Datacenter User Guide

Version 2.2

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There are general best-practice solutions, these include setting the antivirus software to not scan the systems during operating hours and that the Vizrt components, as well as drives on which clips and data are stored, are excluded from their scans (as previously stated, these measures cannot be guaranteed).

Technical Support

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1 Introduction

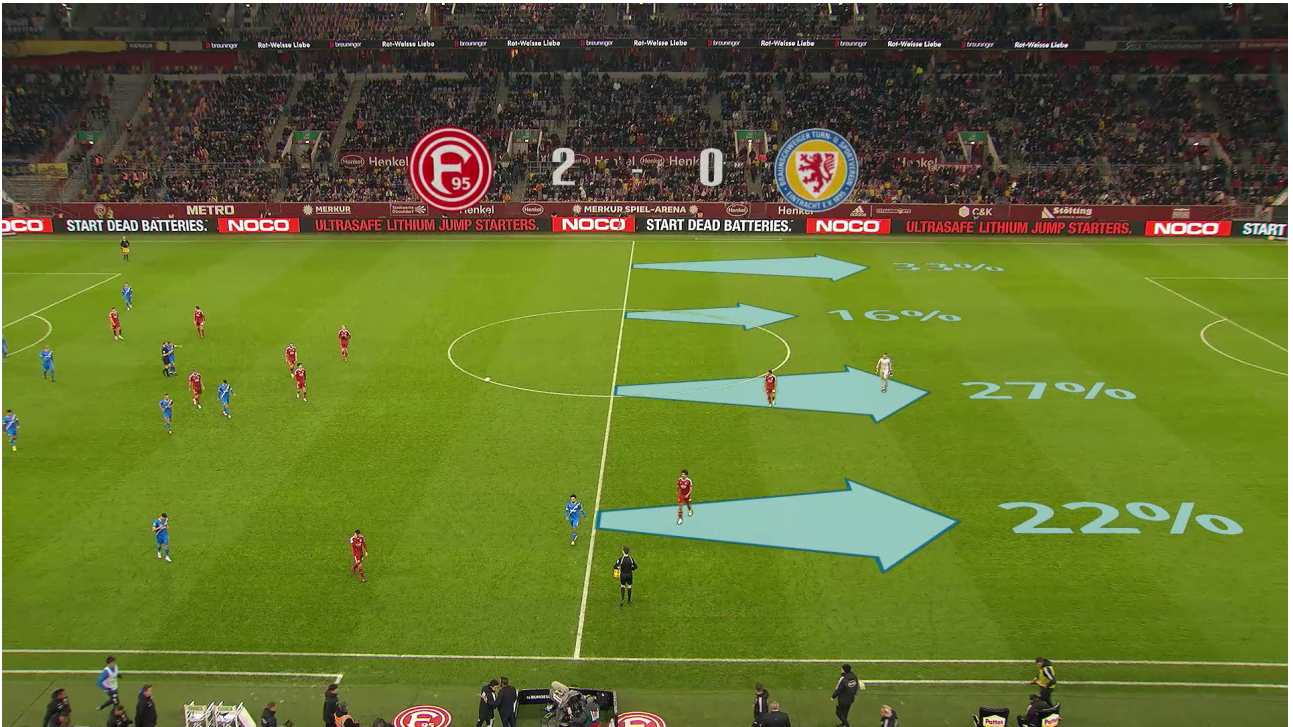Datacenter is an end to end solution that allows you to connect live data sources to fields in your graphics, without the need of any special knowledge of the data at hand.

Therefore, Datacenter acts as the gateway between data providers and the Viz ecosystem, automatically translating data coming from heterogeneous sources to format(s) understood by various Viz applications.

Its main purpose is to connect incoming live data, whether from a local source or an online data provider, to fields in your scenes, handling updates in real time. It is ideal to connect to, for instance, a scoreboard on a venue to clock-and-score graphics, or scene effects to data updating in real time.

1.1   Feedback

We welcome your feedback on Vizrt products and documentation. Please contact your local Vizrt customer support team at http://www.vizrt.com.

1.2   Support

Support is available at the Vizrt Support Portal.

For more information about all Vizrt products, visit:

- www.vizrt.com
- Vizrt Documentation Center
- Vizrt Training Center
- Vizrt Forum

2   Overview

2.1   Accessing Datacenter

Datacenter runs automatically as a service on the host machine. It automatically starts on Windows startup, and its status can be monitored in **Task Manager > Services > VizrtDataCenter**.

While the service is always running in the background, the main user interface can be opened using a browser on the same machine hosting the service, using one of the following addresses:

- http://127.0.0.1:5700. This address is always available, regardless of the service mode being configured (see HTTPS Certificate configuration).
- https://127.0.0.1:5701. This address is only available if a valid HTTPS certificate has been configured (see HTTPS Certificate configuration).

If Datacenter is correctly configured to run an HTTPS backend that listens to all network interfaces, then the user interface is also reachable from:

- https://<host-machine-ip>:5701, where *<host-machine-ip>* is the public IP of the host machine. This mode allows you to reach and monitor Datacenter from all machines in the same network, for example.

> **Info:** The Admin page is only accessible when the Datacenter user interface is reached using the localhost address option.

2.2   Datacenter Main Entities

Datacenter connects data **Providers** to application **Outputs**, organizing the data flow into separate and editable **Datasets.** Specifically:
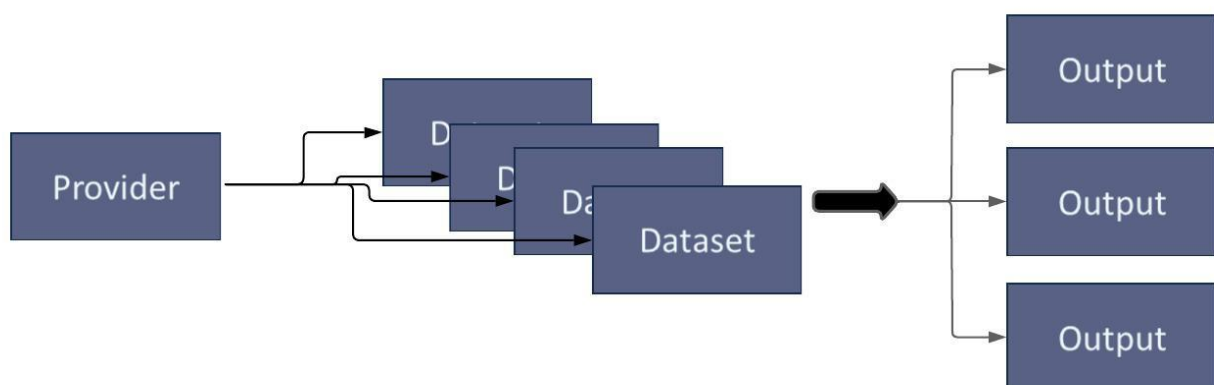
- A data **Provider** represents a data source to which Datacenter connects to. It can be a local (for example, a file) or a remote resource (for example, a server), and its unique (there is only one Provider of type File).

- A **Dataset** represents a collection of data entries from a specific Provider. It is created by the user, and there is no limit to the number of datasets of a specific provider that can exist. Each dataset holds one or more data entries, all coming from the same provider resource.
- An **Output** represents the sending end of the Datacenter data flow. There exists a finite number of output types (for example, Viz Engine or Viz Arc), but there is no limit to the number of instances.

2.3   The Datacenter Main Page

The Datacenter main user interface consists of six sections:

1. **Application Bar:** Use this section to access the **Admin** page (⚙), check the status of the service, as well as the service HTTP(s) mode (🔒), and limit the refresh rate of the UI (⏱). The Documentation can also be opened from the status bar (❓).
2. **Datasets pane:** Where all the configured datasets are listed. A dataset can be selected with its status shown on the status line on the left, and toggled off from here. Its entry can also be cloned to create a second independent dataset.
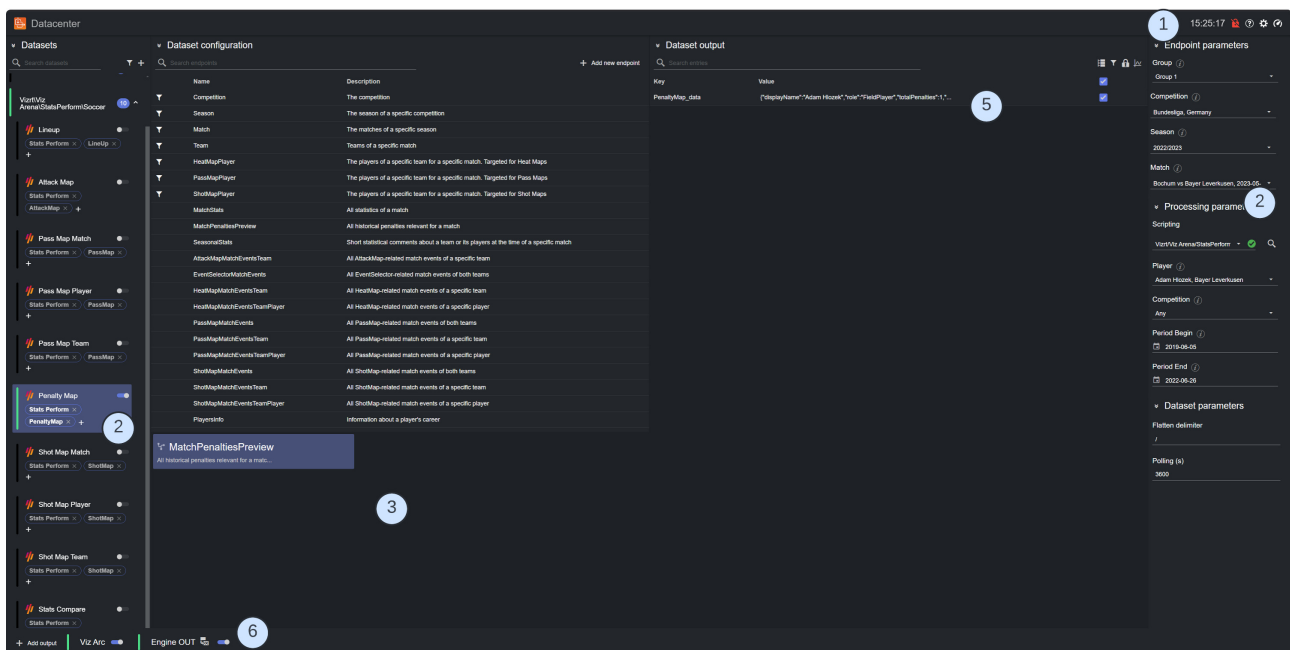3. **Dataset Configuration pane:** In the configuration pane a new dataset can be configured or an existing one edited. Specifically, a dataset source or a provider specific element can be selected in the configuration pane and edited in the Settings Editor. This view changes according to the Provider being used.
4. **Settings Editor:** Edit specific provider elements or a dataset source parameters (for example, endpoint parameters or refresh rate for a source). This view is dynamic and adapts according to the Provider being used and the element being selected in the Dataset Configuration pane.
5. **Dataset Output pane:** In this section, the key and value pairs that belong to the currently selected dataset are shown. These values are available in the configured output, they can be toggled, flattened or merged, and in the case of Manual Provider, values can be edited or keys added/removed.
6. **Viz Outputs footer:** The configured outputs for the incoming data are configured and listed here. Click on an output name to open the edit dialog, the output status is shown on the status line on the left, while the toggle can switch an output ON/OFF.

Info: While limiting the refresh rate of the UI, the corresponding button in the Application Bar is shown in yellow ⊘ .

3 Requirements

3.1 Applications

Datacenter integrates with various Vizrt applications, each with the following requirements:

Application	Version
Viz Engine	4.4.1 or newer
Viz Libero	8.2.0 or newer
Viz Arena	5.3.0 or newer
Viz Arc	1.7.0 or newer

Datacenter has been tested using the following browsers:

Browser	Version
Google Chrome	130.0.6723.60
Brave	1.71.144
Firefox	131.0.3

3.2 User Permissions

3.2.1 Read and Write Access

The user running the Datacenter requires read and write access to the following path locations:

Path	Read Access	Write Access
Folder: *C:\ProgramData\vizrt**	required	required
Folder: *C:\Program Files\vizrt**	required	**Only during installation**
*Indicates all subfolders		

3.3   Ports

Target Port	Protocol	Type	Feature	Required	Comment
`P` (see "Required")	UDP	inbound	Core	When creating a dataset of type Socket Listener UDP listening on port *P.*	Used to receive data.
`P` (see "Required")	TCP	inbound	Core	When creating a dataset of type Socket Listener UDP listening on port *P.*	Used to receive data.
`P` (see "Required")	UDP	outbound	Core	When creating an output of type Viz Engine sending to port *P.*	Used to send data via UDP.
`P` (see "Required")	TCP	outbound	Core	When creating an output of type Socket Connector connecting to host on port *P.*	Used to initiate data streaming via TCP.
`P` (see "Required")	TCP	outbound	Core	When creating an output of type Viz Arc or Generic TCP sending to port *P.*	Used to send data via TCP.
`5700`	TCP	inbound	Core	Always	Main backend on HTTP.
`5701`	TCP	inbound	Core	Always	Main backend on HTTPS.
`443, 37718`	TCP	outbound	Core	When creating a dataset of type Tracab.	Used to receive data.

> **Info:** If the "Stream Port" parameter in the Tracab Provider configuration is changed from the default one (`37718`), then the user must ensure that there is no outbound firewall restriction on the newly setup port.

4 Admin System Configurations

This section provides information on how to configure the system running the Datacenter, which includes:

- Configuring Datacenter
- Configuring Outputs

4.1   Configuring Datacenter

Datacenter runs as a Windows service, and it starts automatically on startup. The main UI can be accessed by navigating to http://127.0.0.1:5700.

If Datacenter is started as an HTTPS service, the UI is reachable at (please note the change of port number):

- https://127.0.0.1:5701
- http://<computer-name>:5701 where *<computer-name>* is the name registered in the configured HTTPS certificate for your machine. More information on how to configure a secure HTTPS service can be found in the General Configuration.

When accessing Datacenter via localhost (the same host that runs the Datacenter service, which also corresponds to the 127.0.0.1 IP address), you can also access the Admin page where a variety of options can be configured. The Admin page can be reached using one of these options:

- Navigating to http://127.0.0.1:5700/admin (or alternatively https://localhost:5701/admin).
- By clicking on the cogwheel icon 🔧 in the main page UI.

When opening the Admin page, the following window is shown:
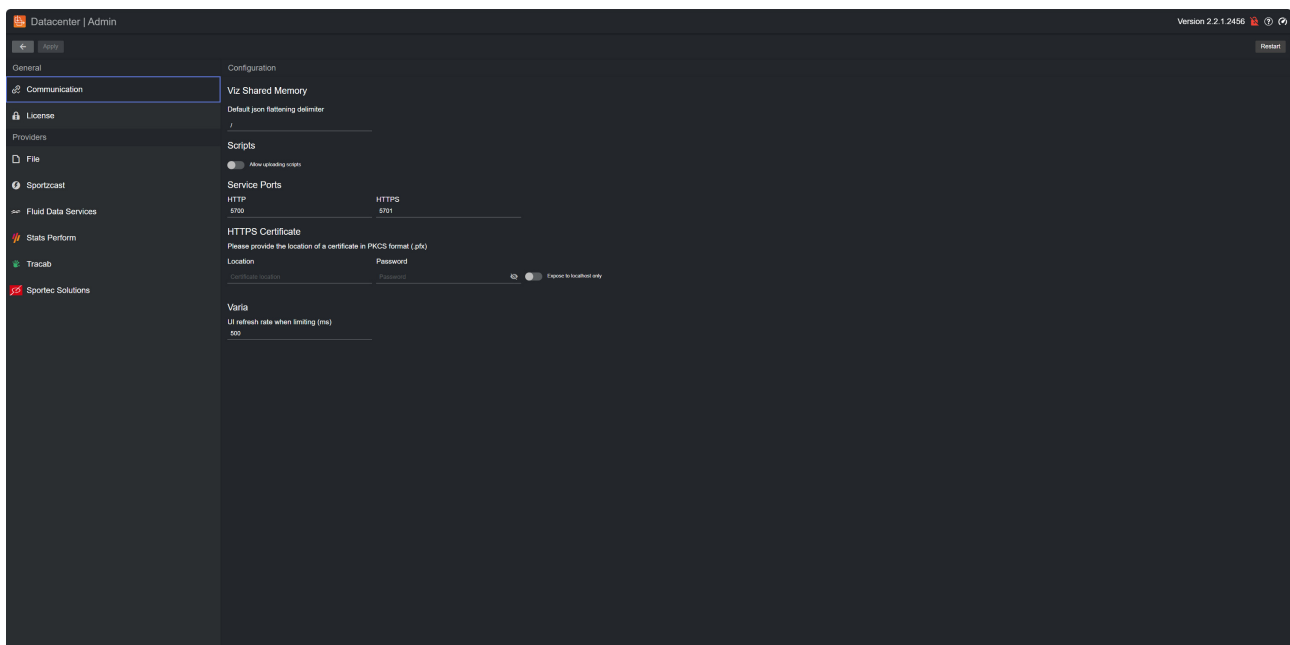
> **Note:** The Datacenter Admin page can only be accessed via localhost. To confirm it can be accessed, please make sure the cogwheel icon 🔧 is present in the top-right corner of the Datacenter Main page.

> **Info:** Changes made in the Admin page are not automatically applied. To apply any change made to the configuration, please make sure to press the **Apply** button in the top-left corner of the UI Apply .

> **Info:** To restart the Datacenter service, please press the **Restart** button in the top-right corner of the UI Restart . A dialog appears where you can confirm whether to restart the service or not. After confirming, the Datacenter service is restarted immediately, **causing the sending of output data to temporary stop**.

This section describes how to configure various aspects of the Datacenter, including:

- Providers Configuration
- General Configuration

4.1.1 Providers Configuration

Datacenter supports a variety of data Providers. Some of them have a global configuration that needs configuring.

This section explains how to use such configurations:

- File
- Sportzcast
- Fluid Data Services
- Stats Perform
- Tracab
- Sportec Solutions

File

The Datacenter can be configured to read files from specific input folders. To be able to open and monitor files on these locations, those folders need to be added to the File provider configuration using the following steps:

1. Click on the **File** entry in the Provider list in the Admin page.
2. Click on the plus button ⊕ .
3. Type the path in the **Folder Path** input field.
4. Enter an alias for this path to be used in the application.
5. Click the **Apply changes** button.

The alias submitted points to the specified folder path when used to create new datasets of type File.
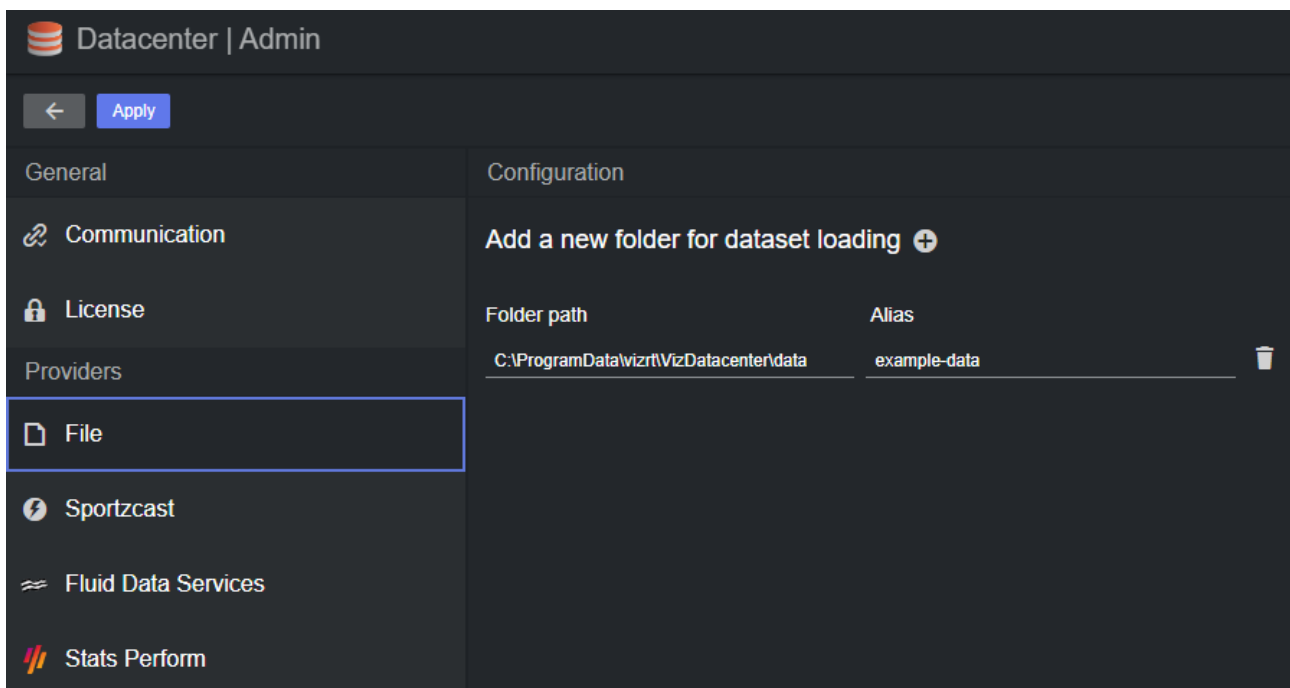
> **Note:** For security reasons, the folders and files to be used in Datacenter can only be accessed when copied to *C:\ProgramData\vizrt\VizDatacenter*.

> **Note:** Datacenter ships with example files that can be used to test a File provider. They are located in *C:\ProgramData\vizrt\VizDatacenter\Data\Files.*

Sportzcast

Datacenter can be configured to fetch data from the Sportzcast by Genius Sports cloud service. Such service requires a username and password that must be obtained from the data Sportzcast.
To be able to fetch data from the Sportzcast by Genius Sports cloud service, the following configurations must be performed:

- **Username:** The username obtained by the Sportzcast data provider.
- **Password/Token:** The password (sometimes referenced as token) obtained by the Sportzcast data provider.
- **Server:** The hostname of the provider (use the default scorebot.sportzcast.net for the default service, or your own server location).
- **Port:** The port used to communicate with the host configured (default: 1402).
- **Test configuration:** Use this button to test whether the specified configuration is correct. If correct, the button turns green, otherwise it turns red. Hovering over the button reveals the error in a tooltip:
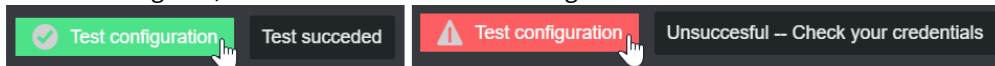
Fluid Data Services

Datacenter can be configured to fetch data from the Fluid Data Services data provider. For this integration to work, the following configurations must be performed:
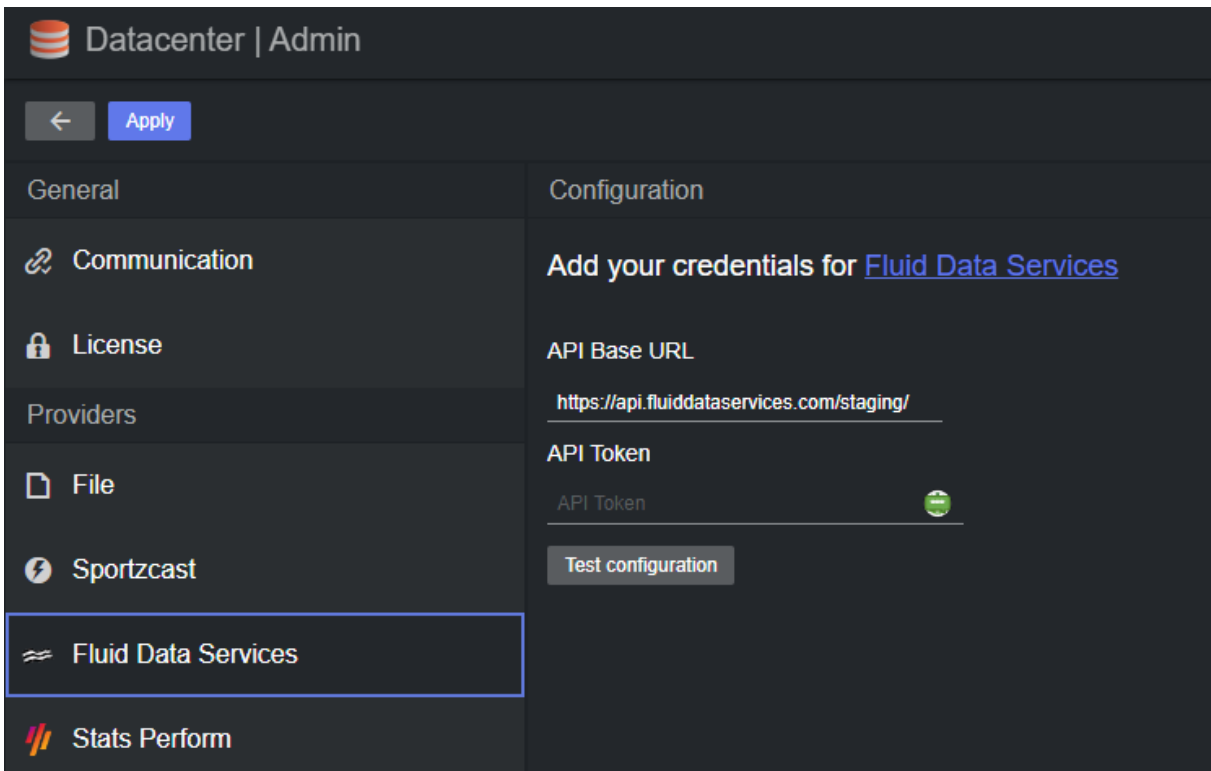
- **API Base Url:** The URL used to fetch data from the desired endpoints (for example, https://api.fluiddataservices.com/staging/).
- **API Token:** This input field is to specify the API token required to authenticate with the Fluid Data Services backend. The token must be obtained directly from the provider. When saved, the token is encrypted and its encrypted value is shown rather than the plain value (it is used when issuing HTTP(s) requests to the webserver).
- **Test configuration:** Use this button to test whether the specified configuration is correct. If correct, the button turns green, otherwise it turns red. Hovering over the button reveals the error in a tooltip:

Stats Perform

Datacenter can be configured to fetch data from the Stats Perform data provider. For this integration to work, the following configurations must be performed:
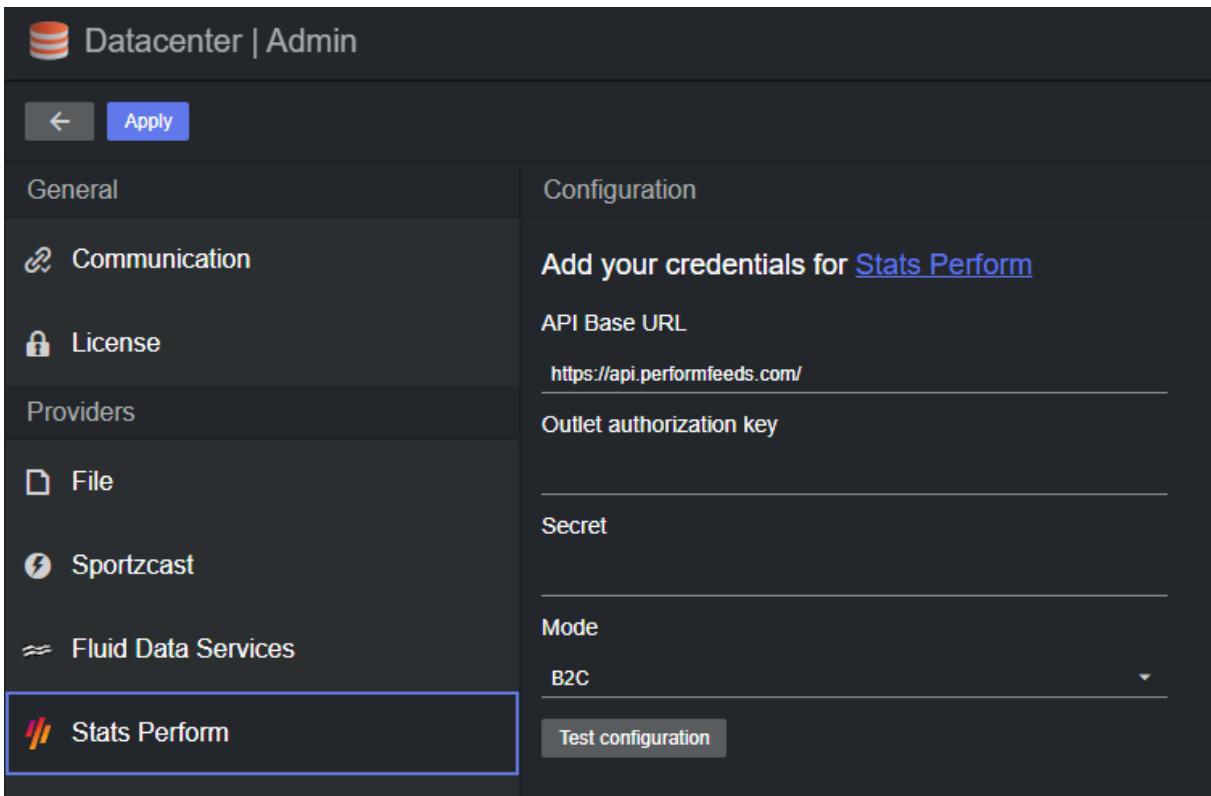
- **API Base URL:** The URL used to fetch data from the desired endpoints, needs to be configured to api.statsperform-hosted.com.cn when using the integration from a Chinese IP or domain.
- **Outlet authorization key:** Authorization key provided by StatsPerform.
- **Secret:** Secret provided by StatsPerform (if needed, depending on the account type).
- **Mode:** Business-to-Business (**B2B**) or Business-to-Customer (**B2C**), depends on the account type.
- **Test configuration:** Use this button to test whether the specified configuration is correct. If correct, the button turns green, otherwise it turns red. Hovering over the button reveals the error in a tooltip:
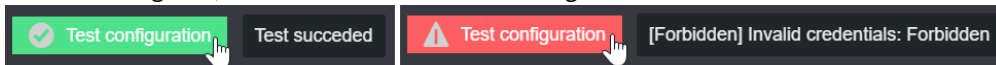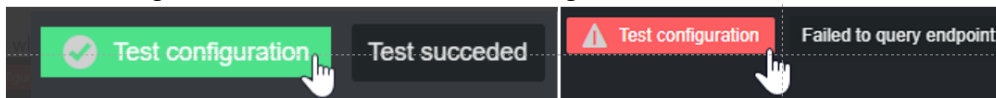

Tracab

Datacenter can be configured to receive data from the Tracab data provider. For this integration to work, the following configurations must be performed:
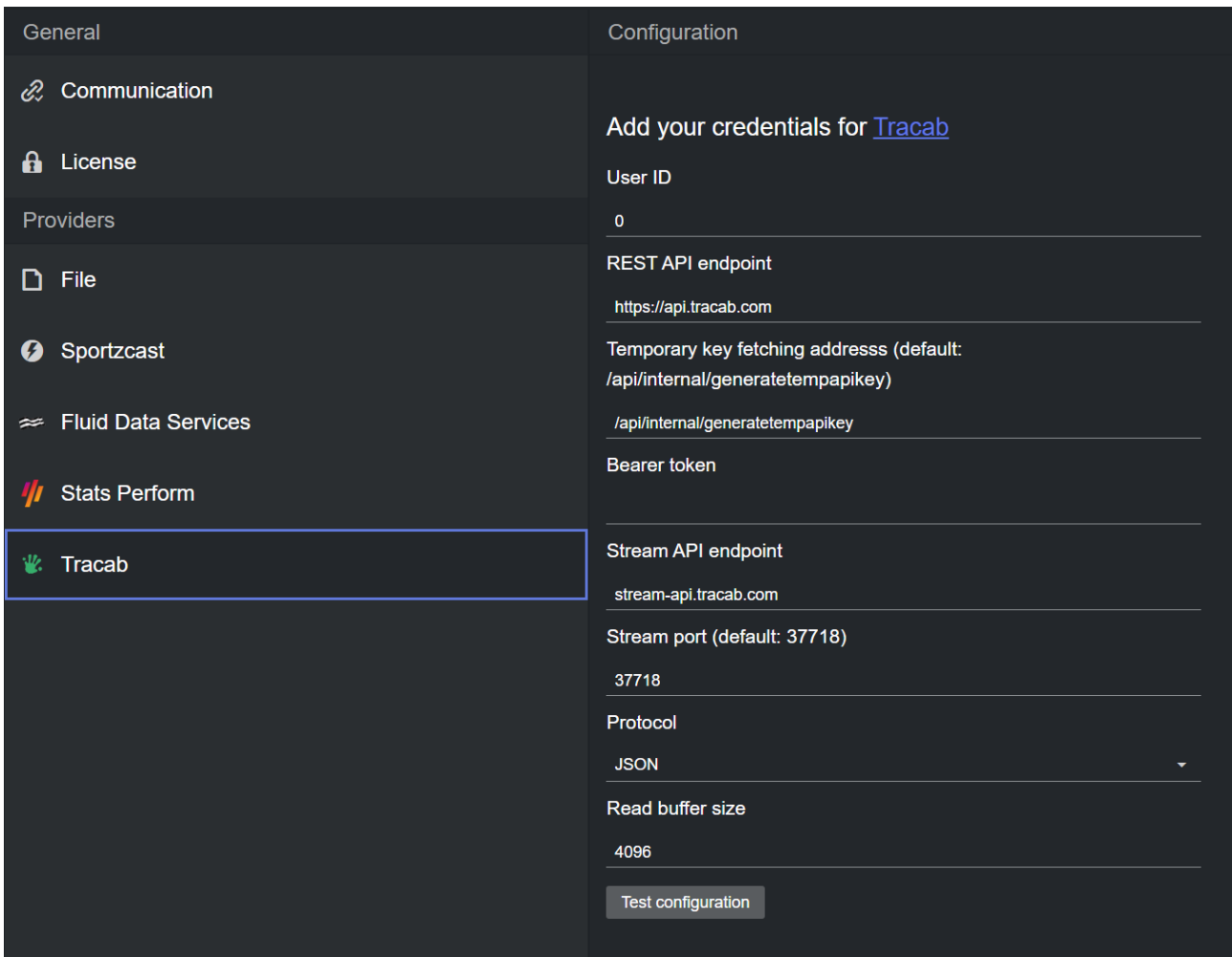
- **User ID:** User ID provided by Tracab.
- **REST API endpoint:** URL used to fetch metadata for a game.
- **Temporary key fetching address:** URL to fetch the authentication keys.
- **Bearer token:** Authentication bearer token provided by Tracab.
- **Stream API endpoint:** URL used to authenticate and request data streaming for a game.
- **Stream port:** Used to receive data.
- **Protocol:** Defines the received data format (JSON, ASCII or Binary).
- **Read buffer size:** Size of the buffer used to read data in.
- **Test configuration:** Used to test whether the specified configuration is correct. If correct, the button turns green, otherwise it turns red. Hovering over the button reveals the error in a tooltip:
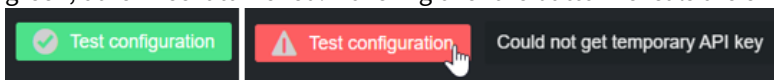

> **Note:** Unless instructed otherwise, we recommend to leave the following options to their default value:
> - **REST API Endpoint**
> - **Temporary key fetching address**
> - **Stream API endpoint**

- **Stream port**
- **Protocol**
- **Read buffer size**

Sportec Solutions

Datacenter can be configured to fetch data from the Sportec Solutions data provider. For this integration to work, the following configurations must be performed:
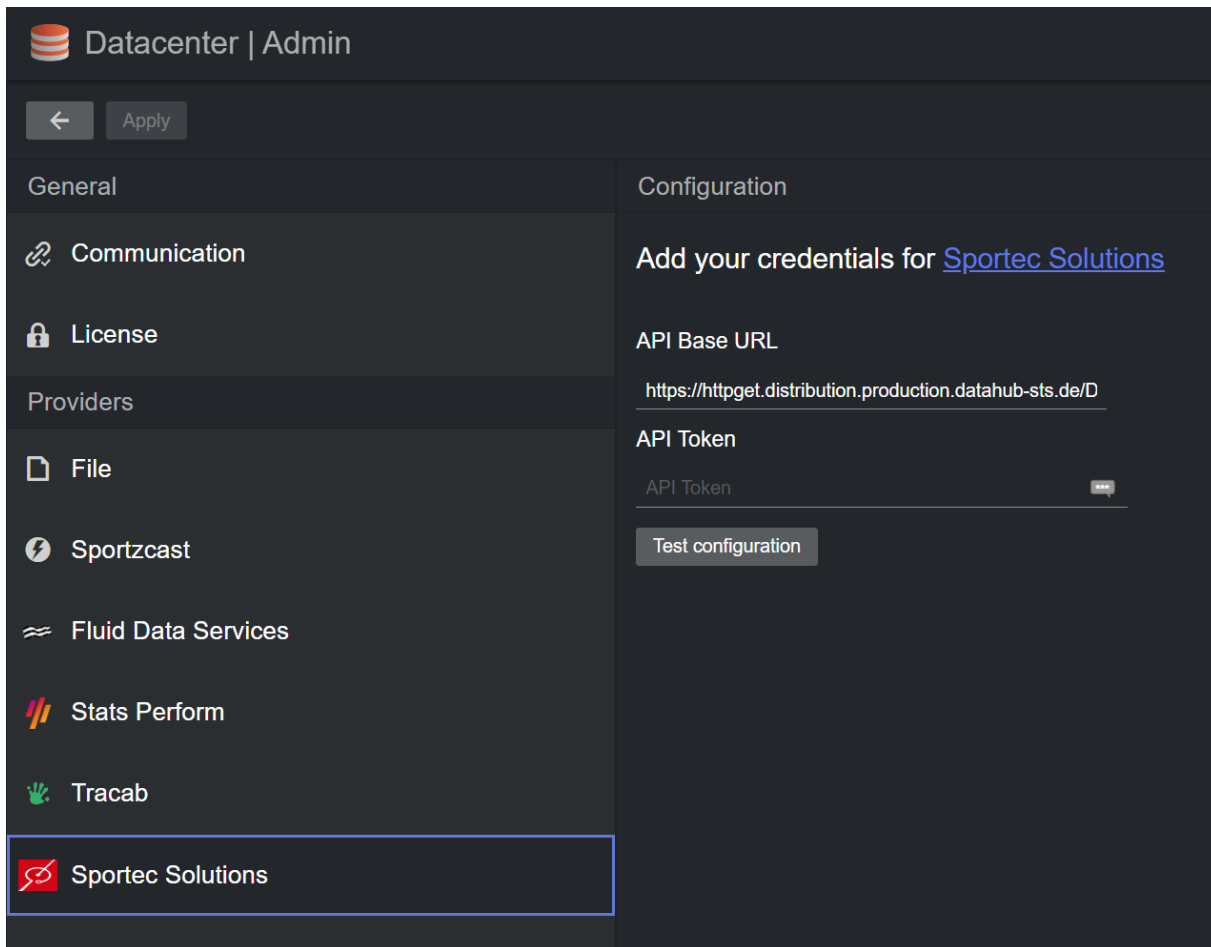

- **API Base Url:** The URL used to fetch data from the desired endpoints (default: https://httpget.distribution.production.datahub-sts.de/DeliveryPlatform/REST/).
- **API Token:** This input field is to specify the API token required to authenticate with the Sportec Solutions backend. The token must be obtained directly from the provider. When saved, the token is encrypted and its encrypted value is shown rather than the plain value (it is used when issuing HTTP(s) requests to the webserver).
- **Test configuration:** Use this button to test whether the specified configuration is correct. If correct, the button turns green, otherwise it turns red. Hovering over the button reveals the error in a tooltip:
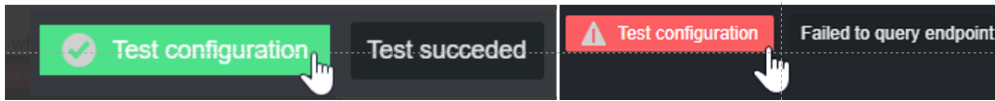
4.1.2   General Configuration

The General configuration page is where you can configure settings related to the Datacenter service:
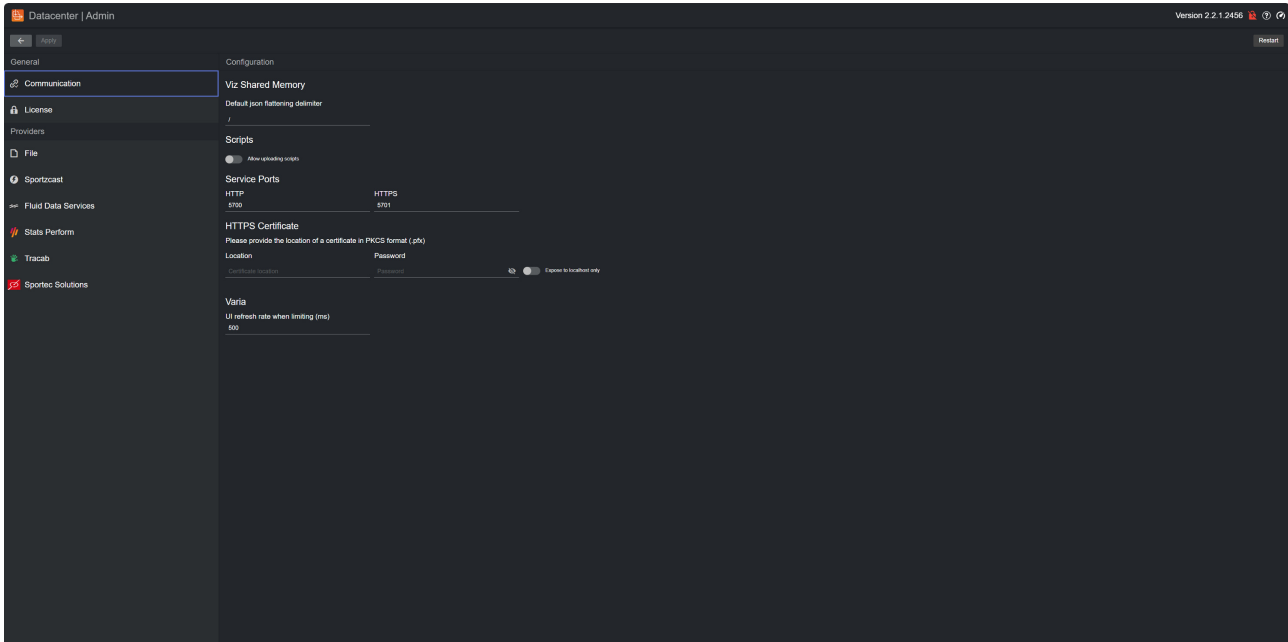
- Communication
  - Viz Shared Memory
  - Script
  - Service Ports
  - HTTPS Certificate
  - Varia
- License

Communication

Under communication you can configure the shared memory and your HTTPS certificate.

Viz Shared Memory

The **json flattening delimiter** specifies the delimiter to use when flattening an incoming JSON payload. The default value is **** .

> **Note:** The character **** cannot be used in SHM keys used on Viz Engine with control channels. When control channels are used, nested channels in your scene can be accessed via the **.** character. Therefore, it can be used as a delimiter to map to control channels in the scene.

Script

Use the **Allow uploading scripts** toggle to enable or disable script uploading in the main page. Uploading a script can be useful when you have no access to the machine where Datacenter runs.

> **Script Uploading:** Datacenter does not vet uploaded scripts, therefore, allowing the upload of arbitrary scripts to Datacenter can pose a security threat. We **strongly recommend** to enable scripts uploading, only when strictly necessary and for the time required.

Service Ports

By default, Datacenter uses ports 5700 and 5701 for HTTP and HTTPS communication, respectively. Should any of these ports be unavailable for the system, they can be changed in the dedicated text input field.

After clicking the **Apply** button, a dialog prompts you to confirm whether you want to restart the service using the newly configured ports. Please note the new addresses.

> **Firewall Exceptions:** By default, the Datacenter installer, installs firewall rules for ports 5700 and 5701. When changing the service ports, you must ensure that correct firewall rules are applied for them, otherwise Datacenter may be unreachable.

HTTPS Certificate

Datacenter runs an HTTP service that is reachable by localhost only on port `5700`, by default. This lowers security risks, and makes sure that unprotected communication is not exposed outside of the service machine.

When running as an HTTP service, a red, broken lock is shown in the top-right corner of the UI . Although HTTP is the default service, Datacenter is capable of running an HTTPS secure service, which handles communication using the HTTPS protocol on port `5701`. To do so, input the location of your signed certificate and its password in the dedicated text input fields, and click on **Apply changes**.

A dialog prompts you to confirm whether you want to restart the service, as it is required to upgrade to HTTPS.

By default, the HTTPS service listens to all network interfaces on port `5701`, as this allows communication in and out of the Datacenter service machine. However, also the HTTPS service can be limited to listen to the localhost only.

Use the **Expose to localhost only** toggle and apply changes if required.
When running Datacenter as an HTTPS service, a green, closed lock is shown in the top-right corner of the UI

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> **Note:** To setup Datacenter to run an HTTPS service, a signed certificate in PKCS format must be provided (this can usually be obtained by your system admin). Please note that the Datacenter does not provide signed certificates. Should you not already have a certificate-authority provided certificate, there exist several services that can issue signed certificates (for example, letsencrypt.org).

> **Note:** When running Datacenter as an HTTPS service, an HTTP version of the service is also started on localhost on port 5700. As in the standard HTTP version of Datacenter, this service listens to localhost only.

Create Self-Signed Certificates

In case you are not able to obtain a certificate-authority provided certificate, a self-signed certificate can be used to run the Datacenter as a HTTPS service. This, however, is not the recommended nor preferred way to setup the Datacenter in HTTPS mode, and should be only done under the supervision of your IT team and following an informed decision to use self-signed certificates. While self-signed certificates are easy to obtain, they do not provide any trust value, and are rejected by many communicating actors, including some data providers. Nevertheless, should a self-signed certificate be required, the following steps can be followed.

> **Info:** OpenSSL can be used to create a self-signed certificate. While OpenSSL is already installed on many major Linux distributions, on Windows workstations one may use the one shipped with Git, or install it from known package managers (for example, chocolatey).

On your workstation, open a Terminal and then follow the steps below:

1. Create a private key.

```
$ openssl genrsa -des3 -out domain.key 2048
```

> **Info:** Make a note of the "PEM pass phrase", as this is used later in this guide.

2. Create a certificate sign request (CSR).

```
$ openssl req -key domain.key -new -out domain.csr

Enter pass phrase for domain.key:
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:XX
State or Province Name (full name) [Some-State]:YY
```

```
Locality Name (eg, city) []:YYyy
Organization Name (eg, company) [Internet Widgits Pty Ltd]:MY_ORG
Organizational Unit Name (eg, section) []:MY_UNIT
Common Name (e.g. server FQDN or YOUR name) []:MY_DATACENTER_HOST_NAME
Email Address []:

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

3. Create a self-signed certificate. /info

```
openssl x509 -signkey domain.key -in domain.csr -req -days 365 -out domain.crt
```

> **Info:** If you are required to issue the "Common Name", you can use the same *MY_DATACENTER_HOST_NAME* as used above.

4. Create a Self-Signed Root CA.

```
$ openssl req -x509 -sha256 -days 1825 -newkey rsa:2048 -keyout rootCA.key -out
rootCA.crt
```

> **Info:** Make note of the PEM pass phrase, as this is used in the next step when signing certificates requests.

> Common Name for CA
>
> **Info:** Use a different "Common Name" than the one used previously, for example ROOT_HOST_NAME.

5. Sign the CSR with the Root CA.

```
$ openssl x509 -req -CA rootCA.crt -CAkey rootCA.key -in domain.csr -out
domain.crt -days 365 -CAcreateserial
```

6. Convert the PEM to PKCS12 (as needed by Datacenter).

```
$ openssl pkcs12 -inkey domain.key -in domain.crt -export -out domain.pfx
```

> **Info:** Make a note of the password used as "Export Password", this is required in the Datacenter Settings page.

7. Copy the pfx file to the machine running Datacenter if required and use it to launch the Datacenter in HTTPS mode.

Varia

Set the **UI refresh rate when limiting (ms)** to the desired milliseconds to control the slowing-down factor of the UI refresh rate when running in limited refresh rate mode (the Application Bar shows the speedometer icon in yellow).

License

In this section you can configure the license to use with Datacenter, as well as the licensed providers. Without a valid Datacenter Core V3 license, no outputs can be configured, nor datasets created, thus no data is streamed out of Datacenter. Additionally, certain providers require specific addons license.

Datacenter requires a WIBU based software license. The CodeMeter license service checks for available licenses and presents the relevant license containers in a dropdown menu next to the License label.

When selecting a license from the list, its information is shown on the right. Additionally, the available (and not expired) Providers license addons on the container, are listed as toggles.
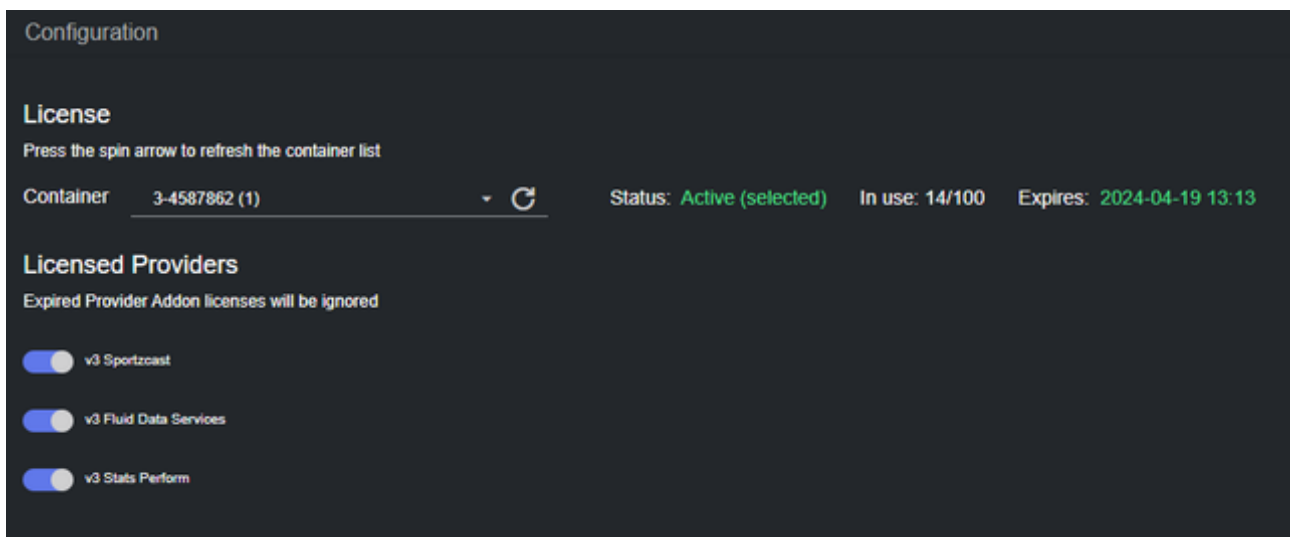
If you do not see the container you wish to use, click the refresh button to trigger a new scan of available licenses.

The currently selected container is listed as **Active (selected)** in the information line. The available containers and expiration date are also shown in the same line. If the license is not expired, its expiration date is shown in green:
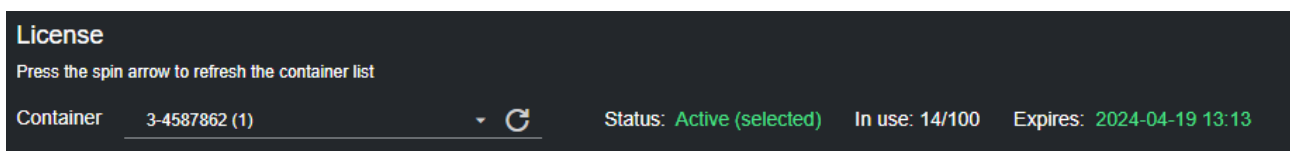
Conversely, expired licenses list their expiration date in red. Similarly, licenses that are not selected, are listed as **Inactive (not selected)**.
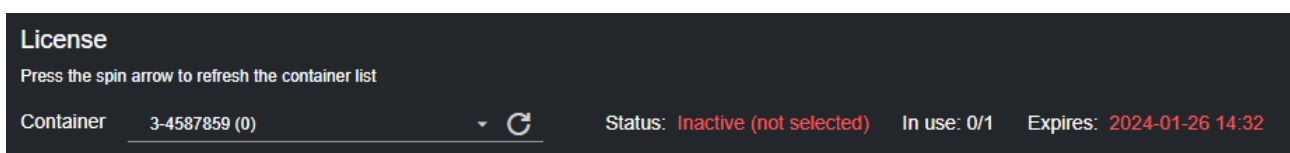
After choosing a container, please allow the software to fetch the licensed providers addons, and then select the ones you want to use from the list of toggle buttons that appears next to the **Licensed Providers** label. When done, click on **Apply changes**.

4.2   Configuring Outputs

To correctly send data to various Outputs from the Datacenter, the receiving end(s) need to be configured correctly.

This section describes how to configure all of the Outputs in Datacenter, including:

- Viz Engine Configuration
- Viz Libero Configuration
- Viz Arena Configuration
- Viz Arc Configuration

4.2.1 Viz Engine Configuration

Each Viz Engine receives live data from Datacenter, and it must be configured to listen to the **Shared Memory** input over the configured communication protocol. This should also be done for any preview Viz Engine that may be in use.

To configure a Viz Engine to receive incoming data from Datacenter, please follow these steps:

1. Open the Viz Engine configuration.
2. Got to **Communication > Global.**
   a. Make sure the **General Communication Port** is set to a port available in your system.
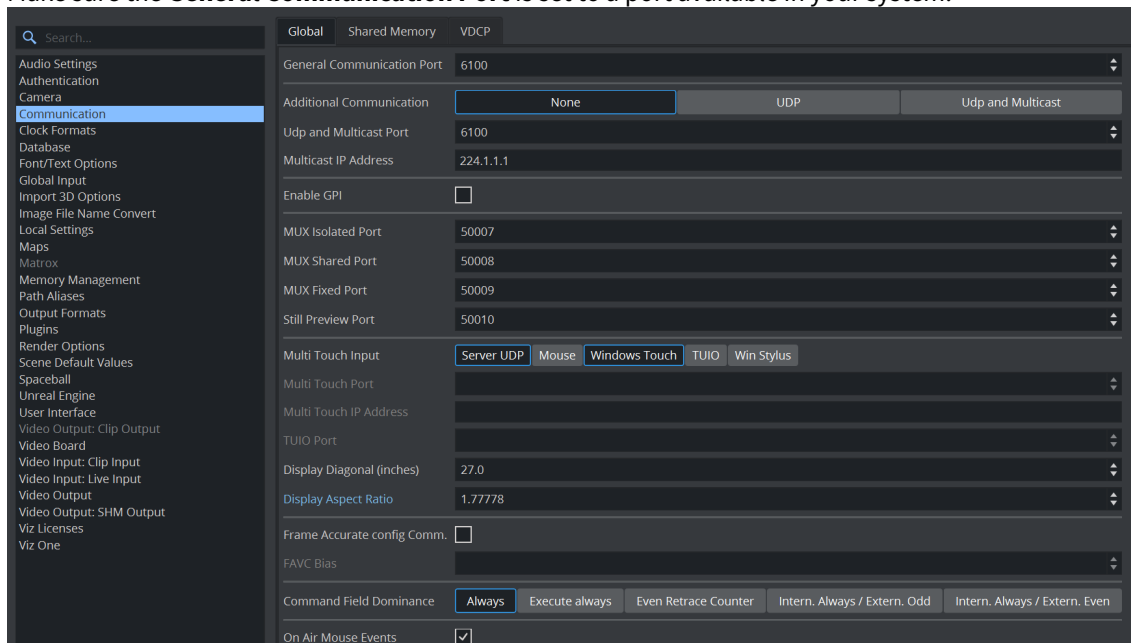
3. Go to **Communication > Shared Memory.**
   a. Depending on the communication protocol chosen for the Viz Engine outputs in Datacenter, enter either a UDP or a TCP port number (or both if a AUTO-selecting protocol output is used).
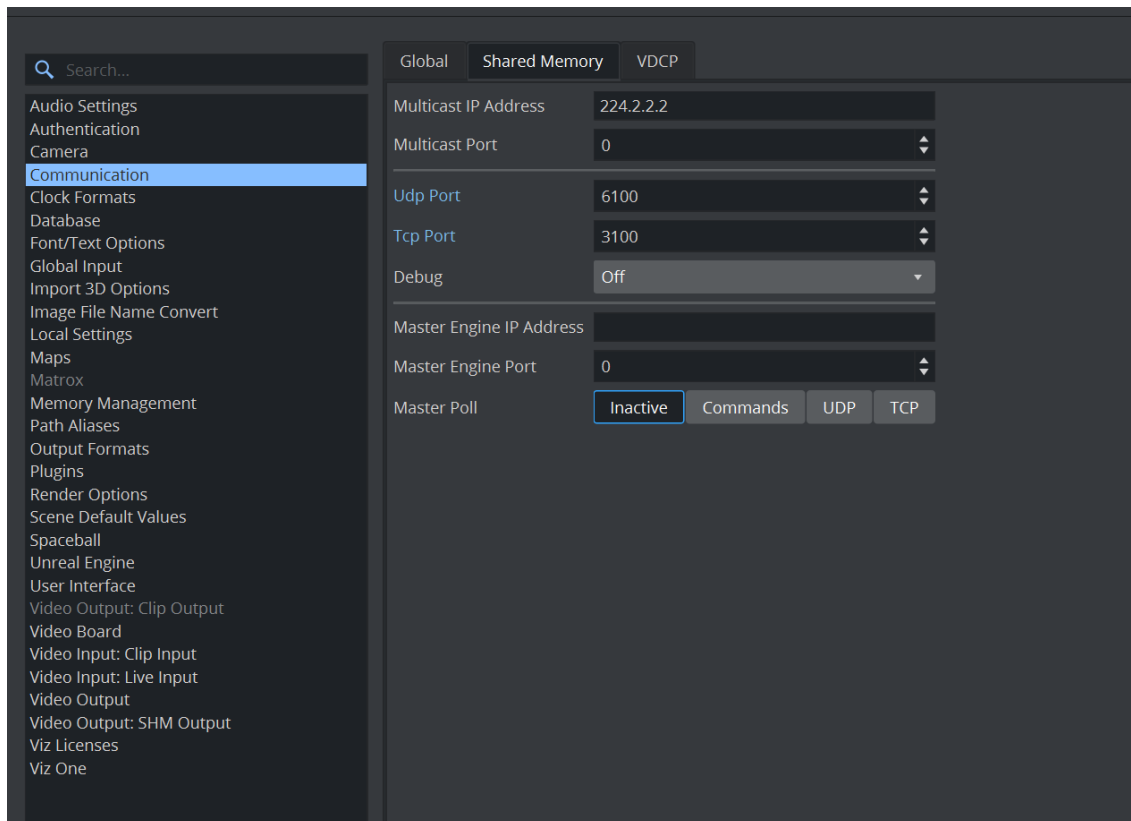
4. Save the configuration and restart.

> **Note:** Take note of the **General Communication Port** specified in the Viz Engine configuration panel, as this is required when configuring the relevant port for the output in Datacenter.

Your Viz Engine is now ready for the Datacenter live input.

Monitor the Incoming Data on a Viz Engine

To monitor the incoming data on a Viz Engine Shared Memory channel, a REST webserver can be installed from the Viz Engine Settings. To do so:

- Open the Viz Engine Configuration, navigate to **Communication > Global**.
- Locate the **REST Webservice** field and enter a port number available on your system.
- Click **Install** and close the settings.

You should be able to monitor the various Shared Memory channels in the address **http://localhost:<YOUR_PORT>#/sharedmemory**.

Viz Engine	Status	Shared Memory	Documentation

Shared Memory

Refresh

System	VizCommunication	Scene

System Map

Key	Value	
SHMCLIP0	0	delete
SHMCLIP0Mode	0	delete
SHMCLIP1	0	delete
SHMCLIP10	0	delete
SHMCLIP10Mode	0	delete
SHMCLIP11	0	delete
SHMCLIP11Mode	0	delete
SHMCLIP12	0	delete
SHMCLIP12Mode	0	delete
SHMCLIP13	0	delete
SHMCLIP13Mode	0	delete
SHMCLIP14	0	delete
SHMCLIP14Mode	0	delete

Key:

Value:

Add

4.2.2   Viz Libero Configuration

The outputs required to integrate with Viz Libero are created by Viz Libero upon connection.

Please check the *Viz Libero User Guide* for relevant configuration options.

4.2.3   Viz Arena Configuration

Viz Arena requires a Datacenter output configuration, for each of its configured Viz Engines (both preview and programs(s)).

Please check the *Viz Arena User Guide* to learn where to retrieve the relevant configuration options.

4.2.4   Viz Arc Configuration

Each Viz Arc configured as an output in Datacenter, receives live data from it. As data is posted to Viz Arc using an HTTP POST protocol, a valid port must be specified for the **Arc Web Server Port** field found in **Setting > General > Communication** of the Viz Arc Configuration panel:

When changing the Web server port, restart Viz Arc to make sure the new changes are applied.

Your Viz Arc is now configured to received data from Datacenter.

> **Note:** Take note of the port specified in the Viz Arc configuration panel, as this is required when configuring the relevant port for the output in Datacenter.

5   Operating Datacenter

This section provides information on how to operate correctly the Datacenter system:

- Getting Started
- Accessing Datacenter
- Creating Datasets
- Configuring Datasets
- Outputs

5.1 Getting Started

To add live data to your graphics with Datacenter, follow these simple steps:

1. Configure your output(s) application to be ready to receive incoming data. Make sure to configure or load a correct Viz Engine scene that works with Datacenter.
2. Access the Datacenter main UI and configure it to add information, such as provider APIs or folders to monitor.
3. Create one or more datasets and configure them.
   a. Each data set contains a list of key/value-pairs that you can filter, edit and control in real-time, deciding which values should be sent to your output(s) to populate their graphics.
4. Create and configure one or more Outputs to receive live data.

> **Note:** Viz Libero and Viz Arena configure the necessary datasets upon installation, and Viz Libero also creates the necessary output when connecting. Therefore, only the relevant provider access tokens need to be configured for a successful Viz Libero integration. However, for a successful Viz Arena integration, the desired output(s) need to be configured.

5.2 Accessing Datacenter

5.2.1 Accessing Datacenter

The Datacenter runs automatically as a service on the host machine. It automatically starts on Windows startup, and its status can be monitored in **Task Manager > Services > VizrtDataCenter**.

While the service is always running in the background, the main user interface can be opened by navigating, using a browser on the same machine hosting the service, to one of the following addresses:

- *http://127.0.0.1:5700*. This address is always available, regardless of the service mode configured (see HTTPS Certificate configuration).
- *https://127.0.0.1:5701*. This address is only available if a valid HTTPS certificate has been configured (see HTTPS Certificate configuration).

If Datacenter is correctly configured to run an HTTPS backend that listens to all network interfaces, then the user interface is also reachable from:

- *https://<host-machine-ip>:5701*, where *<host-machine-ip>* is the public facing IP of the host machine. This mode allows you to reach and monitor Datacenter from all of the machines in the same network.

> **Info:** The Admin page is only accessible when the Datacenter user interface is reached using the localhost address option.

5.3   Creating Datasets

The Datasets panel list, shows all the existing datasets and allows you to create new ones. Existing datasets can be filtered or searched using the respective elements at the top of the list.
The following section explains how to interact with datasets in Datacenter, including:

- Creating a Dataset
- Tagging a Dataset
- Duplicate an Existing Dataset
- Disabling or Deleting a Dataset
- Monitoring a Dataset State

5.3.1   Creating a Dataset

To create a new dataset, use the Dataset pane and press the ➕ button to start.
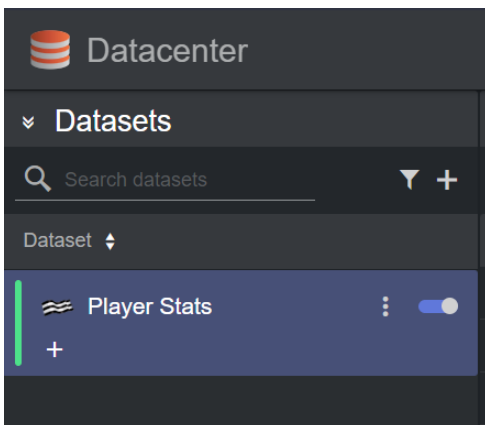
A new panel is shown where you can fill the necessary information.
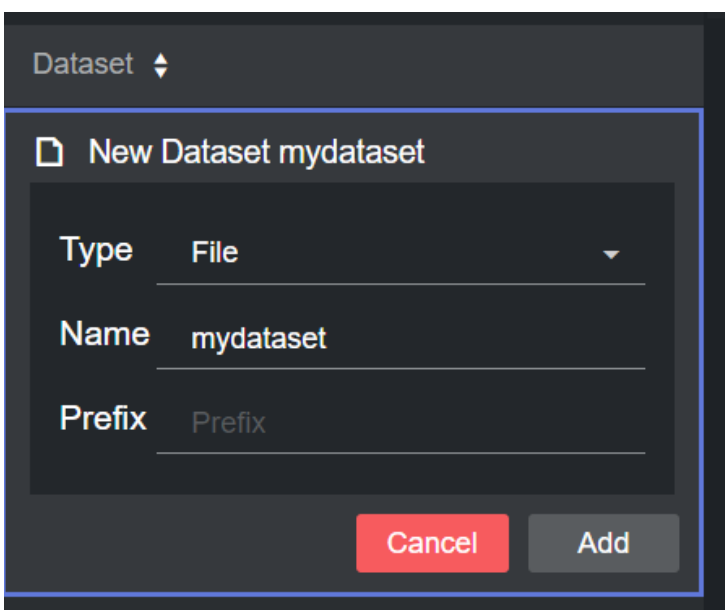
- **Type:** Choose the Provider type for this dataset.
- **Name:** Type a (unique) name for this dataset.
- **Prefix:** This field can be used if keys from different datasets are equal and you need to make them unique. This option is particularly useful when two datasets contain the same key (for example player stats for different players) and should be used simultaneously for the same output. Without using a prefix for one (or both) of the datasets, the values in the scene associated to the duplicate keys would be randomly taken from one of the datasets.

Click the **Add** button to create the dataset, or **Cancel** to abort.

Please refer to the Providers page for specific providers information on how to create a dataset.

5.3.2   Tagging a Dataset

In order to access individual datasets via the simple page, tags can be given to a dataset. To do so, use the "**+**" icon on the dataset:
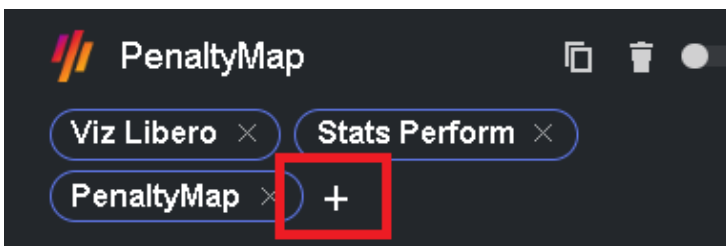
5.3.3   Duplicate an Existing Dataset

Instead of creating each dataset from scratch, you can duplicate existing datasets, and subsequently change some of their properties (for example, change a prefix or add a new endpoint to pull data from). To do so, locate the dataset to clone, expand the hamburger menu next to the name and click on the Duplicate icon .
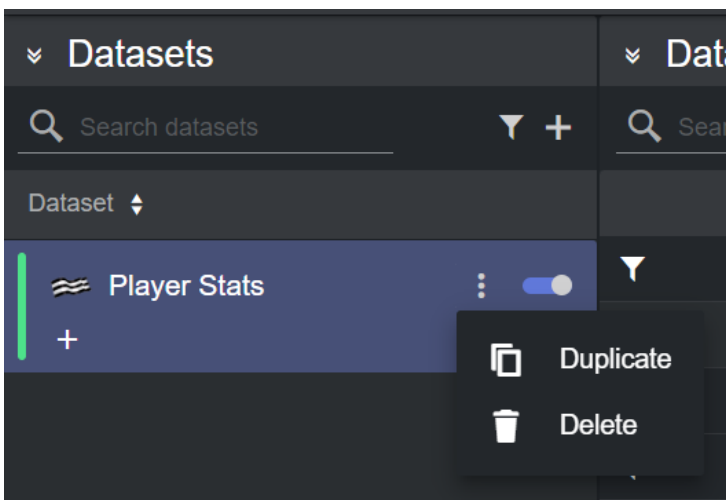
A new dataset is created with the default name *Copy of <original dataset name>*.
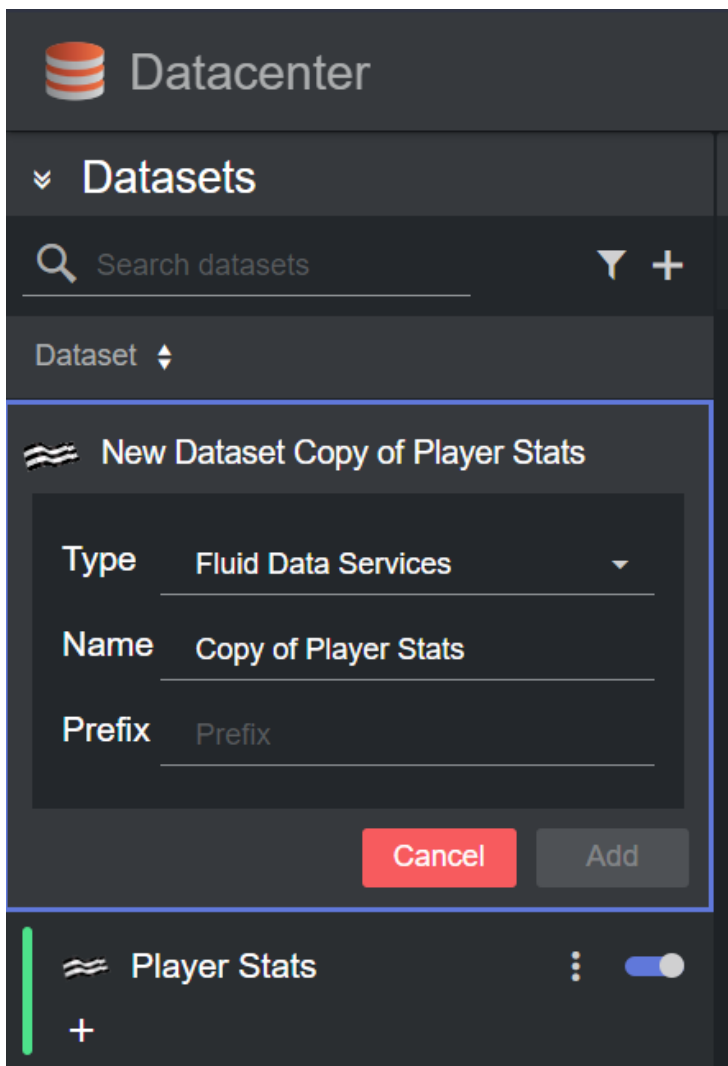
> **Info:** When cloning a dataset, all the properties of the original datasets including data sources and specific settings, are assigned to the new datasets.

5.3.4   Disabling or Deleting a Dataset
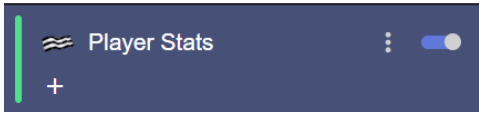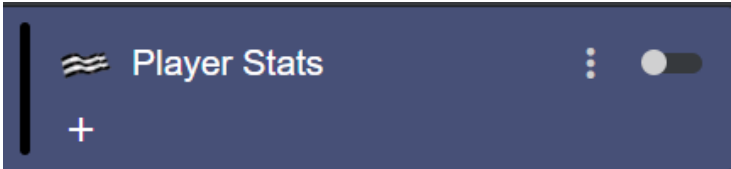
A dataset can be permanently deleted or temporary disabled. These are the steps for each:

- To delete a dataset, expand the hamburger menu next to its name and click on the Delete icon. The dataset is removed, and all its data is removed immediately from the outputs.
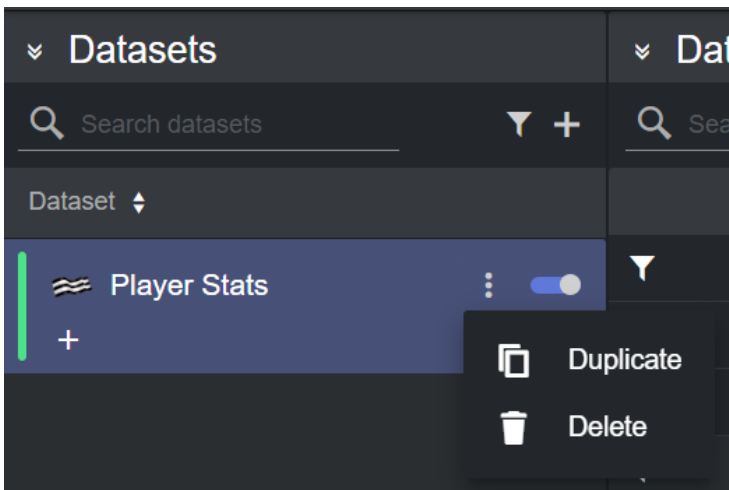
> **Note:** This operation is destructive, as the dataset cannot be recovered after deleting it.
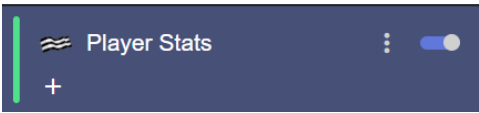
- To disable a dataset, click on the toggle next to its name:
  - A blue toggle means that the dataset is currently active.
  - A grey toggle means that the dataset is currently inactive.
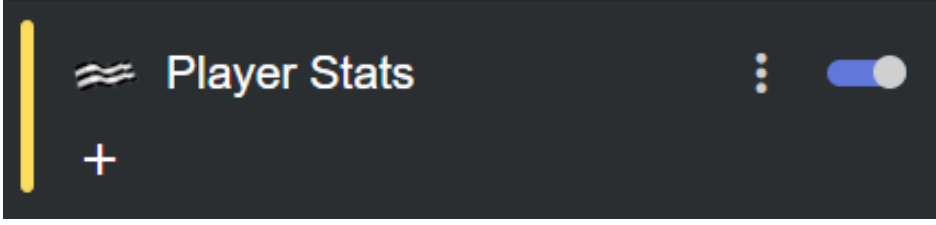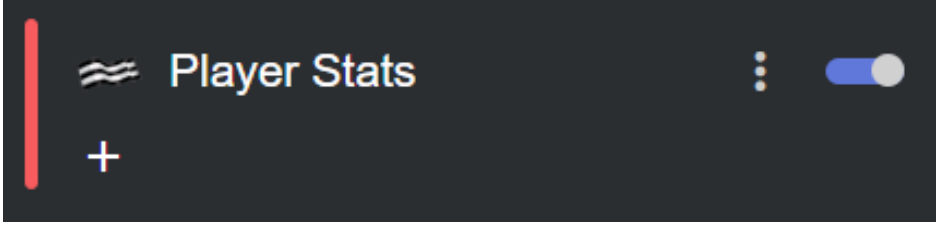
Status	
Active	
Inactive	

5.3.5   Monitoring a Dataset State

A dataset can be in three distinct states:

- **OK:** The dataset is correctly configured and has data entries.
- **Warning:** The dataset is not correctly configured and has (potentially) no data entries.
- **Error:** The dataset source or the dataset itself has blocking errors which prevents the dataset from working correctly.

Status	
OK	

Status	
WARNING	
ERROR	

When one or more datasets are in warning or error state, the app bar shows a red or yellow icon in the top-right corner.

To obtain more information on a dataset in either Warning or Error state, hover the mouse on the dataset name to reveal a tooltip with further information and potential fixes.
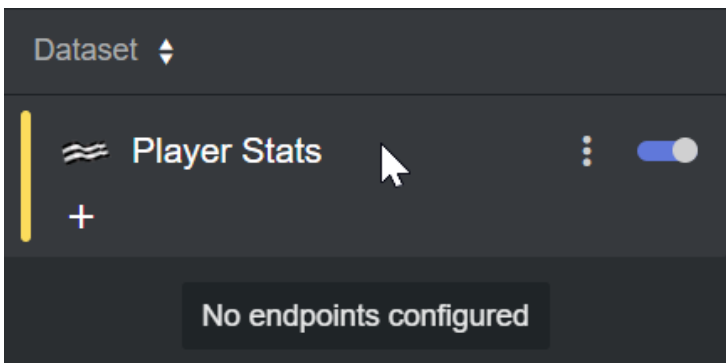
Once all datasets are in the OK state, the app bar shows a green icon .

5.4 Configuring Datasets

The Datacenter allows communication with a variety of Providers, supporting a variety of technologies used to retrieve data.
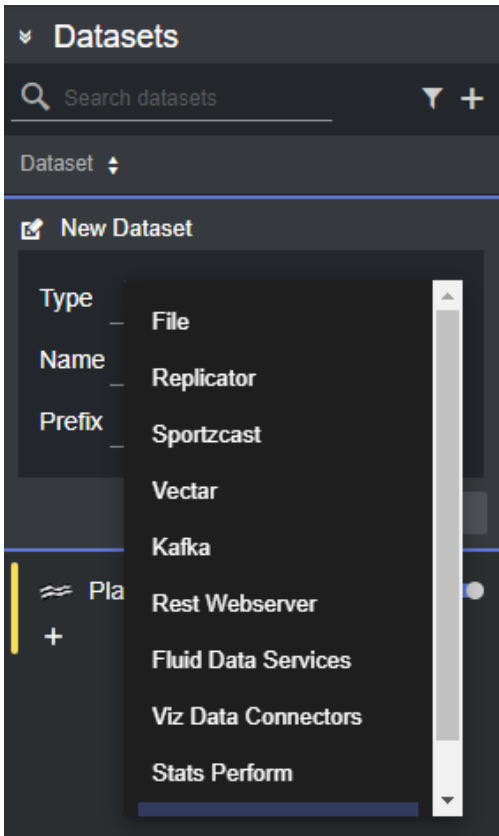
The following Providers can be used to acquire live data from:

- **Manual:** You can specify the key/value pairs manually.
- **File:** Reads and monitors data from the configured files.
- **Replicator:** Replicates data from a specific dataset from a Datacenter instance that runs on a different machine.
- **Sportzcast:** Provides live data from electronic scoreboards in stadiums, as offered by Sportzcast by Genius Sports.
- **Vectar:** Accesses the DataLink data source configured in Viz Vectar.
- **Kafka:** Provides data from a configured Apache Kafka broker.
- **Rest Webserver:** Fetches data from a generic REST-based webserver.
- **Fluid Data Services:** Provides live and telemetry as offered by the Fluid Data Services data provider.
- Stats Perform: Provides live and statistical data as offered by the Stats Perform data provider.
- Viz Data Connectors: Provides data from a configured Viz Flowics existing account. This mode requires a valid Flowics Middleware to be correctly configured and running.
- Socket Listener: Listens for incoming data via a UDP or TCP socket.
- Socket Connector: Connects to a TCP server and initiate data streaming (incoming) via TCP.

- **Tracab:** Provides live and statistical data as offered by the Tracab data provider.

Depending on the Provider chosen, the configuration of each Dataset differs.
The rest of this section illustrates how to configure datasets for each of the supported providers:

- Supported Providers
- Filtering and Manipulating a Dataset Entries
- Enabling or Disabling Dataset Entries
- Inspecting Dataset Entries
- Working with Live Data: the Performance Dashboard
- Joining Endpoints Parameters

5.4.1 Supported Providers

This section provides information on how to configure the supported datasets:

- Sportec Solutions
- Stats Perform
- Fluid Data Services Dataset
- Rest Webserver Dataset
- Viz Data Connectors
- Manual Dataset
- File Dataset
- Replicator Dataset
- Sportzcast Dataset
- Tricaster Vectar
- Kafka Dataset
- Socket Listener
- Socket Connector
- Tracab

Sportec Solutions

These are the steps to configure a Sportec Solutions dataset.

1. Create a new dataset of type **Sportec Solutions**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:
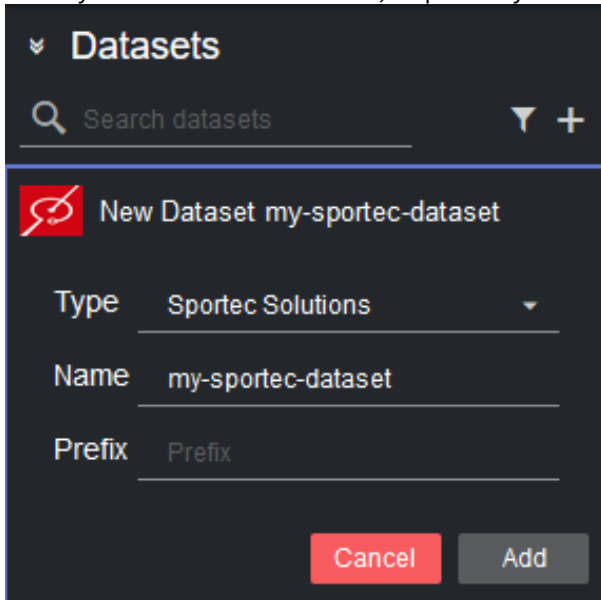
2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no configured endpoints yet.

3. Select one or more endpoints from the table in the **Dataset configuration** panel by double clicking a row. A new endpoint card is then created.

	Name	Description
▼	Competition	The competition
▼	Season	The season of a specific competition
▼	Club	The clubs of a specific season
▼	Matchday	Matchdays of a specific competition
▼	Match	The matches scheduled in a specific matchday
	MatchInformation	Information about a specific match
	AttackingZones	Attacking zones data of a specific match
	MatchEvents	Raw events of a match
	HeatMap	HeatMap of player positions for a specific match
	ClubStatisticsMatch	Statistics of a specific club and its players within a season, and up to a specific matchday
	PenaltiesGoalmouth	The last ten penalties of players in a specific competition

⤜ HeatMap

HeatMap of player positions for a specific m...

Alternatively, you can enter a new endpoint by clicking **Add new endpoint** on the right-side of the panel, and then clicking on the empty endpoint that is added at the bottom of the table to configure it.

⌄ Dataset configuration

🔍 Search endpoints   ＋ Add new endpoint

Doing so reveals the new endpoint details in the Endpoint template parameters on the right side, where its properties can be entered./info

Endpoint Options: When adding a new endpoint, parameters (for example, parts of the endpoint whose value should be fetched from other endpoints) should be encapsulated in curly braces: {part_name}. The value inside curly braces is resolved either by using other endpoints present in the **Dataset configuration** table, or the ones specified in the **Endpoint fixed options** section of the right-most column in the main view.

Using as an example the images above, the following endpoint *DFL-04.06-Heatmaps-Match/{Match}*, would use the {Match} options from the respective endpoint in the table.

4. Once an endpoint is added to a dataset, you can select the endpoint card. This reveals the Endpoint parameters panel on the right side, where its properties can be entered. You can now edit the endpoint configuration (**Competition** and **Matchday**, as shown in the image below):

5. To change the polling rate (how often the Sportec Solutions remote host is polled for data, in s) for the dataset, select a card from the list and edit the **Polling** field in the Dataset parameters on the right-most column.
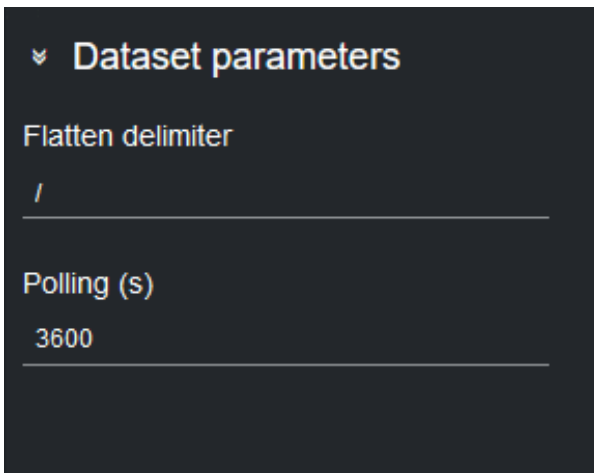
6. When done, the data is added to the **Dataset output** table.
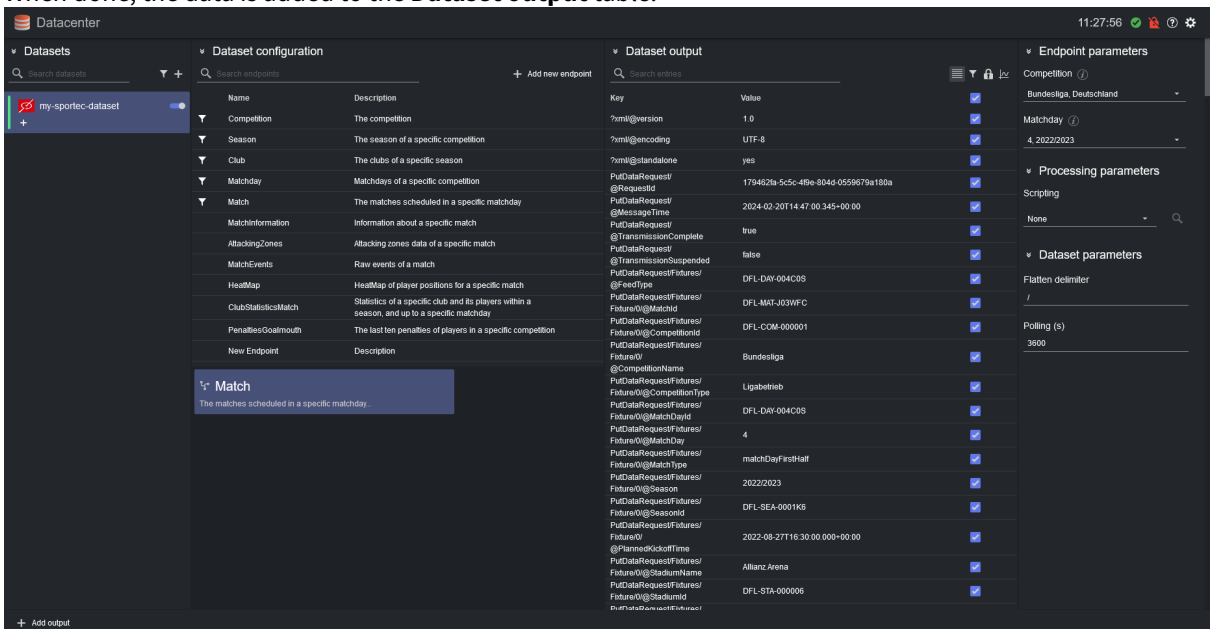
Filtering a Dataset

Values read from a file into a dataset can be filtered via the Filtering tool. To do so, select the dataset card, click on the hamburger menu and then press the **Filter** button.
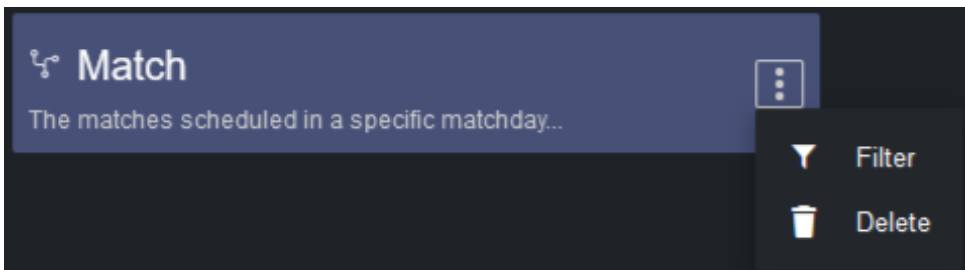
A dialog visualizing the file's payload schema opens, where you can filter the source data.
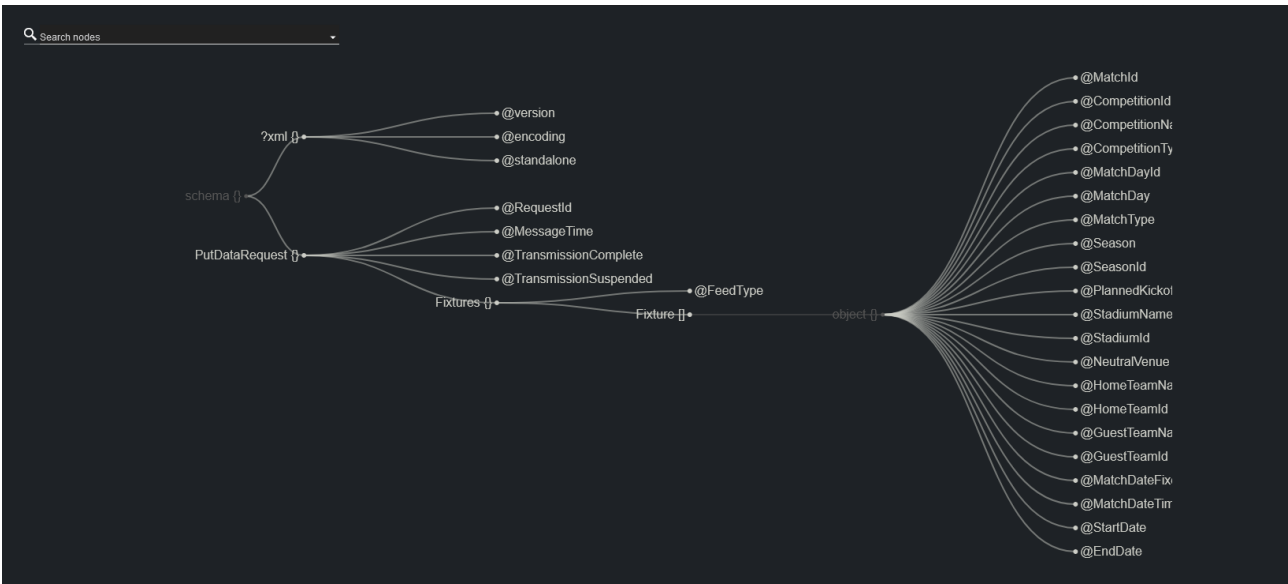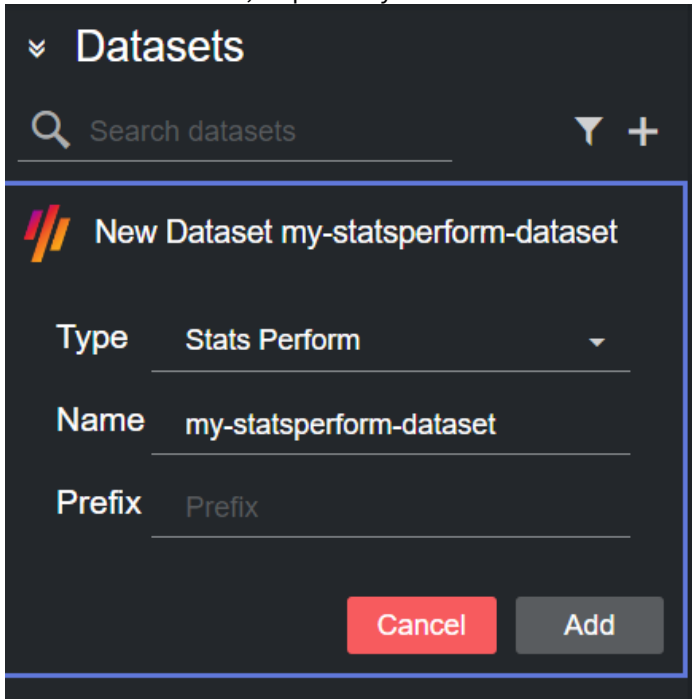
Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Stats Perform

These are the steps to configure a **Stats Perform** dataset.

1. Create a new dataset of type **Stats Perform**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no configured endpoints yet.

3. Select one or more endpoints from the table in the **Dataset configuration** panel by double clicking a row. A new endpoint card is then created.

Alternatively, you can enter a new endpoint by clicking **Add new endpoint** on the right-side of the panel, and then clicking on the empty endpoint that is added at the bottom of the table to configure it.

Doing so reveals the new endpoint details in the Endpoint template parameters on the right side, where its properties can be entered.

> **Endpoint Options:** When adding a new endpoint, parameters (for example, parts of the endpoint whose value should be fetched from other endpoints) should be encapsulated in curly braces: {part_name}. The value inside curly braces is resolved either by using other endpoints present in the **Dataset configuration** table, or the ones specified in the **Endpoint fixed options** section of the right-most column in the main view.
> Using as an example the images above, the following endpoint */soccerdata/matchevent/{outletAuthKey}/ {Match}?ctst={Team}&type={EventType}*, would use the {Match} and {Team} options from the respective endpoint in the table, and the {EventType} option from the fixed options. The {outletAuthKey}, on the other hand, is fetched from the Provider configuration in the Admin page.

4. Once an endpoint is added to a dataset, you can select the endpoint card. This reveals the Endpoint parameters panel on the right side, where its properties can be entered. You can now edit the endpoint configuration (**Competition** and **Season**, as shown in the image below):

5. To change the polling rate (how often the Stats Perform remote host is polled for data, in s) for the dataset, select a card from the list and edit the **Polling** field in the Dataset parameters on the right-most column.

6. When done, the data is added to the **Dataset output** table.

Filtering a Dataset

Values read from a file into a dataset can be filtered via the Filtering tool. To do so, select the dataset card, click on the hamburger menu and then press the **Filter** button.

A dialog visualizing the file's payload schema opens, through which a user can filter the source data.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Fluid Data Services Dataset

This section provides the steps to configure a **Fluid Data Services** dataset.

1. Create a new dataset of type **Fluid Data Services**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no configured endpoints yet.

3. Select one or more endpoints from the table in the **Dataset configuration** panel by double clicking a row. A new endpoint card is then created.

Alternatively, you can enter a new endpoint by clicking **Add new endpoint** on the right-side of the panel, and then clicking on the empty endpoint that is added at the bottom of the table to configure it.

This reveals the new endpoint details, where its properties can be entered.
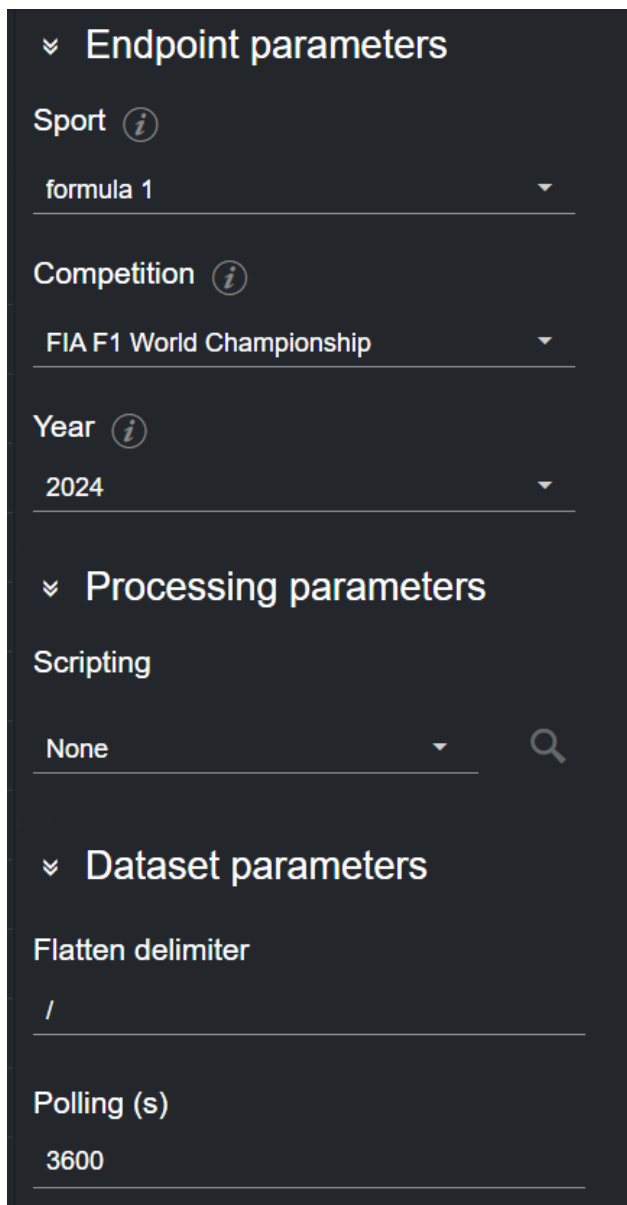
> **Endpoint Options:** When adding a new endpoint, parameters (for example, parts of the endpoint whose value should be fetched from other endpoints) should be encapsulated in curly braces: {part_name}.
> The value inside curly braces is then resolved either using other endpoints present in the **Dataset configuration** table, or the ones specified in the **Endpoint fixed options** section of the main view.
> Using as example the images above, the following endpoint */Competitions/{Competition}/{%year%}/teams/ {Team}/actors*, would use the {Competition} and {Team} options from the respective endpoint in the table. The {%year%} option, on the other hand, is a special token used to list years as date.

4. Once an endpoint is added to a dataset, you can select the endpoint card in the Dataset configuration panel. You can now edit the endpoint configuration (for example, **Sport**, **Competition** and **Year** shown in the picture below) in the Endpoint parameters panel on the right.

5. To change the polling rate (how often the Fluid remote host is polled for data, in s) for the dataset, select an endpoint card from the list and edit the **Polling** field in the Dataset parameters on the right-most column.

6. When done, the data is added to the **Dataset output** table.

Filter a Dataset

Values read from a file into a dataset can be filtered with the Filtering tool. To do so, select the dataset card, click on the hamburger menu and then press the **Filter** button.
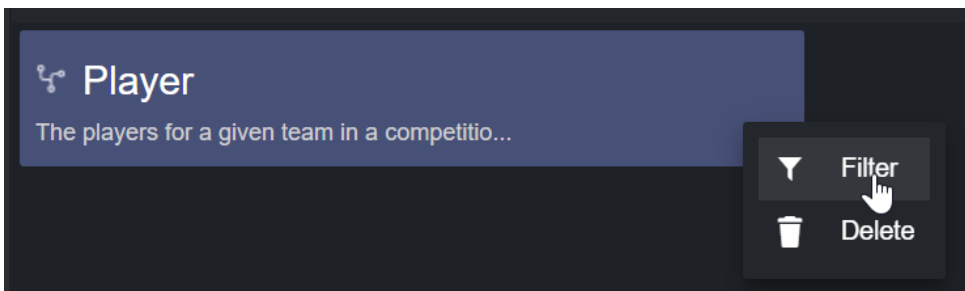
A dialog visualizing the file's payload schema opens, through which a user can filter the source data.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Rest Webserver Dataset
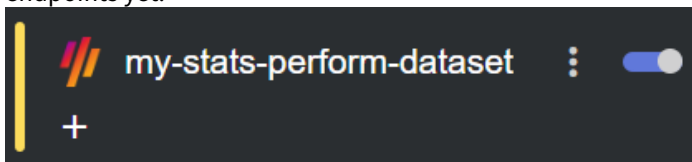
This section provides the steps to configure a **Rest Webserver** dataset, to poll data from a generic REST provider.

1. Create a new dataset of type **Rest Webserver**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no configured endpoints yet.

3. Click on the dataset card and configure the webserver options in the **Dataset parameters** section of the main UI./info

If the host to connect to does not require a port to be specified, please leave the **Port** field as zero.
If needed, use the **API Token** and **Authentication type** fields to specify how an API token should be passed in the request:
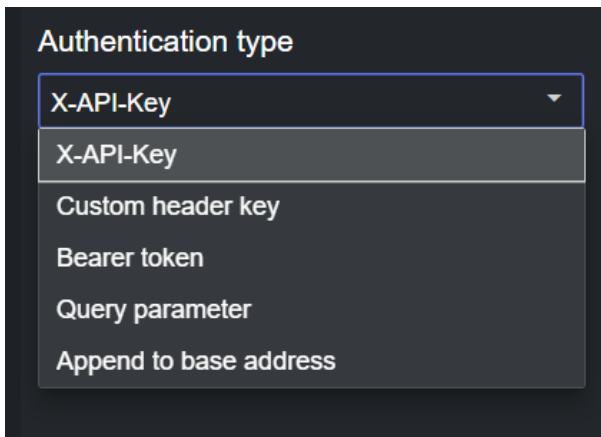
- **X-API-Key:** Embeds the API token in the *X-API-Key* key of the request header.
- **Custom header key:** Embeds the API token in the request header key specified in the **Custom Key** field.
- **Bearer token:** Embeds the API token in the *Authorization* key of the request header, and prefixes it with "*Bearer*".
- **Query parameter:** Embeds the API token in the query parameter specified in the **Custom Key** field.
- **Append to base address:** Appends the API token to the host address, for example *http://my-api-address/<my-api-key>.*

> **Info:** More information on authentication and authorization can be found on the following link: https://swagger.io/docs/specification/authentication/.

4. Select one or more endpoints from the table in the **Dataset configuration** panel by double clicking a row. A new endpoint card is then created.

Alternatively, you can enter a new endpoint by clicking **Add new endpoint** on the right-side of the panel, and then clicking on the empty endpoint that is added at the bottom of the table to configure it.
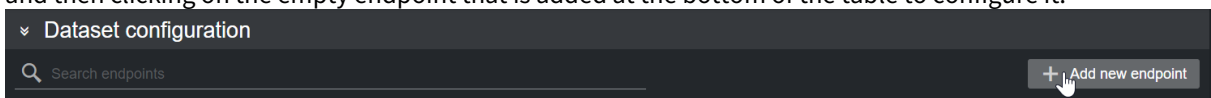
Doing so reveals the new endpoint details, where its properties can be entered.

When adding a new endpoint, parameters (parts of the endpoint whose value should be fetched from other endpoints) should be encapsulated in curly braces: *{part_name}*. The value inside curly braces is resolved either by using other endpoints present in the **Dataset configuration** table, or the ones specified in the **Endpoint fixed options** section of the main view.

Using as example the images above, when adding a new endpoint "*/authors/{authors}*", the *{authors}* option would be resolved by using the endpoint named "authors" in the table to then present the user a dropdown with various authors to configure the newly added endpoint.

5. Once an endpoint is added to a dataset, you can select the endpoint card, where its properties can be entered. You can now edit the endpoint configuration.

6. To change the polling rate (how often the remote REST host is polled for data, in seconds) for the dataset, select if from the list and edit the **Polling (s)** field in the **Dataset parameters** on the right-side column.

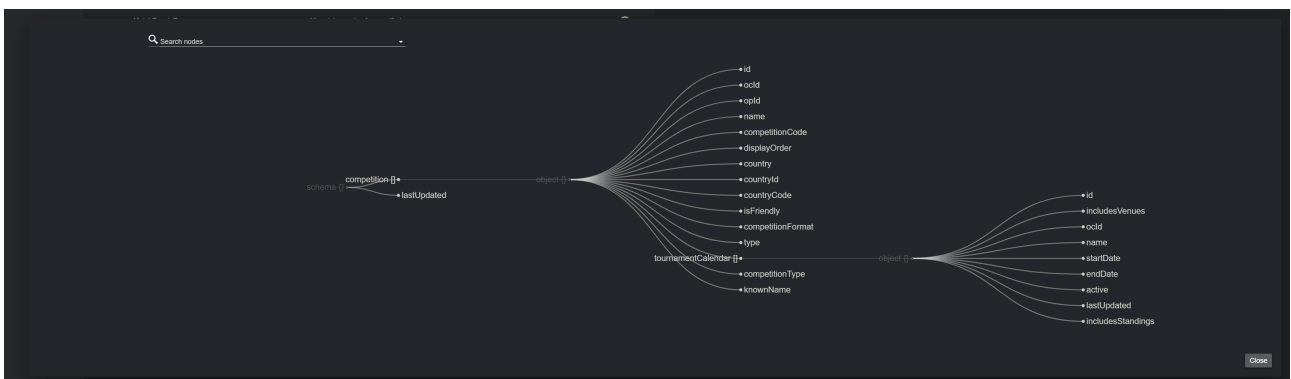7. When done, the data is added to the **Dataset output** table.

Filter a Dataset

Values read from a file into a dataset can be filtered with the Filtering tool. To do so, select the dataset card, click on the hamburger menu and then press the **Filter** button.

A dialog visualizing the file's payload schema opens, through which a user can filter the source data.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.
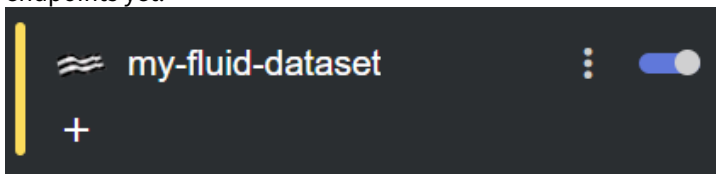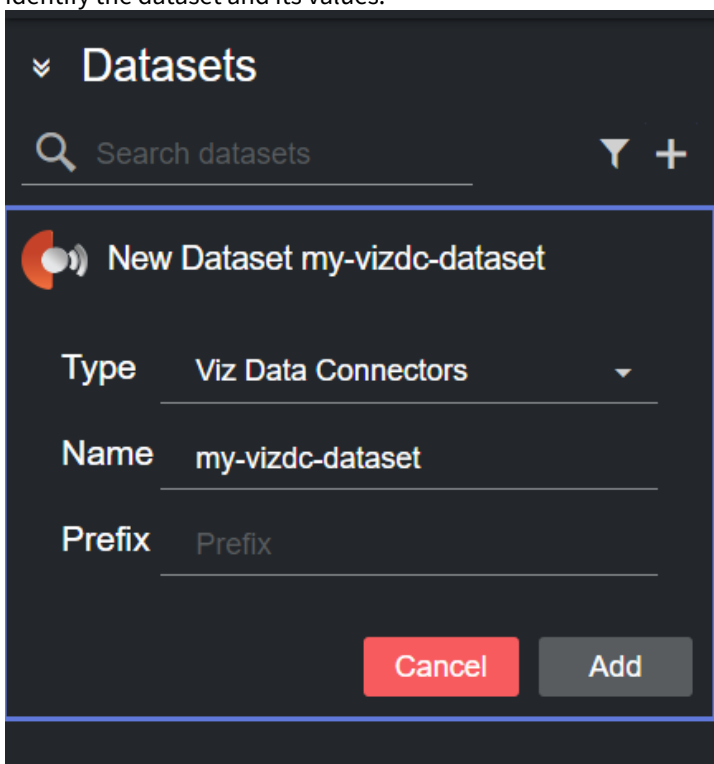
Viz Data Connectors

For a Viz Data Connectors dataset to work correctly, an existing account with Flowics by Vizrt must be obtained (separately) by the customer. Additionally, the connectors to forward to Datacenter via the Flowics Middleware, as well as its setup, must be performed via the Flowics web-ui. Please refer to the Flowics by Vizrt documentation for further information on how to install the Fowics Middleware.

> **Note:** The Viz Data Connectors integration requires Datacenter to run in HTTPS mode. Please refer to the General Configuration page for instructions on how to setup a HTTPS service.
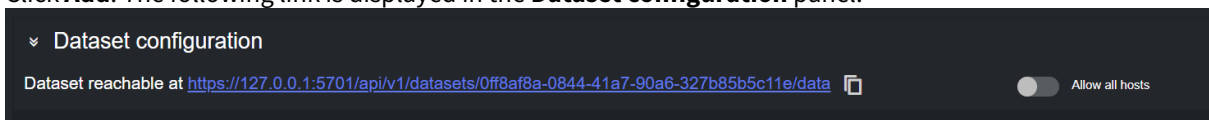
This section provides the steps to configure a Viz Data Connectors dataset using Flowics Middleware.

1. Create a new dataset of type **Viz Data Connectors**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The following link is displayed in the **Dataset configuration** panel:

This link can be used in the Flowics web-ui, to configure the Middleware to forward data to Datacenter.

The basic setup assumes that both Datacenter and the Flowics Middleware run on the same machine. When this is the case, no further steps are required to setup a Flowics dataset, and any data configured to be forwarded by the Middleware, should also appear in the Dataset Entries panel. However, for setups where Datacenter runs on a different machine than the Flowics Middleware, the following additional steps have to be performed:

1. In Datacenter's **Dataset configuration** panel, enable the **Allow all hosts** toggle.

a. Substitute the *localhost/127.0.0.1* part of the address shown in the **Dataset configuration** panel with the machine public IP, and use this new address to configure the Middleware to forward data to Datacenter.

> **Info:** On Windows, a machine IP can be found by running the *ipconfig* command from a command line terminal (CMD), or the *Get-NetIPAddress* cmdlet in Powershell.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Configuring Middleware to Send Data to Datacenter

> **Note:** This guide assumes the Flowics Middleware has been installed on a machine in the following location: */home/user/dev/middleware-cli*. Please refer to the Flowics by Vizrt documentation for further information on how to install the Fowics Middleware.

> Middleware Token
>
> **Note:** The token used when configuring Middleware can be found in the Flowics web-ui, under **Settings → Middleware → General Settings → Token.** This value needs to be associated to the entry *flowics.middleware.id* in the file *middleware.properties,* **found in /home/user/dev/middleware-cli/conf.**

The Middleware can be accessed via the Flowics platform. For that, a registered user account is required.

To start sending data to Datacenter:

- Once logged in, navigate to **Data Connectors → Data Middleware Sources** and select the source from the list where relaying to Datacenter needs to be enabled.
- On the Data Source page, locate the **Middleware Integration** section and click on the Edit button. In the dialog that opens, make sure to enable **Push to an HTTP Webhook** and in the **Endpoint** input the Datacenter dataset link shown in the **Dataset configuration** panel.

> **Info:** If the Middleware runs on a separate machine than the one running Datacenter, substitute the *localhost/127.0.0.1* part of the address in the **Dataset configuration** panel, with the machine public IP.

- Click **Save**. The configuration should be downloaded to the Middleware, and shortly after the dataflow should start towards Datacenter.

Using Signed Certificates

> **Note:** Please refer to the General Configuration page for instruction on how to setup Datacenter to run as an HTTPS service.

The Flowics Middleware requires Datacenter to run an HTTPS service to correctly forward data to it. Please note that Datacenter does not provide signed certificates. Should you not already have a certificate-authority provided certificate, there are several services that can issue signed certificates (for example, letsencrypt.org). When using a TLS certificate signed by a valid authority, no further steps are required to integrate Middleware to Datacenter (this is the recommended way to integrate both).

Using Self-Signed Certificates

> ### Editing a Trust Store
>
> **Warning:** The following guide requires you to edit the **Java Virtual Machine** (JVM) trust store. This can potentially expose your machine to malicious actors and attacks, therefore, we recommend carrying the following steps with care. Please have your IT team assist you during this process.

In case you are not able to obtain a certificate-authority provided certificate, a self-signed certificate can be used to run Datacenter as an HTTPS service. This, however, is not the recommended way to setup Datacenter in HTTPS mode, and should only be done under the supervision of your IT team and following an informed decision to use self-signed certificates.

While self-signed certificates are easy to obtain, they do not provide any trust value, and are therefore rejected by default by many communicating actors, including Flowics Middleware. To allow the Middleware to accept self-signed certificates from Datacenter, some additional work is required.

> **Note:** Please refer to the General Configuration page for instructions on how to create a self-signed certificate.

> **Info:** This guide assumes the JVM used to run Middleware is installed in *home/user/jre-21,* while Flowics Middleware is installed in *home/user/dev/middleware-cli.*

To enable Middleware to accept self-signed certificates, one needs to ensure that:

- The self-signed certificate is imported in the **Java Virtual Machine** (JVM) trust store.
    - We **strongly recommend** to first create a copy of the default JVM trust store, and add the self-signed certificate to the copy **only**. This prevents making permanent changes to the machine's trust store

        > **Warning:** Avoid changing the default JVM trust store, instead, work on a copy. We strongly recommend to carry out this step only under the supervision of your IT team.

- If a copy of the JVM trust store has been used (for example, in *home/user/jre-21/cacert_bk/cacerts*), Middleware needs to be made aware of its location. This can be done by adding a line pointing to the modified trust store in the config file *home/user/dev/middleware-cli /conf/middleware.conf*. To do so, open this config file and replace the line starting with *wrapper.java.additional.6* with the following line:

```
wrapper.java.additional.6=-Djavax.net.ssl.trustStore=/home/user/jre-21/
cacert_bk/cacerts
```

```
# Java Additional Parameters
wrapper.java.additional.1=-client
wrapper.java.additional.2=-Djava.net.preferIPv4Stack=true
wrapper.java.additional.3=-Dsun.net.inetaddr.ttl=0
wrapper.java.additional.4=-Djava.io.tmpdir=tmp/
wrapper.java.additional.5=-Dwebapp.env_override=true
wrapper.java.additional.6=-Djavax.net.ssl.trustStore=/home/user/jre-21/cacert_bk/cacerts
#wrapper.java.additional.6=-Djava.security.policy=conf/policy.all
#wrapper.java.additional.7=-Dcom.sun.management.jmxremote
#wrapper.java.additional.8=-Dcom.sun.management.jmxremote.port=8997
#wrapper.java.additional.9=-Dcom.sun.management.jmxremote.authenticate=false
#wrapper.java.additional.10=-Dcom.sun.management.jmxremote.ssl=false
```

- Create an alias for the IP address of the machine running Datacenter by opening the operating system hostfile */etc/hosts* file and adding the line (assuming Datacenter runs at 1.2.3.4:5701):

```
1.2.3.4 YOUR_DATACENTER_HOST_NAME
```

> **Note:** The *YOUR_DATACENTER_HOST_NAME* value, **must** match the CN field listed in the self-signed certificate used on the Datacenter machine.

> **Info:** Typically, the hostfile in the Windows installation can be located under *C:\windows\system32\drivers\etc*, while in Linux, the same file can be found in */etc/hosts*.

> **Warning:** We strongly recommend to carry out this step only under the supervision of your IT team.

- Finally, restart Middleware.

Manual Dataset

These are the steps to configure a **Manual** dataset:

1. Create a new dataset of type **Manual**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:
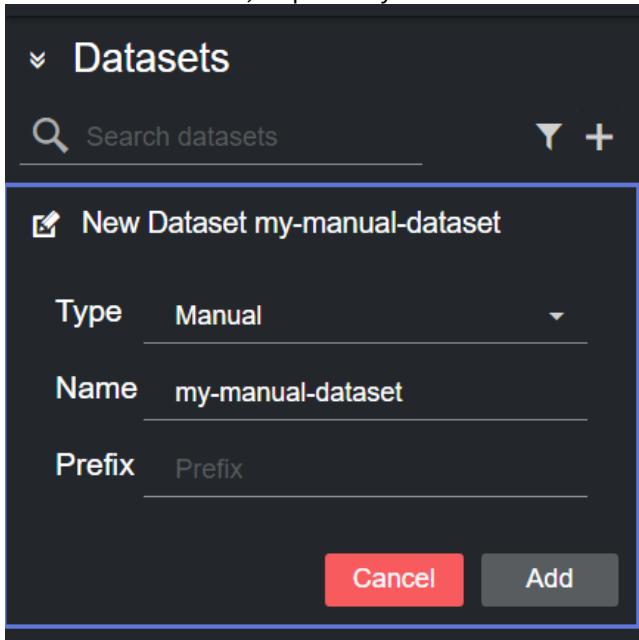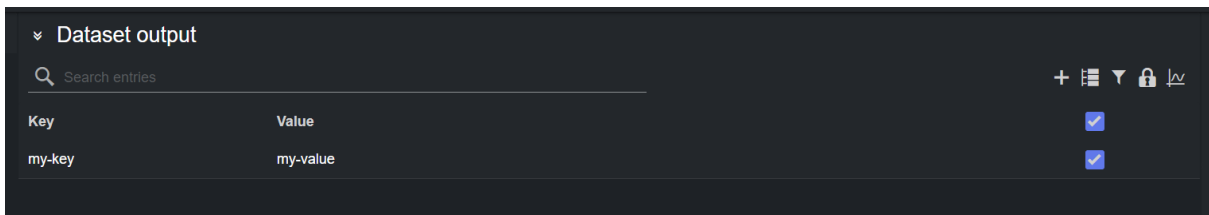
2. Click **Add**. You can now manually add new key-value data entries that work together with other datasets.
3. In the **Dataset Output** panel, click on the + button:
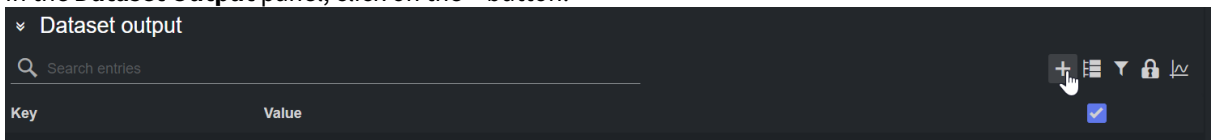
4. Fill the **Key/Value** pair in the panel that just opened. You can toggle the start activation state of the entry by using the toggle ●.
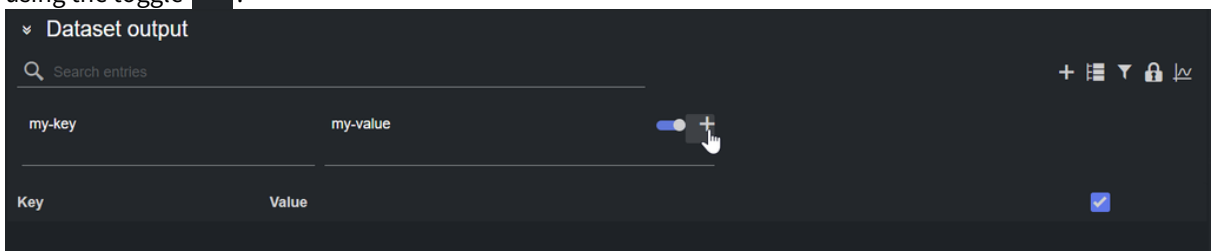
5. Click the plus ➕ button to add the value to the entries. You should see the entry listed in the table below.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

File Dataset

This section provides the steps to configure a **File** dataset.

1. Create a new dataset of type **File**, specifying a name and (optionally) a prefix to use to identify the dataset and its values, respectively:
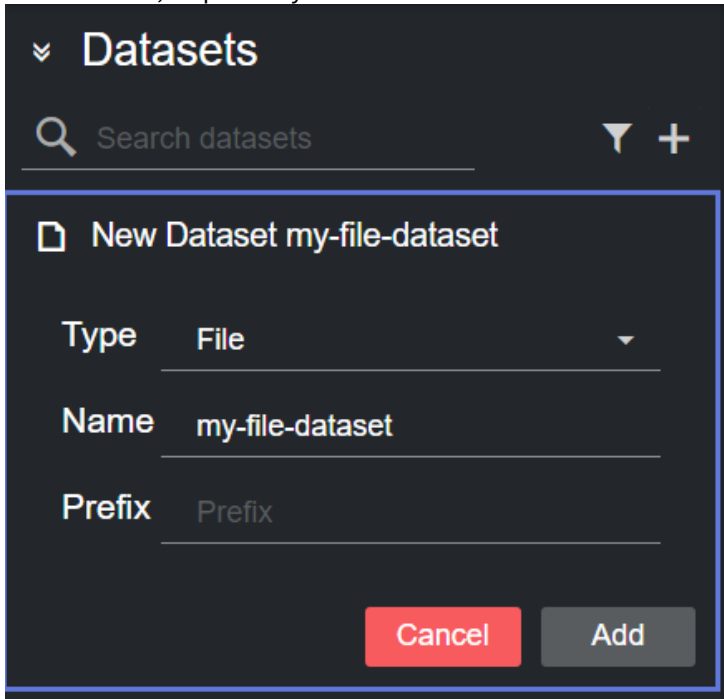
2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no source file yet.
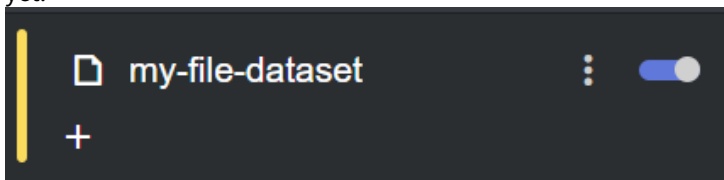
3. You can now select a source file from the table in the **Dataset configuration** panel, by double clicking one of its rows. The table lists all recently used **Files**.

Alternatively, you can type a file location in the input box at the top of the table and press the plus sign. The file is added to the dataset source, and included in the Files table for future reference.
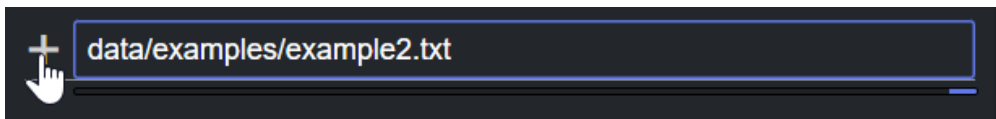
The input box supports autocomplete, listing the files in the folder alias that were setup while configuring the File provider in the Admin page.

Datacenter supports the following file types:

    a. **Text** (These are key-value pairs, using the '=' or ':' char as separators. The separators can be mixed.)
    b. **Ini-file**
    c. **JSON**
    d. **CSV** (comma-separated)

TXT files

TXT files accept two separators: '=' or ':', which can be mixed. White space added *after* the separator, is preserved in the *value*. White space added *before* the separator is stripped from the *key*.

Editing Recently Added Files

The table in the **Dataset configuration** panel lists all the recently added files. When adding a file, its values are set to default.

Follow these steps to edit those properties:

1. Click on the file you want to edit, the corresponding row is highlighted in blue:
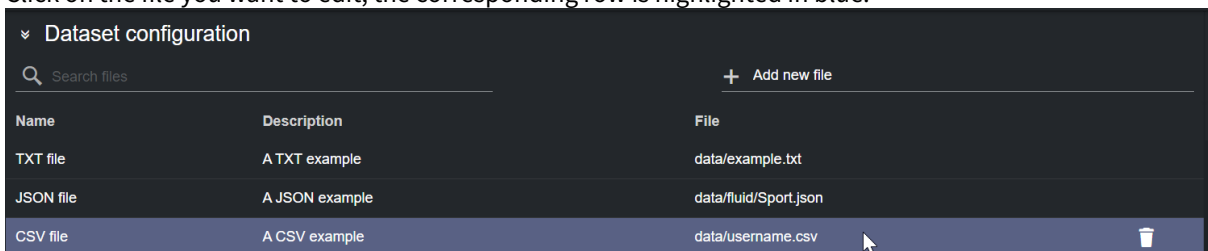
2. Edit the properties listed, such as **Name** and **Description**.
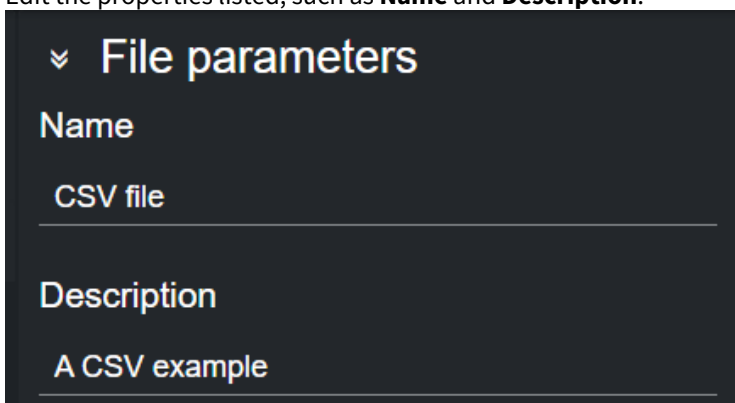
Working with CSV Files

When adding a CSV file, Datacenter attempts to read the keys from the first column in the file, and the values from the second.

To change this behavior, click on the filename in the Dataset Configuration panel:
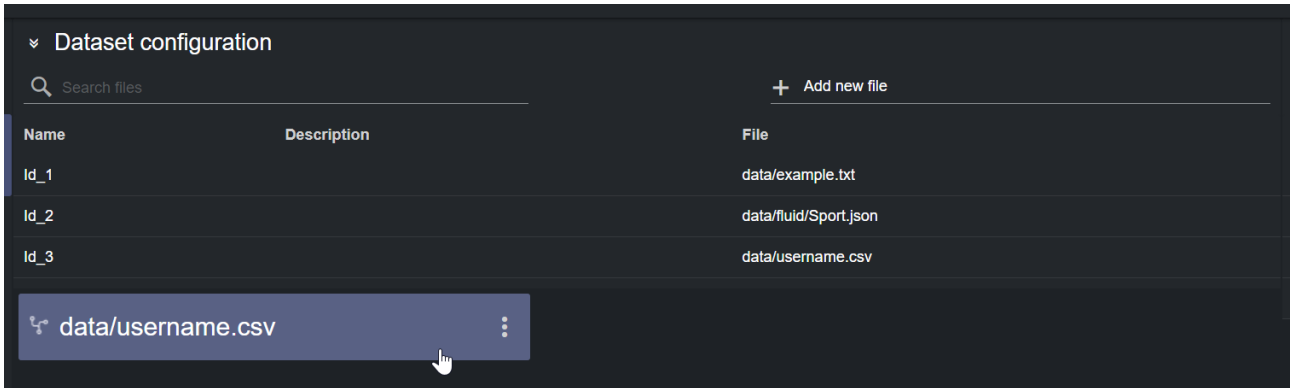
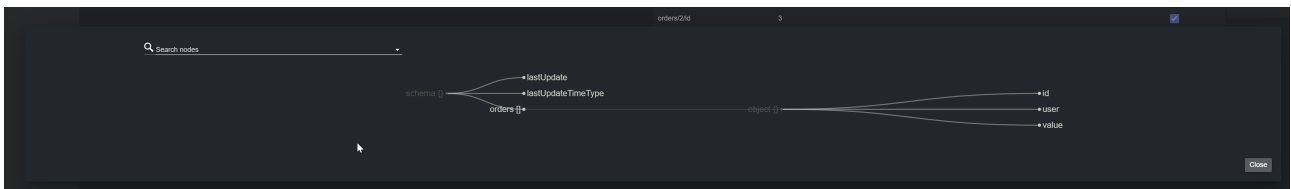Change the **Keys Column** or **Values Column** options in the Setup Panel.
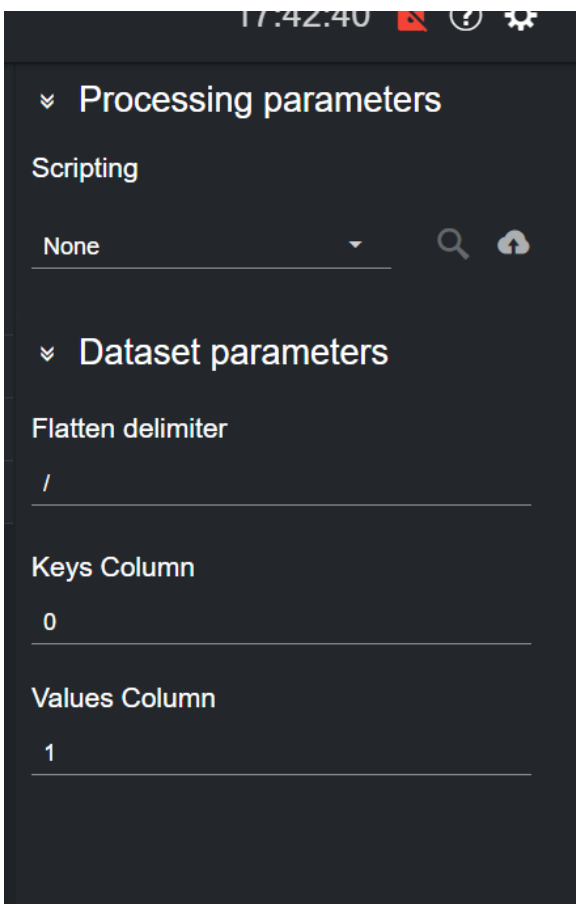
Filtering a Dataset

Values read from a file into a dataset, can be filtered via the Filtering tool. To do so, select the dataset card, click on the hamburger menu and then press the **Filter** button.
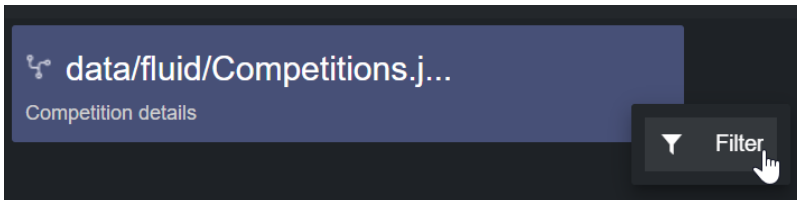
A dialog visualizing the file's payload schema opens, where a user can filter the source data.
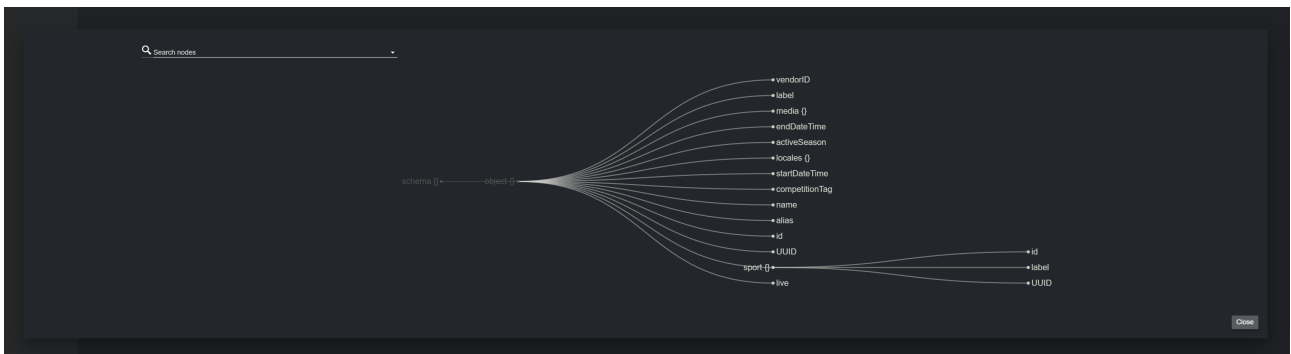
Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Replicator Dataset

Datacenter supports datasets of type **Replicator,** and such data can be used to use one Datacenter as input for another.
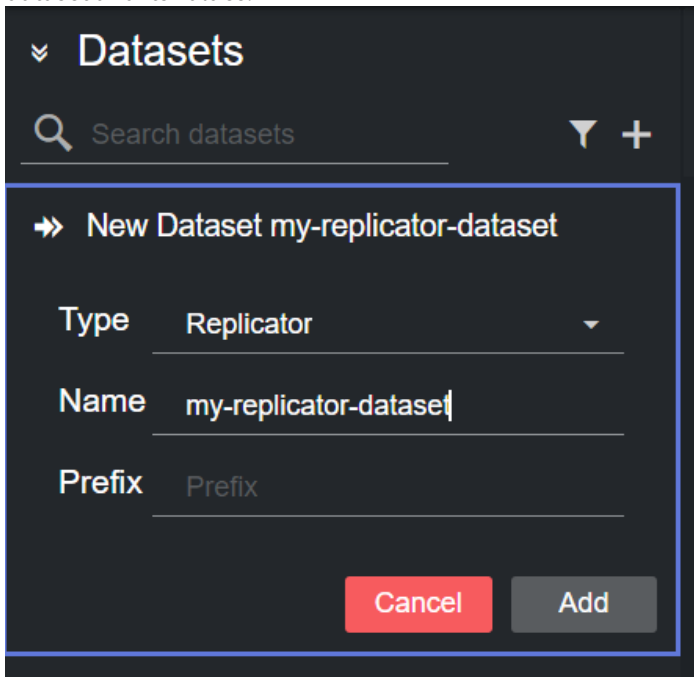
This is particularly useful when a Datacenter machine has to be removed from public internet, but still needs to fetch data from an online Provider. In this scenario, a Datacenter machine can be connected to the internet and the provider, and the protected machine, not on the internet but reachable from the first machine, setup with one or more Replicator datasets pointing to the online machine.

> **Info:** For security reasons, to allow a Datacenter service to be reachable by other machines, a HTTPS certificate must be correctly configured. Therefore, currently only Datacenter machines that run a secure (HTTPS) service can be replicated. A service running an unsafe HTTP service can still be replicated, but only on the localhost (on the same machine).

> **Note:** When connecting to a Datacenter service that runs as HTTPS, the certificate used on that machine must be valid, signed by an authority and in general, must pass a standard authentication procedure. Failing to do so, may result in the connection to that machine being refused by the connecting Replicator dataset, due to security issues.

Follow these steps to configure a Replicator dataset:

1. Create a new dataset of type **Replicator**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no dataset to replicate yet.

3. You can now select a host to replicate from the table in the **Dataset configuration** panel by double clicking a row. The table lists all the recently used hosts.

Alternatively, you can add a new host by clicking on **Add new host** on the right-side of the panel, and then clicking on the empty host that is added at the bottom of the table.

Doing so reveals the new host details, where its properties can be entered.

You can now double click on the configured host in the host table to select it as source to replicate.
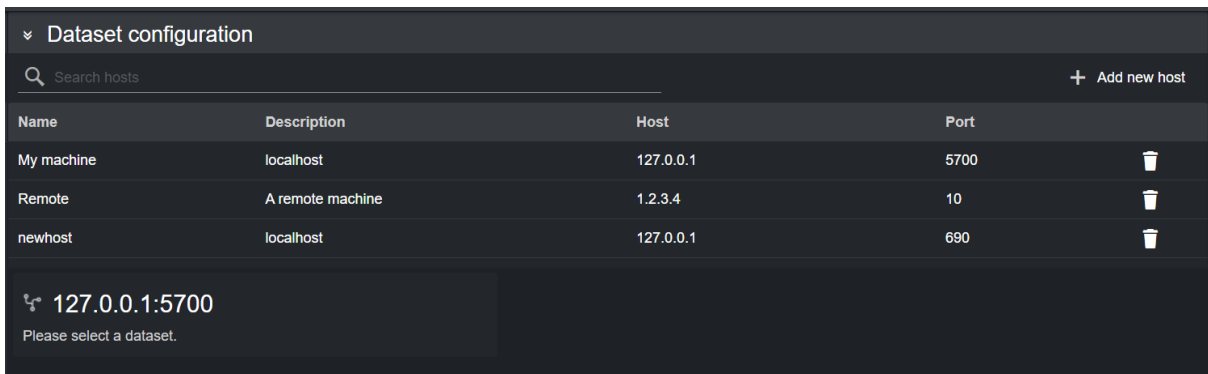
4. By clicking on the card in the Dataset configuration panel, the Dataset parameters will be shown on the right side of the screen
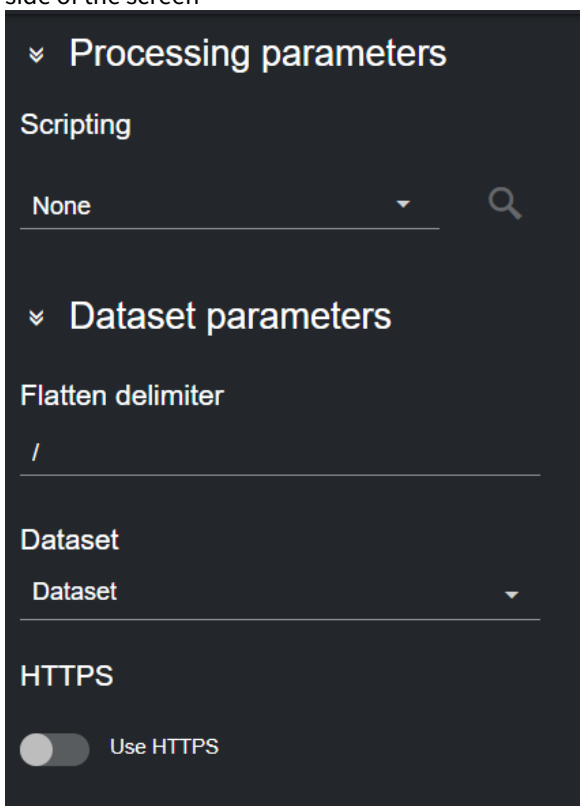
    a. The **HTTPS** toggle can be used to specify a host that runs an HTTPS Datacenter service.
    b. If the specified host runs a Datacenter, the datasets created on that machine are listed in the dropdown **Dataset** menu available in the **Dataset parameters** section.
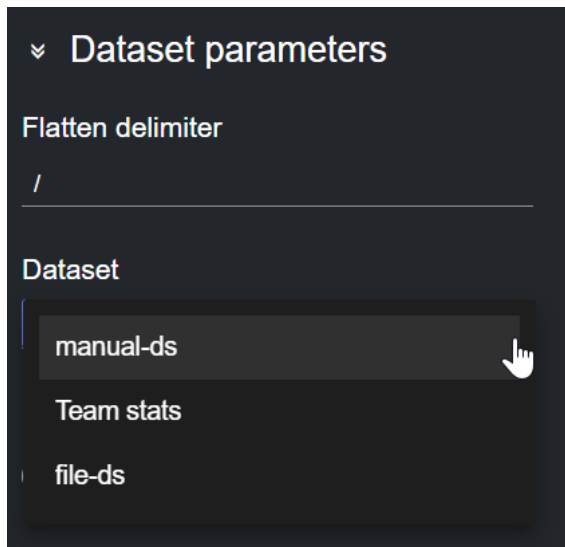
5. After selecting a dataset, its entries are added to the **Dataset Entries** table.
    For example, the images below show a Replicator dataset (top) replicating entries from a Fluid dataset (bottom):
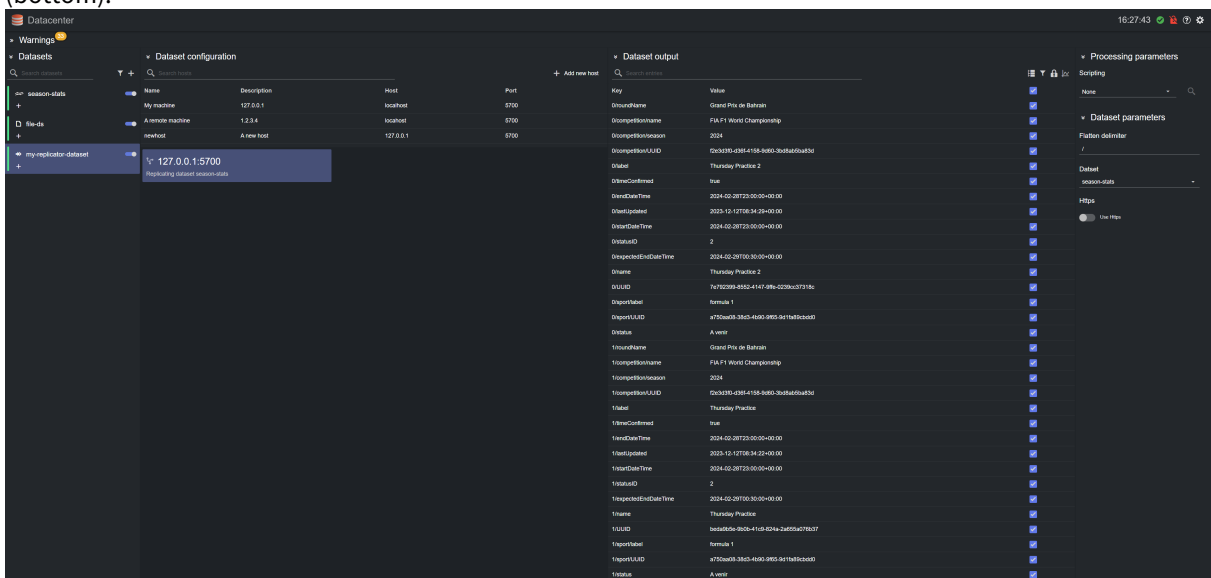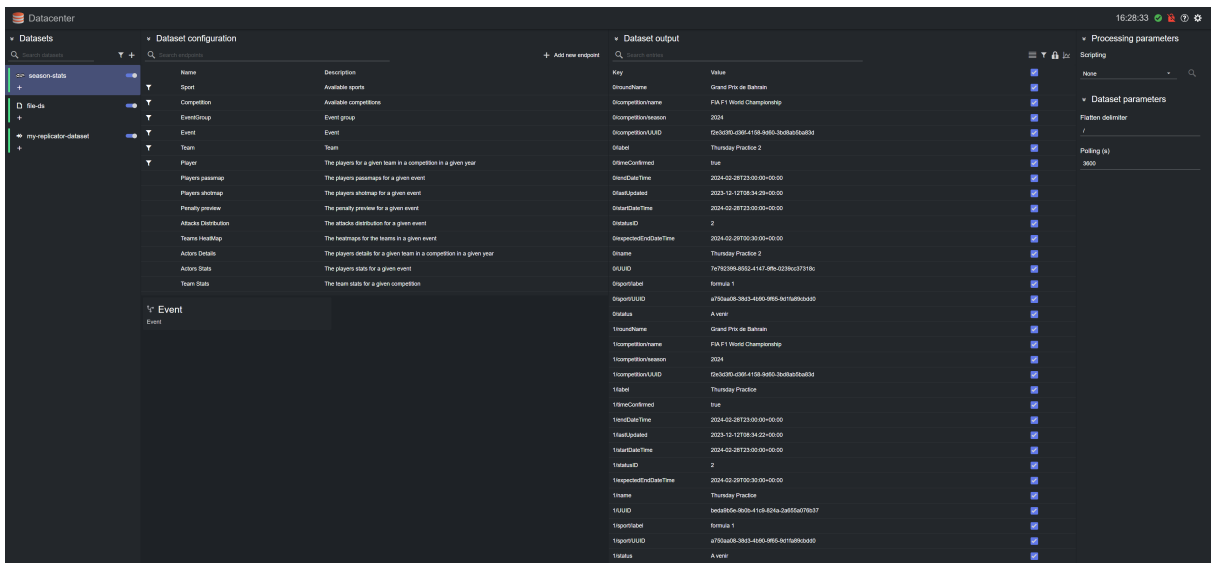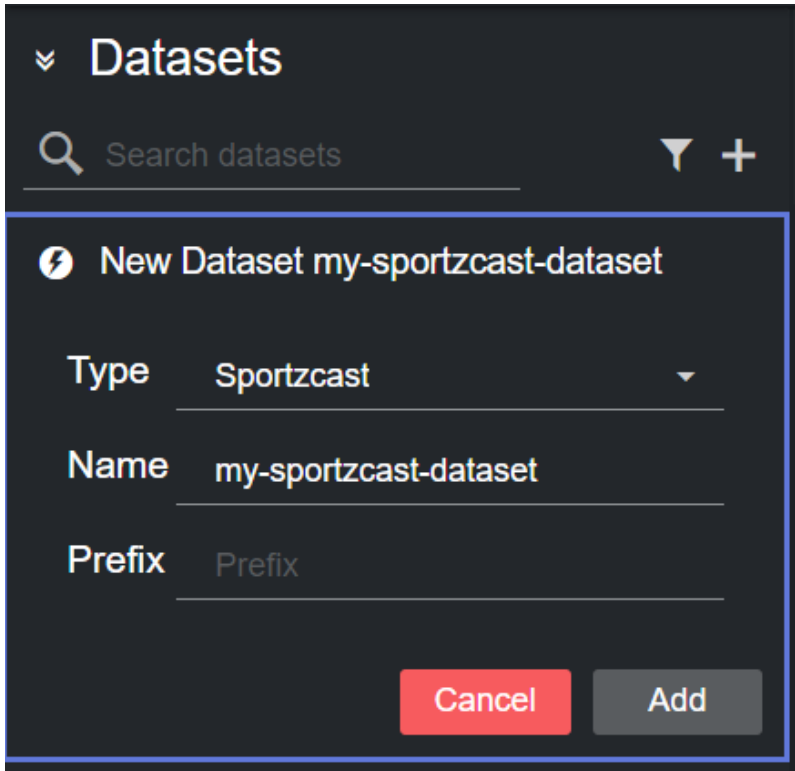
> **Info:** When replicating a Dataset, each edit on the original dataset source (for example, disabling an entry or modifying a value) is immediately reflected in the Replicator dataset. Changes done on the Replicator dataset; however, do not reflect on the original source dataset.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Sportzcast Dataset

This section provides the steps to configure a **Sportzcast** dataset.

1. Create a new dataset of type **Sportzcast**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no source bots yet.
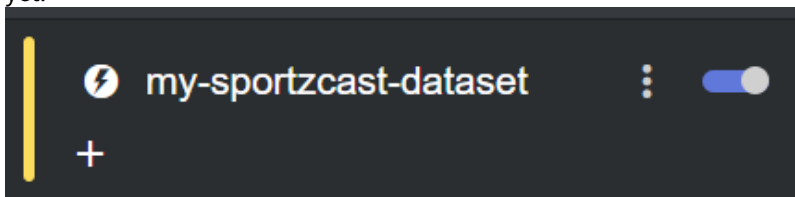
3. You can now select a bot from the **Bot** dropdown in the **Dataset parameters** panel:
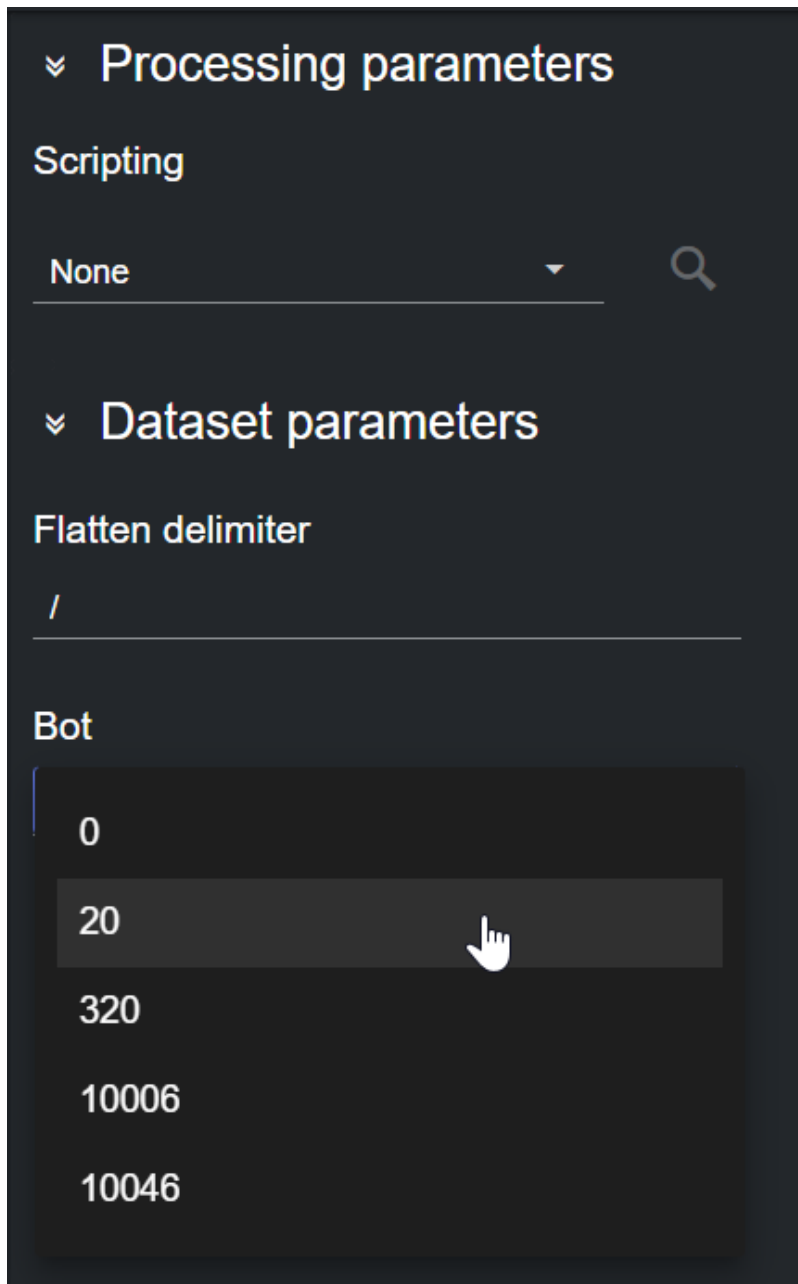
After adding a source bot, its content is added to the **Dataset Entries** table.
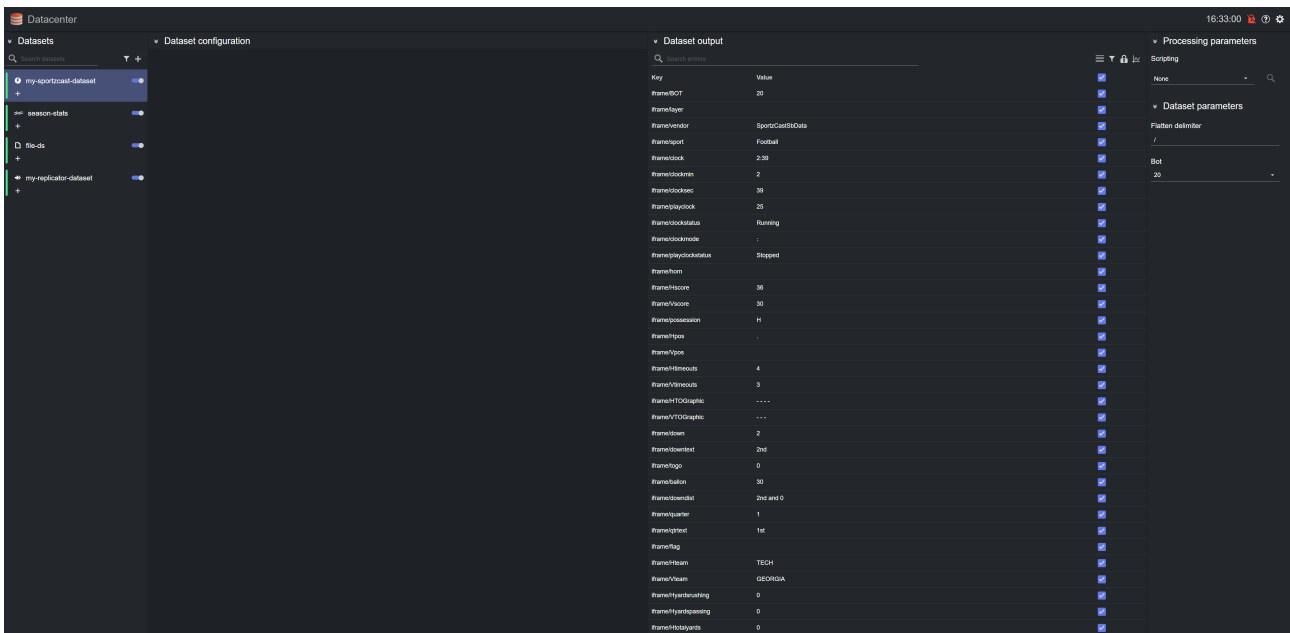
Note: Data from the Sportzcast data provider is event based, meaning that the data is pushed to Datacenter and the output is updated instantly when data changes.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Tricaster Vectar

This section provides the steps to configure a TriCaster Vectar dataset, using **Datalink**.
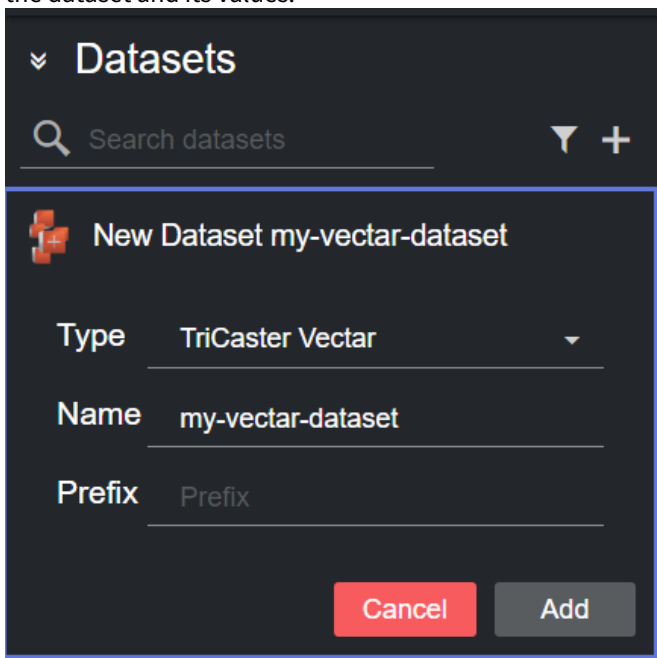
Datalink in TriCaster Vectar allows live data input from a wide range of data sources, such as:

- Daktronics devices
- DSI devices
- Nevco devices
- OES devices
- Ranbow devices
- Translux devices
- Whiteway devices
- Access to all external databases (anything supported by ODBC).
- All sorts of internal clocks.
- External CSV files, Excel Files, Text files and XML files.
- Web based score controllers.
- Web page real-time updates.

The data is available in a TriCaster Vectar system, therefore, it can be used in Datacenter datasets.

Configuring a **TriCaster Vectar** dataset requires the following steps:

1. Create a new dataset of type **TriCaster Vectar**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no source file yet.
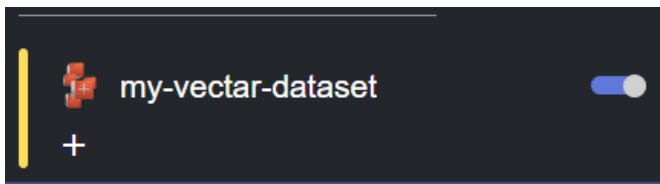
3. You can now select a host from the table in the **Dataset configuration** panel by double clicking a row. The table lists all the recently used hosts.

Alternatively, you can add a new host by clicking on **Add new host** on the right-side of the panel, and then clicking on the empty host that is added at the bottom of the table.
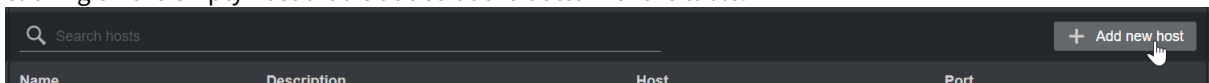
Doing so reveals the new host details on the right column, where its properties can be entered.

You can now double click on the configured host in the host table, to select a source.

4. After adding a host machine and establishing a successful connection to it, the data from the TriCaster Vectar system is added to the **Dataset output** table.
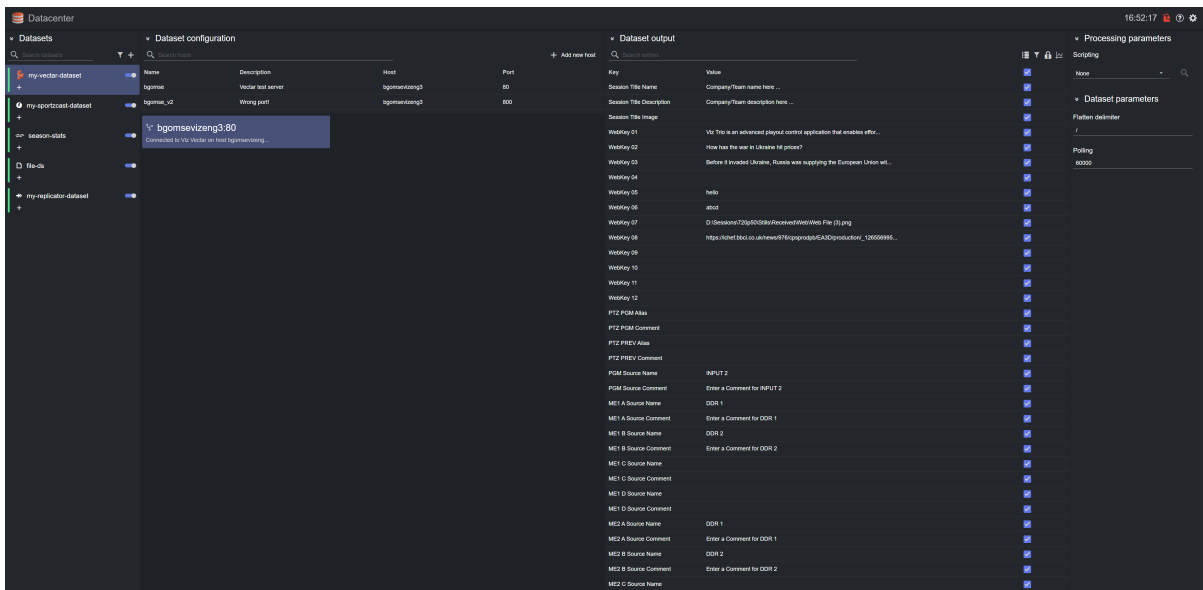
5. To change the polling rate (how often the TriCaster Vectar host machine is polled for data, in s) for the dataset, click on the dataset card in the Dataset configuration panel and edit the **Polling** field in the **Dataset parameters**.
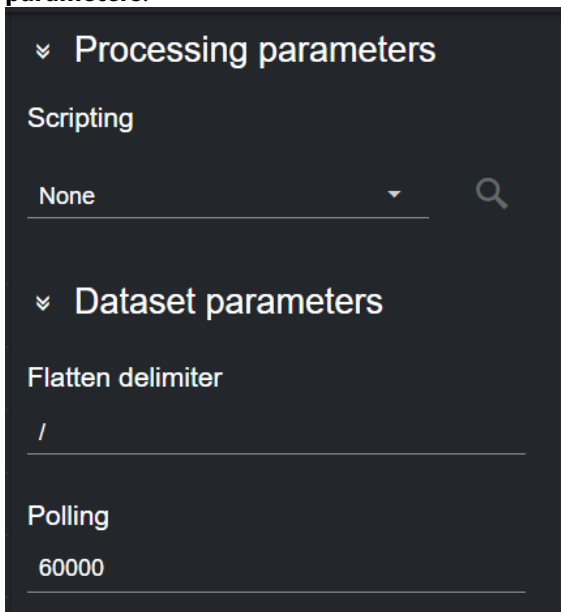
Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

Kafka Dataset

This section provides the steps to configure a **Kafka** dataset, which can be used to connect your outputs to data incoming from one of more Apache Kafka Brokers.

1. Create a new dataset of **Type** Kafka, specifying a name and (optionally) a prefix to use to identify the dataset and its values:
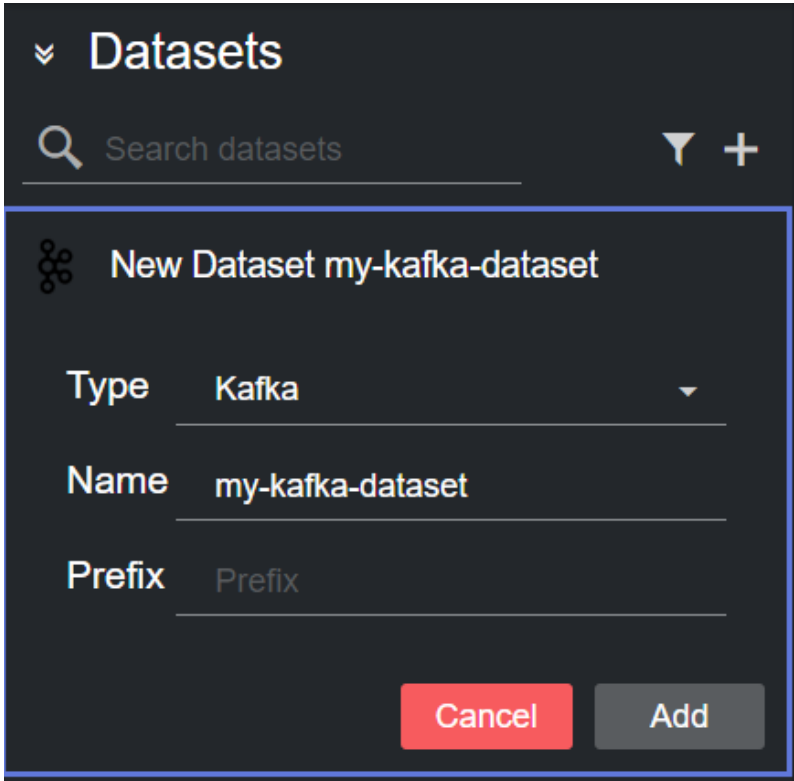
2. Click **Add**. The dataset is added to the list, and it has an initial WARNING status as it contains no Kafka broker source yet.

3. You can now select a host to replicate from the table in the **Dataset configuration** panel by double clicking a row. The table lists all the recently used hosts.

Alternatively, you can add a new host by clicking on **Add new host** on the right-side of the panel, and then clicking on the empty host that is added at the bottom of the table.

4. Doing so reveals the new host details, where its properties can be entered.

5. If the specified host runs a Kafka Broker, the topics advertised by the broker are listed in the dropdown **Topics** menu available in the **Dataset parameters** section.
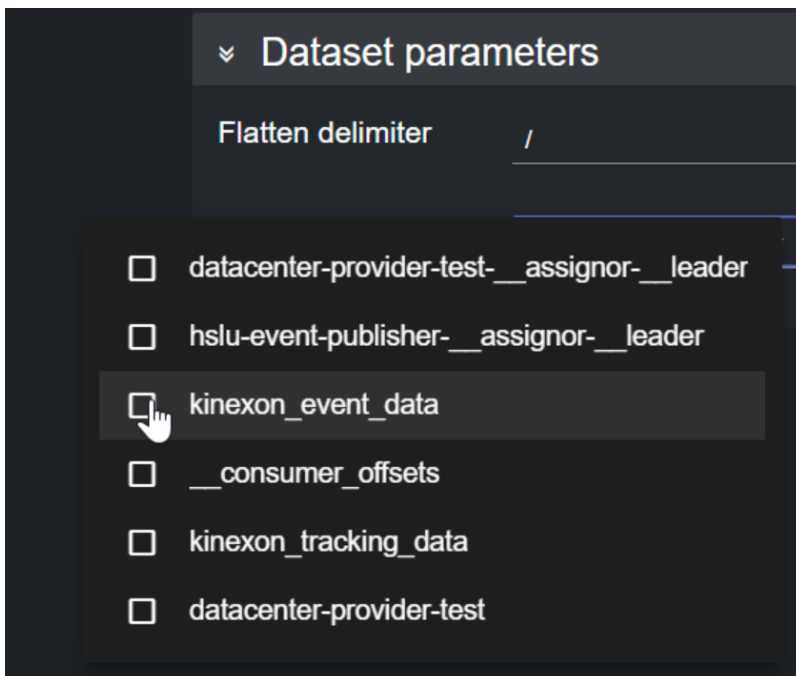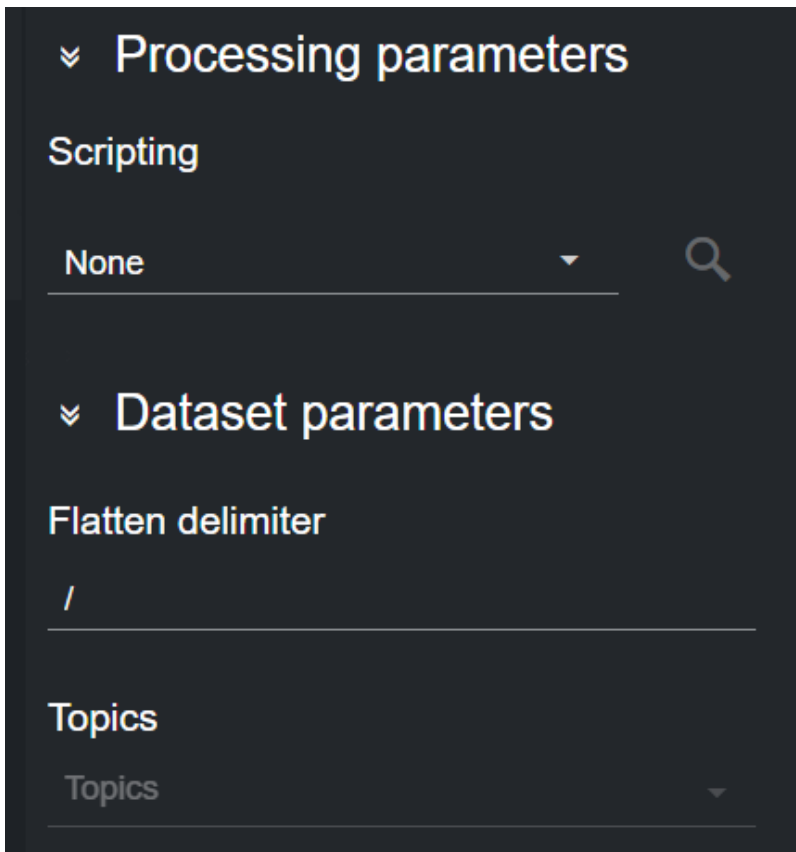
Select one or more topics from this list. The data published on these topics are added to the Dataset Entries table.

> **Info:** Datacenter expects from the Kafka broker messages to contain valid JSON as payload. All other formats are discarded and the dataset state is set to Warning.

> **Note:** Data from a Kafka data provider is typically event based. Therefore, if your broker publishes updating data (values of the same key that change over time), the data that is pushed to Datacenter updates the graphics instantly.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.
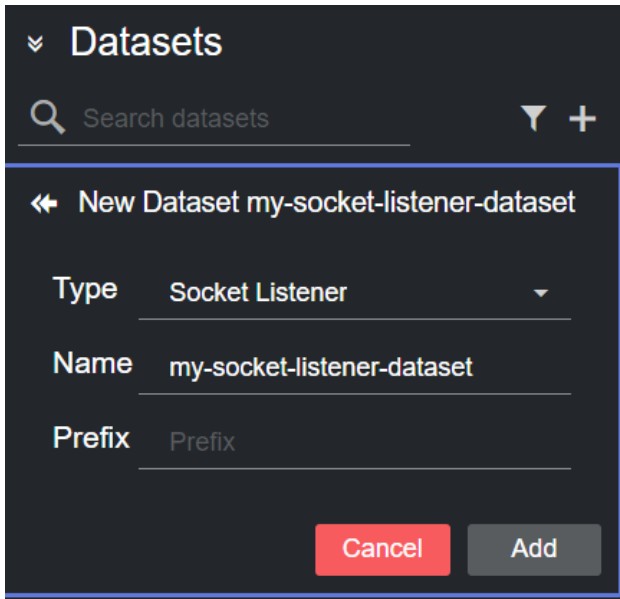
Socket Listener

Datacenter supports datasets of type **Socket Listener,** allowing user to stream data into Datacenter via UDP or TCP. This provider effectively create a server that listens for incoming data.
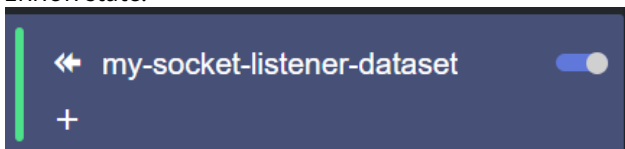
This is particularly useful for scenarios when a user needs to stream frequently updating data to the Datacenter.

Follow these steps to configure a Socket dataset:

1. Create a new dataset of type **Socket Listener**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The dataset is added to the list, and it has an initial *OK* status as its default protocol is UDP, for which is impossible to establish whether a connection to the socket has been made. However, in case another existing dataset is using the same default port (6000), then the newly added dataset is in an initial *ERROR* state.

3. You can now configure the dataset in the **Dataset parameters** section panel by double clicking a row. Here you can specify a **Protocol** and a **Port** to start receiving data.
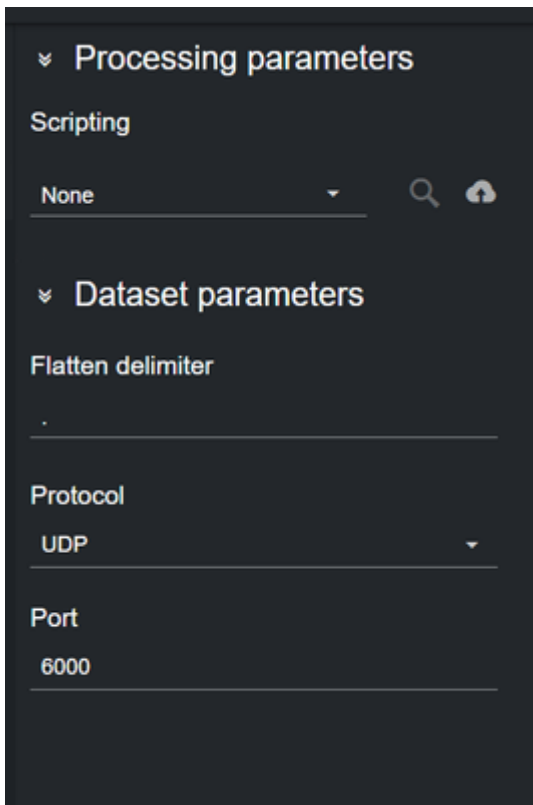
4. Depending on the protocol selected, the dataset can be in one of the following states:
   a. **UDP**
      i. *OK:* The specified port can be bound and (optionally) Datacenter receives data on it.
      ii. *Error*: The specified port cannot be bound (already in use), a socket error happened or Datacenter is receiving malformed data.
   b. **TCP**
      i. *OK:* The specified port can be bound, a connection to it is established and (optionally) Datacenter receives data on it.
      ii. *Warning*: Awaiting incoming connection.
      iii. *Error*: A connection/socket error happened or Datacenter is receiving malformed data.
5. Given that the dataset is in an *OK* state, as soon as Datacenter receives data, the corresponding entries are added to the **Dataset Entries** table.
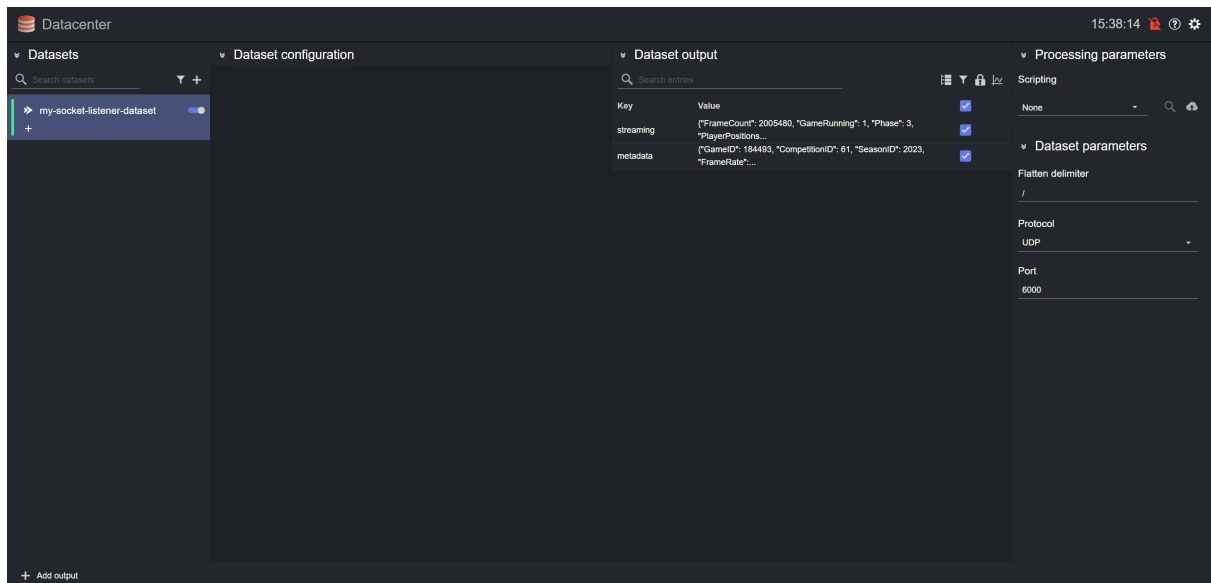
Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

> **Note**: a Socket Listener provider expects the data formatted as a valid **JSON**.

> **Note**: a Socket Connector provider, when using the TCP protocol, expects the data payload to terminate with a **new line** (i.e., **'\n'**) separator character.
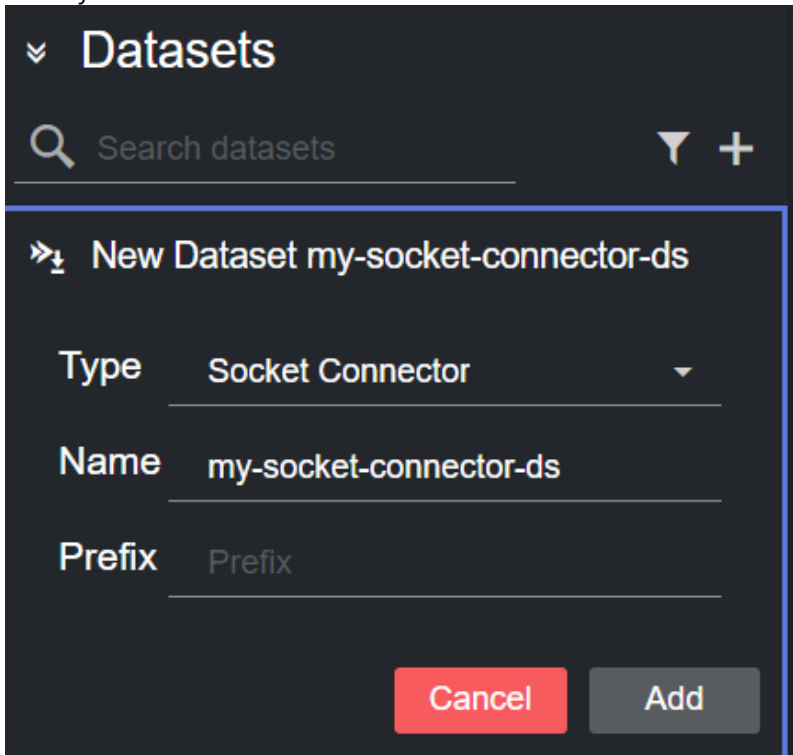
Socket Connector

Datacenter supports datasets of type **Socket Connector,** allowing user to initiating streaming data to Datacenter from a TCP streaming server. Unlike a Socket Listener dataset, a dataset of this provider connects to an existing TCP server to initiate the streaming.

This is particularly useful for scenarios when a user needs to receive frequently updating data.

Follow these steps to configure a Socket dataset:

1. Create a new dataset of type **Socket Connector**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:

2. Click **Add**. The dataset is added to the list, and its status depends on whether the server it is connecting to is up and running.
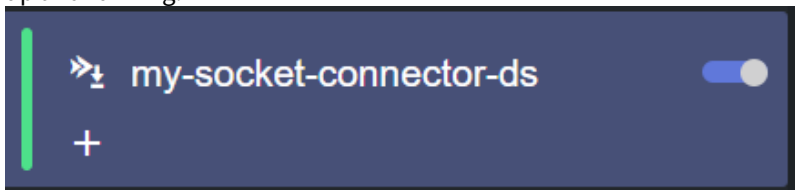
3. You can now configure the dataset in the **Dataset parameters** section panel by double clicking a row. Here you can specify a **IP** and a **Port** to start receiving data.

4. Depending on the state of the connecting sever, the dataset can be in one of the following states:
   a. *OK:* a connection to it is established and (optionally) Datacenter receives data on it.
   b. *Warning*: Awaiting connection.
   c. *Error*: A connection error happened or Datacenter is receiving malformed data.
5. Given that the dataset is in an *OK* state, as soon as Datacenter receives data, the corresponding entries are added to the **Dataset Entries** table.
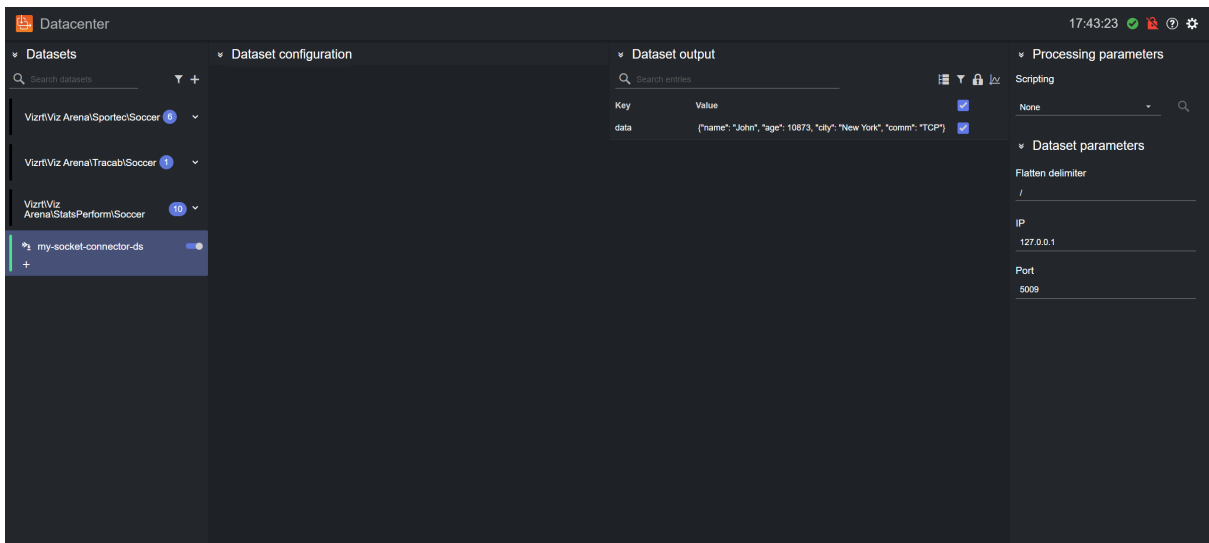
Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

> **Note**: a Socket Connector provider expects the data formatted as a valid **JSON**.

> **Note**: a Socket Connector provider expects the data payload to terminate with a **new line** (i.e., **'\n'**) separator character.

Tracab

Datacenter supports datasets of type **Tracab,** allowing you to stream data into Datacenter from Tracab data streams.

Follow these steps to configure a Tracab dataset:

1. Create a new dataset of type **Socket Listener**, specifying a name and (optionally) a prefix to use to identify the dataset and its values:
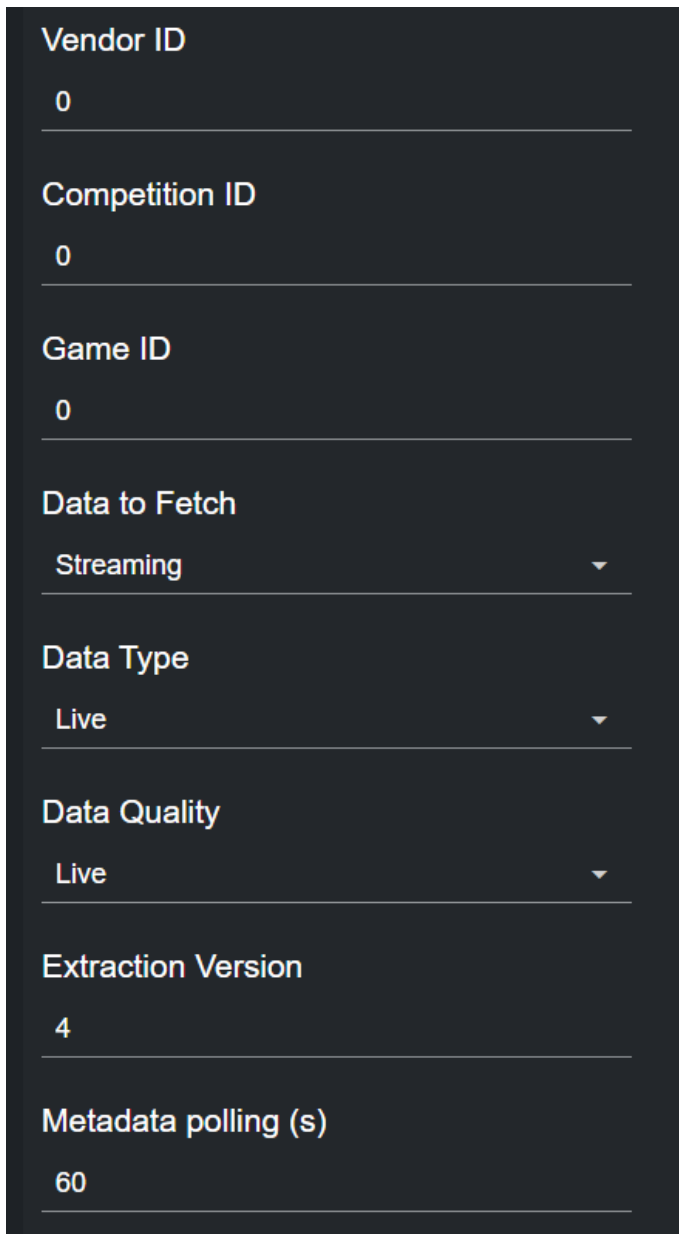
2. Click **Add**. The dataset is added to the list, and it has an initial *ERROR* status as its default values are to not allow for a successful authentication.
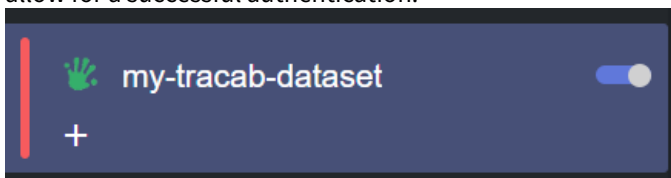
3. You can configure the dataset in the **Dataset parameters** section panel by double clicking a row.
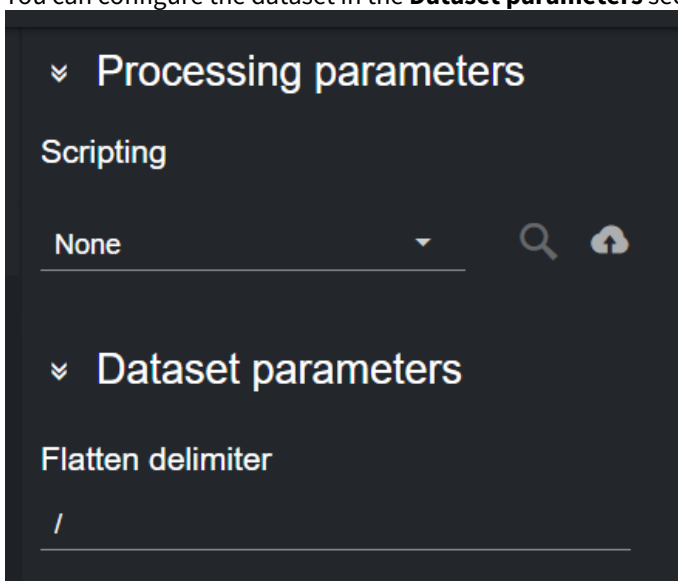
4. Values provided by Tracab that need to be adjusted per game:
   a. **Vendor ID:** ID of the vendor provided by Tracab.
   b. **Competition ID:** ID of the competition provided by Tracab.
   c. **Game ID:** ID of the game provided by Tracab.
5. These values can be used to configure the type of data to get:
   a. **Data to Fetch:** Selected whether to fetch streaming data only, metadata only, or both.
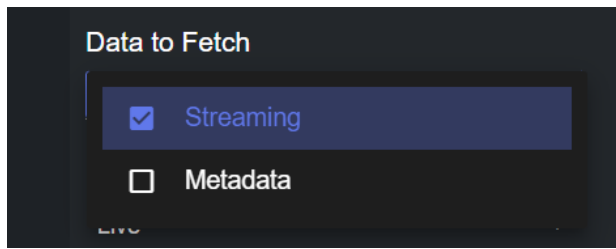
b. **Data Type:** Fetches Live or Delayed data type, provided by Tracab.
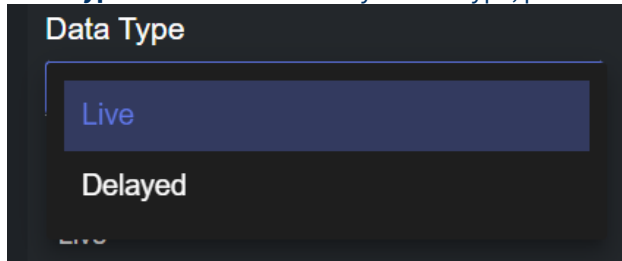
c. **Data Quality:** Fetches Live, Scrubbed or Secondary Live data quality, provided by Tracab.
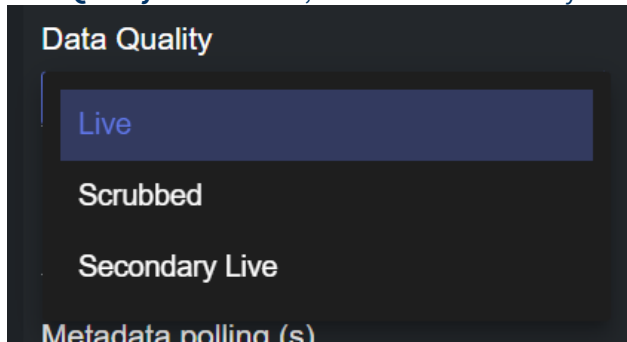
d. **Extraction Version:** Version of the data to use provided by Tracab. Default to 4.
e. **Metadata polling (s):** How often the metadata should be polled from the Tracab Statistical API backend. This value has only effect if **Data to Fetch** includes **Metadata.**

6. Depending on the settings, the dataset can be in one of the following states:
   a. *OK:* The settings are correct and the Tracab authentication was performed correctly. A stream is opened and Datacenter receives data (if any is sent). If specified, metadata is polled from the Statistical RESt Api.
   b. *Error*: The settings are incorrect (either in the **Dataset parameters** or in the Provider Configuration). Hover on the dataset name to reveal the error.
7. Given that the dataset is in an *OK* state, as soon as Datacenter receives data, the corresponding entries are added to the **Dataset Entries** table.

Please refer to the Filtering and Manipulating a Dataset Entries page to learn how to enable, disable and edit the entries added.

5.4.2   Filtering and Manipulating a Dataset Entries

The data contained in each dataset can be filtered or modified with tools provided by Datacenter. This way, a user can control in real-time, which values are sent to the output(s) and in which format.

Data manipulation can be done by filtering, scripting and flattening. Each step acts on the dataflow, whether it is globally (filtering) or locally (scripting and flattening), and is applied in a specific order, as shown in the diagram below:
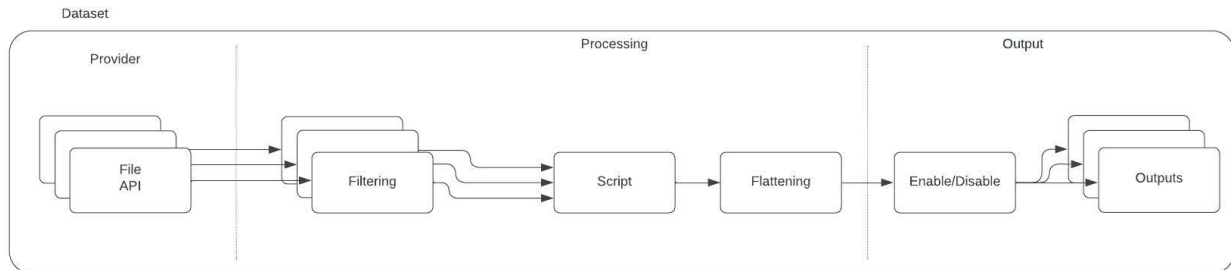
This section describes how to filter and manipulate dataset entries in Datacenter, including:

- Filtering a Dataset
- Manipulating Dataset Entries via Scripting
- Flattening a Dataset

Filtering a Dataset

Introduction

Filtering can be used to process the incoming data before it is sent to the outputs, allowing flexible data manipulation.

These are the following topics:

- Introduction
- Accessing the Filter Page
- Interacting with the Tree: Filtering Nodes
- Searching Nodes and Inspecting Sample Values

Unlike other data manipulation operations (scripting and flattening), filtering acts on the data schema rather than the payload. That is, filtering acts on an object representation rather than on its instance.

> **Info:** When filtering a dataset, the incoming data must be a valid JSON object. When this is not the case, filtering cannot be applied to a dataset.

For example, given the incoming data below:

Incoming Object

```
[
    {
        "id": "457e14f6-6244-4fb5-882a-eafc874ac384",
        "label": "Soccer",
        "UUID": "457e14f6-6244-4fb5-882a-eafc874ac384"
    },
    {
        "id": "1f66f5cf-978e-4fc1-9c39-7f2bde73778c",
        "label": "Basketball",
        "UUID": "1f66f5cf-978e-4fc1-9c39-7f2bde73778c"
    },
    {
        "id": "fb238641-7e4b-4578-b34f-bdd172be03bf,
        "label": "Tennis",
        "UUID": "fb238641-7e4b-4578-b34f-bdd172be03bf"
    }
]
```

Filtering it to remove "id" and "UUID" results in the data held in the datacenter to be:

Incoming Object

```
[
```

```
    {
        "label": "Soccer"
    },
    {
        "label": "Basketball"
    },
    {
        "label": "Tennis"
    }
]
```

On subsequent data, should the array contain more entries and assuming the same filtering is applied, then the Datacenter only reads the property "label" for all entries.

Currently, the following providers support filtering:

Provider	Filtering Supported
Manual Dataset	✅
File Dataset	❌
Replicator Dataset	❌
Sportzcast Dataset	❌
Tricaster Vectar	❌
Kafka Dataset	❌
Rest Webserver Dataset	✅
Fluid Data Services Dataset	✅
Stats Perform	✅
Viz Data Connectors	❌
Socket Listener	❌
Socket Connector	❌
Tracab	❌
Sportec Solutions	✅

Accessing the Filter Page

To access the filtering page, select a dataset of one of the supported providers, hover on an instance of a template and in the hamburger menu that appears, select **Filter**:
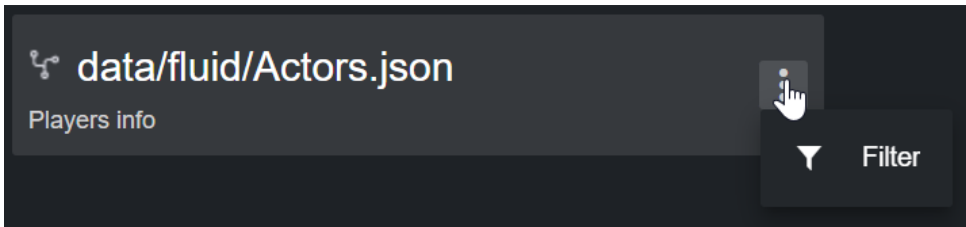
This opens a dialog, where the "schema" (an abstract representation that describes your existing data format) is shown as an interactive tree.
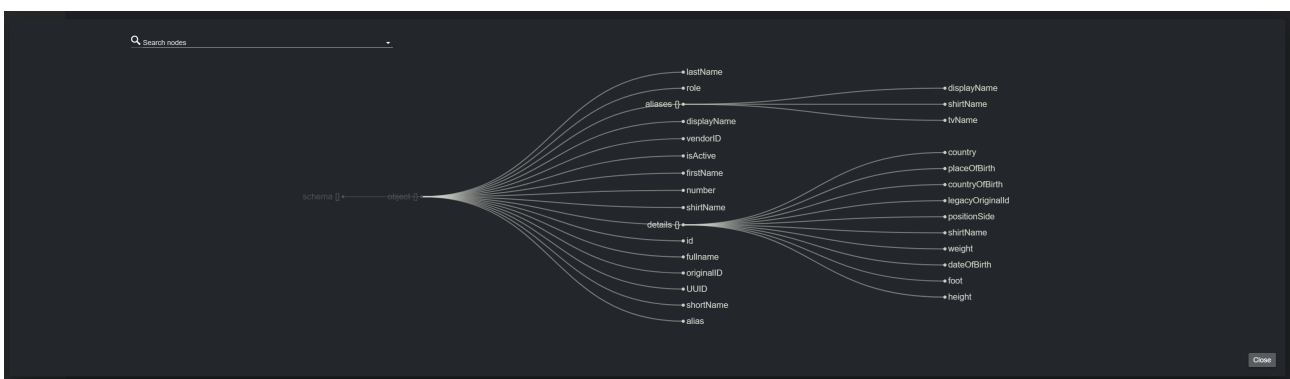
Interacting with the Tree: Filtering Nodes

The tree shown in the filtering dialog can be panned and zoomed: use your mouse's left-button to pan, and the mouse scroll wheel to zoom.

A node in the tree can be in one of the following three states:

State	
Active (filtered in)	
Inactive (filtered out)	
Disabled	

- **Active:** The node is added to the dataset data. If a node represents an object, its children are also added if no further filtering is applied, or the individual filtering on the children is considered.

- **Inactive:** The node is not added to the dataset data. If a node represents an object, all its children is excluded from the dataset.
- **Disabled:** No interaction is possible with the node.

When adding a new data source, by default, the incoming data is set to active. That is, all fields in the incoming object are added to the dataset data. To start filtering nodes in the tree, click on the nodes you wish to add to the dataset.

When clicking on a node, there are three possible scenarios:

1. A **leaf node that is directly connected to the root** is clicked: a single node is added to the dataset.
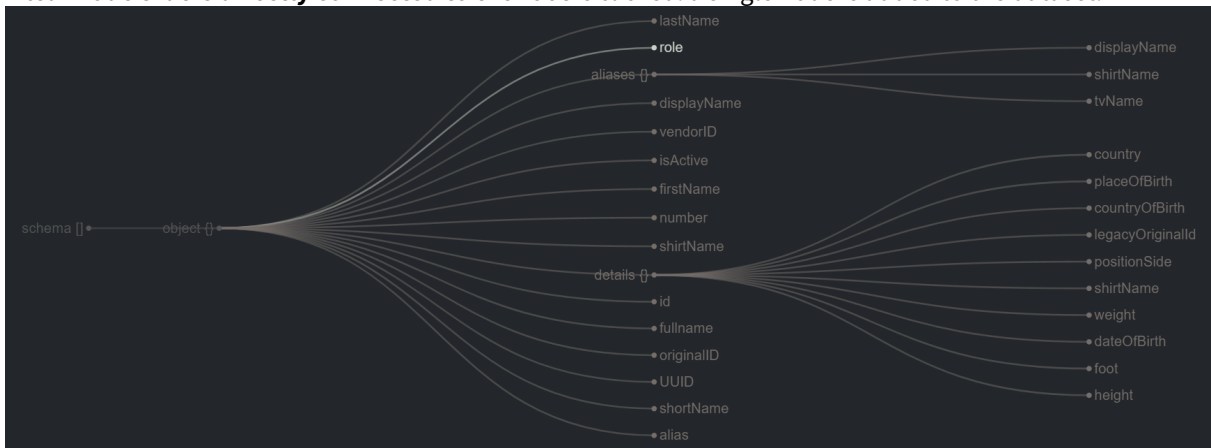
2. A **leaf node that is a children of an object** is clicked: the leaf node, its parents, and all other parents up to the root are added to the dataset.
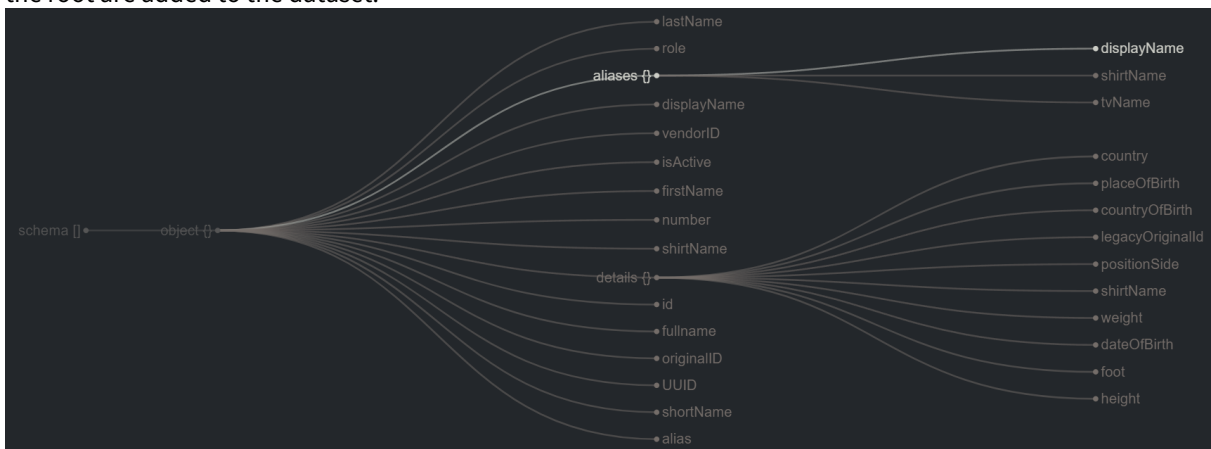
3. A **node representing an object** is clicked: the object node, its children, and its parents and all other parents up to the root are added to the dataset.
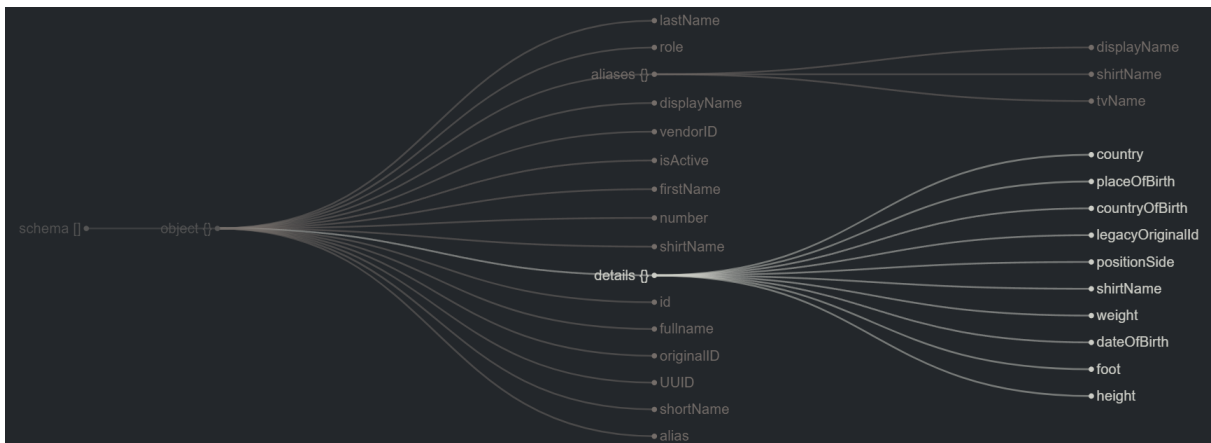
Once you start filtering a dataset, you can click on a node to toggle its state. That is, clicking on a node for the first time sets its state to active. Clicking on it again sets its state to inactive.

To further illustrate how filtering works, consider the following filtered tree:
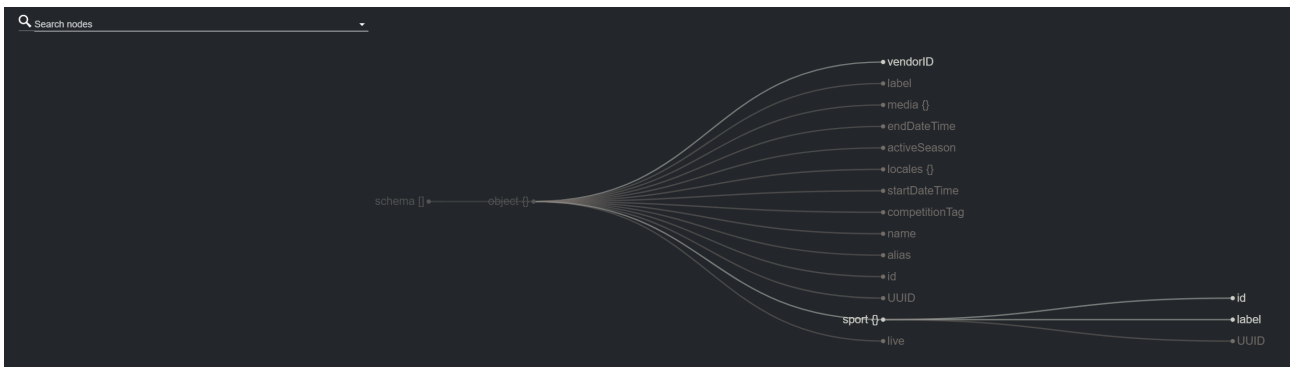
This selection results in the dataset to hold the following (flattened) values.

Searching Nodes and Inspecting Sample Values

Nodes in the tree can be searched using the **Search nodes** field in the top-left of the dialog. Start typing a node name in the text field to see all possible matches. By selecting one of the results, the corresponding node briefly changes color and size.
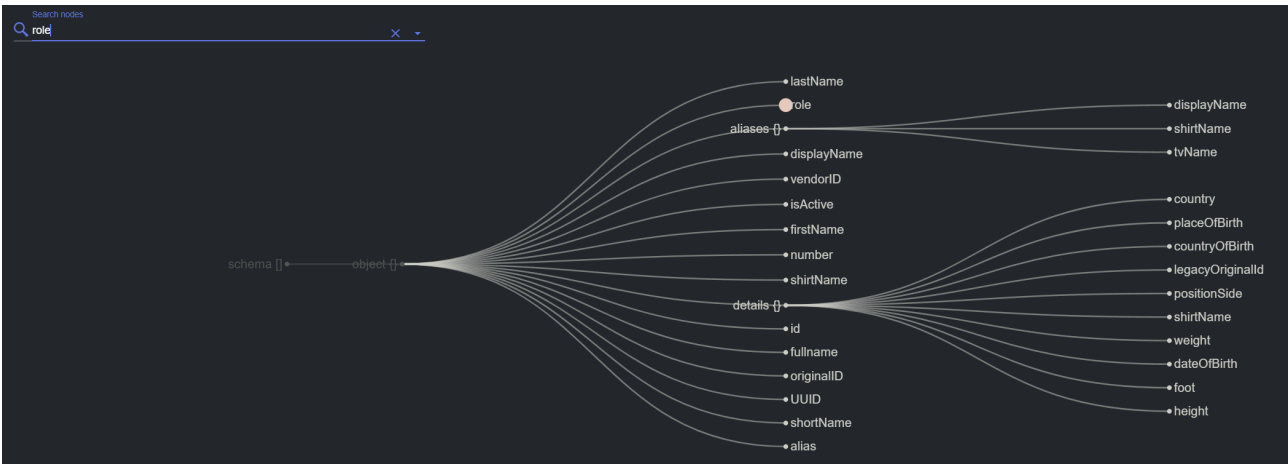
> **Note:** Searching a node triggers highlighted animations on the tree and has no effect on the final dataset. That is, selecting a node name from the search text field does not add the node to the dataset output.

To get an idea of the incoming data, sample payload can be inspected for each node in the tree. To reveal the sample content of a node, hover on its name.
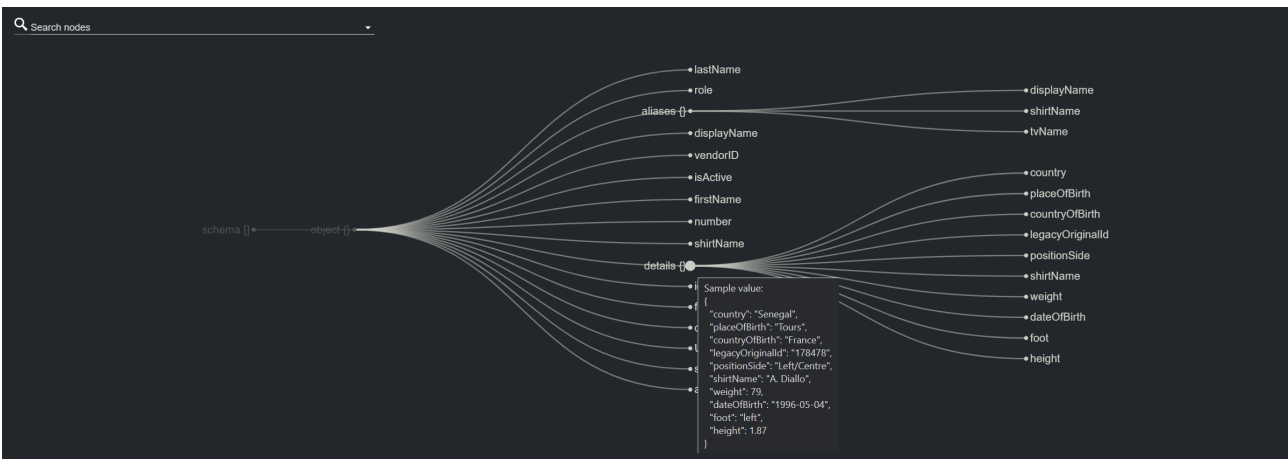
Manipulating Dataset Entries via Scripting

Introduction

Scripting can be used to process the incoming data before it is sent to the output, allowing flexible data manipulation. For example, data can be normalized to an expected format / units, and new entries can be computed from incoming data.

These are the following topics:

- Introduction
- Applying a Script
- Development
- Process
- Arguments
- Imports
- Caching Data
- Debugging

Applying a Script

Scripts can be applied to a dataset via the **Processing parameters** panel:
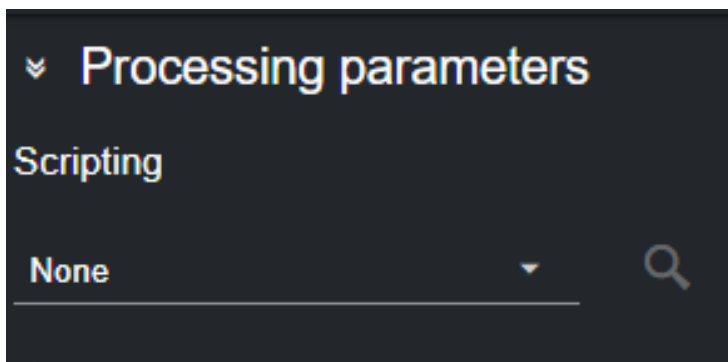
- To apply a script, open the corresponding dropdown menu and select the script to apply.
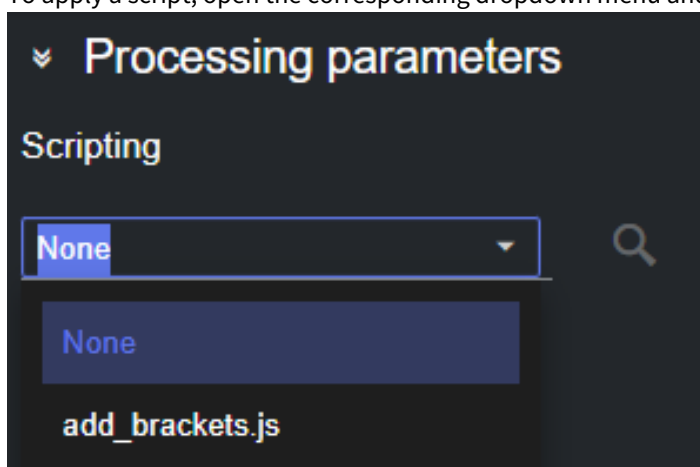
- Scripts are applied immediately on the dataset output. When applied successfully, the icon next to the script name turns green.

- Conversely, scripts that are not applied successfully show a red icon next their name. You can hover over the icon to reveal the error message.
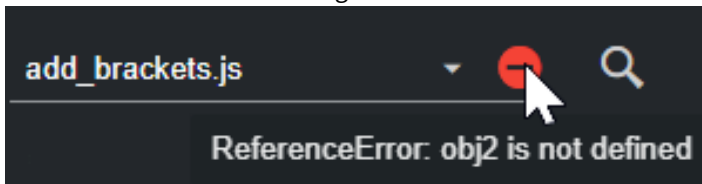
- By clicking the magnifier glass icon 🔍 you can inspect the content of the loaded script.
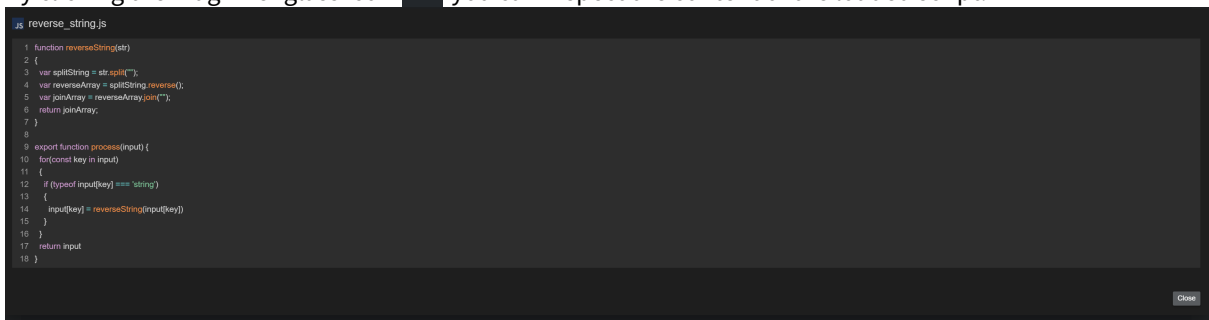
- In case of errors, information about the error(s) type and location is displayed below the code section.

Adding A New Script

Datacenter, constantly monitors all the scripts located in *C:\ProgramData\vizrt\Datacenter\scripts*, and therefore, the new scripts added to that folder are immediately visible in the Datacenter script list.

Another option to add a new script is to enable the **Allow uploading scripts** toggle in the General/Communication section of the Admin page.
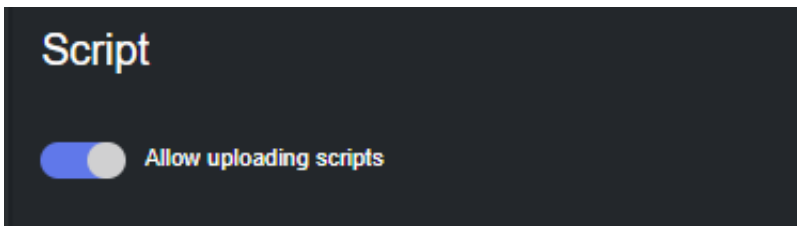
Doing so, enables an upload button next to the scripts list in the main page, which can be use to load new scripts.
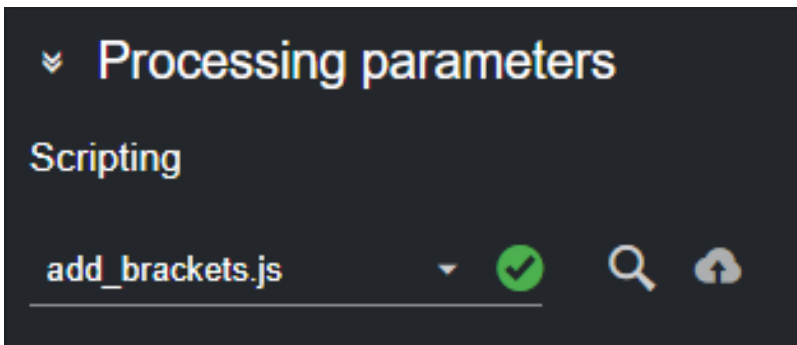
> **Warning:** Datacenter does not vet uploaded scripts, therefore, allowing the upload of arbitrary scripts to Datacenter can pose a security threat. We **strongly recommend** to enable scripts uploading, only when strictly necessary and for the time required.

Development

Scripts are Javascript programs located in *C:\ProgramData\vizrt\Datacenter\scripts*, and they must be named as **.js (*sub-directories are supported).

Scripts are constantly monitored by Datacenter, and are reloaded every time there is a change.

To start developing a script, simply open a Visual Studio Code (or any other text editor) in *C:\ProgramData\vizrt\Datacenter\scripts*, create a script and see your changes applied as soon as the file is saved.

> **Warning:** Because of the file watcher, when saving a script with VS Code, the file might suddenly become empty. Therefore, simply Undo (**CTRL + Z**) the last action and save the file again.

Process

All scripts must export a function named process, which is then called whenever data is received from a provider.

When multiple inputs are configured (for example multiple endpoints for a REST provider), the input variable holds the incoming data in multiple members named data, data_1, data_2.

Example

Here is an example of a script with the following inputs:

Input

```
raw_endpoint_data_1 = { // in the script, this is readable from input.data
```

```
    "key11": 1,
    "key12": 2
}

raw_endpoint_data_2 = { // in the script, this is readable from input.data_1
    "key21": 3,
    "key22": 4
}
```

Script

```
export function process(input) {
    var obj1 = JSON.parse(input.data);
    var obj2 = JSON.parse(input.data_1);
    return {
        a: obj1.key11,
        b: obj2.key21,
        c: obj1.key12 + obj2.key22
    }
}
```

The output data is then three keys (a, 1), (b, 3) and (c, 6).

Arguments

To allow more flexible scripts, arguments can be added to the code and are shown in the UI.

It is possible to add numbers, strings, enums and date arguments that are then passed to the script during execution.

A function named *getProcessArguments* must be exported from the script and must return the arguments created with helper functions (see example). This function takes an optional parameter of the current provider input, allowing to create arguments dependent on the currently received values.

Argument Declaration Helper Functions

The following helpers can be used to declare scripts arguments:

```
function argumentEnum(name, defaultIndex, values, description="") { /*... */ }
function argumentString(name, defaultValue, description="") { /*... */ }
function argumentInt(name, defaultValue, min = Number.MIN_VALUE, max =
Number.MAX_VALUE, description="") { /*... */ }
function argumentFloat(name, defaultValue, min = Number.MIN_VALUE, max =
Number.MAX_VALUE, description="") { /*... */ }
function argumentDate(name, defaultValue, description="") { /*... */ }
function argumentIntegerRange(name, min = Number.MIN_VALUE, max = Number.MAX_VALUE,
stepSize, description = "") { /*... */ }
```

The enum values can be of type *string*, or an object of type *{label: string, data: string}*. On the second case, the label is displayed to the user and the script receives the data.

Example

Example with hard-coded arguments

```
export function getProcessArguments() {
    return [
        argumentEnum("enumArg", 0, ["option1", "option2"], "An enum argument"),
        argumentEnum("enumWithValuesArg", 1, [ {"label": "option3", "data": "value3"}
, {"label": "option4", "data": "value4"}], "Another enum argument"),
        argumentString("stringArg", "default value", "A string argument"),
        argumentInt("intArg", 2, 0, 5, "An int argument"),
        argumentFloat("floatArg", 3.1, 1.2, 5.6, "A float argument"),
        argumentDate("dateArg", "2023-07-01", "A date argument"),
        argumentIntegerRange("integerRangeArg", 0,90,1, "A range argument"),
    ];
}

export function process(input, args) {
    var result = {}
    result["receivedInput"] = input.data;
    result["receivedEnumArg"] = args.enumArg;
    result["receivedEnumWithValuesArg"] = args.enumWithValuesArg;
    result["receivedStringArg"] = args.stringArg;
    result["receivedIntArg"] = args.intArg;
    result["receivedFloatArg"] = args.floatArg;
    result["receivedDateArg"] = args.dateArg;
    result["receivedIntegerRangeArg"] = args.integerRangeArg;

 return result;
}
```

Example with arguments generated from input

```
/** Function called by the Viz Datacenter scripting stage. The script's input
arguments are defined with this function.
 * @param {object} input The input object
 * @returns {object[]} An Array of arguments
 */
export function getProcessArguments (input) {
  const events = getEvents(input)
  const options = getEventOptions(events)

  return [argumentEnum('Event', 0, options, 'The event to select')]
}

/** Retrieves the list of events from the input object
 * @param {object} input The input object
 * @returns {object[]} A list of all the events
 */
```

```
function getEvents (input) {
  let events = []
  if (input.data) {
    const obj = parseInputObject(input)
    for (const event of obj.liveData.event) {
      events.push(event)
    }
  }
  return events
}
```

Assuming some kind of input and if the user does not modify the default arguments, the dataset would contain the following values:

```
receivedInput                { "inputData": "something" }
receivedEnumArg              option1
receivedEnumWithValuesArg    value4
receivedStringArg            default value
receivedIntArg               2
receivedFloatArg             3.1
receivedDateArg              2023-07-01
```

Imports

In order to allow code reuse, it is possible for a script to import another file. Those imported files must be named *.import.js*, so they are not shown as scripts in the Datacenter UI.

The imports are relative to the scripts root directory *C:\ProgramData\vizrt\Datacenter\scripts*, not the current script directory.

Example

utils/helpers.import.js

```
export function doNothing(input) {
    return input;
}
```

provider/script.js

```
import { doNothing } from "utils/helpers.import.js"

export function process(input) {
    return doNothing(input);
}
```

Caching Data

The Scripting module allows to cache data across executions. This is particularly useful when handling time-series, or when statistics across several executions need to be computed. Similarly, the value from one time slice can be saved and fetched at later stages. The cache can be directly accessed from within scripts and it is allocated per-script (two scripts cannot access the same cache values).

As the cache is implemented as an unordered map, you can **update** a value by writing in the same key on each run, or can **store** the value of an item in *different runs* by using a time-increasing key.

The following utility functions can be used to manipulate the cache:

- Cache.Read()

  - read the current cache. Return a dictionary Dictionary<string, object>.
- Cache.Remove(key: string)

  - removes the entry with key 'key' from the cache.
- Cache.Write(newCache: Dictionary<string, object>)

  - swaps the current cache with 'newCache'.
- Cache.Keys()

  - get all cache keys, as an Array<string>

Example

utils/helpers.import.js

```
function getCachedData(key: string)
{
  const cachedData = Cache.Read(key);
  return cachedData !== null ? cachedData : undefined;
}

function writeCachedData(key: string, value: string)
{
  let cache = Cache.Read();
  cache [key] = value;
  Cache.Write(cache);
}

function cleanCache()
{
    var cacheKeys = Cache.Keys();
    for(let i=0; i<cacheKeys.length; ++i)
    {
      let key = cacheKeys[i];
      Cache.Remove(cacheKeys[i]);
    }
}

export function manipulateCache() {
    const key = "my_key";
```

```
    const data = 10;
    writeCachedData(key, data);
    const cached_data = getCachedData(key);
    console.log(cached_data); // 10
    cleanCache();
    const cached_data2 = getCachedData(key);
    console.log(cached_data2); // undefined
}
```

Debugging

To debug a script add the following launch configuration to VS Code:

Launch Configuration

```
{
    "launch": {
        "configurations": [
            {
                "name": "ClearScript",
                "type": "node",
                "request": "attach",
                "address": "localhost",
                "port": 9757
            }
        ],
        "compounds": []
    }
}
```

Then add the following line to the script to debug:

```
//SCRIPT_DEBUG_PORT=9757
```

In VS code, execute **Run and debug** with the ClearScript configuration. The debugger attaches to the running script and breakpoints can be set in the **Loaded scripts** section.

> **Info:** Because of some internal limitations, the debug port is not immediately freed after modifying a script. Therefore, it is necessary to adapt the debug port in the script and launch configuration when modifying and saving the debugged script.

Flattening a Dataset

By default, datasets connected to providers providing data in valid JSON format (for example, Fluid Data Services) hold the incoming payload using the key-value pair *[data_N][Data_as_JSON_object]*, where N is the index of the dataset source where the data originates from (for example, in Fluid Data Services, the index of the endpoint configured for the dataset).

In the following scenario, a Fluid Data Services dataset is configured to accept data from two endpoints (Sport and Competition), and subsequently the data is organized in two key-value pairs (data and data_1), one per endpoint:
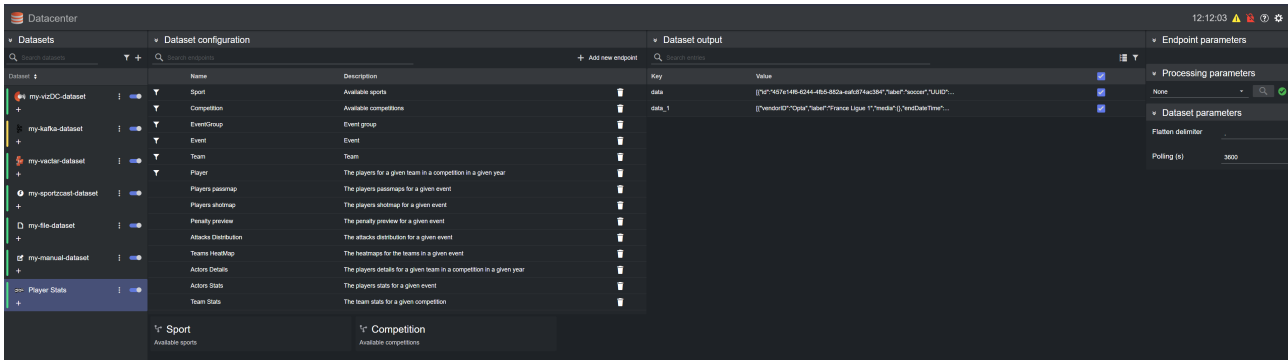
However, in certain scenarios, all values in the JSON objects need to be associated with a specific key. For these cases, one can automatically flatten the incoming data for a given dataset, by clicking on the flatten icon in the top-right corner of the **Dataset output** panel. Doing so results in a flattened version of all the values of the incoming payload, where each atomic value in the JSON object(s) is associated to its own key:
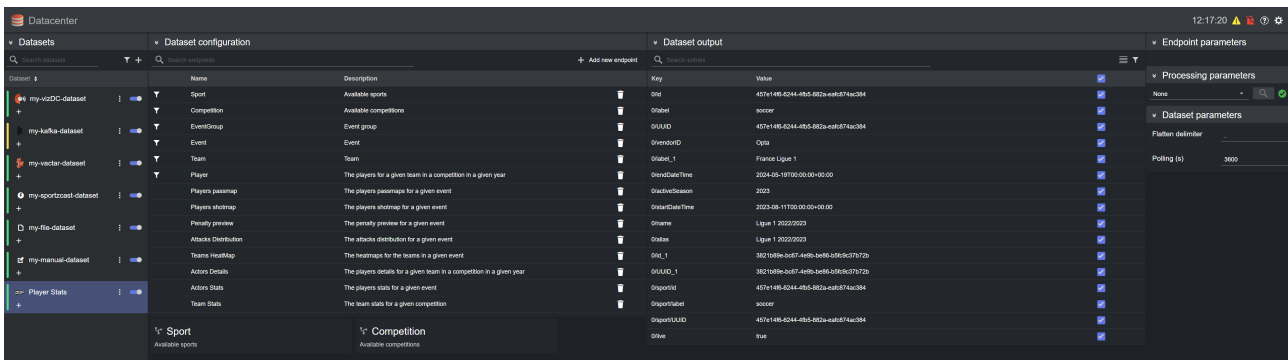
> **Note:** When flattening several objects there is a chance of running into key duplication. Datacenter automatically detects such keys and appends a number to them, to make them unique again (for example, 0/label and 0/label_1 in the image above).

> **Note:** When flattening a payload that contains arrays, the index of the array element is prepended to the the element key, such that unique keys are created (for example, 0/id in the image above).

The default separator used to flatten the incoming data is specified in the General configuration in the Admin page. However, the delimiter can be changed per dataset, by using the **Flatten delimiter** field in the **Dataset parameters** section of the main view.
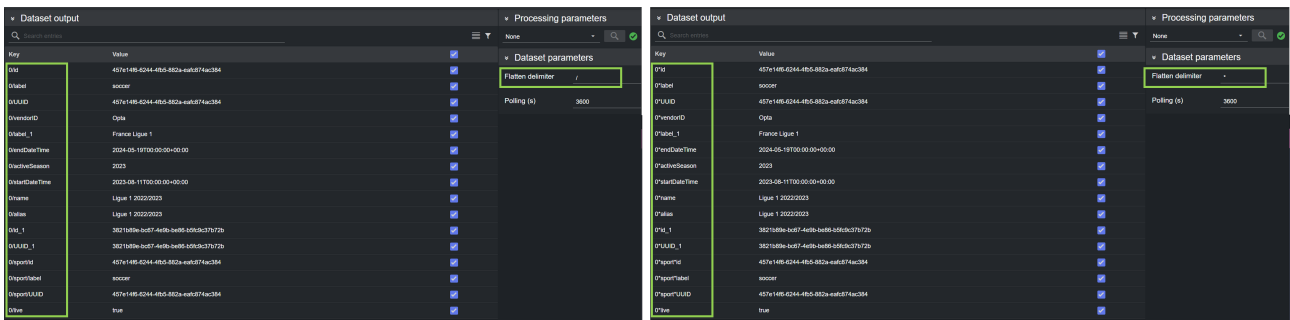
To unflatten the data back to the original [data_N][Data_as_JSON_object] format, click on the unflatten icon ▤ in the top-right corner of the **Dataset output** panel.

> **Note:** The flattening operation is only successful if the data to flatten is in JSON format. If you apply a script prior flattening, make sure the resulting script output is still a valid JSON objects for the flattening to have effect.

> **Info:** For performance reasons, the number of flattened data elements that can be displayed is limited to 1024. This is also true for the search mechanism. All flattened keys are forwarded to the outputs, however.

5.4.3   Enabling or Disabling Dataset Entries

Once added, dataset entries are immediately enabled on all connected outputs. This results in all entries in the **Dataset output** to have a checked checkbox.

However, individual entries state can easily be toggled from the Datacenter UI. To disable a single entry, uncheck the checkbox in the relevant entry row in the **Dataset output** table.

Likewise, all dataset entries can be disabled at once by clicking the checkbox in the header of the Dataset output table.
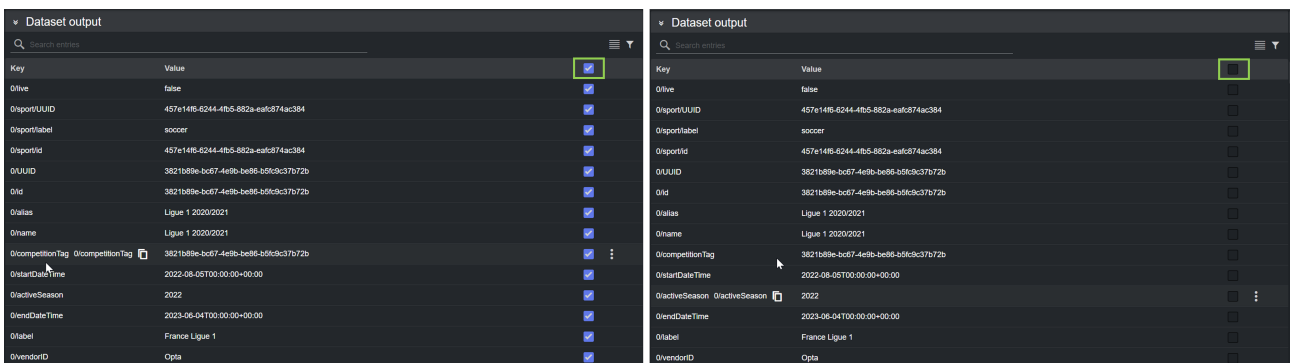
5.4.4 Inspecting Dataset Entries

The Dataset Output Panel

The Dataset Output panel shows the received data for the selected dataset.

Dataset output

Search entries

Key	Value	
timecode	4036580	☑
frame_nr	2018290	☑
GlobalData.home.teamname	FC Bayern München	☑
GlobalData.home.shortteamname	FC Bayern	☑
GlobalData.home.color.primary	black	☑
GlobalData.home.color.secondary	black	☑
GlobalData.home.players	[{"jerseynumber":26,"firstname":"Sven","lastname":"Ulreich","startingp...	☑
GlobalData.home.jerseynumbers	26,4,2,19,5,27,6,10,42,7,39,43,40,3,38,45,41,8,11,9	☑
GlobalData.away.teamname	RB Leipzig	☑
GlobalData.away.shortteamname	Leipzig	☑
GlobalData.away.color.primary	black	☑
GlobalData.away.color.secondary	black	☑
GlobalData.away.players	[{"jerseynumber":21,"firstname":"Janis","lastname":"Blaswich","startin...	☑
GlobalData.away.jerseynumbers	21,39,4,2,24,20,44,22,17,7,11,25,23,16,10,13,18,30,9,38	☑
GlobalData.referee.color.primary	black	☑
GlobalData.referee.color.secondary	black	☑
GlobalData.referee.players	[{"jerseynumber":0,"firstname":"Bastian","lastname":"Dankert","startin...	☑
GlobalData.game.running	true	☑
GlobalData.game.phase	3	☑
GlobalData.venue	?	☑
GlobalData.city	?	☑
GlobalData.scaleUnit	m	☑
HOME.10.jerseynumber	10	☑
HOME.10.team	HOME	☑
HOME.10.onfield	1	☑
HOME.10.firstname	Leroy	☑
HOME.10.lastname	Sane	☑
HOME.10.fullname	Leroy Sane	☑
HOME.10.nametag	10 SANE	☑
HOME.10.position.x	67.05	☑
HOME.10.position.y	0	☑
HOME.10.position.z	-23.79	☑
HOME.10.normalizedposition.x	0.13857142857142857	☑
HOME.10.normalizedposition.y	0.150147058823529...	☑

Inspecting Dataset Entries

- To inspect a dataset entry, hover over the entry on the right-most part of the corresponding row. On the menu revealed, press the **Show full value** option:
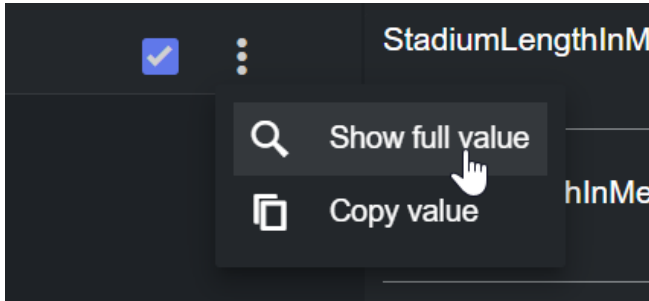
- A dialog is shown with the full entry.
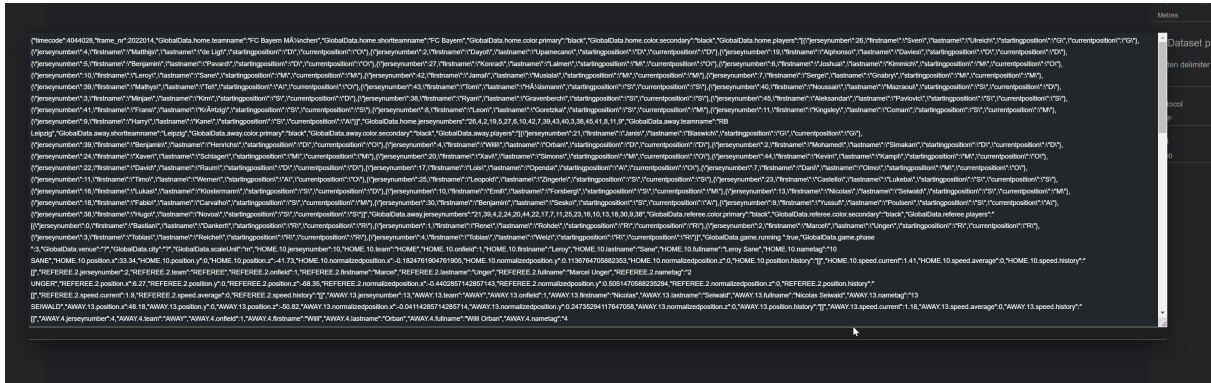
This feature is particularly useful for data entries that have long strings/JSON payloads as value.

Copy Entries Key/Value

- To copy a dataset entry's value, hover over the entry on the right-most part of the corresponding row. On the menu revealed, press the **Copy Value** option:
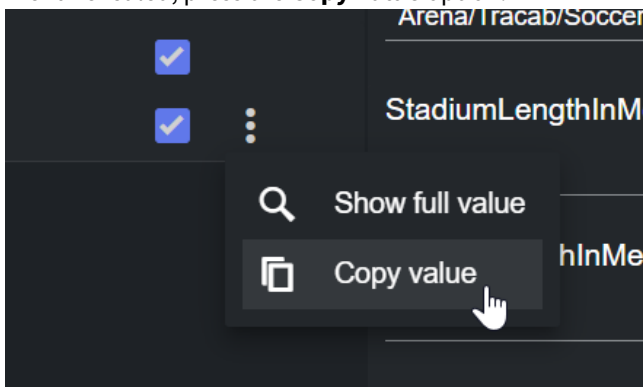
- To copy a dataset entry's key, hover over its key and click on the copy icon that is revealed:
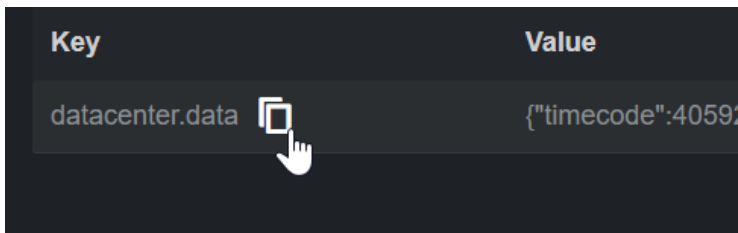
- After performing one of the copy actions, the copied value is available in the clipboard.

Working with Live Data: Pause a Dataset View or Limit UI Updates

When working with real time data, inspecting or copying the incoming stream may be challenging, as the data at hand may be changing too fast. Therefore, the view of the data can be temporary paused or the entire UI refresh rate limited.
While the earlier affects only the view of a dataset, the latter slows down the view updates for all datasets. It is therefore recommended for cases using multiple datasets, and at least one has real-time data updates.

> **Note:** While in pause mode, the incoming entries **are still forwarded** to all the configured outputs. Any assigned script to the dataset is also applied.

> **Note:** Regardless of the mode selected, pausing a dataset view or limiting the UI updates have no effect on the Datacenter user interaction.

Limit the UI Refresh Rate

To limit the UI refresh rate, click on the speedometer icon on the top right corner of the Application Bar ⊘ . While running in limited mode, the speedometer icon turns yellow 🟡 , and to remove the limit, click on the icon again. The limited refresh rate interval has a default value of 500 milliseconds. This value can be configured in the General Configuration section of the Admin page.

Pause UI Updates

To pause UI updates click on the lock icon on the top of the data entries:
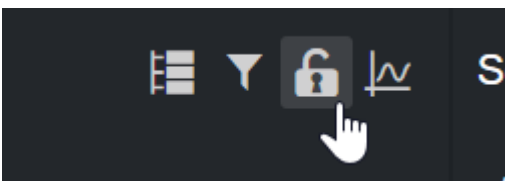
A yellow message informs that the data is not being updated for this dataset, while the entries are greyed out.

All supported interactions with the data (copying or inspecting an entry) are still available while in pause mode.

5.4.5   Working with Live Data: the Performance Dashboard

When working with real-time data (data coming from a Tracab dataset), inspecting the performance of the incoming data streams, as well as applied scripts, can be crucial to spot problems in the pipeline. To help with this, Datacenter offers a **Performance Dashboard.**

The **Performance Dashboard** helps operators inspect the sanity of the incoming data, and the runtime of any applied script.

- To open the dashboard, click on the graph icon in the Dataset Entries panel:
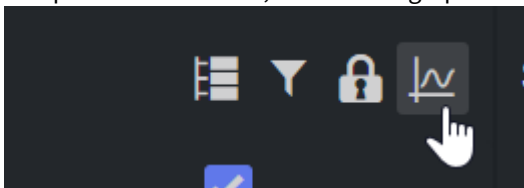
- Adjust the settings at the bottom of the dashboard to configure the viewing options.
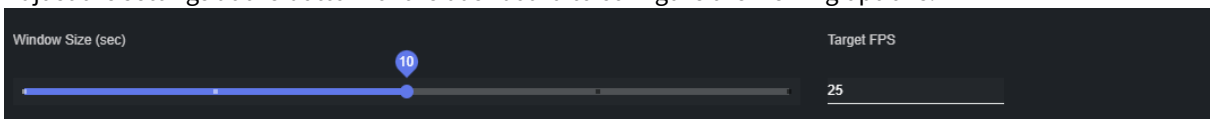
- **Window Size:** Select the time span (in seconds) to inspect.
- **Target FPS:** Configure these parameters to match the incoming stream FPS. This parameter, in combination with the **Window Size**, effectively configures how many frames are shown in the graph.

- To temporary freeze the dashboard updates, click anywhere on the graph. Clicking again resumes the updates.

Intertimes

- Click on the **Intertimes** button at the top of the dashboard to show Interarrival times statistics.

The resulting graph shows the time elapsed, in milliseconds, between the reception of two 'packets' from a data stream.
The current average is reported in the title, and shown in light blue in the graph. When hovering on the chart, the intertime for that frame is revealed:

When inspecting intertimes, you can easily figure out if the incoming stream is sending packets slower or faster than the declared FPS. For the earlier, the reported average is larger than the ideal intertime average, while for the latter it is smaller.

FPS

- Click on the **FPS** button at the top of the dashboard to show FPS (frames per second) statistics.
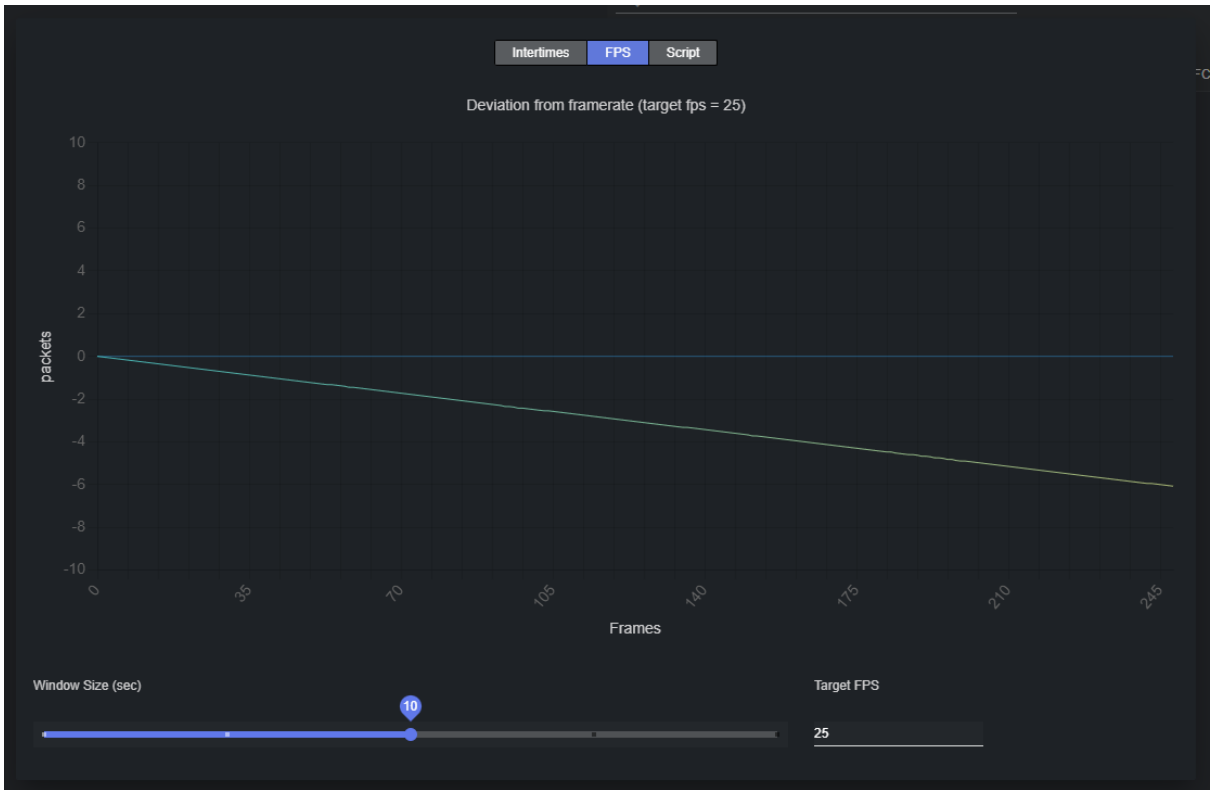
The resulting graph shows the difference between the ideal number of packets that the provider should have sent at a given frame and the actual number of received packets.

The current target FPS is reported in the title. When hovering on the chart, the deviation from the ideal framerate for that frame is revealed:
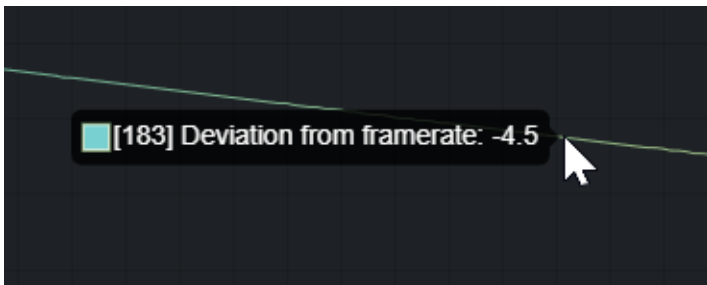
- When inspecting FPS stats, you can easily examine if the incoming stream is sending a different number of packets than the declared FPS. In case of a slower stream, the deviation should move towards the negative part of the Y axis over time.
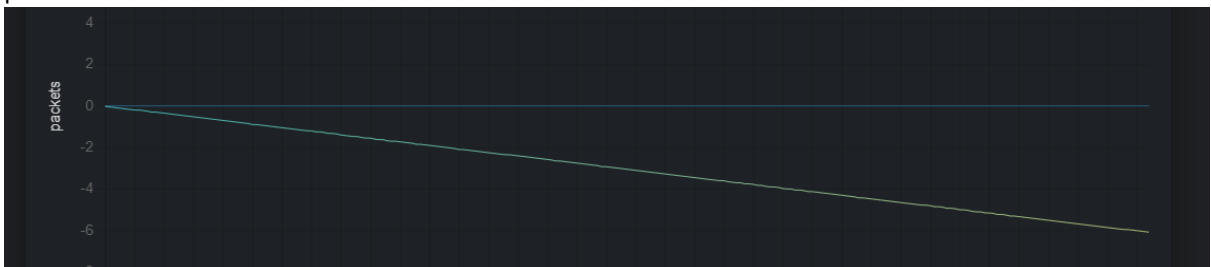
In the example above, an increasingly smaller number of packets than expected is received as the time advances.
Conversely, in case of faster stream, the deviation should move towards the positive Y axis over time.

In the example above, an increasingly larger number of packets than the expected is received as the time advances.

Script

- Click on the **Script** button at the top of the dashboard to show script execution time (in milliseconds) statistics.

The resulting graph shows the execution time (in milliseconds) of the applied script, if any, over time.

5.4.6 Joining Endpoints Parameters

In Datacenter, it is possible to share parameters of different end points.

- When creating a dataset like with two end points that share same parameters, it looks as shown below:
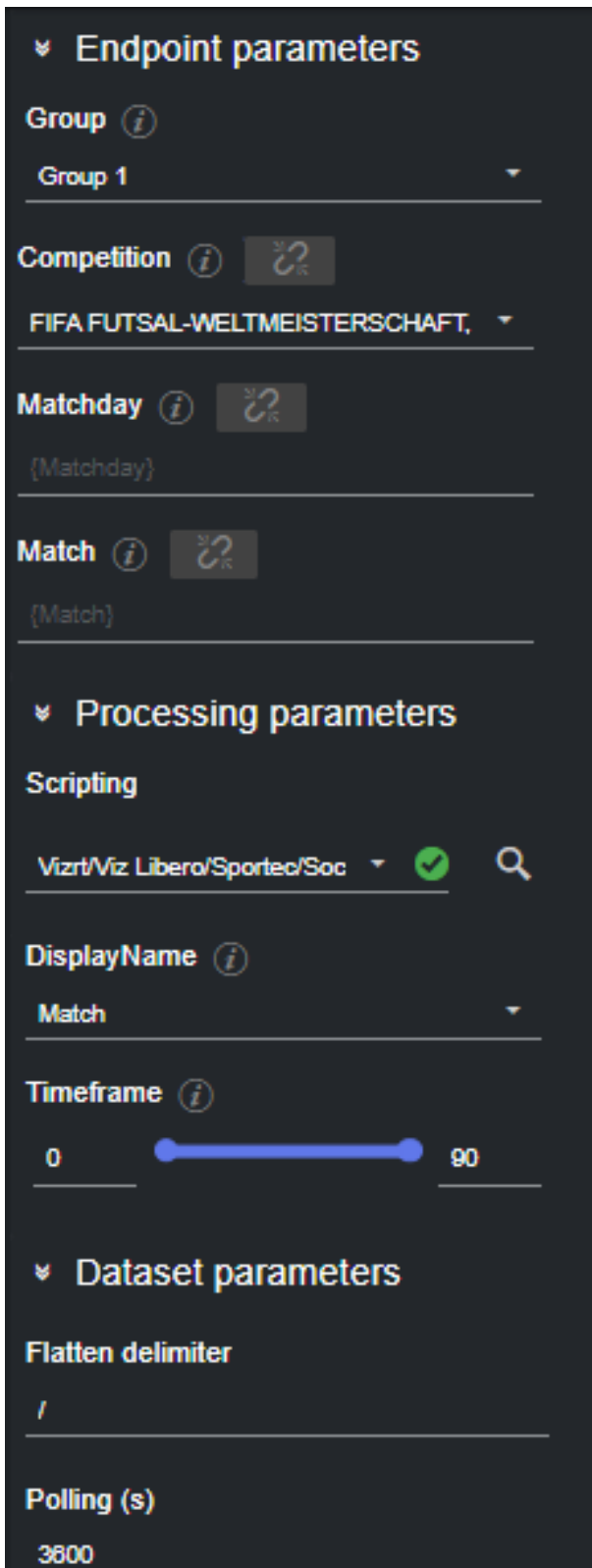
- To deactivate joining any end point parameters, put one end point in a different group:
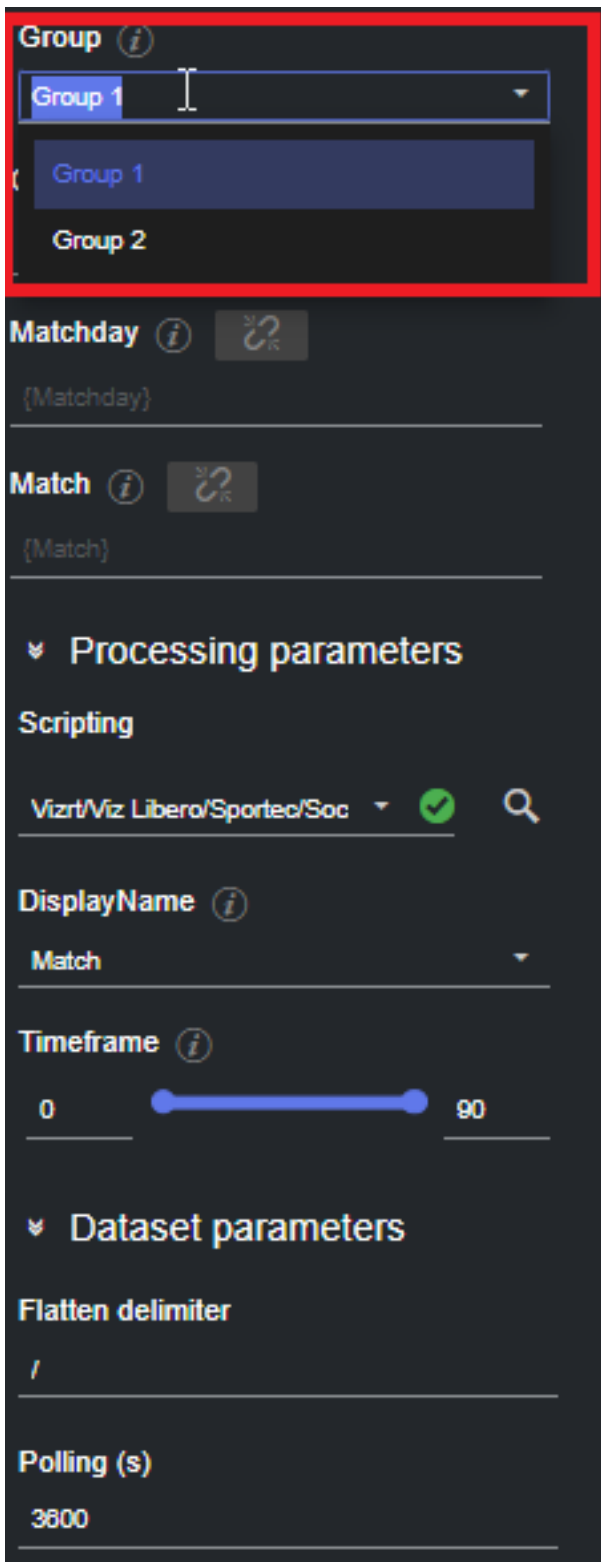
- This results in the following view, where the broken link icon disappears:
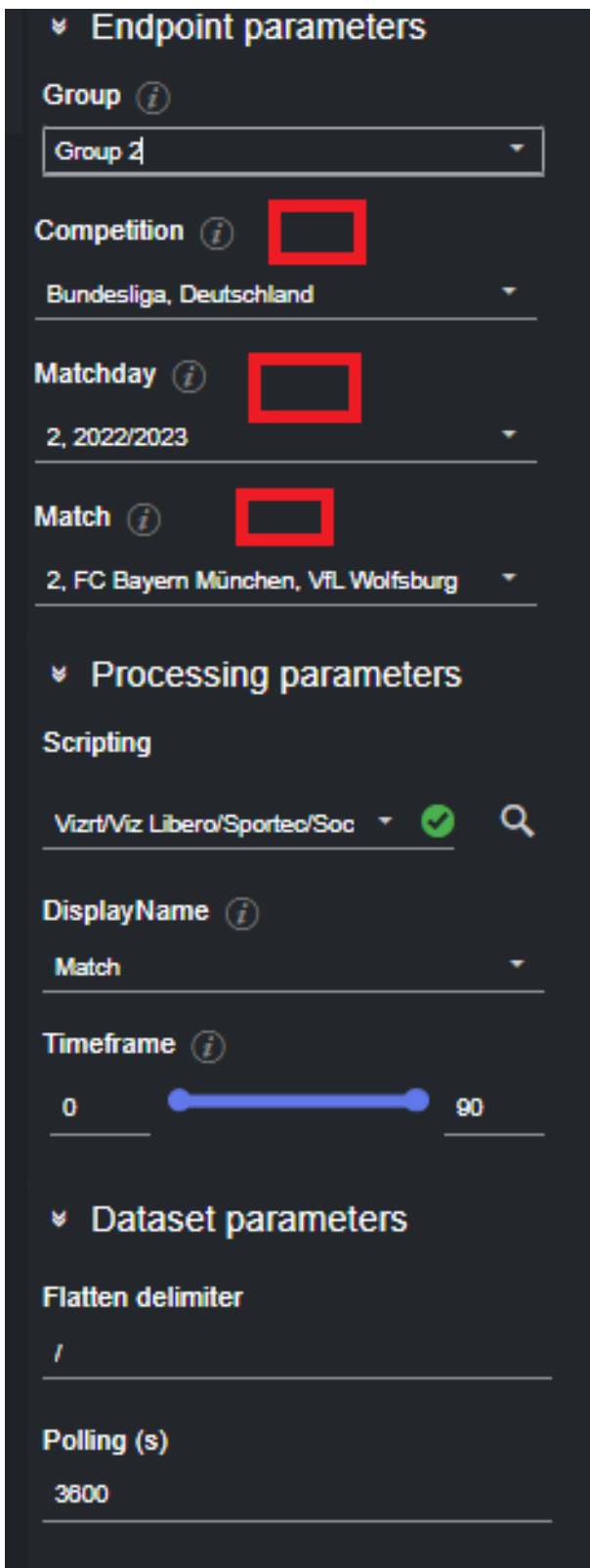
- To join endpoint parameters first make sure that the endpoints are in the same group, then click on the broken link icon:
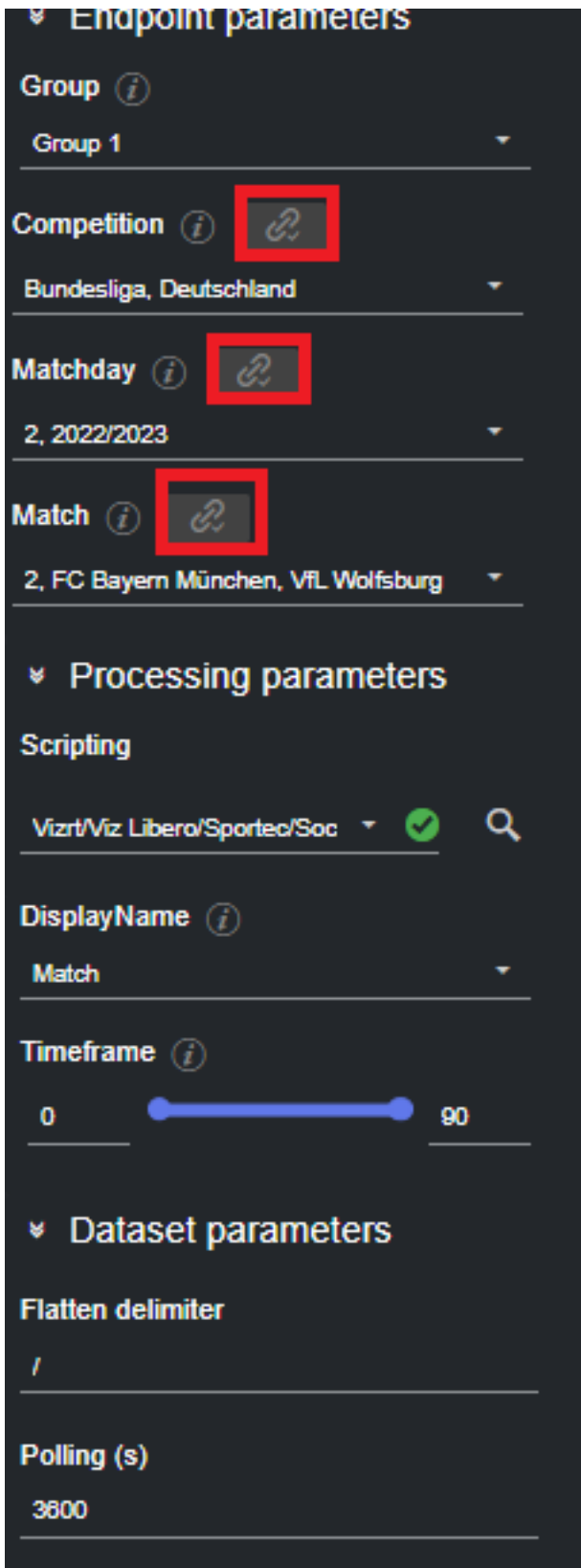
- If the connected link icon is active, then the endpoint parameters of all endpoints in the group are joint. To break the connection just click on the icon again → .

5.5   Outputs

This section describes how to configure the following outputs in Datacenter:

- Viz Engine Output
- Viz Arc Output
- Generic TCP Output

Please refer to the Configuring Outputs section for steps on how to correctly setup each supported receiving end to accept incoming data from Datacenter.

5.5.1   Overview

Datacenter provides data to one or more outputs, so graphics can be linked to it seamlessly. To do so, first create and configure the desired output(s), which is then listed at the bottom of the main UI, in the **Viz Outputs footer.**
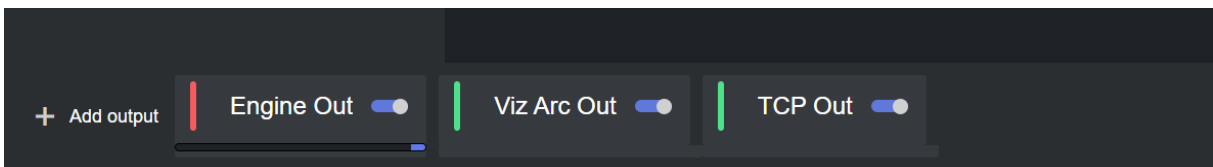
Each output can be either in Connected state (green) or not connected (red):

State	View	Description
Connected		Connected successfully.
Not Connected		When not connected, an output periodically attempts to reconnect. A progress bar appears at the bottom of the connecting output, and the tooltip shown when hovering on the status bar informs the user of any warnings or errors.

5.5.2   Add and Edit an Output

Add an output by clicking on the **Add output** button in the bottom left of the **Viz Outputs footer**.
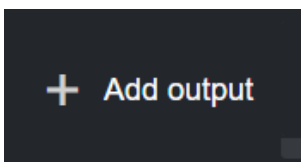
To configure or edit an output, click on its name in the output list, and edit the fields that are listed in the dialog that appears.

> **Info:** When editing an output, click on **Confirm** to apply changes, or they are lost when closing the dialog.

After adding and configuring an Output, a connection is attempted.

5.5.3   Disable an Output

An output can be temporary disabled by using the toggle next to its name in the Output list. When disabled, the output does not receive incoming data from Datacenter.

State	Enabled	Disabled

5.5.4   Viz Engine Output

To create an output of type Viz Engine, add a new output and click on the new entry.

On the dialog shown, select **Viz Engine** in the **Type** field, and fill all other fields as required:

- **Name:** Name of the output that is displayed in the output list.

- **Type:** Output type, set it to Viz Engine.
- **Host:** Host address where the Viz Engine runs.
- **Port TCP (General Communication port):** The port used to communicate with Viz Engine. This must match the port specified in the Viz Engine Configuration under **Config** > **Communication** > **General Communication Port**.
- **Check connection every (ms):** Specifies how often the communication between the Viz Engine and Datacenter is health-checked.

> **Note:** You can temporarily increase the value of the **Check connection every (ms)** field if the messages sent to Viz Engine appear too often in the Viz Engine console while trying to use it. However, leaving this setting to 1000 ms is strongly recommended to be able to timely detect potential connection issues.

- **Send to:** Toggle between communication done via **Global Shared Memory Map** (default, typically used with Control Objects) and **Scene Local Shared Memory Map** (typically used with Control Channels).
- **Connection mode:** Specifies the communication protocol to use when sending data to the Viz Engine:
    - **Auto:** Prefers UDP, but switch to TCP each time the packet size exceeds 1.5kB.
    - **UDP:** Use UDP, regardless of the packet size.
    - **TCP:** Use TCP, regardless of the packet size.
- **SMM UDP:** Read only and auto-populated field, is the port to use for data communication to the Viz Engine. Only available if **Connection mode** is set to **UDP** or **Auto**.
- **SMM TCP:** Read only and auto-populated field, is the port to use for data communication to the Viz Engine. Only available if **Connection mode** is set to **TCP** or **Auto**.
- **Scene ID:** Read only and auto-populated field. Only available if **Send to** is set to **Global SMM**.

> **Note**: If any of the SMM ports are not correctly configured, a warning symbol is displayed next to the **SMM UDP**/TCP fields. If that is the case, please refer to the Configuring Output section to correctly configured the ports.
>
>
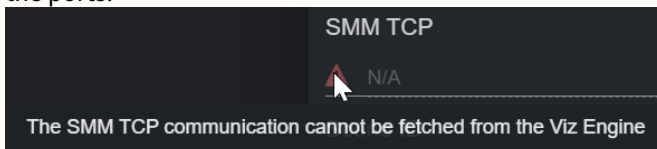
To learn more about configuring a Viz Engine to accept incoming data from Datacenter, please refer to the Configuring Output section.

To learn more about preparing your Viz Engine scene to accept incoming data, please refer to Prepare Scenes for Data Input in Viz Artist.

Custom Mapping of Dataset Keys

To facilitate matching input data with existing control channels/objects on a configured Viz Engine setup, Datacenter offers a way to intuitively map input entries keys to known Viz Engine channels/objects.
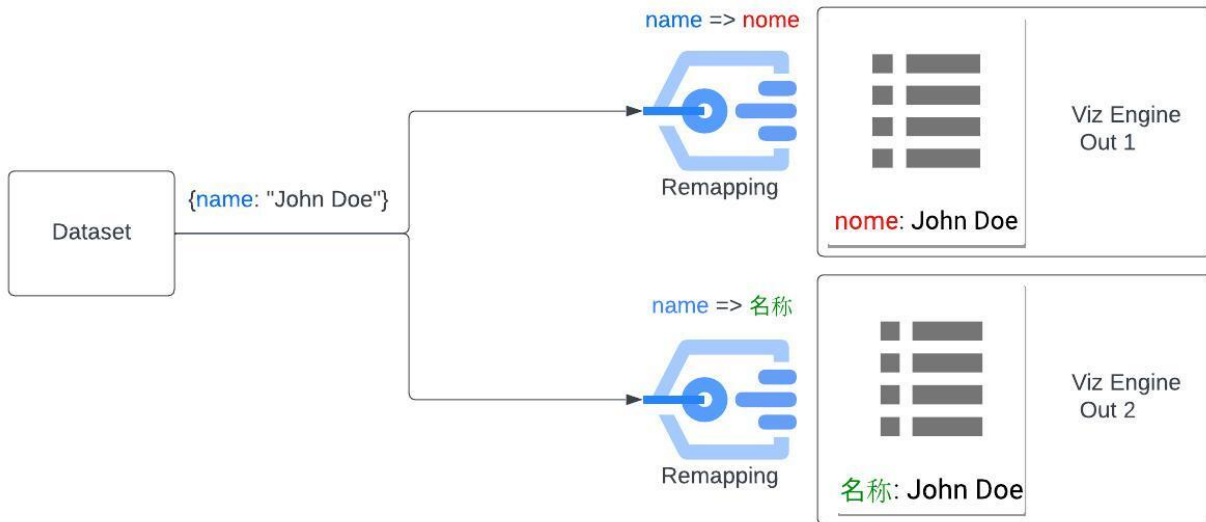
To do so, select a dataset from the **Datasets** panel and click on the custom mapping icon on the engine output to edit:
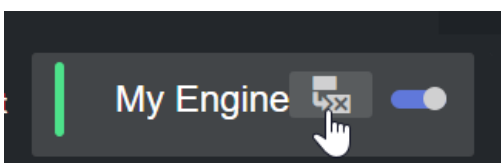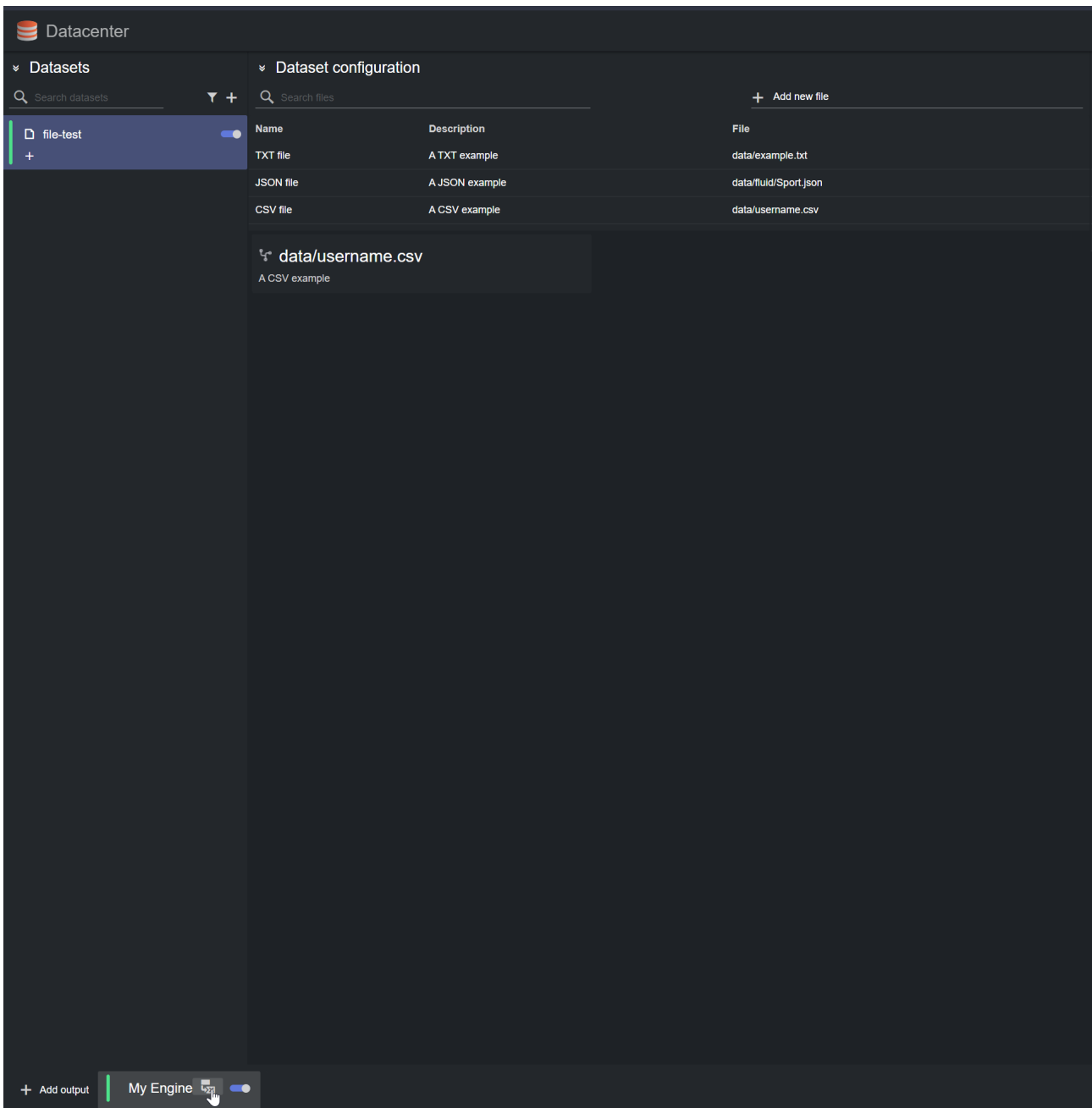
All current keys are listed in the dialog shown. Next to each, there's a search-box to search for all the advertised control channels and control objects on the selected viz Engine output.
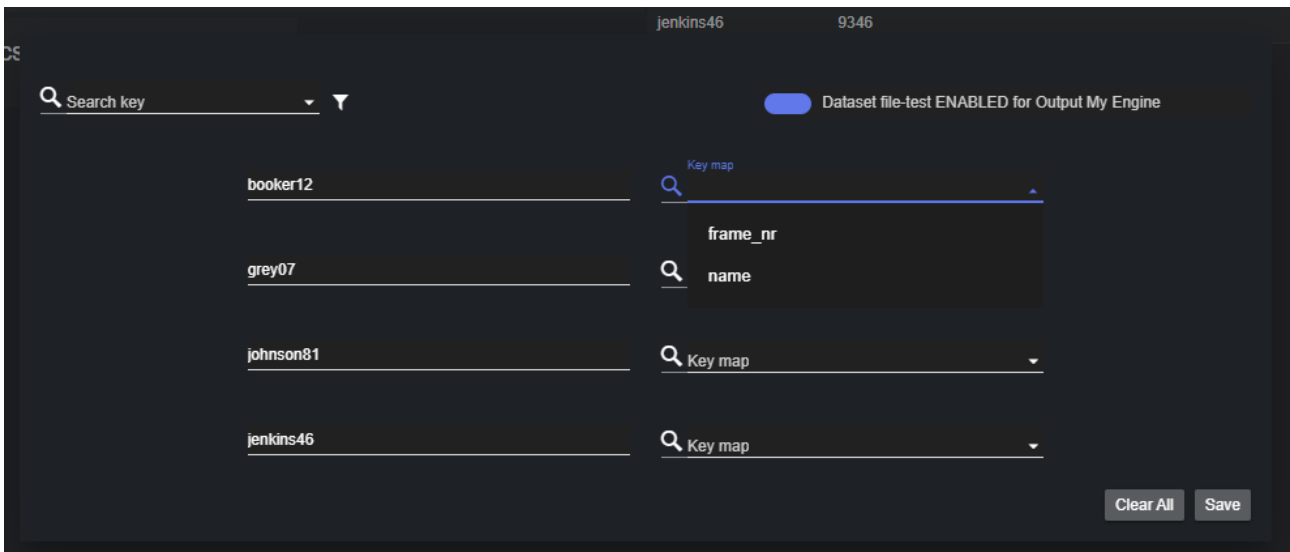
In the example above, the input dataset "file-test" has four keys ("*booker12*", "*grey07*", "*johnson81*" and "*jenkins46*"), while the selected Viz Engine "My Engine" exposes two control channels/objects ("*frame_nr*" and "*name*").

You can now choose a custom mapping for any input key, by simply selecting a value from the right-side search-box:
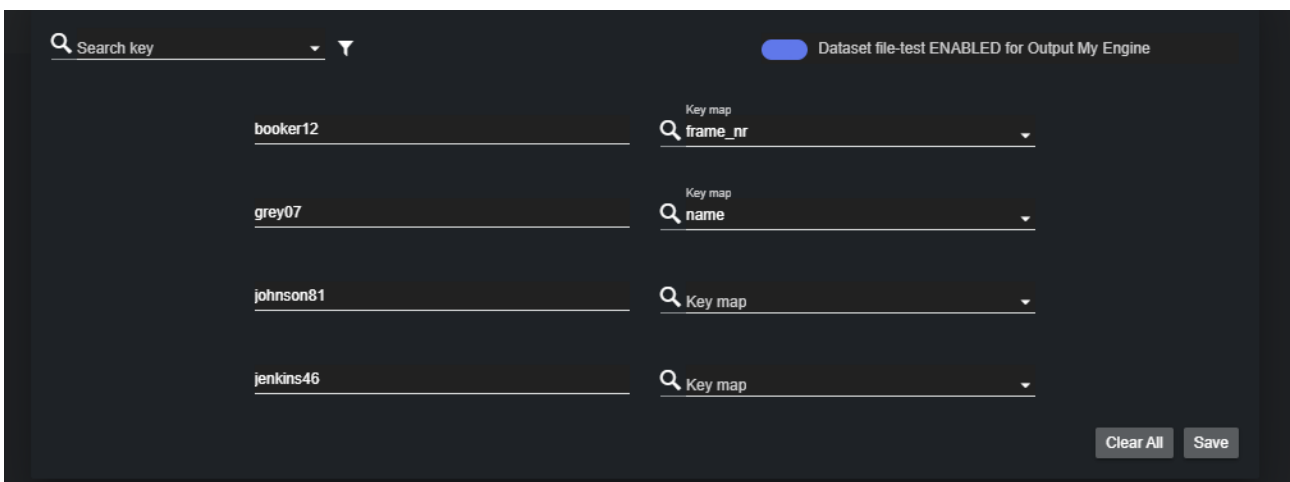
For example, the picture above shows the current custom mapping:

- booker12 → frame_nr
- grey07 → name
- johnson81 → johnson81
- jenkins46 → jenkins46

By clicking **Save**, the current mapping is applied. **Clear All** resets the mapping to its default value (input keys not remapped).

When a custom mapping is applied to a dataset, selecting that dataset reveals a green dot next to the output name:
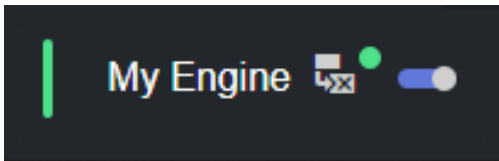
For example, the picture below shows the case where the Dataset "*file-test*" has a custom mapping specified for the output "*My Engine*" but **not** for the output "*My output*".

Disable Sending Dataset Entries for a Viz Engine Output

In certain setups, a specific dataset may not be required on a specific Viz Engine output. In these cases, sending all dataset entries can be disabled by using the custom mapping of dataset keys functionality.
To do so, select a dataset from the **Datasets** panel and click on the custom mapping icon on the engine output to edit:

In the dialog that appears, switch the toggle in the right corner to **Dataset <dataset name> DISABLED for Output <output name>**, and press the **Save** button.
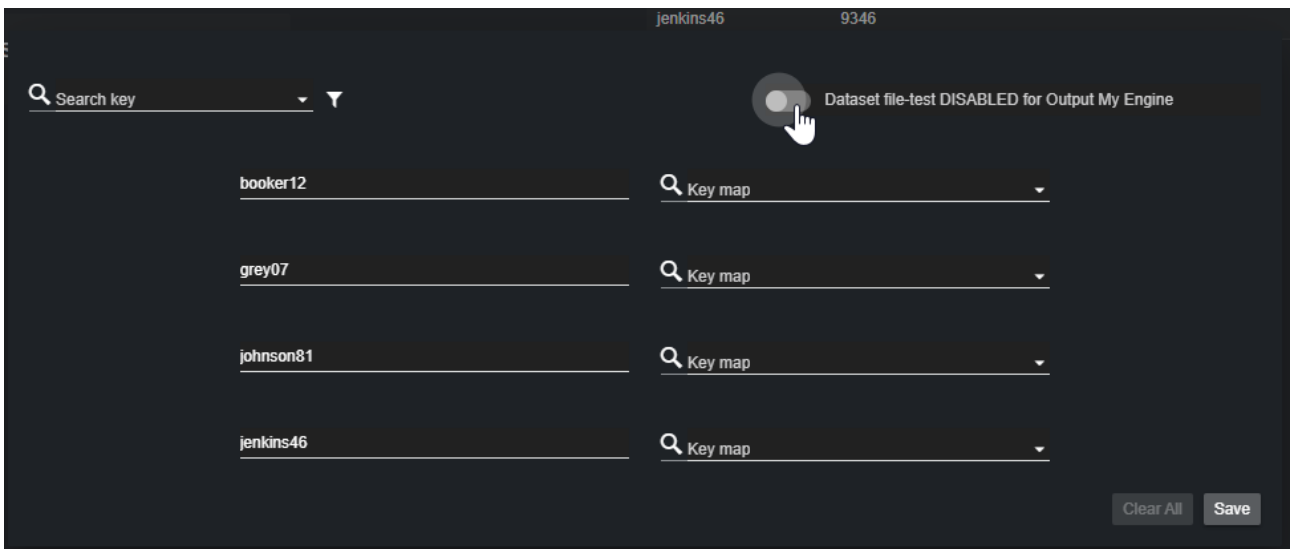
The output card should show a green dot, to signal that a custom mapping is specified for the selected Dataset:
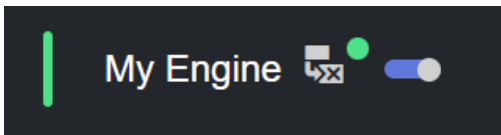
From now on, updates to the entries of the selected dataset are not sent to the selected output.

Prepare Scenes for Data Input in Viz Artist

When working with a Viz Engine output, the scenes that receive live data from Datacenter, must be correctly prepared, depending on the communication option selected.

Global Shared Memory Map Communication via Control Objects

Control objects communication is the default option when creating a new Viz Engine output.

For the communication to work, the Viz Engine scene must enable **Use shared memory placeholders** for the control plugins that are updated with data. The following control plugins support Global Shared memory placeholder out of the box:

- ControlText
- ControlParameter
- ControlImage

To enable live data input from Datacenter:

1. Open the scene in **Viz Artist**.
2. Locate the control plugin for the field that should receive live input.
3. Check **Use shared memory placeholders**. Note that this enables listening for shared memory in the System (Global) memory map.
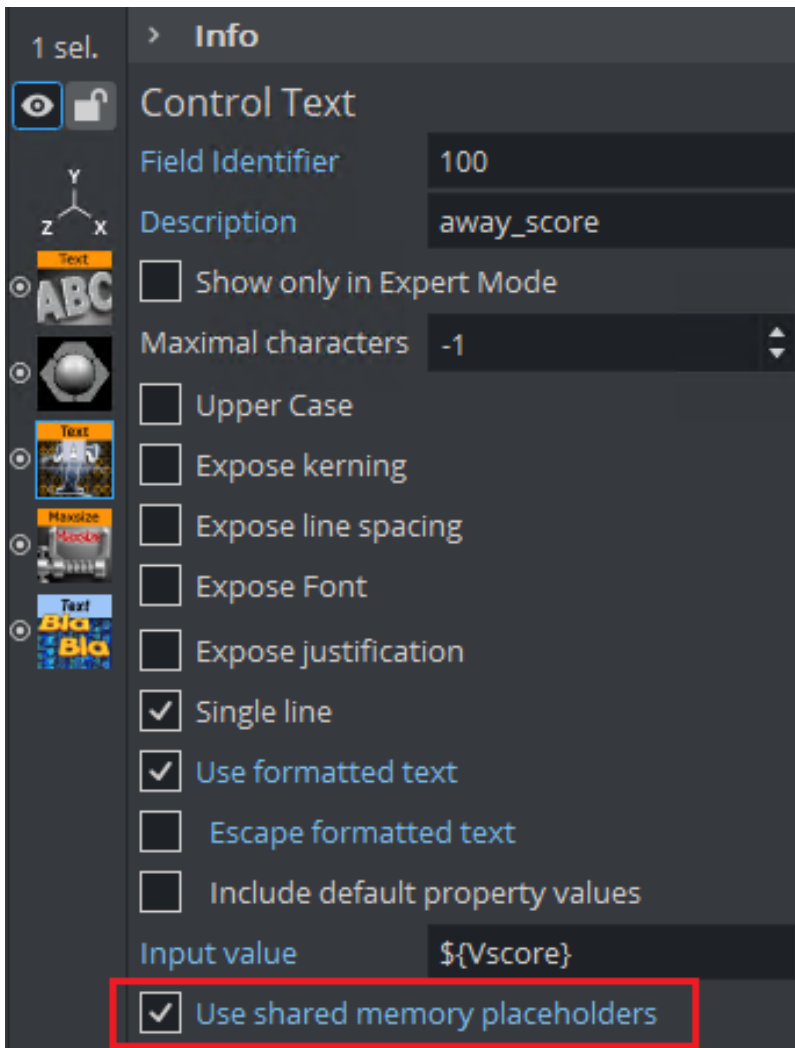
4. Set the **Input value** field to the *key* of the Datacenter dataset entry that should update this object, using the *${KEY_NAME}* syntax (in the example above the value would be updated with a dataset entry with key *Vscore*).
5. Save the scene.
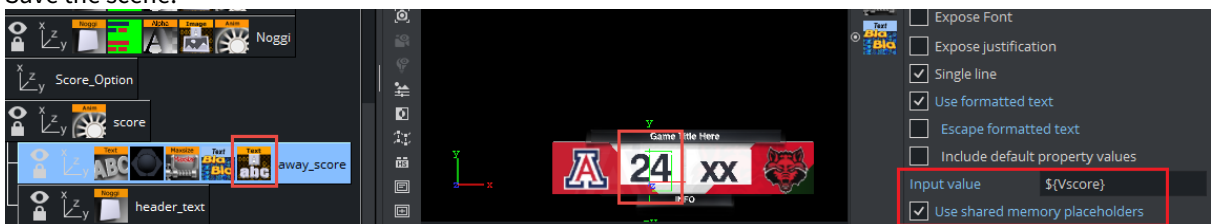
Scene-local Shared Memory Map Communication via Control Channels

Control channels communication must be enabled on each Viz Engine output that uses it . To do so, click on the output you want to send data to and enable the **Control channels** toggle.

Scene ID Fetching: Make sure that the scene is loaded in Viz Artist before connecting to Viz Engine, as the Output automatically fetches the Scene ID of the main scene. Should there be an error reported in the **Scene ID** field, or should you change the scene in Viz Artist after having connected to it, please temporary disable and re-enable the output to force a new scene ID fetch.

Then, to enable live data input from Datacenter:

1. Open the scene in **Viz Artist**.
2. Locate the container that should receive live input, and the container field that should be updated with data from the Datacenter.

3. Drag the field in the Control Channels panel of Viz Artist.
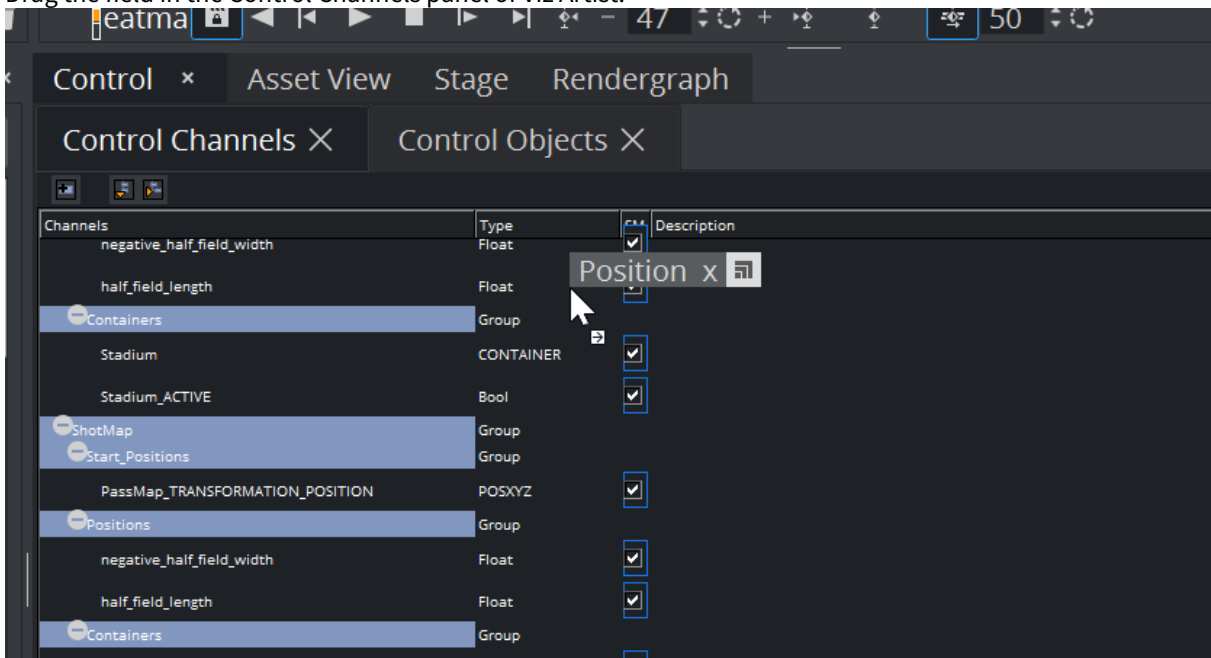
4. In the dialog that appears, set the Control Channel name to the *key* of the dataset entry that should update this object (in the example below the value would be updated with a dataset entry with key *my-entry-key*).
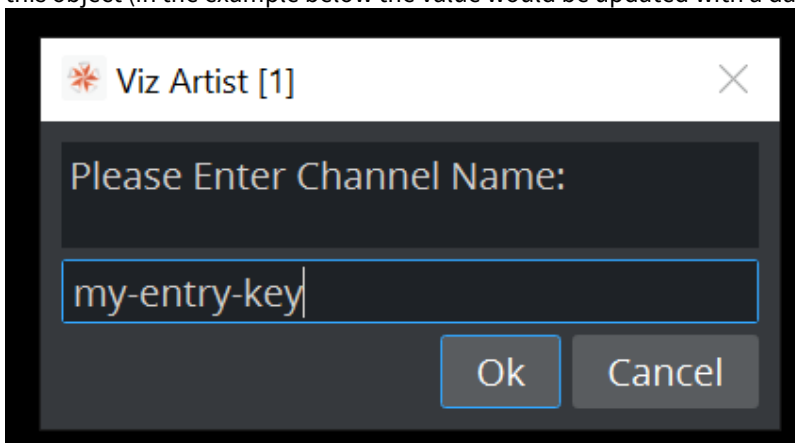
5. Make sure to enable the control channel by clicking on the SM column
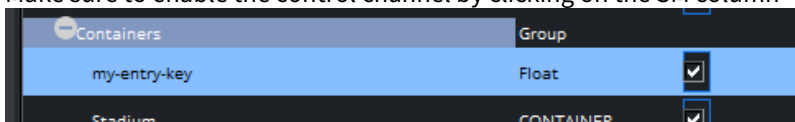
Control Channel Groups: Control channels in Viz Engine can be organized in Groups. Groups can be created using the 🔲 icon in the Control channels panels.
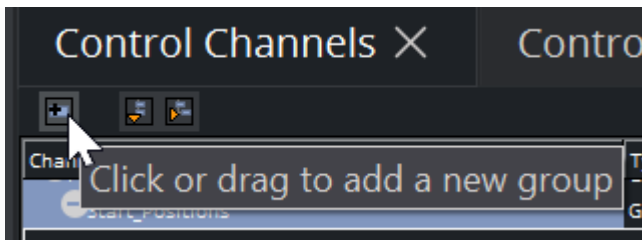
To access a control channel inside a group one must use the '.' delimiter. For example, the *my-entry-key* channel in the example below can be accessed using the following SHM key: *Containers.my-entry-key.*

This property is particularly useful when flattening data in a Datacenter dataset. By setting the flattening delimiter to '.', one can organize the control channels to reflect the flattened data structure.

5.5.5 Viz Arc Output

To create an output of type Viz Arc, add a new output and click on the new entry.

On the dialog shown, select **Viz Arc** in the **Type** field, and fill all other fields as required:

- **Name:** Name of the output that is displayed in the output list.
- **Host:** Host address where Viz Arc runs.
- **Port:** The port to connect to.
- **Check connection every (ms):** Specifies how often the communication between Viz Arc and Datacenter is health-checked.

To learn more about configuring Viz Arc to accept incoming data from Datacenter, please refer to the Configuring Output section of this manual.

5.5.6   Generic TCP Output

To create an output of type Generic TCP, add a new output and click on the new entry.

On the dialog that appears, select **Generic TCP** in the **Type** field, and fill all other fields as required:

- **Name:** Name of the output and that is displayed in the output list.
- **Host:** Host address.
- **Port:** The port to connect to.

A generic TCP output sends the data entries with the following format:

```
{
    "type": "data",
    "payload": {
        "key": "entry_key",
        "value": "entry_value"
    }
}
```

A ping packet is also sent regularly to test the connection. This packet can be ignored by the receiver:

```
{
```

```
    "type": "ping",
    "payload": null
}
```

A TCP output is used to send data to Viz Libero. To learn more about configuring Viz Libero to accept incoming data from Datacenter, please refer to the Configuring Output section of this manual.

6   Alternative Views

Datacenter can be run in "simplified" mode, where some of its panels are hidden to create a focus view, or information relevant for a certain integration (for example, integration with Viz Libero) is shown.

This section goes through the simplified views supported by Datacenter, each accessible via a unique URL:

- Simple Page
- Configurable Page

6.1   Simple Page

The simple page is accessible via *<datacenter_url>/simple* (for example, http://127.0.0.1:5700/simple), and provides a minimalistic UI that allows the selection of endpoints through the pre-configured tags (see Creating Datasets).
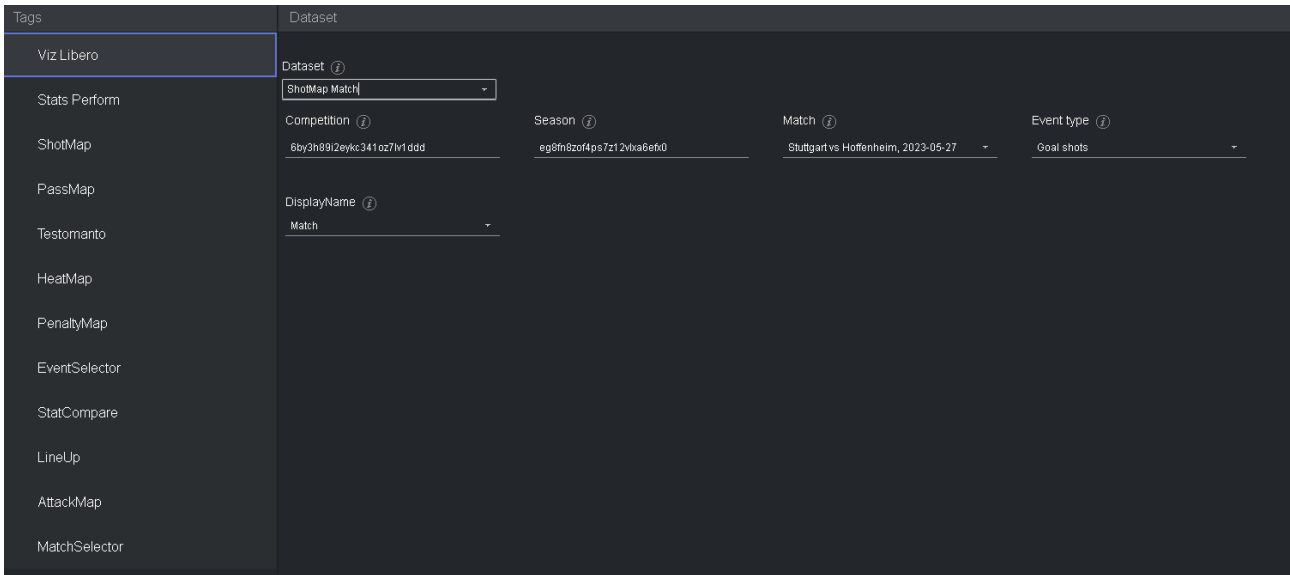
Tags can be selected directly through the UI or passed as an argument in the URL (for example, http://127.0.0.1:5700/simple?tags=Viz%20Libero,ShotMap).

If the tags are passed in the URL, the **Tags** column is not shown and only datasets relevant for the given tags are available for selection. If, given the tag filtering, only one dataset is available, it is automatically selected.

6.2   Configurable Page

The configurable page is accessible via *<datacenter_url>/?components=<ComponentsCommaSeparatedList>* (for example, http://127.0.0.1:5700/?components=DatasetPanel), and gives the option to create configurable views that can, for instance, improve focus or remove unnecessary panels from the main UI for a given workflow.

The available configurable components are:

1. Dataset Panel
2. Dataset Edit Panel
3. Dataset Entries Panel
4. Properties Panel
5. Outputs Panel

They must be specified as a comma separated list argument to the *?components* query element, representing respectively:
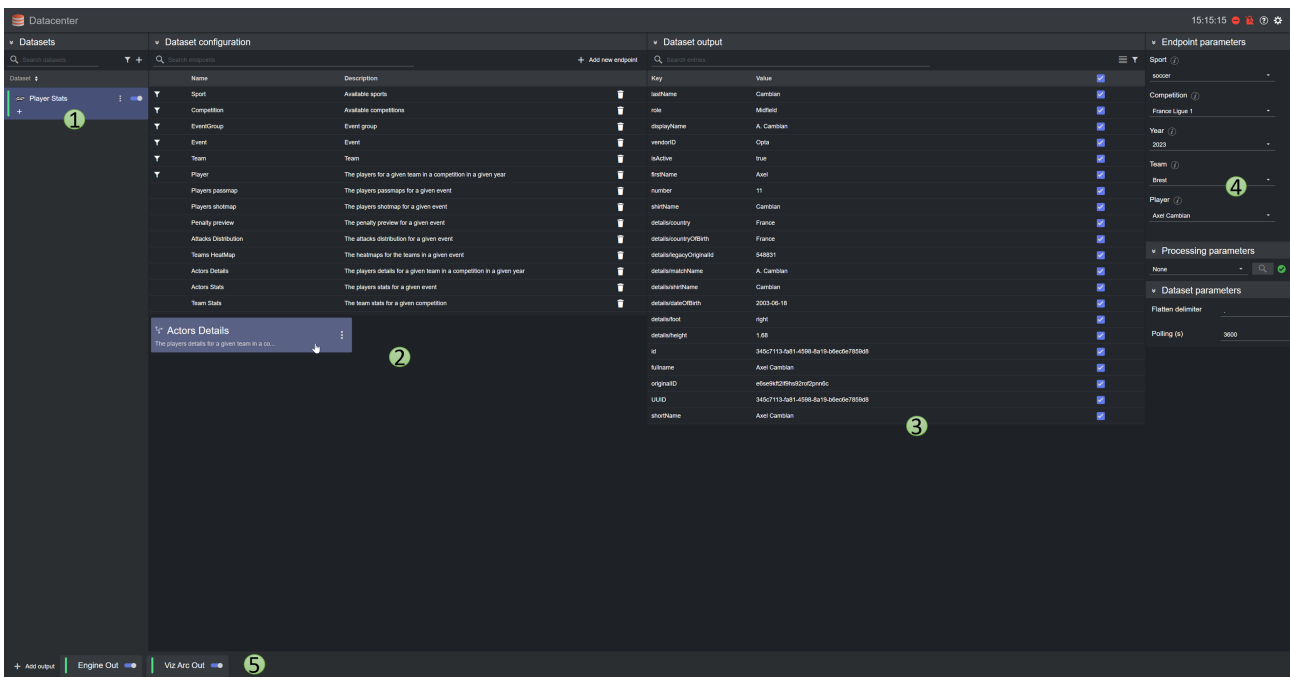
For example, the http://127.0.0.1:5700/?components=DatasetPanel,DataEntriesPanel creates a simplified view where only the configured datasets and their data entries are shown:

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rollup-pluginutils@2.8.2	MIT	https://github.com/rollup/rollup-pluginutils
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rw@1.3.3	BSD-3-Clause	https://github.com/mbostock/rw
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vue-demi@0.13.11	MIT	https://github.com/antfu/vue-demi
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7.9   Sep

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7.11 Serilog Graylog Sink

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