever a Stream Deck button has been released.
  - sdEvent contains the following fields:
    - string **EventType** (the event type, for example, "keyUp")
    - string **Id** (the unique ID of the device)

        - int **DeviceIndex** (the index assigned to this device)
        - int **XKey** (the column index of the key)
        - int **YKey** (the row index of the key)
        - string **Payload** (the user defined payload)
- **OnStreamDeckKeyDown** (sdEvent)
    - Called whenever a Stream Deck button has been pressed.
    - sdEvent contains the same fields as **OnStreamDeckKeyUp**
- **OnStreamDeckDialUp** (sdEvent)
    - Called whenever a Stream Deck button has been pressed.
    - sdEvent contains the same fields as **OnStreamDeckKeyUp**
- **OnStreamDeckDialDown** (sdEvent)
    - Called whenever a Stream Deck button has been pressed.
    - sdEvent contains the same fields as **OnStreamDeckKeyUp**
- **OnStreamDeckDialRotate** (sdEvent)
    - Called whenever a Stream Deck button has been pressed.
    - sdEvent contains the same fields as **OnStreamDeckKeyUp** and additionally:
        - int **Ticks** positive number for clockwise rotation and negative for anticlockwise rotation. Minimum value is 1 and increases when doing fast movementes.
- **OnStreamDeckTouchTap** (sdEvent)
    - Called whenever a Stream Deck button has been pressed.
    - sdEvent contains the same fields as **OnStreamDeckKeyUp** and additionally:
        - int **TapPosX** number from 0 to 200 (on Stream Deck + device) representing the horizontal touch position
        - int **TapPosY** number from 0 to 100 (on Stream Deck + device) representing the vertical touch position
- **OnMidiEvent** (midiEvent)
    - Called whenever a midi event is registered on one of the attached and configured midi devices.
    - midiEvent contains the following fields:
        - string **DeviceName** (the name of the device triggering the midi event.
        - string **EventType** (either "ControlChange", "NoteOn" or "NoteOff").
        - int **Channel** (the control channel of the event).
        - int **Number** (the control number of the event).
        - int **Value** (the value of the event, in the range [0..127]).
        - int **Note** (the note of the event in case EventType is NoteOn or NoteOff).
        - int **Velocity** (the velocity of note event in case EventType is NoteOn or NoteOff).
- **OnDMXEvent** (dmxEvent)
    - Called whenever a dmx lighting value changes
    - dmxEvent contians the followinf fields:
        - short **Universe** (the Univers ehtat changed)
        - byte[] **DMXData** (the entire 512 byte long data array)
        - byte[] **change** (a 512 byte long array containing information about channel changes)
        - int **firstDiff** (the index of the first channel that changed)
    - bool HasChanged(int index)
      Call this function to check whether a certain channel has changed
- **Table Callbacks**

- **OnTableColumnsChanged** (string tableID)
  - Called whenever a table parameter's columns change in number. *tableID* is the ID of the table that triggered the callback.
- **OnTableRowsChanged** (string tableID)
  - Called whenever a table parameter's rows change in number. *tableID* is the ID of the table that triggered the callback.
- **OnTableCellValueChanged** (string tableID, int row, int column, BaseBlock cell)
  - Called whenever a table parameter's cell changes value. *tableID* is the ID of the table that triggered the callback. *row* and *column* indicate the position of the cell within the caller table parameter. *cell* is the cell object that was changed. Users can interact directly with it. When **Trigger on live changes** is enabled on the table property, this callback is called also while editing the cell, if not the callback is called when keyboard focus is lost on the edited cell.

Video Output Callbacks

- **OnVideoMouseLeftButtonDown** (Point point)
  - Invoked when the left mouse button is pressed on the preview output. *point.X* and *point.Y* are normalized coordinates in the range of [-0.5…0.5] where [0,0] is the centre of the screen.
- **OnVideoMouseRightButtonDown** (Point point)
  - Invoked when the right mouse button is pressed on the preview output. *point.X* and *point.Y* are normalized coordinates in the range of [-0.5…0.5] where [0,0] is the centre of the screen.
- **OnVideoMouseMove** (Point point)
  - Invoked when the right mouse moves on the preview output. *point.X* and *point.Y* are normalized coordinates in the range of [-0.5…0.5] where [0,0] is the centre of the screen.
- **OnVideoMouseWheel** (double delta)
  - Invoked when the mouse wheel is turned on the preview output. delta is a floating point typically being -120/120 depending on the direction of the wheel turn and the hardware connected.
- **OnVideoKeyDown** (char charKey , uint rawKey , KeyEventArgs eventArgs)
  - Invoked when a keyboard down event has taken place on the preview output. *charKey* contains the actual character of the pressed key, *rawKey* is the numeric representation of the pressed key and *eventArgs is a* System.Windows.Input.KeyEventArgs instance from the operating system representing the raw event information.

4.1.28 Exposed Objects

Console

- void **Write** (string message)
  - Writes the message to the scripting console.
- void **WriteLine** (string message)
  - Writes the message to the scripting console followed by a new line.

Info: When Viz Arc's log level is set to **TRACE**, the strings sent to *Write* and *WriteLine* are also logged in the global log file.

MessageBox

- void **Show** (string message)
    - Shows a message box with its content equal to *message*.
- void **Show** (string message, string title)
    - Shows a message box with titled *title* and with its content equal to *message*.

File Handling Example

```
// Log an error and show a message to the user
Console.WriteLine("Unable to load data")
MessageBox.Show("Unable to load data", "Load Error")
```

XmlDocument

XmlDocument allows you to read XML files or strings and aggregate data using XPath. Read more about XMLDocument and other classes here.

```
// create XmlDocument and load a xml from disc
xmlDoc = new XmlDocument()
xmlDoc.Load("C:/tmp/TestData.xml")
Console.WriteLine("nodes " + xmlDoc.ChildNodes.Count)


// create namespace manager
nsmgr = new XmlNamespaceManager(xmlDoc.NameTable)
// add namespace
nsmgr.AddNamespace("x", "http://www.contoso.com/books")

// search for book nodes under the books node
root = xmlDoc.DocumentElement
nodeList=root.SelectNodes("/x:books/x:book", nsmgr)
Console.WriteLine("books " + nodeList.Count)

for( var book of nodeList )
    Console.WriteLine("ISBN: " + book.GetAttribute("ISBN") + " title: " +
book.SelectSingleNode("./x:title", nsmgr).InnerXml)
```

The content of the sample test file *C:/tmp/TestData.xml* might look like this:

```
<?xml version="1.0" encoding="utf-8"?>
<books xmlns="http://www.contoso.com/books">
  <book genre="novel" ISBN="1-861001-57-8" publicationdate="1823-01-28">
    <title>Pride And Prejudice</title>
    <price>24.95</price>
  </book>
```

```
  <book genre="novel" ISBN="1-861002-30-1" publicationdate="1985-01-01">
    <title>The Handmaid's Tale</title>
    <price>29.95</price>
  </book>
  <book genre="novel" ISBN="1-861001-45-3" publicationdate="1811-01-01">
    <title>Sense and Sensibility</title>
    <price>19.95</price>
  </book>
</books>
```

XMLHttpRequest

With the XMLHttpRequest class you can fetch data from a remote server. Below is a sample that fetches asynchronously JSON data from a server.

```
var request = new XMLHttpRequest()

request.onreadystatechange = function() {
  if (request.readyState == 4 && request.status == 200 ) {
    Console.WriteLine("we are here")

    var json = JSON.parse(request.responseText)

    Console.WriteLine(JSON.stringify(json))

    for (elem of json)
        Console.WriteLine(elem.name)
  }
}
request.open("GET", "https://jsonplaceholder.typicode.com/users", true)
request.setRequestHeader( "Content-Type", "application/json" ) // make sure the
request header is set AFTER calling open
request.send()
```

Prevent Caching

It is possible that requests through **XMLHttpRequest** get cached and the results of the queries might seem outdated. In order to prevent caching you can add a random number as parameter of the request.

`request.open("GET", "https://jsonplaceholder.typicode.com/users?dummy="+Date.now() , true)`

In this case a dummy parameter is assigned with the current EPOCH date in milliseconds.

xlAppType

This type allows you to read Excel sheets directly.

Note: This object only works if there is a local Excel installation on the same machine where Viz Arc is running.

FSO

The FSO object allows you to read, create and write files.

- **OpenTextFile** (*filename*, [*iomode*, [*create*, [*format*]]])
  - *iomode* can be one of the following: IOMode.ForReading, IOMode.ForWriting, IOMode.ForAppending
  - *format* can be of the following: Tristate.TristateUseDefault (system default), TriState.TristateTrue (Unicode), TriState.TristateFalse (ASCII).

Reading a UTF8 Encoded Text File

```
var file = new FSO()
var stream = file.OpenTextFile("d:/testexport.txt")
// or
var stream = file.OpenTextFile("d:/testexport.txt", IOMode.ForReading, false,
Tristate.TristateTrue)

Console.WriteLine(stream.ReadAll())
```

4.1.29 xHost

The xHost object gives you access to virtually any .NET resource.

V8 Script Sample

```
var List = xHost.type('System.Collections.Generic.List')
var DayOfWeek = xHost.type('System.DayOfWeek')
var week = xHost.newObj(List(DayOfWeek), 7)
week.Add(DayOfWeek.Sunday)
```

You can even import entire assemblies:

V8 Enumerate Files in Directory

```
var clr = xHost.lib('mscorlib', 'System', 'System.Core', 'System.IO')
dropdown_0.Clear()
var dir = clr.System.IO.Directory
dropdown_0.SetItems(dir.GetFiles('c:\\tmp'))

// another sample that starts an external process "calc.exe"
var proc = xHost.lib('System.Diagnostics.Process')
```

```
proc.System.Diagnostics.Process.Start("calc.exe")
```

In the example above, a UI dropdown element named *dropdown_0* is populated with a file list contained in *c:\tmp* using .NET **System.IO.Directory** class instance.

4.1.30 Performance

The performance object provides access to performance-related information.

- **now** ( )
  Returns a floating point value of the EPOCH time in milliseconds.
- **sleep** (milliseconds, precise)
  Sleep for a certain amount of milliseconds. Set precise to **true** when a high precision timer is required.

```
let timeA = Performance.now()
Performance.sleep(500, true) // high perf sleep half second
// do something else
let timeB = Performance.now()

Console.WriteLine("timeA " + timeA)
Console.WriteLine("timeB " + timeB)
Console.WriteLine("time difference " + (timeB- timeA) + " ms")
```

4.1.31 SQL Sample

If you know the assembly name of a specific type, you can instantiate it using xHost.type(name, assemblyName) method.

```
var queryString = "SELECT * FROM someTable"
var connetionString = "Server=192.168.1.42,1433;UID=aUserID;PWD=SomePassword;"

// get types using xHost.type
var SqlConnection = xHost.type('System.Data.SqlClient.SqlConnection',
'System.Data.SqlClient')
var SqlCommand = xHost.type('System.Data.SqlClient.SqlCommand',
'System.Data.SqlClient')
var SqlDataReader = xHost.type('System.Data.SqlClient.SqlDataReader',
'System.Data.SqlClient')

connection = new SqlConnection(connetionString)
connection.Open()
var command = new SqlCommand(queryString, connection)
var reader = command.ExecuteReader()
// do something with the data
while (reader.Read())
{
    // iterate over the result and print the result on the console
    Console.WriteLine(reader.GetString(0))
}
```

```
connection.Close()
```

4.1.32 SQLite Sample

Another sample that uses the xHost.type function is the usage of a simple SQLite database. It is required that the SQLite libraries/DLLs are in the search path of the system or in the same directory as the Viz Arc executable.

```
var SQLiteConnection = xHost.type('System.Data.SQLite.SQLiteConnection',
'System.Data.SQLite')
// those two below are not needed for this sample as they dont get instantiated
explicityl
var SQLiteDataReader = xHost.type('System.Data.SQLite.SQLiteDataReader',
'System.Data.SQLite')
var SQLiteCommand = xHost.type('System.Data.SQLite.SQLiteCommand',
'System.Data.SQLite')

function ReadData(conn)
{
    // create q query
    sqlite_cmd = conn.CreateCommand()
    sqlite_cmd.CommandText = "SELECT Name FROM Artist LIMIT 10;" // read first 10
artists of the table

    // execute the query
    sqlite_datareader = sqlite_cmd.ExecuteReader();
    while (sqlite_datareader.Read())
    {
        // iterate over the result and print the result on the console
        Console.WriteLine(sqlite_datareader.GetString(0));
    }
}

function testSQLiteDB()
{
    // create a new connection specifying the database file name and the version
    // sample database can be found here https://github.com/lerocha/chinook-database
    conn = new SQLiteConnection("Data Source=C:\\tmp\\Chinook.db;Version=3;")
    try
    {
        // Open the connection:
        conn.Open()

        // read some data
        ReadData(conn)

        // close the connection
        conn.Close()
    }
    catch (ex)
    {
        Console.WriteLine("error in SQLite query " + ex)
```

```
    }
}

Global.OnInit = function ()
{
    testSQLiteDB()
}
```

4.1.33 TcpSend

The TcpSendAsync method, is used to send a short message to any host on any port of the network.

- Task<string> **TcpSendAsync** (string hostname, int port, string command, int timeoutInMs = 1000)
    - Send *command* to *hostname* on *port*. If the parameter *timeoutInMs* is not specified, a default timeout of 1 second is used.

```
Global.OnButtonPressed = async function (id)
{
    if( id == "sendTcp"){
        let response await TcpSendAsync("192.168.1.22", 1234, "say something\0",
5000)
        Console.WriteLine("response from client " + response)
    }
}
```

4.1.34 HtmlAgility Example

The classes **HtmlDocument** and **HtmlWeb** are exposed by the HtmlAgility library and enable parsing and data extraction of html pages.

```
//sample to use HtmlDocument class from HtmlAgility
 var doc = new HtmlDocument()
 doc.Load("c:/tmp/HtmlAgilityTest.html")

 for (var table of doc.DocumentNode.SelectNodes("//table")) {
   Console.WriteLine("Found: " + table.Id)

   for (var row of table.SelectNodes("tr")) {
     for (var cell of row.SelectNodes("th|td"))
       Console.Write(cell.InnerText + " ")
     Console.WriteLine("")
   }
 }

 // sample to use HtmlWeb class from HtmlAgility
 var html = "http://html-agility-pack.net/"
 var web = new HtmlWeb()
 var htmlDoc = web.Load(html)
```

```
var node = htmlDoc.DocumentNode.SelectSingleNode("//head/title")
Console.WriteLine("Node Name: " + node.Name + "\n" + node.OuterHtml)
```

The contents of the file from the sample above *c:/tmp/HtmlAgilityTest.html*:

HTML Sample with Table

```
<!DOCTYPE html>
<html>
<style>
    table, th, td {
        border: 1px solid black;
    }
</style>
<body>
    <h2>A HTML table to test HTML Agility</h2>
    <table style="width:100%" id="dataTable">
        <tr>
            <th>Name</th>
            <th>Number</th>
            <th>Country</th>
        </tr>
        <tr>
            <td>Athlete A</td>
            <td>42</td>
            <td>Italy</td>
        </tr>
        <tr>
            <td>Athlete B</td>
            <td>34</td>
            <td>Japan</td>
        </tr>
    </table>
    <p>Here is some more text</p>
</body>
</html>
```

Read more about HtmlAgility here.

4.1.35 Main Script-only

There are functionalities that are specific to Viz Arc's main script:

Canvas Tabs Handling

- void **SetActionsSelectedTab** (string tabName)
    - Looks for a tab named *tabName* and sets it as active.
- void **SetActionsSelectedTab** (int tabIndex)
    - Sets the Action selected tab to the tab at *tabIndex* index.

- string **GetActionsSelectedTabName** ( )
    - Returns the currently selected tab's name.
- string[] **GetActionsTabs** ( )
    - Returns a string array with all tab names.

Action Template Handling

Arc's main scripts allows the user to interact with template actions on the action canvas.

- void **PreviewSelectedTemplate** ( )
    - Previews the currently selected template action.
- void **ExecuteSelectedTemplate** ( )
    - Executes the currently selected template action.
- void **UpdateSelectedTemplate** ( )
    - Updates the currently selected template action.
- void **ContinueSelectedTemplate** ( )
    - Continues the currently selected template action.
- void **StillPreviewSelectedTemplate** ( )
    - Generates a still preview of the currently selected template action.

> ⚠ **Note:** The method presented only works when one and only one action (template action) is selected on the action canvas.

Callbacks

- **PreActionExecute** (string actionName)
    - Called whenever an is executed and before the actual execution occurs.
    - actionName is the name of the action that is being executed.
- **PosActionExecute** (string actionName)
    - Called whenever an is executed and after the actual execution occurs.
    - actionName is the name of the action that is being executed.
- **OnInit** ( )
    - Called when the main script is started (User clicks on the **Start** button).

4.1.36 Template Script-only

The template script is a specific version that is used on the template designer and on the template action.

Action/Designer Handling

- void **ExecuteTemplate** ( )
    - Execute the owner template action or loaded template in the designer.
- void **ContinueTemplate** ( )
    - Continues the owner template action or loaded template in the designer.
- void **OutTemplate** ( )
    - Takes out the owner template action or loaded template in the designer.

- void **UpdateTemplate** ( )
  - Updates the owner template action or loaded template in the designer.
- void **UpdateTemplate** (string COs = null)
  - Updates the owner template action or loaded template in the designer. The parameter COs is a space separated list of Control Object ID's that shall be updated. For large templates containing a big amount of ControlObjects this is a very efficient alternative whenever only a small part in the scene needs to be updated. For example, UpdateTemplate("currentScore totalScore") updates only the two ControlObjects with id "currentScore" and "totalScore".
- void **UpdateTemplate** ("BP_Name.VariableName")
  - Updates the owner template action or loaded template in the designer. This method can be used if the scene is in Unreal Engine. For large templates containing a large amount of variables, this is a very efficient alternative when only a variable in the blueprint needs to be updated.
- void **UpdateTemplate** ("BP_Name", "[VariableName1, VariableName2, ecc...]")
  - Updates the owner template action or loaded template in the designer. This method can be used if the scene is in Unreal Engine. For large templates containing a large amount of variables, this is a very efficient alternative when only a few variables in the blueprint need to be updated.
- void **PreviewTemplate** ( )
  - Previews the owner template action or loaded template in the designer.
- void **PreviewExecuteTemplate** ( )
  - Executes the owner template action or loaded template in the designer to the preview channel.
- void **PreviewContinueTemplate** ( )
  - Executes the owner template action or loaded template in the designer to the preview channel.
- void **PreviewOutTemplate** ( )
  - Executes the owner template action or loaded template in the designer to the preview channel.
- void **PreviewUpdateTemplate** (string COs = null)
  - Updates the owner template action or loaded template in the designer to the preview channel. The parameter COs is a space separated list of Control Object ID's that shall be updated. For large templates containing a big amount of ControlObjects this is a very efficient alternative whenever only a small part in the scene needs to be updated. For example, UpdateTemplate("currentScore totalScore") updates only the two ControlObjects with id "currentScore" and "totalScore".

Properties

- BaseAction **ThisAction**
  - Returns the script accessor of this template. **ThisAction** might be null when using the template editor.

```
if( ThisAction ){
  // set the action's name
  ThisAction.Name = "Hello"
  // set the action's tooltip description
  ThisAction.Description = "Hello Description"
}
```

Control Object Handling

The template script allows the user to interact with the template's control objects.

- void **SetControlObject** (string objectID, dynamic value)
  - Sets the control object with id equal to *objectID's* value to *value*. The set object's value is sent on template execute/update.
  - ControlObject ID's set by this methods which have not been present in the payload during template creation, are added dynamically.

> ⚠ **Note:** SetControlObject only works on control objects that aren't already linked to parameters.

Template Channels Handling

The template script allows the user to change the program output channel.

- void **SetSelectedChannel** (string name)
  - Sets the selected program output channel to *name*.
- ScriptingChannel **GetSelectedChannel** ( )
  - Returns the currently selected program channel of the template action.

ScriptingChannel

The ScriptingChannel class is used for finer control on the Engines contained in the channel.

Properties

- **Name**
  - The channel's name.
- **Count**
  - The number of Engines in the channel.

Methods

- void **SendSingleCommand** (string command)
  - Sends *command* to all the Engines in the channel.
- void **SendMultipleCommands** (string[] commands)
  - Sends all the input *commands* to all the Engines in the channel.
- void **SendToSMM** (string key, string value, bool doEscape)
  - Sends key-value pair to Shared Memory to all Engines contained in the channel. doEscape specifies whether the value string is escaped.
- void **SendToSMM** (string key, string value, bool doEscape, string destination)
  - Sends key-value pair to Shared Memory to all Engines contained in the channel. doEscape specifies whether the value string is escaped.
  - *destination* can be either SYSTEM, COMMUNICATION or DISTRIBUTED

Template Scene Handling

The template script allows the user to set the scene that should be loaded when executing.

- void **SetSceneFullpath** (string fullpath = null)
  - The input fullpath is the value that is sent to the Engine when executing the template. When no full path is provided the user config value is removed and the original attached scene is used.
- string **GetBaseContainerPath** ( )
  - Returns the current base container path where the root control object is located.
- bool **SetBaseContainerPath** ( )
  - Sets the base container path where the root control object is located. This might be useful to redirect the destination of the ContolObjects to a different container in the same scene.
- string **GetDirector** ( )
  - Gets the current director executed on **Execute** or on **Continue**.
- bool **SetDirector** (string dir)
  - Sets the director executed on **Execute** or on **Continue**.

Template Action Configuration

- bool **IsCommandHeaderVisible**
  - Indicates whether the CommandHeader should be visible on the template action.
- bool **UpdateOnSelected**
  - When this flag is set, the script callbacks are only triggered when the template action is selected on the action canvas (blue border).

Callbacks

- **OnCreated** ( )
  - Called when the template script is executed (when the template action is created and when the template opened on the designer is started).
- **OnShow** ( )
  - Called when the template is shown (when the template action's pop-up is opened, when the action becomes embedded and when the template opened on the designer is started).
- **OnExecute** ( )
  - Called when the template is executed.
- **OnPreviewExecute** ( )
  - Called when the template is executed to the preview channel.
- **OnContinue** ( )
  - Called when the template is continued.
- **OnPreviewContinue** ( )
  - Called when the template is continued to the preview channel.
- **OnUpdate** ( )
  - Called when the template is updated.
- **OnPreviewUpdate** ( )
  - Called when the template is updated to the preview channel.

- **OnOut** ( )
    - Called when the template is taken out.
- **OnPreview** ( )
    - Called when the template is previewed.
- **OnTrackerAction** (string action)
    - Called on certain Object Tracker events. the *action* parameter determines the type of event:
        - **take:** Triggered when Object Tracker is taken On Air.
        - **takeout:** Triggered when Object Tracker is taken Off Air.
        - **preview:** Triggered when Object Tracker preview is taken.
        - **previewout:** Triggered when Object Tracker preview is taken out.
        - **newTracker <index>:** Triggered whenever a new object has been selected for tracking. *index* is 1 based.
        - **lostTracker <index>:** Triggered whenever a tracked object has lost tracking. *index* is 1 based.

Sample Usage of Object Tracker Script API

```
Global.OnTrackerAction = function (action)
{
    Console.WriteLine("tracker action " + action )

    if( action == "take" )
        GetAction("DATA").Execute()
    else if( action.startsWith("newTracker" ) ){
        // we want to take off air whatever is On Air when we select a new tracked
object
        TakeOutTracker()
        Console.WriteLine("OFF AIR" )
    }
}
```

- **OnArenaPosition** (double screenX, double screenY, double worldX, double worldY, double worldZ)
    - Called when the user clicks on the Viz Arena view with the positioning tool.
        - **screenX** and **screenY** are the screen coordinates of the mouse click. The lower left corner of the arena screen is the origin (0,0).
        - **wolrdX**, **worldY** and **worldZ** are Viz Engine world coordinates, the units (default meters) are the same as for the selected **Viz Arena** project.

4.1.37 Common Callbacks

Callbacks that can be used in the global script and template scripts

- **OnVideoMouseLeftButtonDown** (point)
    - Called when the user pressed the left mouse button on the video output.
        - **point.X** normalized value in the range [-0.5, 0.5]
        - **point.Y** normalized value in the range [-0.5, 0.5]
- **OnVideoMouseRightButtonDown** (point)
    - Called when the user pressed the left mouse button on the video output.

        - **point.X** normalized value in the range [-0.5, 0.5]
        - **point.Y** normalized value in the range [-0.5, 0.5]
- **OnVideoMouseMove** (point)
    - Called when the user moved the mouse on the video output.
        - **point.X** normalized value in the range [-0.5, 0.5]
        - **point.Y** normalized value in the range [-0.5, 0.5]
- **OnVideoMouseWheel** (delta)
    - Called when the user rolled the mouse wheel on the video output.
        - **delta** is a floating point value, typical values are -120.0 for mouse wheel down and 120.0 for mouse wheel up.

4.1.38 Parameters

Parameters are the base components of Viz Arc's scripting. A list of all existing parameters types and their associated properties is presented below.

Base Parameters Functionality

The following properties and methods are shared among all parameters

- string **Label** [Get, Set]
    - Gets/sets the label that is displayed on the UI.
- bool **IsEnabled** [Get, Set]
    - Gets/sets the enabled status of the parameter. Disabled parameters can be interacted with.
- bool **IsVisible** [Get, Set]
    - Whether the parameter is visible. Invisible parameters are visible (displayed as grayed out) only while editing (and scripts are not running).
- double **X** [Get, Set]
    - Gets/sets the horizontal position of the parameter on the canvas.
- double **Y** [Get, Set]
    - Gets/sets the vertical position of the parameter on the canvas.
- double **Width** [Get, Set]
    - Gets/sets the width of the parameter.
- double **Height** [Get, Set]
    - Gets/sets the height of the parameter.
- void **SetColor** (byte r, byte g, byte b, byte a = 255)
    - Sets the parameter's color to the input RGBA color.
- string **Color**
    - Gets/sets the parameter's selected color in Hex format, for example, #FF0A0A8C (#RRGGBBAA).
- int **ColorR**
    - Gets/sets the parameter's selected red color value in the range **[0, 255]**.
- int **ColorG**
    - Gets/sets the parameter's selected green color value in the range **[0, 255]**.
- int **ColorB**
    - Gets/sets the parameter's selected blue color value in the range **[0, 255]**.
- int **ColorA**

    - Gets/sets the parameter's selected alpha value in the range **[0, 255]**.
- string **Tooltip** [Get, Set]
    - Gets/sets the tooltip of the UI element.
- string **LinkedCO** [Get]
    - The name of the associated ControlObject (Template Scripting only).
- void **UpdateDataLink**()
    - Forces an explicit evaluation of the DataLink expression associated with this parameter.

A sample use of the **LinkedCO** property:

```
Global.OnParameterChanged = function (id)
{
    // get linked ControlObject id associated to parameter 'id'. It is null if it's
not linked to any CO.
    let linkedCO = GetParameter(id).LinkedCO

    if( linkedCO )
    {
        Console.WriteLine("Changed: " + id + ", Linked Control Object ID: " +
linkedCO)

        // live update the template
        UpdateTemplate(linkedCO)
    }
}
```

Layout

The layout parameters allow the user to organize and improve the usability of a script/template.

Panel

- BaseParameter [ ] **Children** [Get]
    - Returns an array with all of the panel's children.
- BaseParameter **GetParameter** (string parameterID)
    - Tries to find a child with id equal to *parameterID*. Returns it if successful.

Tabs

- string **Value** [Get, Set]
    - Set: Attempts to find a tab with its name equal to the input. If found, sets it as selected tab.
    - Get: Returns the name of the selected tab.
- BaseParameter [ ] **Children** [Get]
    - Returns an array with all of the panel's children.
- BaseParameter **GetParameter** (string parameterID)
    - Tries to find a child with id equal to *parameterID*. Returns it if successful.
- bool **AllowReordering**
    - Whether a user can reorder the tabs.

- int **SelectedIndex** [Get, Set]
    - Gets/sets the index of the selected tab.

Info

- string **Value** [Get, Set]
    - Gets/sets the info text that displays on the parameter.

Label

TextColor

- string **Value** [Get, Set]
    - Gets/sets the labels text color in Hex format, for example, #FF0A0A8C (#RRGGBBAA).

Dialogs

Color

- string **Value** [Get, Set]
    - Gets/sets the parameter's selected color in Hex format, for example, #FF0A0A8C (#RRGGBBAA).
- int **R** [Get]
  Gets the value of the red component in the range **[0, 255]**.
- int **G** [Get]
  Gets the value of the green component in the range **[0, 255]**.
- int **B** [Get]
  Gets the value of the blue component in the range **[0, 255]**.
- int **A** [Get]
  Gets the value of the alpha component in the range **[0, 255]**.
- int **RPercent** [Get]
  Gets the value of the red component in the range **[0, 1]**.
- int **GPercent** [Get]
  Gets the value of the green component in the range **[0, 1]**.
- int **BPercent** [Get]
  Gets the value of the blue component in the range **[0, 1]**.
- int **APercent** [Get]
  Gets the value of the alpha component in the range **[0, 1]**.
- void **SetR** (int R)
  Sets the red component in the range **[0, 255]**.
- void **SetG** (int G)
  Sets the green component in the range **[0, 255]**.
- void **SetB** (int B)
  Sets the blue component in the range **[0, 255]**.
- void **SetA** (int A)
  Sets the alpha component in the range **[0, 255]**.

- void **SetRGB** (int R, int G, int B)
  Sets the red, green and blue components in the range **[0, 255]**.
- void **SetRGBA** (int R, int G, int B, int A)
  Sets the red, green, blue and alpha components in the range **[0, 255]**.
- void **SetRPercent** (double R)
  Sets the red component in the range **[0, 1]**.
- void **SetGPercent** (double G)
  Sets the green component in the range **[0, 1]**.
- void **SetBPercent** (double B)
  Sets the blue component in the range **[0, 1]**.
- void **SetAPercent** (double A)
  Sets the alpha component in the range **[0, 1]**.
- void **SetRGBPercent** (double R, double G, double B)
  Sets the red, green and blue components in the range **[0, 1]**.
- void **SetRGBAPercent** (double R, double G, double B, double A)
  Sets the red, green, blue and alpha components in the range **[0, 1]**.

Directory

- string **Value** [Get, Set]
  - Gets/sets the selected directories fullpath.
  - Set: The input value must be a valid directory in the file system.

File

- string **Value** [Get, Set]
  - Gets/sets the selected file's fullpath.
- bool **WatchFile** [Get, Set]
  - Enable/disable the watchfile feature.
- bool **ReadRawContent** [Get, Set]
  - Set to true if the raw file content should be read into the DataMap. Set to false if it is an excel or csv file.
- string **Separator** [Get, Set]
  - The separator when reading a csv file. Default is “,”.
- string **Sheet** [Get, Set]
  - The name of the excel sheet to be read.
- string **StartCell** [Get, Set]
  - The name of the start cell to read the content from (for example, “B5”).
- string **StartCell** [Get, Set]
  - The name of the end cell to read the content from (for example, “H11”).
- bool **HasHeaders** [Get, Set]
  - Indicates whether or not the first row of the table content is a header row.
- bool **ConvertToJson** [Get, Set]
  - Whether to convert the content of the file into a json format.
- string **DataMapTarget** [Get, set]

    - The name of the key to be used in the DataMap to send the content of the file to.
- void **ReloadFile**()
    - Forces to read the content of the file. Might be used when **WatchFile** is disabled.

Asset

- string **Value** [Get, Set]
    - Gets/sets the selected asset's fullpath.
    - Set: The input path needs to be valid.
- string **Prefix** [Get, Set]
    - The prefix to be added to the **Value** when sent to the engine.
- string **Postfix** [Get, Set]
    - The postfix to be added to the **Value** when sent to the engine.
- async void **SetImage** (string name)
    - An awaitable method to set an image *name*.

> ⚠ **Note:** Valid input values are: Graphic Hub items (Image, Geom, Material), Media service links (http://...) or local file system files.

WebView

This component lets you view a web page.

- string **Value** [Get, Set]
    - Gets/sets the URL of the web page to be visualized.
- void **Reload** ()
    - Reloads the current page.
- void **GoBack** ()
    - Navigates back in history.
- void **GoForward** ()
    - Navigates forward in history.
- void **ExecuteJavascript** (string method)
    - Invokes *method* on the currently loaded web page.
- void **ExecuteJavascript** (string method, params object[] args)
    - Invokes *method* with *args* as arguments on the currently loaded web page.

> ⚠ **Note:** The browser used for rendering is based on CEF. It might not play all video codecs.

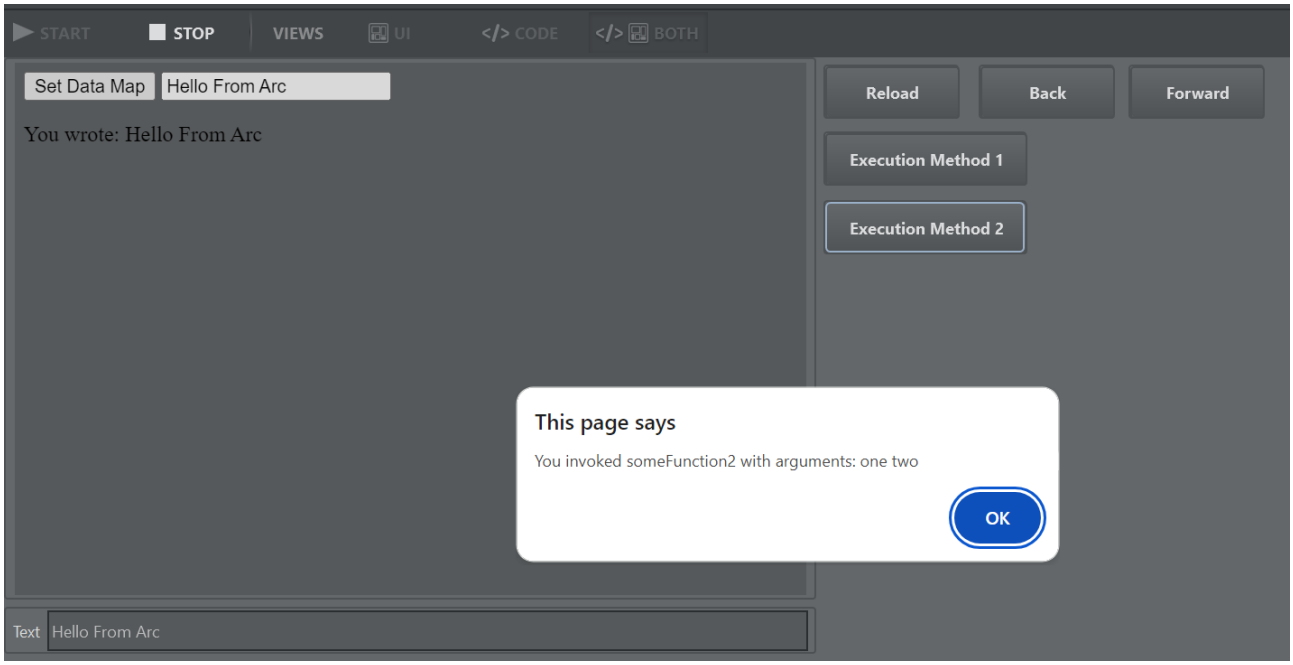
A sample html file that might be loaded in a WebView:

```
<!DOCTYPE html>
<html>
<body>

<button onclick="DataMapButton()">Set Data Map</button>
<input type="text" id="someText" oninput="wroteSomeText()">
```

```
<p id="demo"></p>

<script>
function DataMapButton() {
  let text = document.getElementById("someText").value;
  // set the data map variable 'fromWebPage' to the entered value
  arc.SetData("fromWebPage", text);
}
function wroteSomeText() {
  let text = document.getElementById("someText").value;
  document.getElementById("demo").innerHTML = "You wrote: " + text;
  // interact with arc and set the parameter "text_0" to the value just entered
  arc.SetParameterValue("text_0", text);
}

function someFunction1()
{
   alert("You invoked someFunction1!")
}

function someFunction2(para1, para2)
{
   alert("You invoked someFunction2 with arguments: " + para1 + " " + para2)
}
</script>

</body>

</html>
```

Note the **arc** object which gets injected and gives access to all scripting methods available in Viz Arc. For example *arc.SetData(“matchResult”, “0:1”)* sets a variable on the **DataMap**.

A Viz Arc template interacting with the html page above after clicking the *Execute Method 2* button:



The code of the Viz Arc template might look like this, note the **ExecuteJavascript** methods that allow you to interact with the web page.

```
Global.OnButtonPressed = function (id)
{
    switch( id )
    {
    case "reloadBrowser":
        webview_0.Reload()
        break
    case "backBrowser":
        webview_0.GoBack()
        break
    case "backBrowser":
        webview_0.GoFoward()
        break
    case "exe1":
        webview_0.ExecuteJavascript("someFunction1")
        break
    case "exe2":
        webview_0.ExecuteJavascript("someFunction2", "one", "two")
        break
    }
}
```

Bool

- bool **Value** [Get, Set]
    - Gets/sets the parameter's bool value.

Button

- void **Click** ( )
  - Trigger a click event on the button parameter.
- string **BackgroundImage**
  - Gets/sets the path to the background image. It can be either a local file path (for example, *c:/tmp/someimage.png*) a Graphic Hub path (for example, *IMAGE*/project/A/imageButton*) or a URL (for example, *http://storage.internal/image.jpg*).
- string **ImageMargin**
  - Gets/sets the margins in pixels of the background image. Specify either one, two or four comma separated margins. A value of `5` applies a margin of 5 pixels in all directions, a value of `5, 3` applies a margin of 5 pixels on the left and right and a margin of 3 at the top and bottom. A value of `1, 2, 3, 4` applies the respective margins in the order left, top, right and bottom.
- string **DirectorPath**
  - Gets/sets the Stage Director to be executed on click. For example, *$Director$SubDirector*
- string **DirectorExecute**
  - Gets/sets the type of action type to execute on click. Possible values are *<nothing>, START, CONTINUE, CONTINUE REVERSE, PAUSE or RESET*.
- string **ActionExecute**
  - Gets/sets the name or UUID of the action to be executed on click.

Toggle Button

- void **SetCheckedColor** (byte r, byte g, byte b, byte a = 255)
  - Sets the toggle's color to the input RGBA color when the toggle is in it's checked state.
- string **CheckedColor**
  - Gets/sets the toggle's color in Hex format, for example, #FF0A0A8C (#RRGGBBAA) when the toggle is in it's checked state.
- int **CheckedColorR**
  - Gets/sets the toggle's red color value in the range **[0, 255]** when the toggle is in it's checked state.
- int **CheckedColorG**
  - Gets/sets the toggle's green color value in the range **[0, 255]** when the toggle is in it's checked state.
- int **CheckedColorB**
  - Gets/sets the toggle's blue color value in the range **[0, 255]** when the toggle is in it's checked state.
- int **CheckedColorA**
  - Gets/sets the toggle's alpha value in the range **[0, 255]** when the toggle is in it's checked state.
- string **BackgroundImage**
  - Gets/sets the path to the background image. It can be either a local file path (for example, *c:/tmp/someimage.png*) a Graphic Hub path (for example, *IMAGE*/project/A/imageButton*) or a URL (for example, *http://storage.internal/image.jpg*).
- string **ImageMargin**
  - Gets/sets the margins in pixels of the background image. Specify either one, two or four comma separated margins. A value of `5` applies a margin of 5 pixels in all directions, a value of `5, 3`

applies a margin of 5 pixels on the left and right and a margin of 3 at the top and bottom. A value of `1, 2, 3, 4` applies the respective margins in the order left, top, right and bottom.

- bool **IsChecked**
  - Gets/sets the toggle button's state to checked or unchecked.
- string **ContainerPath**
  - Gets/sets the Viz scene container path (for example, *$object$ALL$left*) to be used when **VisibilityCheckd/VisibilityUncheckd** or **KeyChecked/KeyUnchecked** actions are set.
- string **DirectorPath**
  - Gets/sets the Stage Director path (for example, *$Director$SubDirector*)to be executed when **DirectorCheckd/DirectorUnchecked** actions are set.
- string **ActionChecked**
  - The action name or uuid to be executed when the toggle button gets **checked**.
- string **ActionUnchecked**
  - The action name or uuid to be executed when the toggle button gets **unchecked**.
- string **VisibilityChecked**
  - Gets/sets the visibility of the container specified in **ContainerPath** when the toggle button gets **checked**. Possible values are *<nothing>, ON or OFF*.
- string **VisibilityUnchecked**
  - Gets/sets the visibility of the container specified in **ContainerPath** when the toggle button gets **unchecked**. Possible values are *<nothing>, ON or OFF*
- string **DirectorChecked**
  - Gets/sets the action to be executed on the director specified in **DirectorPath** when the toggle gets **checked**. Possible values are *<nothing>, START, CONTINUE, CONTINUE REVERSE, PAUSE or RESET*.
- string **DirectorUnchecked**
  - Gets/sets the action to be executed on the director specified in **DirectorPath** when the toggle gets **unchecked**. Possible values are *<nothing>, START, CONTINUE, CONTINUE REVERSE, PAUSE or RESET*.
- string **KeyChecked**
  - Gets/sets the key action of the container specified in **ContainerPath** when the toggle button gets **checked**. Possible values are *<nothing>, ACTIVE, INACTIVE, COMBINE WITH BG ON, COMBINE WITH BG OFF*.
- string **KeyUnchecked**
  - Gets/sets the key action of the container specified in **ContainerPath** when the toggle button gets **un checked**. Possible values are *<nothing>, ACTIVE, INACTIVE, COMBINE WITH BG ON, COMBINE WITH BG OFF*.

Double / Double Slider

- double **Value** [Get, Set]
  - Gets/sets the parameter's double value.
- double **MinValue** [Get, Set]
  - Gets/sets the parameter's minimum double value. Input value needs to be lower than the current MaxValue.
- double **MaxValue** [Get, Set]
  - Gets/sets the parameter's maximum double value. Input value needs to be higher than the current MinValue.

- double **MinRange** [Get, Set]
    - Gets/sets the parameter's minimum range double value.
- double **MaxRange** [Get, Set]
    - Gets/sets the parameter's maximum range double value.
- bool **RangeEnabled** [Get, Set]
    - If true, forces the slider to remain within the specified Min/Max range.
- bool **ShowReset** [Get, Set]
    - Enable or disable the reset to the default button on the UI.

Dropdown / Radio

- string **Value** [Get, Set]
    - Gets/sets the selected entry on the dropdown.
- int **SelectedIndex** [Get, Set]
    - Gets/sets the selected index of the dropdown.
- int **Count** [Get]
    - Gets the number of entries on the dropdown.
- int **IndexOf** (string option)
    - Looks for an entry equal to *option*. Returns its index if found, -1 otherwise.
- void **Insert** (int index, string option)
    - Inserts an entry with value *option* at *index* position. *index* needs to be between 0 and Count.
- void **Add** (string option)
    - Adds an entry with value *option* atthe end of the entry list.
- void **Remove** (string option)
    - Looks for an entry equal to *option*. Removes it if found.
- void **RemoveAt** (int index)
    - Removes the entry at position *index*. *index* needs to be between 0 and Count.
- void **SetItems** (string[] entries)
    - Sets the dropdown's entry list to the input *entries*.
- string **Get** (int index)
    - Returns the entry located at *index* position. *index* needs to be between 0 and Count.
- string parameter[int index]
    - Array accessor for entries. Returns the entry located at *index* position.
- void **Clear** ( )
    - Removes all entries from the dropdown.

Int / Int Slider

- int **Value** [Get, Set]
    - Gets/sets the parameter's int value.
- int **MinValue** [Get, Set]
    - Gets/sets the parameter's minimum int value. Input value needs to be lower than the current MaxValue.
- int **MaxValue** [Get, Set]

- Gets/sets the parameter's maximum int value. Input value needs to be higher than the current MinValue.

MultiText / Text

- string **Value** [Get, Set]
  - Gets/sets the parameter's text value.

Triplet

- double **X** [Get, Set]
  - Gets/sets the parameter's X double value.
- double **Y** [Get, Set]
  - Gets/sets the parameter's Y double value.
- double **Z** [Get, Set]
  - Gets/sets the parameter's Z double value.
- double **DefaultX** [Get, Set]
  - Gets/sets the default parameter’s X value.
- double **DefaultY** [Get, Set]
  - Gets/sets the default parameter’s Y value.
- double **DefaultZ** [Get, Set]
  - Gets/sets the default parameter’s Z value.
- bool **XEnabled** [Get, Set]
  - Gets/sets the enabled status of the X value.
- bool **YEnabled** [Get, Set]
  - Gets/sets the enabled status of the Y value.
- bool **Z Enabled** [Get, Set]
  - Gets/sets the enabled status of the Z value.
- bool **AllowProportional** [Get, Set]
  - Gets/sets whether the user can toggle the proportional lock.
- bool **IsProportional** [Get, Set]
  - Gets/sets the state of the proportional lock.

Table

Properties

- string **Value** [Get]
  - Gets an string containing the table content in a XML format (much like ControlList).
- int **MinimumRows** [Get, Set]
  - Gets/sets the parameter's minimum number of rows. Input value needs to be lower than the current MaximumRows.
- int **MaximumRows** [Get, Set]
  - Gets/sets the parameter's maximum number of rows. Input value needs to be higher than the current MinimumRows.

- int **MinimumColumns** [Get, Set]
    - Gets/sets the parameter's minimum number of columns. Input value needs to be lower than the current MaximumColumns.
- int **MaximumColumns** [Get, Set]
    - Gets/sets the parameter's maximum number of columns. Input value needs to be higher than the current MinimumColumns.
- int **RowCount** [Get]
    - Gets the current number of rows on the table.
- int **ColumnCount** [Get]
    - Gets the current number of columns on the table.
- int **SelectedRow** [Get]
    - Gets the currently selected row. In case of multi-selection it returns the first selected row. If no row is selected, `-1` is returned.
- int **SelectedIndex** [Get]
    - An alias for **SelectedRow**.
- bool **MatchHeaders** [Get, Set]
    - Try to match headers of the incoming data, with the names of the column header names of the table.
- bool **MatchDataColumns** [Get, Set]
    - Create and match columns of the table according to incoming data.
- bool **MatchDataRows** [Get, Set]
    - Create and match as many rows in the table as there are in the incoming data.
- bool **TransposeData** [Get, Set]
    - Set to true to swap rows and columns.
- bool **TriggerOnAllChanges** [Get, Set]
    - Set to true to trigger the **OnTableCellValueChanged** callback, when a table cell value has been changed by user input.

Methods

Cell Handling

- BaseCell **Accessor** [int row, int column] [Get]
    - Gets the cell located at *row*-indexed row and *column*-indexed column.
- BaseCell **GetCell** (int row, int column)
    - Gets the cell located at *row*-indexed row and *column*-indexed column.
- void **SetCellValue** (int row, int col, dynamic value)
    - Sets the cell’s value (located at [row, column]) to *value.* [dynamic] *value* can either be a string or have a type that is compatible with the target cell.
- string**GetCellValue** (int row, int col)
    - Gets the cell’s (located at [row, column]) string value representation.
- void **ClearColumnValues** (int columnIndex)
    - Resets all the cell’s values in *columnIndex* column.
- void **ClearRowValues** (int rowIndex)
    - Resets all the cell’s values in *rowIndex* row.
- void **ClearAllValues** ( )

    - Resets all the cell's values.
- void **Clear** ( )
    - Removes all the content (all columns and rows are deleted).

Columns Handling

Inserting a column from code requires the user to specify the type of column that needs to be created, the valid column types are:

- **bool:** Column with BoolCell
- **string:** Column with StringCell
- **int:** Column with IntCell
- **ivec2:** Column with IntDupletCell
- **ivec3:** Column with IntTripletCell
- **double:** Column with DoubleCell
- **dvec2:** Column with DoubleDupletCell
- **dvec3:** Column with DoubleTripletCell
- **asset:** Column with AssetCell

All column interactions take into consideration the maximum and minimum number of columns of the table

- void **AddColumn** (string columnType)
- void **AddColumn** (string columnType, string name)
    - Adds a column of type *columnType* named *name* if specified, otherwise the default is used.
- void **AddMultipleColumn** (int count, string columnType)
    - Adds *count* columns of *columnType* type.
- void **InsertColumn** (int index, string columnType)
- void **InsertColumn** (int index, string columnType, string name)
    - Inserts a column at *index* index of *columnType* type named *name* if specified, otherwise the default is used.
- vodi **InsertMultipleColumn** (int index, string columnType, int count)
    - Inserts *count* columns at *index* index of *columnType* type.
- void **RemoveColumnAt** (int index)
    - Removes column at *index* index.
- void **MoveColumn** (int targetIndex, int newPosition)
    - Moves column from *targetIndex* position to *newPosition*.
- void **ClearColumns** ( )
    - Removes all columns.
- double **GetColumnWidth** (int index)
    - Returns the column *width* in pixels of column.
- void **SetColumnWidth** (int index, double width)
    - Sets the column *width* in pixels of column with index *index*.
- double **GetColumnName** (int index)
    - Returns the column *label*.
- void **SetColumnName** (int index, string name)
    - Sets the column label to *name* of column with index *index*.

Rows Handling

All row interactions take into consideration the maximum and minimum number of rows of the table

- void **SetNumberRows** (int count)
  - Adds/removes rows until the table's RowCount is equal to *count*.
- void **AddRow** ( )
  - Adds a Row to the table.
- void **AddMultipleRow** (int count)
  - Adds *count* rows to the table.
- void **InsertRow** (int index)
  - Inserts a row at *index* position to the table.
- void **InsertMultipleRow** (int index, int count)
  - Inserts *count* rows at *index* position to the table.
- void **RemoveRowAt** (int index)
  - Removes row at *index* position.
- void **MoveRow** (int targetIndex, int newPosition)
  - Moves row from *targetIndex* position to *newPosition*.
- void **ClearRows** ( )
  - Removes all rows.

Table Parameter Example

```
// Open the cvs file with the starters, parse the content and add all riders to the
RaceTable (TableParameter)
function LoadRaceTable()
{
    // Setup columns from UI, Comment if already done manually
    //RaceTable.Clear()
    //RaceTable.AddColumn( "string", "Horse")
    //RaceTable.AddColumn( "string", "Trainer")
    //RaceTable.AddColumn( "string", "Jockey")
    //RaceTable.AddColumn( "string", "Owner")
    //RaceTable.AddColumn( "string", "Colors")
    //RaceTable.AddColumn( "string", "Horse CN")
    //RaceTable.AddColumn( "asset", "Silk")

    // Clear rows
    RaceTable.ClearRows()

    var i = 0
    var FileContent = arc.ReadTextFile("D:/Horses/Starter.csv")
    var EntryArr = FileContent.split("\n")

    // First line is for the headers, ignore it
    for(i = 1; i < EntryArr.length; i++)
    {
        // Split the rider content
```

```
        var splitContent = EntryArr[i].split(",")

        // CVS file has great amount of data but we only want to display certain
stuff
        RaceTable.AddRow()
        RaceTable.GetCell(i-1 , 0).Value = splitContent [19]
        RaceTable.GetCell(i-1 , 1).Value = splitContent [22]
        RaceTable.GetCell(i-1 , 2).Value = splitContent [25]
        RaceTable.GetCell(i-1 , 3).Value = splitContent [27]
        RaceTable.GetCell(i-1 , 4).Value = splitContent [34]
        RaceTable.GetCell(i-1 , 5).Value = splitContent [20]
        // image assets need to be assigned using the SetCellValue method
        RaceTable.SetCellValue(i-1 , 6, splitContent[21])
    }
}
```

4.1.39 Unreal

These are helper functions to invoke BluePrint functions:

- void **InvokeBPFunction** (string blueprintName, string functionName, params object[] arg)
  - Invokes the function *functionName* on the Blueprint *blueprintName,* with a variable number of parameters (typically strings and/or numbers).
- void **InvokeBPFunction** (string blueprintName, string functionName)
  - Invokes the function *functionName* on the Blueprint *blueprintName*, without any arguments.

The methods are invoked on all Unreal Engines of the template's currently selected channel.

```
Global.OnExecute = function ()
{
    // before executing the template, update some data on the Blueprint invoking
updateData
    InvokeBPFunction("BP_main", "updateData", "Hello", "World", 42.0, 3)
    // change the appearance of the car
    InvokeBPFunction("BP_CarManager_Blue", "Change Car", 1, true, "This is the new
car model");
}
```

4.1.40 Video

Set the video and PTZ source.

- void **SetVideoSource** (string name)
  - Sets the name of the preview source window.
- void **SetNDIPTZVideoControl** (string ptzControl)
  - Sets the name of the NDI PTZ control overlay source.
- void **SetFlowicsOutput** (string URL)
  - Sets the global Flowics output URL.

4.1.41 Using async/await

Some methods are declared **async**, meaning the method might be time consuming (for example, while waiting for an answer from a server). To avoid locking up the UI, one can **await** an async method, such that Viz Arc can continue to process other events like user interaction. The async method might be processed on a different thread.

The following example shows how to retrieve the version of the first engine of the active channel on a template:

```
Global.OnButtonPressed = async function (id)
{
  if( id == "getFromEngineButton"){
    let answer = await GetFromEngineAsync("VERSION", 3000)
    Console.WriteLine("engine version is " + answer)
  }
}
```

Note that it is mandatory to declare the calling functions as **async,** when using **await**. The async keyword can be safely added to any Viz Arc callback, as shown with *OnButtonPressed*.

Using try/catch

It is highly recommended to use a try/catch block around awaited methods, otherwise, eventual errors are not detected.

```
Global.OnButtonPressed = async function (id)
{
  try{
    if( id == "getFromEngineButton"){
      let answer = await GetFromEngineAsync("VERSION", 3000)
      Console.WriteLine("engine version is " + answer)
    }
  }catch(ex)
  {
    Console.WriteLine("Error " + ex + " " + ex.stack)
  }
}
```

4.2 Profile

This section contains a list of properties and functions grouped by type that are useful for communicating with Profile, Channel, and Engine (Viz Engine and Unreal Engine).

4.2.1 Scripting Profile

- string **Name** [Get]
  - Returns the profile's name
- int **NumChannels** [Get]
  - Returns the number of channels
- ScriptingChannel **VizEditingEngine** [Get]
  - Returns the configured Viz Editing Engine of the profile
- ScriptingChannel **UnrealEditingEngine** [Get]
  - Returns the configured Unreal Editing Engine of the profile
- ScriptingChannel **VizProgramChannel**[Get]
  - Returns the configured Viz program Engine of the profile
- ScriptingChannel **UnrealProgramChannel**[Get]
  - Returns the configured Unreal program Engine of the profile
- ScriptingChannel **VizPreviewChannel**[Get]
  - Returns the configured Viz preview Engine of the profile
- ScriptingChannel **UnrealPreviewChannel**[Get]
  - Returns the configured Unreal preview Engine of the profile
- ScriptingChannel **Accessor** [int index] [Get]
  - Returns the *index*-indexed Scripting Channel
- ScriptingChannel **GetChannel** (int index)
  - Returns the *index*-indexed Scripting Channel
- ScriptingChannel **GetChannel** (string channelName)
  - Returns the first channel found with name *channelName*

4.2.2 Scripting Channel

- string **Name** [Get]
  - Returns the channel's name
- int **NumChannels** [Get]
  - Returns numbers of Engines in the channel
- ScriptingChannel **Accessor** [int index] [Get]
  - Returns the *index*-indexed Scripting Engine Class
- void **SendSingleCommand** (string command)
  - Sends the command to all the Engines in the channel
- void **SendCommands** (string[] commands)

    - Sends a list of commands to all the Engines in the channel
- ScriptingEngine **GetEngineByName** (string name)
    - Return the first Engine found with name

4.2.3 Scripting Engine

- void **SendSingleCommand** (string command)
    - Sends the command to the Engine
- void **SendCommands** (string[] commands)
    - Sends a list of commands to the Engine
- string **QueryEngine** (string command, int timeout = -1)
    - Queries the Engine with command
      If timeout is specified and larger than 0, the method times out after *timeout* milliseconds if it does not receive an answer within that time
- Task<string> **QueryEngineAsync** (string command, int timeout = -1)
    - Queries the Engine with command asynchronously
      If timeout is specified and larger than 0, the method times out after *timeout* milliseconds if it does not receive an answer within that time
- string **GetFlowicsOutput**()
    - Returns the Flowics live output URL associated to the API token of this engine. Return null if it's not a Flowics output engine.

4.3 Control Object

After having accessed the action holding the list of ControlObjects thought the **GetAction** method, the single ControlObjects can be retreived using the global method

- BaseControlObject **GetControlObject**(BaseAction action, string ControlObjectID)

Most Control Object types have the following generic properties:

- **Text** (String)
  - This property adapts to all objects (execute string)
  - `IntControl.Text = "5"`
  - `ImageControl.Text = "IMAGE*FolderA/SubfolderB/ImageName"`
- **ID** (String)
  - Returns ObjectID
- **Description**
  - Returns the object description

Each Control Object type has specific properties:

- Control Container
- Control Image
- Control Material
- Control Omo
- Control Text
- Control List
  - Single Cells Properties
- Control Integer
- Control Double
- Control Boolean

4.3.1 Control Container

Properties:

- Visibility
- Position
  - posX (double)
  - posY (double)
  - posZ(double)
- Rotation
  - rotX (double)
  - rotY (double)
  - rotZ (double)
- Scaling
  - scaX (double)
  - scaY (double)

- scaZ (double)

This type doesn't have the Text property.

4.3.2 Control Image

Properties:

- Path (string)
- Position
  - posX (double)
  - posY (double)
- Scaling
  - scaX (double)
  - scaY (double)

4.3.3 Control Material

Properties:

- Path (string)

4.3.4 Control Omo

Properties:

- Value (integer)

4.3.5 Control Text

Properties:

- Value (string)

4.3.6 Control List

Example:

```
sub OnInit()
    'declare variables
    dim objAction, table, cell
    dim output1, output2, output3
    'get table obj action
    objAction = arc.GetAction("object")
    table = arc.GetControlObject (objAction, "controlObj_ID")
    Console.WriteLine("Table name: " & table.Text)
    'set values in single cells inside the table
    table(0,0).value = false
```

```
    table(0,1).value = 5
    table(2,5).x = 12
    table(3,6).value = "IMAGE*/Default/GER"
    'assign values to a variable and show in debug console
    output1 = table(0,0).Text
    output2 = table(0,1).Text
    output3 = table(0,2).Text
    Console.WriteLine("cell - " & output1 & " | " & output2 & " | " & output3)
end sub
```

Properties:

- Accessor
  - **table[int row, int col]:** returns a cell
  - **nbcolumns (integer):** number of columns
  - **nbrows (integer):** numbers of rows

Single Cells Properties

Cell	Type	Additional Information	Example
BaseCell	Text (string)	Sets or gets value as string. Common to every cell type.	`table(0,5).x= 12 (intCell)` `table(0,5).text = "12" (intCell)`
BoolCell	Value (boolean)		`table(0,5).active= true`
DoubleCell	Value (double)		table(0,5).x= 12.8
DupletCell	X (double) Y (double)		table(0,5).text = "0.55 0.2"
GeomCell	Value (string)		table(0,5).value = "GEOM*/folder/geometry"
ImageCell	Value (string)		table(0,5).value = "IMAGE*/folder/image"
IntCell	Value (integer)		
MaterialCell	Value (string)		table(0,5).value = "MATERIAL*/folder/material"
TextCell	Value (string)		

Cell	Type	Additional Information	Example
TripletCell	X (double) Y (double) Z (double)		table(0,5).text = "0.55 0.23 1.23"

4.3.7 Control Integer

Properties:

- Value (integer)

4.3.8 Control Double

Properties:

- Value (double)

4.3.9 Control Boolean

Properties:

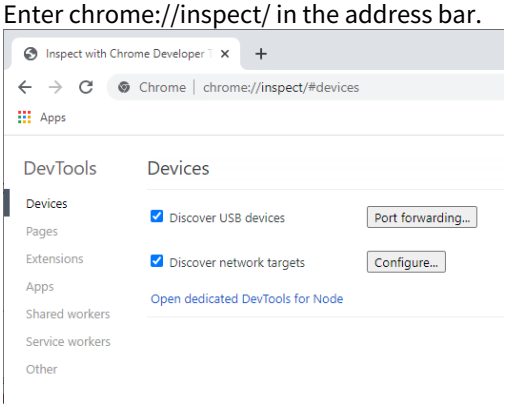
- Value (boolean)

5 Debugging Scripts

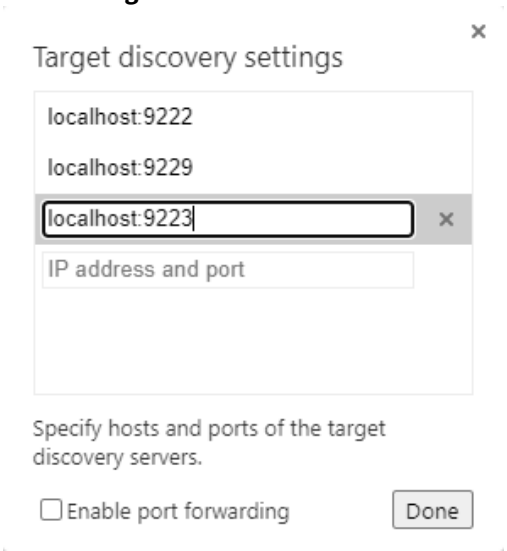
5.1 DevTools

You can use any chrome based web browser (for example, Google Chrome or Microsoft Edge) to step through Viz Arc scripts.

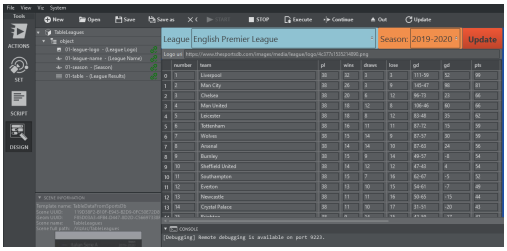
1. Open your browser.
2. Enter chrome://inspect/ in the address bar.



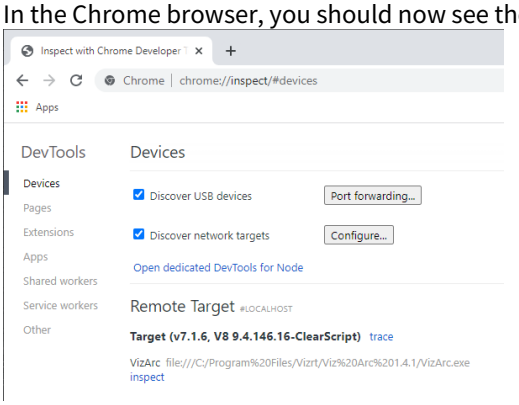
3. Click **Configure...**



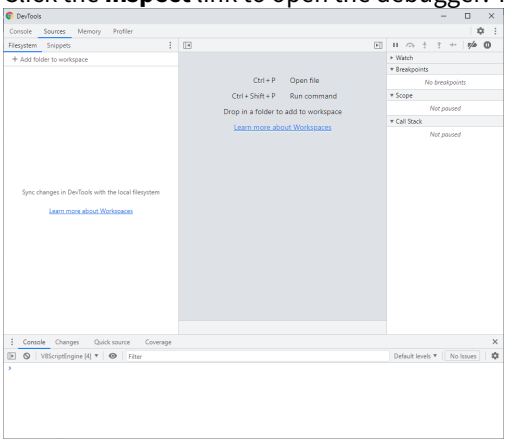
   Add the host name where Viz Arc is running and specify the debug script port (by default, port `9222` for the global script and port `9223` for the template builder script). Confirm by clicking the **Done** button.
4. Open a template in Viz Arc's template builder and start it.



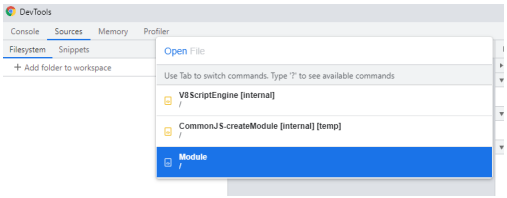
5. In the Chrome browser, you should now see the Viz Arc script available for debugging.



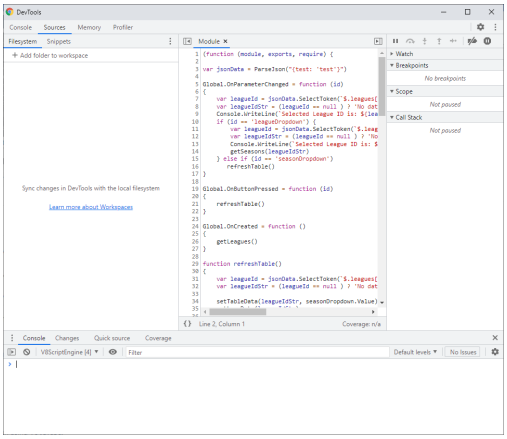
6. Click the **inspect** link to open the debugger. The first time you open the debugger it does not show any code.



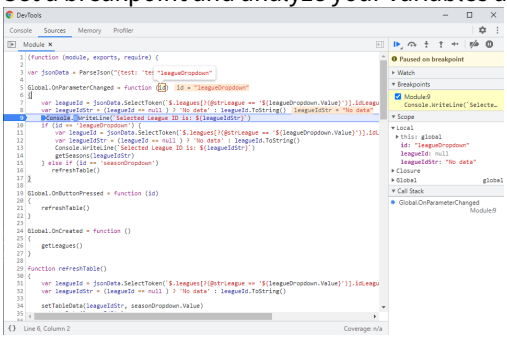
Hit **CTRL + P** and select *Module*.



You'll now be able to set breakpoints and see the code.



7. Set a breakpoint and analyze your variables and code.



5.2 Visual Studio Code

You can debug scripts with Visual Studio Code when using V8 JavaScript in the global script or in any scripted template.

1. Install and launch Visual Studio Code.
2. Set up one or more Viz Arc V8 debug configurations:
    a. Click **File** > **Preferences** > **Settings** to open your user settings.
    b. Locate or search for the **Launch** configuration and click **Edit in settings.json**.
    c. Add the following section to the file:

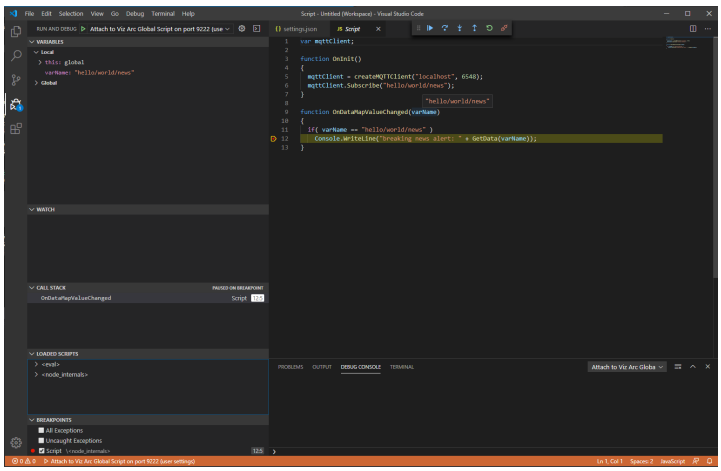
```
{
 "debug.javascript.usePreview": false,
 "launch": {
    "version": "1.2.0",
    "configurations": [
        {
            "name": "Attach to Viz Arc Global Script on port 9222",
            "type": "node",
            "request": "attach",
            "protocol": "inspector",
            "address": "localhost",
            "port": 9222
        },
```

```
        {
            "name": "Attach to Viz Arc Template Scrip on port 9223",
            "type": "node",
            "request": "attach",
            "protocol": "inspector",
            "address": "localhost",
            "port": 9223
        }
    ]
  }
}
```

d. You can specify additional configurations for different hosts, port numbers, and other options. See Node.js debugging in VS Code for more information.
e. Click **File > Save**.

3. If you'd like to debug your application remotely, you must also make sure that your firewall allows incoming connections to your TCP port.
4. Attach the Visual Studio Code debugger to your application:
   a. Click **View > Debug** to bring up the Debug view.
   b. Select the appropriate debug configuration at the top of the Debug Side Bar.
   c. Click **Debug > Start Debugging**.

> **Note:** There are two different ports in use: One for the global script (default `9222`) and one for template scripts (default `9223`). Template scripts can be debugged only when running in the designer. The ports can be configured in the global configuration settings.



The screenshot above shows a global script being stopped at a breakpoint.

See Also

- Node.js debugging in VS Code