



ibaPDA-Data-Store-MindSphere

Data streaming into MindSphere cloud

Manual
Issue 1.0

Measurement Systems for Industry and Energy

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1 About this manual

This documentation describes the function and application of the data store *ibaPDA-Data-Store-MindSphere*.

This documentation is a supplement to the *ibaPDA* manual. Information about all the other characteristics and functions of *ibaPDA* may be found in the *ibaPDA* manual or in the online help.

You will find basic information about data storage in *ibaPDA* in the *ibaPDA* manual part 5.

1.1 Target group and previous knowledge

This documentation addresses qualified professionals, who are familiar with handling electrical and electronic modules as well as communication and measurement technology. A person is regarded as professional if he/she is capable of assessing the work assigned to him/her and recognizing possible risks on the basis of his/her specialist training, knowledge and experience and knowledge of the standard regulations.

This documentation in particular addresses persons, who are concerned with the configuration, test, commissioning or maintenance of the supported database, cloud or cluster storage technology. For the handling of *ibaPDA-Data-Store-MindSphere* the following basic knowledge is required and/or useful:

- Windows operating system
- Basic knowledge of *ibaPDA*
- Basic knowledge of databases, cloud or cluster storage technology

1.2 Notations

In this manual, the following notations are used:

Action	Notation
Menu command	Menu <i>Logic diagram</i>
Calling the menu command	<i>Step 1 – Step 2 – Step 3 – Step x</i> Example: Select the menu <i>Logic diagram - Add - New function block</i> .
Keys	<Key name> Example: <Alt>; <F1>
Press the keys simultaneously	<Key name> + <Key name> Example: <Alt> + <Ctrl>
Buttons	<Key name> Example: <OK>; <Cancel>
File names, paths	"Filename", "Path" Example: "Test.doc"

1.3 Used symbols

If safety instructions or other notes are used in this manual, they mean:

Danger!



The non-observance of this safety information may result in an imminent risk of death or severe injury:

- Observe the specified measures.

Warning!



The non-observance of this safety information may result in a potential risk of death or severe injury!

- Observe the specified measures.

Caution!



The non-observance of this safety information may result in a potential risk of injury or material damage!

- Observe the specified measures

Note



A note specifies special requirements or actions to be observed.

Tip



Tip or example as a helpful note or insider tip to make the work a little bit easier.

Other documentation



Reference to additional documentation or further reading.

2 Introduction

Different types of data storage are available in *ibaPDA* for different purposes and methods of data storage. Depending on the licenses registered in the dongle, different types of data storage are available for configuration in the dialog.

This documentation describes the “MindSphere timebased data store” type of recording. This type of data store writes timebased data into the MindSphere cloud.

MindSphere is the cloud-based and open IoT operating system from Siemens for collecting, processing and evaluating data. In MindSphere, plants, machines and the entire structure of an industrial process are modeled using assets, types and aspects.

The connection to MindSphere cloud can basically be divided into two parts:

- The first part describes how to create a connection between *ibaPDA* and MindSphere to write data to MindSphere. See chapter ↗ *Data store configuration*, page 9.



- The second part describes how the data can be viewed with MindSphere Fleet Manager. This part is not required if there is another tool for viewing MindSphere data and MindSphere is only used as a data store. MindSphere Fleet Manager is only used to see that it contains data. Due to the limitations of Fleet Manager, detailed data cannot be measured or accessed. See chapter ↗ *Display in Fleet Manager*, page 23.

2.1 System requirements

The following system requirements are necessary when using data storage in the MindSphere cloud:

- MindAccess IoT Value Plan (MindSphere license from Siemens)
- *ibaPDA* v7.0.0 or higher
- License for *ibaPDA-Data-Store-MindSphere*

The licenses are staggered according to the number of signals that should be written into the MindSphere cloud. The number of used data stores is unlimited.

Order no.	Product name	Description
30.670180	ibaPDA-Data-Store-Mind-Sphere-16	Additional license for data streaming into MindSphere cloud, max. 16 signals
30.670181	ibaPDA-Data-Store-Mind-Sphere-64	Additional license for data streaming into MindSphere cloud, max. 64 signals
30.670182	ibaPDA-Data-Store-Mind-Sphere-256	Additional license for data streaming into MindSphere cloud, max. 256 signals
30.670183	ibaPDA-Data-Store-Mind-Sphere-1024	Additional license for data streaming into MindSphere cloud, max. 1024 signals
30.670191	upgrade-ibaPDA-Data-Store-MindSphere-16 to 64	License for extension from 16 to 64 signals
30.670192	upgrade-ibaPDA-Data-Store-MindSphere-64 to 256	License for extension from 64 to 256 signals
30.670193	upgrade-ibaPDA-Data-Store-MindSphere-256 to 1024	License for extension from 256 to 1024 signals

Table 1: Available licenses for the MindSphere data storage

3 Data store configuration



Fig. 1: Connection ibaPDA - MindSphere

The following steps are necessary to write data to MindSphere.

- Create an asset in the MindSphere Asset Manager, see chapter ↗ *Creating an asset in MindSphere*, page 9
- Configure a MindSphere timebased data store in *ibaPDA*, see chapter ↗ *MindSphere data store configuration*, page 14
- Select signals, see chapter ↗ *Signal selection*, page 16
- Configure trigger (optional), see chapter ↗ *Trigger mode*, page 19

3.1 Creating an asset in MindSphere

After you have logged into your MindSphere account, open the Asset Manager.

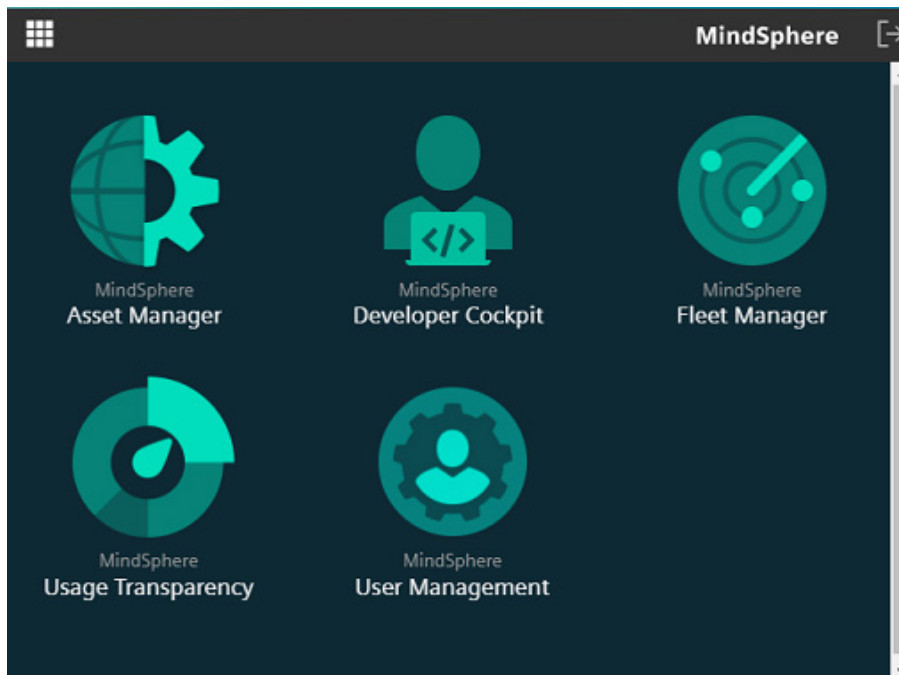


Fig. 2: Open Asset Manager

Create an asset in the MindSphere Asset Manager. With a click on <+Create asset> you add a new asset.

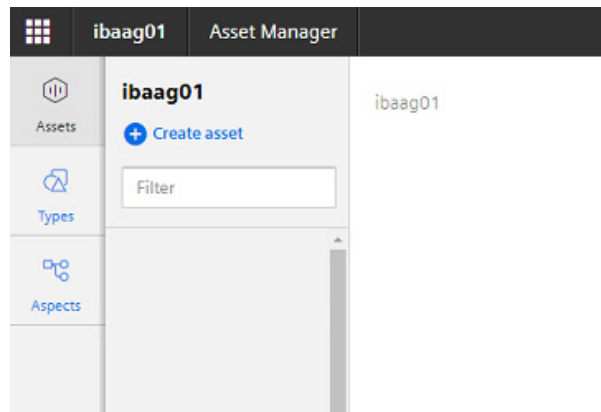


Fig. 3: Create asset

Select the type "MindConnectLib" for the connection with *ibaPDA*.

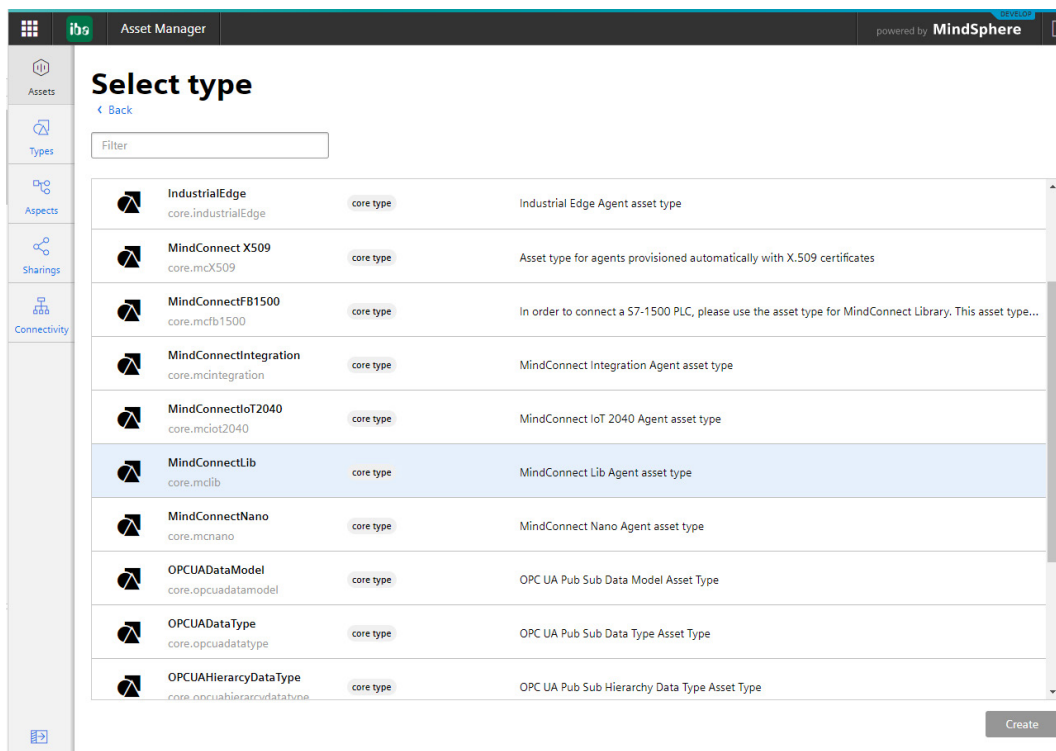


Fig. 4: Select asset type

Enter a unique name (in the example: *ibaPDA_MindConnectTest_Asset*) and optionally a description. The other fields are not relevant. Confirm with <Save>.

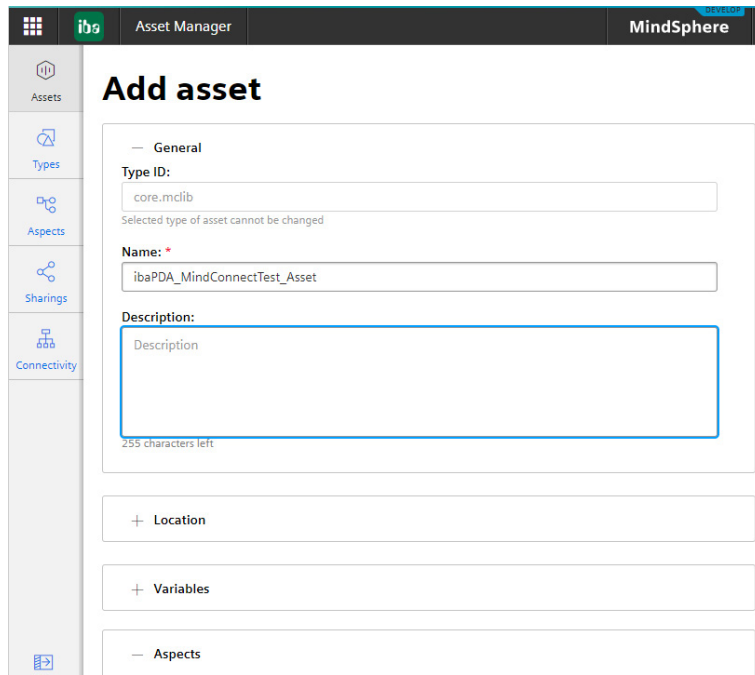


Fig. 5: New asset

The new asset is now available in the selection list on the left side.

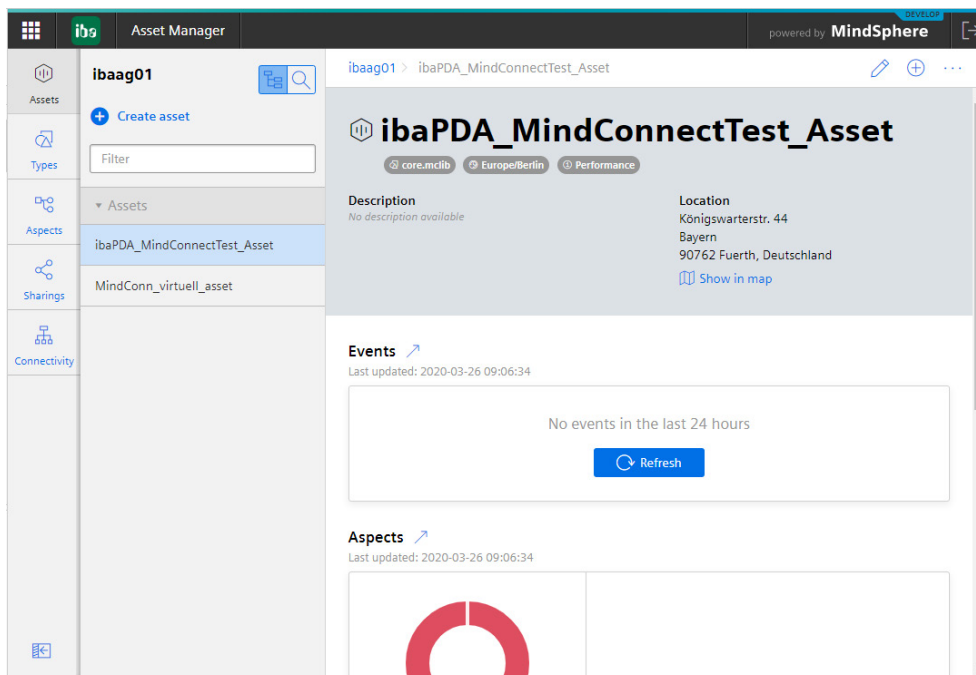


Fig. 6: Select asset

Open the asset by clicking the button at the top left (green arrow).

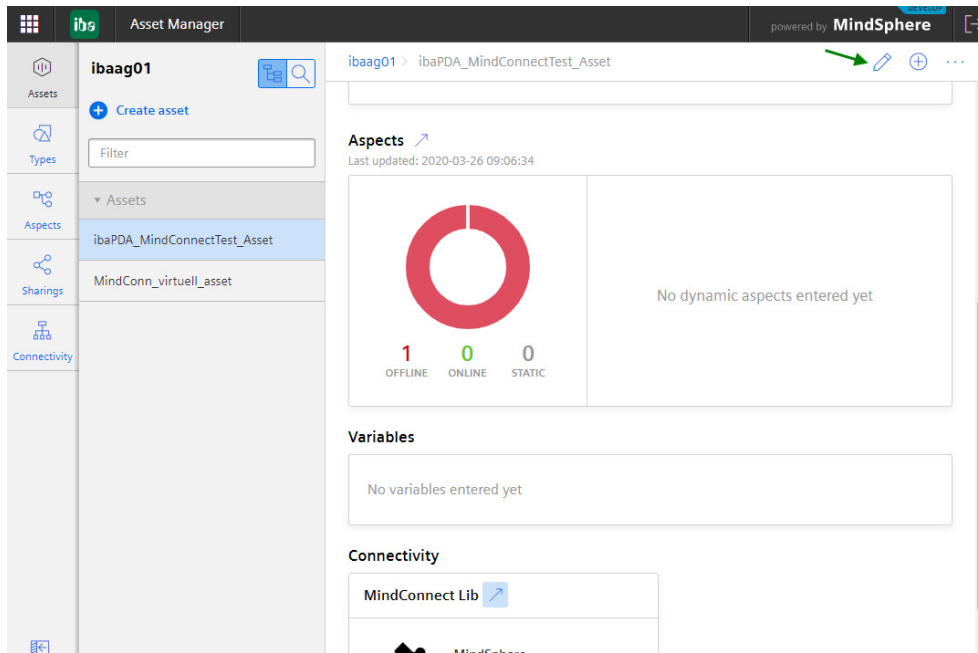


Fig. 7: Open asset

When you open the asset for the first time, you have to select a security profile. Select one of the security profiles and confirm with <Save>.

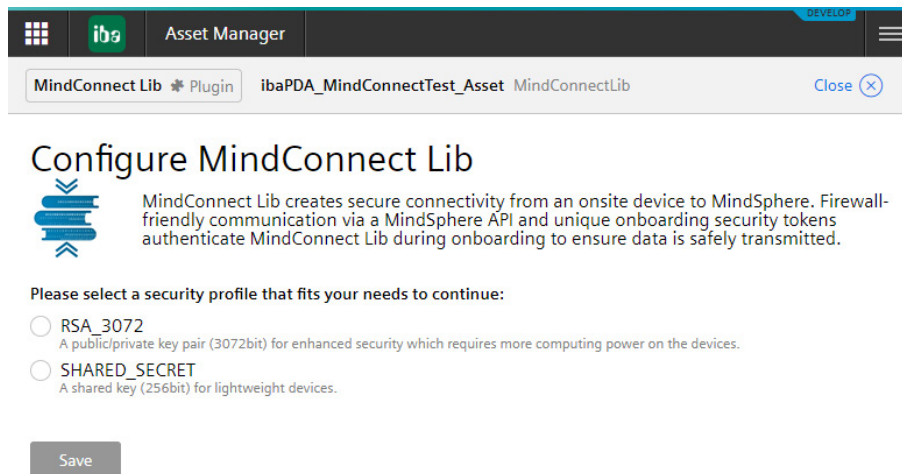


Fig. 8: Select security profile

Now the properties dialog of the asset appears. Create a boarding configuration with a click on the button <Generate onboarding key>.

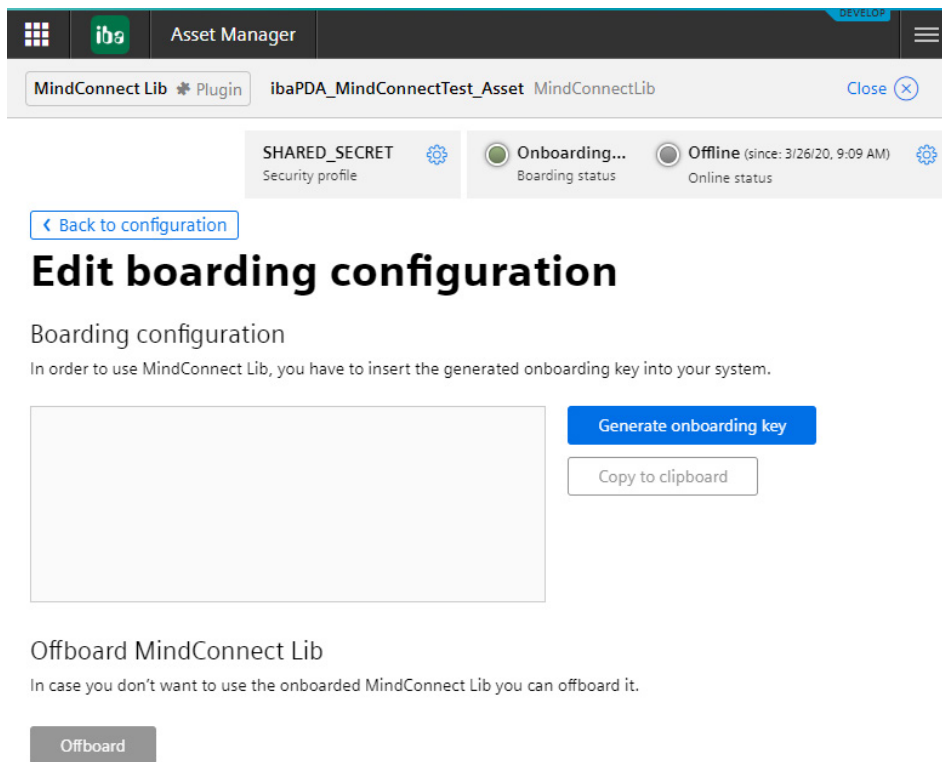


Fig. 9: Generate onboarding key

Copy the text (onboarding key) into the clipboard with a click on <Copy to clipboard>.

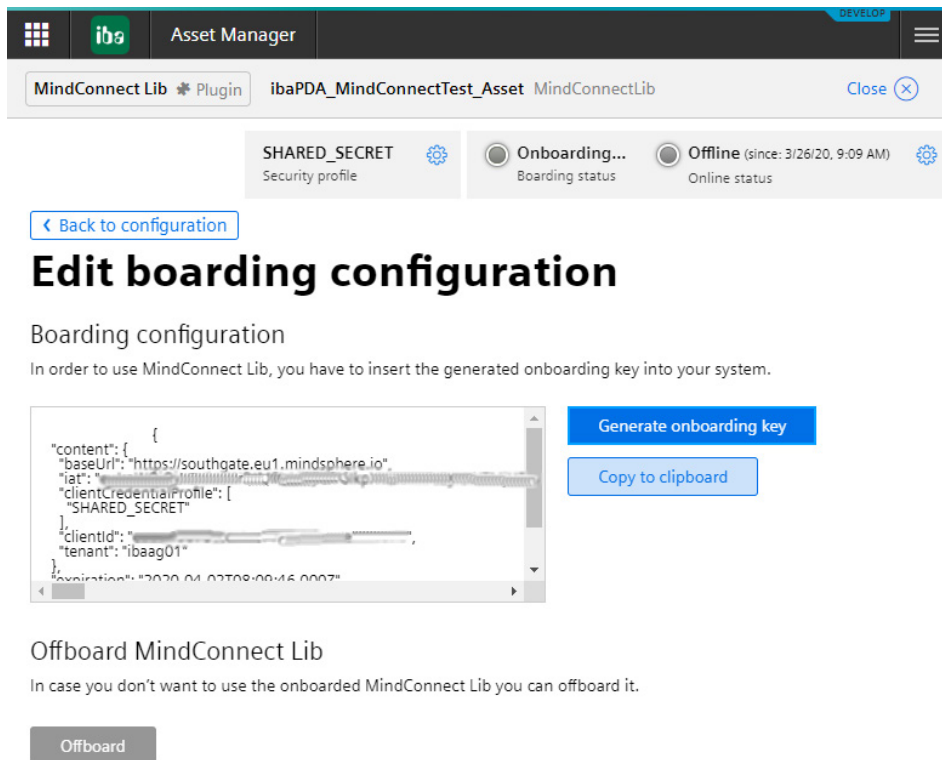



Fig. 10: Copy onboarding key

Now open *ibaPDA* and configure a *MindSphere timebased data store*. See the following chapters.

3.2 MindSphere data store configuration

First start the *ibaPDA* client. The dialog for data storage configuration can be opened in the *Configure – Data storage* main menu or by clicking on the button  in the main toolbar.

In order to add a new data store, click on the blue link *Add data store* in the tree structure. You can also right-click on the data store node in the tree structure and choose *Add data store* from the context menu.

Select *MindSphere timebased data store* for the recording of timebased data in a MindSphere cloud.

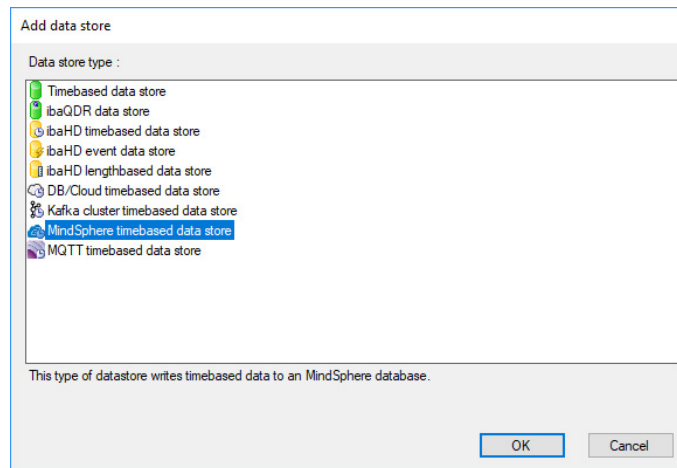


Fig. 11: Add a data store

The MindSphere data store configuration dialog appears.

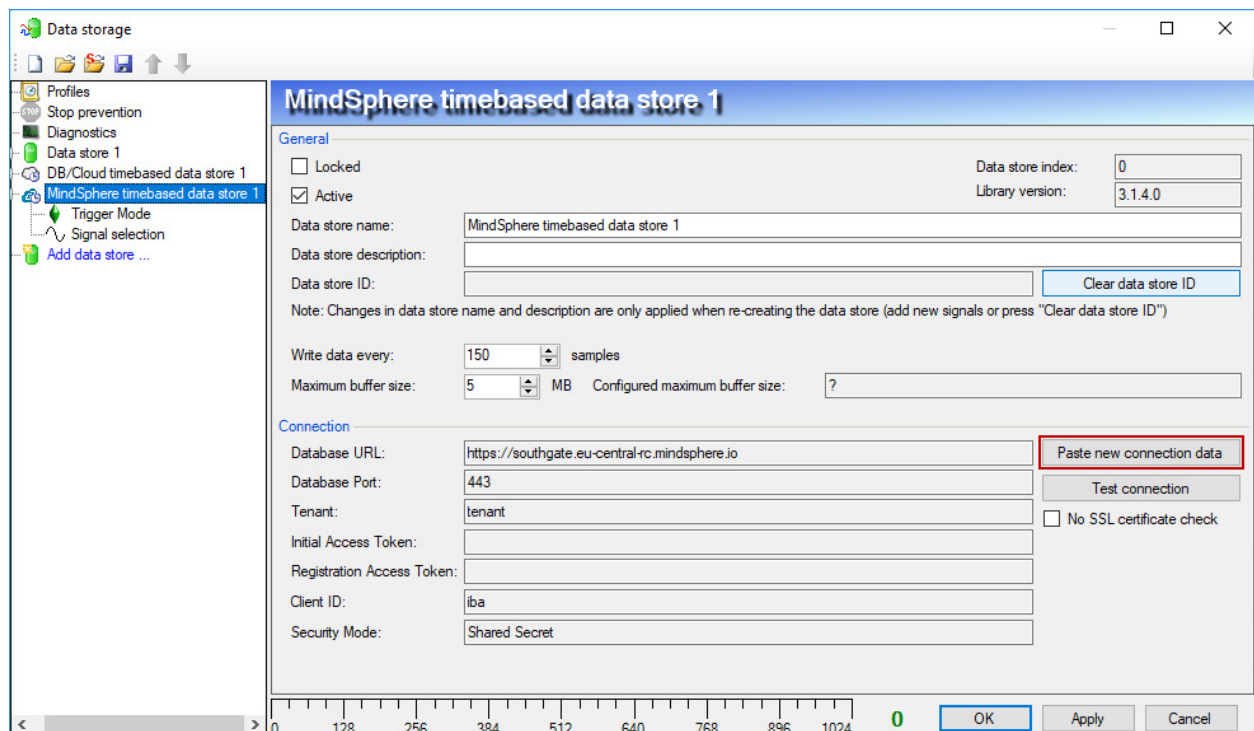


Fig. 12: Configure MindSphere data store

In the configuration dialog, click the button <Paste new connection data>. Paste the MindSphere connection data from the clipboard into the text field that opens and confirm with <OK>.

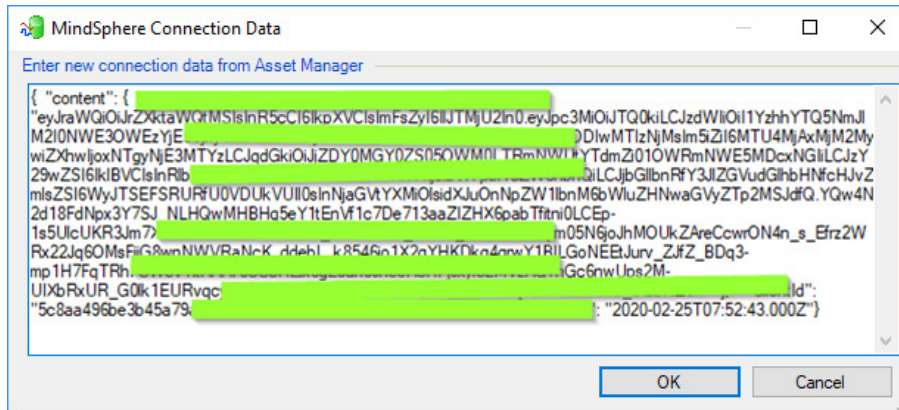


Fig. 13: Paste connection data

This defines the connection to the previously created asset and the fields in the *Connection* area are filled in automatically (display only). Use the <Test connection> button to test the connection.

Note



These steps need to be performed only once per asset. If *ibaPDA* cannot connect to the MindSphere any more due to Access Token problems, you might go to the Asset property page in MindSphere Asset Manager. Click on <Offboard>, copy the new connection key and enter it again in *ibaPDA*. Also the button <Clear data store ID> can be used to disconnect from MindSphere and create a new connection.

Further settings can be made in the configuration dialog:

Locked

A data store can be locked in order to prevent an accidental or unauthorized change of settings.

Active

A data store must be enabled in order to work. However, you can configure various data stores and disable data stores that are not required.

Data store name

You can enter a name for the data store here.

Data store description

You can also enter a description here.

Data store ID

This index is automatically assigned by the system and is only displayed here.

Note

As long as the data store ID remains the same, existing signals and their links within MindSphere are maintained. No signals are deleted in MindSphere, even if they do no longer exist in *ibaPDA*. By resetting the data store ID, the signals are newly created, i.e. signals that do not longer exist are also removed.

Write data every ... samples

Here you define the time base for writing the data. Normally, about up to 300 samples can be transferred to the MindSphere, but it will wait no longer than 30 seconds before uploading data. If different profiles are used, the data is sent when the number of samples is reached. This means that the fastest profile is relevant for the transmission.

While MindSphere basically supports time series data with 1 ms, FleetManager may have problems displaying values for times smaller than 1 s. So if you have slow data e.g. every 10 seconds, you should use a smaller value here. If you have more high-resolution data, you should use a larger value here to collect data before it is sent to MindSphere. This reduces the total load.

Maximum buffer size

The maximum buffer size determines how much data is buffered in *ibaPDA* in the event of a temporary connection loss with the MindSphere.

No SLL certificate check

If a connection to MindSphere is not possible due to a failed certificate check, the certificate chain check can be deactivated to bridge the gap. However, for security reasons the problem should be solved correctly, usually the relevant or correct certificates are missing in the Windows system certificate store.

3.3 Signal selection

For signals to be recorded, they must be assigned to a storage profile of the *Time* type.

Note

Additional information about the storage profiles can be found in the manual *ibaPDA*, part 5.

Mark the node *Signal selection* and select a storage profile in the profile list. Set a check mark in the selection fields next to the signals which you would like to assign to this profile.

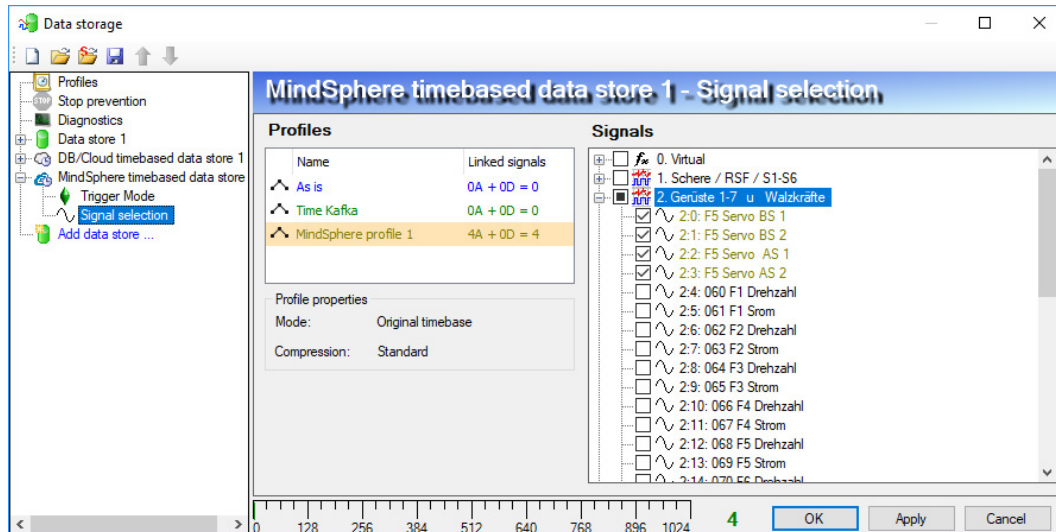


Fig. 14: Signal selection

Note



All data is sent to MindSphere as text. If you select a fast timebase in the profile, this can lead to many data/frames being sent to MindSphere. You can check this using the virtual diagnostic function for MindSphere (see chapter ↗ *Virtual diagnostics for MindSphere data store*, page 34).

MindSphere data stores are licensed per number of written signals. The current number of selected signals in all MindSphere data stores is shown at the bottom of the dialog, similar to the number of configured signals in the I/O Manager. The length of the bar corresponds to the licensed number of signals. In the example above, a maximum of 1024 signals can be written via MindSphere data stores. 4 signals are currently already used.

Check signals in the MindSphere

Once the configuration is accepted, the configured signals are created in the asset. To check if the configuration in *ibaPDA* was correct, switch to the Asset Manager again and open the connected asset.

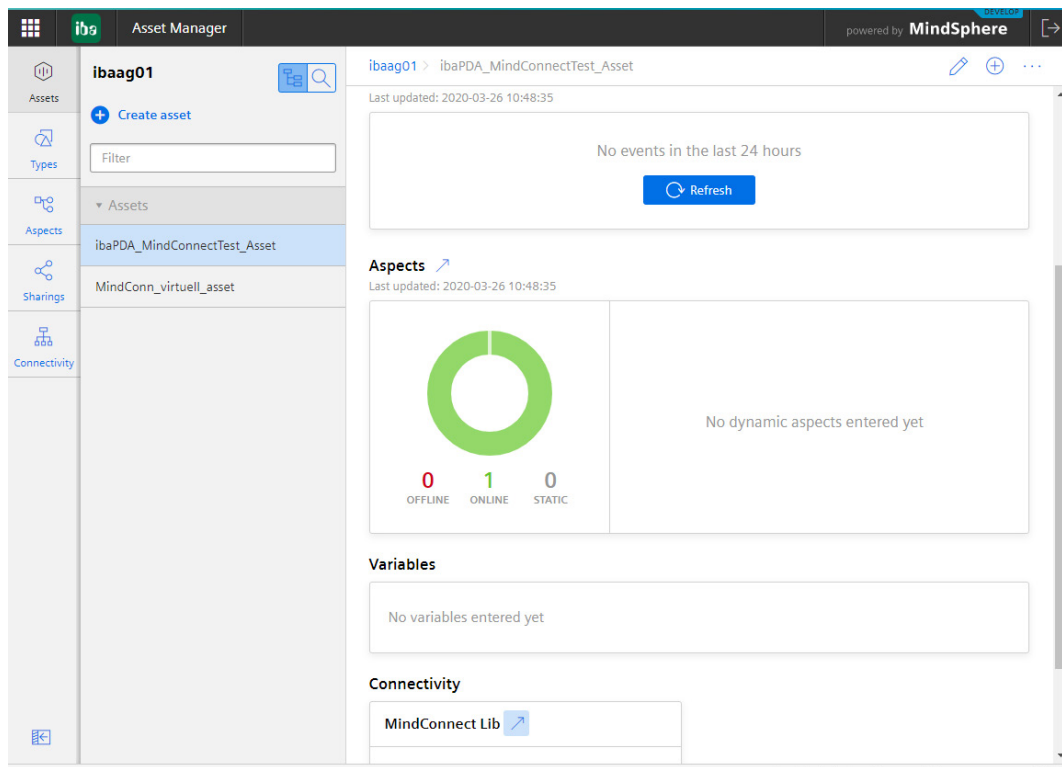


Fig. 15: Open asset again

Select the asset in the list and open the edit mode.

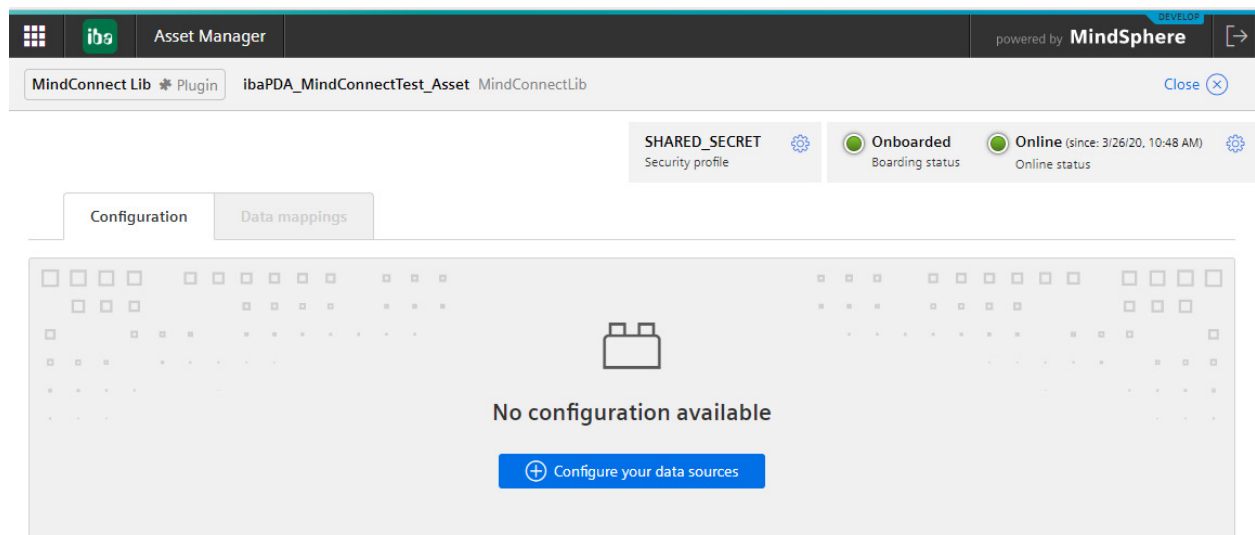


Fig. 16: Configuration tab

Click <+Configure your data sources>. Now you should see all selected signals from *ibaPDA* with their units. The use of units is mandatory in MindSphere. If the *ibaPDA* signal had no unit, "raw" is added automatically.

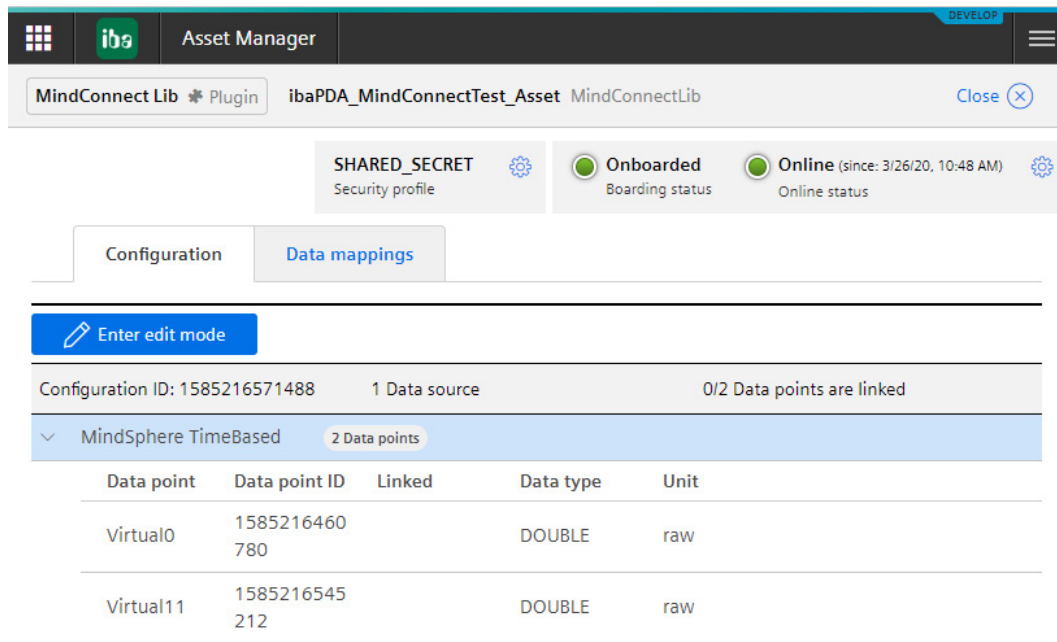


Fig. 17: Displaying the signals in the asset

3.4 Trigger mode

The description applies to the following types of data stores:

- Database/cloud timebased
- Kafka cluster timebased
- Mindsphere timebased
- MQTT timebased.

In the *Trigger Mode* node, you determine when data is recorded.

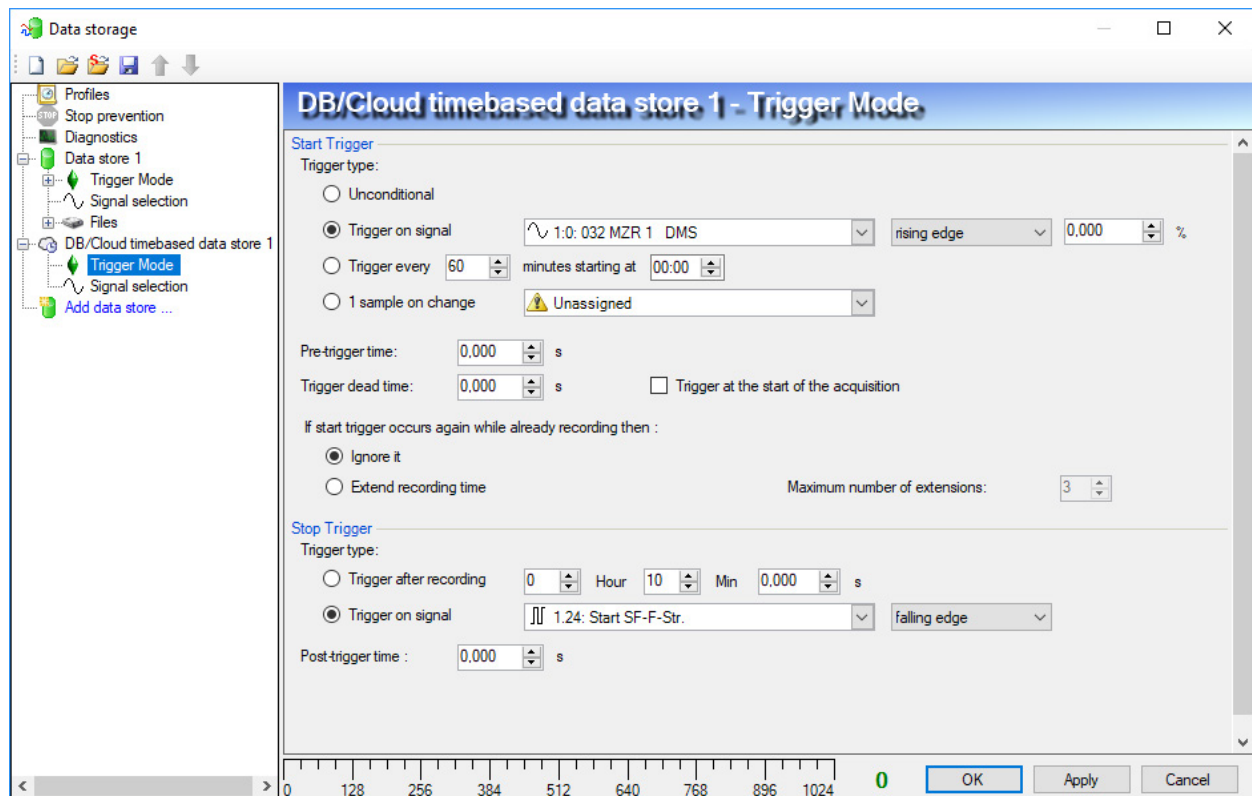


Fig. 18: Trigger mode, Database/cloud example

Start trigger

You initially choose whether you would like to continuously record or it should be fired by a trigger.

Unconditional

The data is continuously recorded with this selection. In this case, the recording will start immediately at the start of the measurement or when pressing the "GO" button.

Trigger on signal

If you want the trigger to fire on a measured signal or a virtual signal, you need to check *Trigger on signal* in the option field. In the fields next to this, define the properties of the trigger signal.

- Field 1: Drop-down list for signal selection (available analog and digital signals)
- Field 2: Drop-down list for selecting edges or levels
- Field 3: Drop-down list for selecting the trigger level value given in the specific physical unit (field 3 is only enabled in case of analog trigger signals)

Both analog and digital signals can serve as triggers. The signal to trigger on is to be selected from the drop-down lists (see picture below, field 1). In the drop-down list, you will find the well-known signal tree containing available signals. Select the signal you want to use as trigger signal.

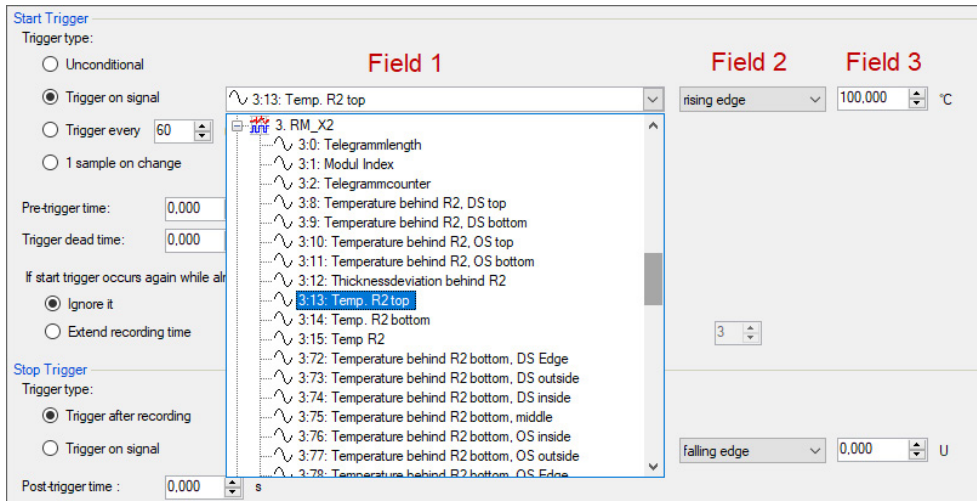


Fig. 19: Configuring "Trigger on signal"

Depending on whether a digital or an analog signal was selected, the fields 2 or 3, respectively, are offered allowing the trigger event to be defined more specifically.

As for analog signals, you can choose between level or edge triggers including a predefined level (field 3).

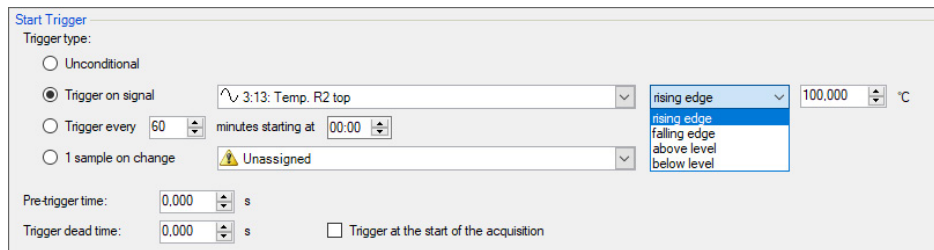


Fig. 20: Configuring "Trigger on signal", analog signal, edge or level

As for digital signals, you can choose between level or edge triggers including the 2 levels logical 0 (FALSE) and logical 1 (TRUE).

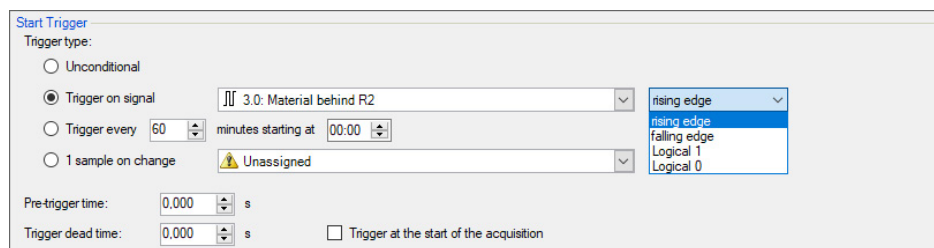


Fig. 21: Configuring "Trigger on signal", digital signal

Trigger every ...

If you want to use a start trigger always at a certain time regularly, you can check the "Trigger every ... minutes starting at ..." option. Enter the period given in minutes, or select it from the input field. Value range is from 0 to 1440, which equals one day. Then enter or select the start time for the first trigger. Value range is from 00:00 to 23:59, which equals one day.

Pre-trigger time

You can configure a pre-trigger time and then the recording begins by the pre-trigger time before the trigger event. If the trigger condition is met, the incoming data is added to the data buffered during the pre-trigger time.

Trigger dead time

This property is available for the start triggers "Trigger on signal" and "Trigger every ...". The trigger dead time determines the time of suppressing subsequent triggers after a trigger occurred.

If the dead time, for instance, is set to 5 seconds, all other triggers are ignored for the duration of 5 seconds after the first trigger occurrence.

Trigger at the start of the acquisition

If you want the recording to start immediately at acquisition start or as soon as you apply a new data storage configuration, you also need to check the *Trigger on acquisition start* option. If you do not enable this option, the recording first starts once the trigger is fired.

If start trigger occurs again while file is already recording, then:

You can determine here what should happen if a new start trigger occurs while a recording is already running.

■ Ignore it:

Selecting this option will cause the system to ignore any new start trigger during a running recording for as long as the stop trigger occurs

■ Extend recording time:

If this option is enabled, it extends the duration of the running recording upon occurrence of another start trigger during an ongoing recording. This occurs as often as set in the "Maximum number of extensions on single file" field. If the max. number of extensions is reached, all subsequent start triggers will be ignored. Of course, the recording is stopped immediately by any stop trigger.

Stop trigger

The settings for the stop trigger are made in the same way as those for the start trigger. Here, both analog and digital signals can also be used as triggers.

Trigger after recording of x hours x minutes x seconds

Here you can configure a time span according to which the recording is ended - after the occurrence of the start trigger.

Trigger on signal

See explanation for start trigger above.

Post trigger time

You can configure a post trigger time and then the recording ends by the post trigger time after the stop trigger event.

4 Display in Fleet Manager

Several steps are necessary for the signals to be displayed in Fleet Manager.

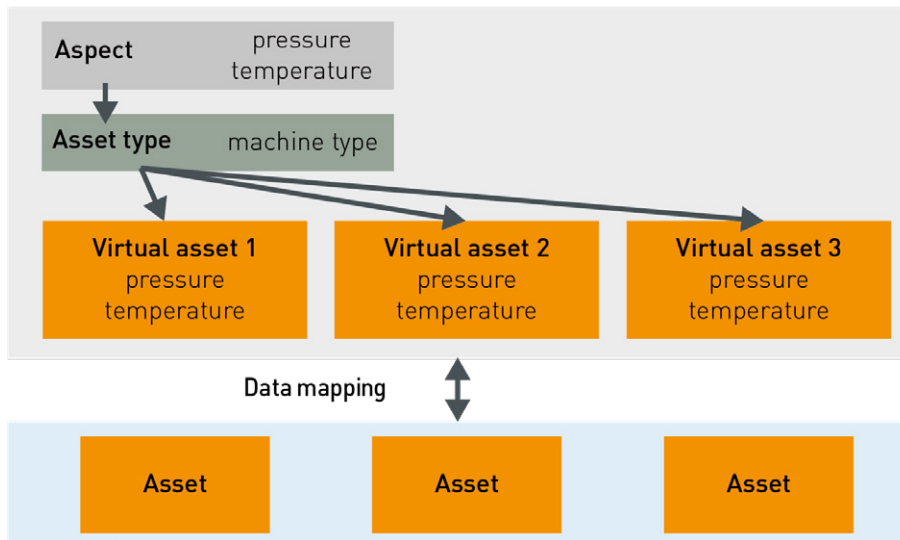


Fig. 22: Procedure for the display in Fleet Manager

- Create an aspect (=data structure), see chapter [↗ Create an Aspect](#), page 24
- Create an asset type (= machine type) and link it to the aspect, see chapter [↗ Create a Type](#), page 25
- Create a virtual asset with the previously defined asset type, see chapter [↗ Create a virtual asset](#), page 26
- Perform a data mapping between the asset into which the data is written by *ibaPDA* (from chapter [↗ Creating an asset in MindSphere](#), page 9) and the virtual asset, see chapter [↗ Data mapping](#), page 28. For better differentiation, the asset in which the data is written by *ibaPDA* will be called "connect asset" in the following.

Other documentation



Please refer to the MindSphere documentation for detailed information on using the Fleet Manager.

4.1 Create an Aspect

To display signals in MindSphere Fleet Manager, a "digital twin" must be created.

Define an aspect in which you create the "twins" of signals from *ibaPDA* with the same data type and the same unit as it was created in the asset. That means, for each selected signal in the data store in *ibaPDA* you create a variable in MindSphere Aspect.

Switch to the *Aspects* tab and create a new Aspect by clicking <+Add aspect>.

Fig. 23: Create an Aspect

Enter a name (here in the example: `ibaPDA_MindSphere_ASPECT`) and a description and select the category:

- Dynamic (aspect is used for time series)
- Static (aspect is used for static data)

Click on <+Add variable> and enter the signals from the *ibaPDA* data storage as variables (variable name = signal name). When creating the variables, it is important that the data type and the unit correspond to the signals in *ibaPDA*. (*ibaPDA* float = double !) Select "raw" for each signal without unit.

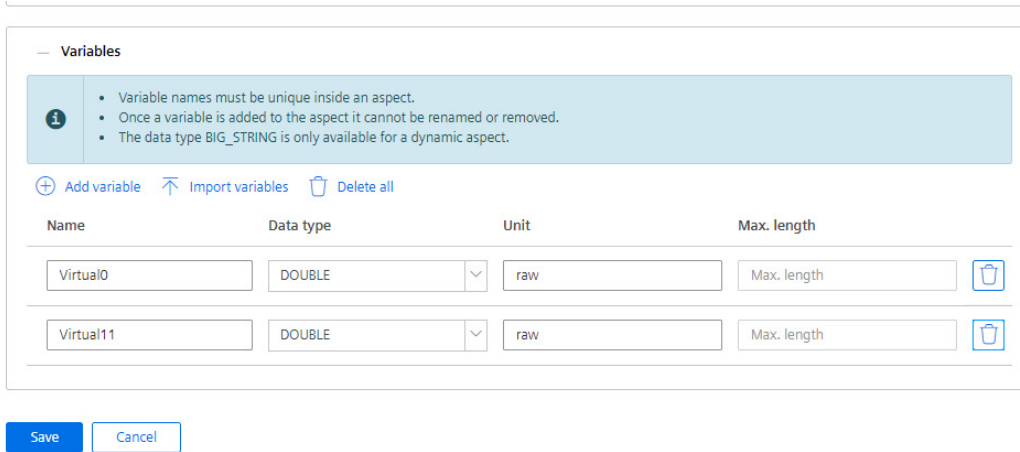


Fig. 24: Variables list

4.2 Create a Type

Now create a new type in the *Types* tab that references the defined aspect.

Mark *BasicDevice* in the list on the left and click <+Create type>.

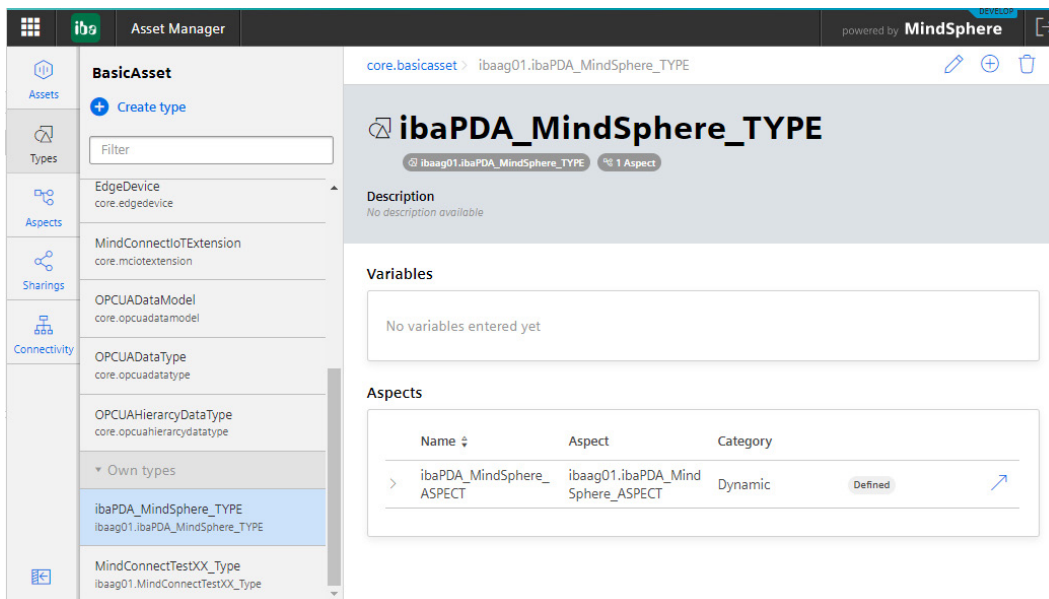


Fig. 25: Add type

Enter a name and a description for the type. Add the previously defined aspect under *Aspects* by clicking <Browse aspect>.

Edit type

Type information

Parent type:

Parent type due to hierarchical order

Type ID:

Type ID cannot be changed after creation

Name: *

Name cannot be changed after creation

Description:

255 characters left

+ Image

+ Variables

Aspects

⊕ Add aspect 🔍 Browse aspects

Name	Aspect	Category	
> <input type="text" value="ibaPDA_MindSphere_ASPECT"/>	<input type="text" value="ibaag01.ibaPDA_MindSphere_ASPECT"/>	Dynamic	Defined

Fig. 26: Edit type

4.3 Create a virtual asset

Create a virtual asset, the so called virtual twin, with the previously defined type. The connect asset, that was created in chapter [Creating an asset in MindSphere](#), page 9, is the connection to *ibaPDA*.

The "virtual" asset is the one linked to the type you created. Both assets are connected via data mapping.

Create a new asset by clicking <+Create asset> and select the previously defined type (here: *ibaPDA_MindSphere_TYPE*).

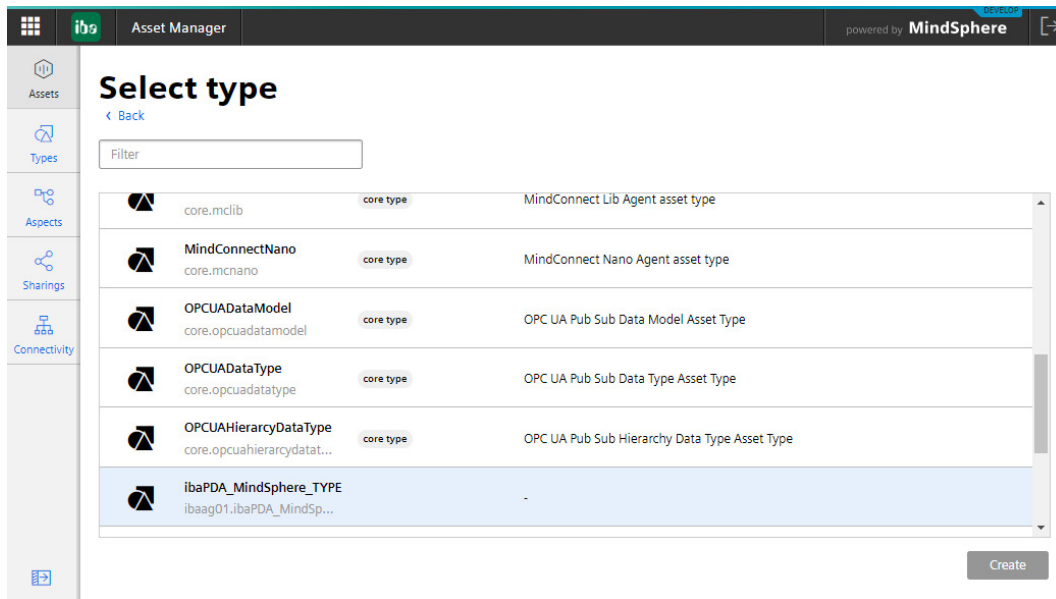


Fig. 27: Select type

Enter a name and confirm with <Save>. The connect asset and the virtual asset are now displayed in the list.

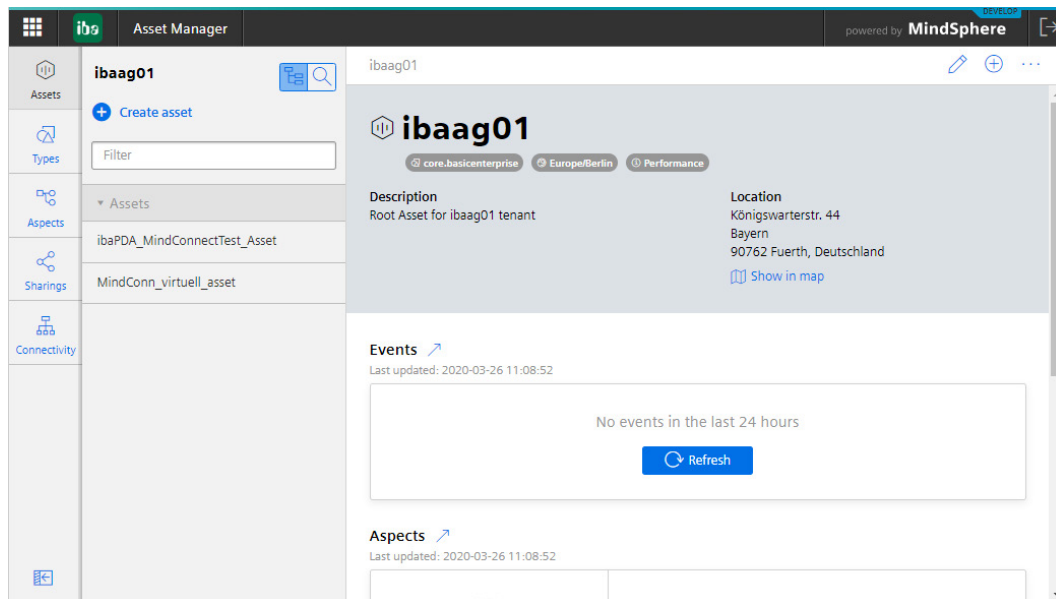


Fig. 28: Select asset type

4.4 Data mapping

The last step is to link the variables of the connect asset and the virtual asset.

Open the property page of the connect asset (ibaPDA_MindSphereTest_Asset). It should now have the state *Onboarded*.

Switch to the *Data mappings* tab. The configuration of the data source is displayed here, i.e. the signals with the names and description as defined in *ibaPDA* (here: MindSphere TimeBased).

The screenshot shows the Asset Manager interface for the asset `ibapda_MindConnectTest_Asset`. The `Data mappings` tab is active, showing a table with 0 data mappings. Below the table, there is a section for `MindSphere TimeBased` with a sub-header `0 of 2 Data points linked`. The table lists two data points:

Data point	Data mapping
Virtual0 raw, DOUBLE	Link variable
Virtual11 raw, DOUBLE	Link variable

Fig. 29: Data mappings

Here every signal must be newly linked. To do this, click on `<Link variable>` for each signal and select the created "virtual" asset in the following dialog (here: `MindConn_virtual_asset`). Only compatible assets are displayed.

Note



Use the buttons `<Up>` or `<Down>` to navigate to the appropriate MindSphere directory where the "virtual" assets are stored.

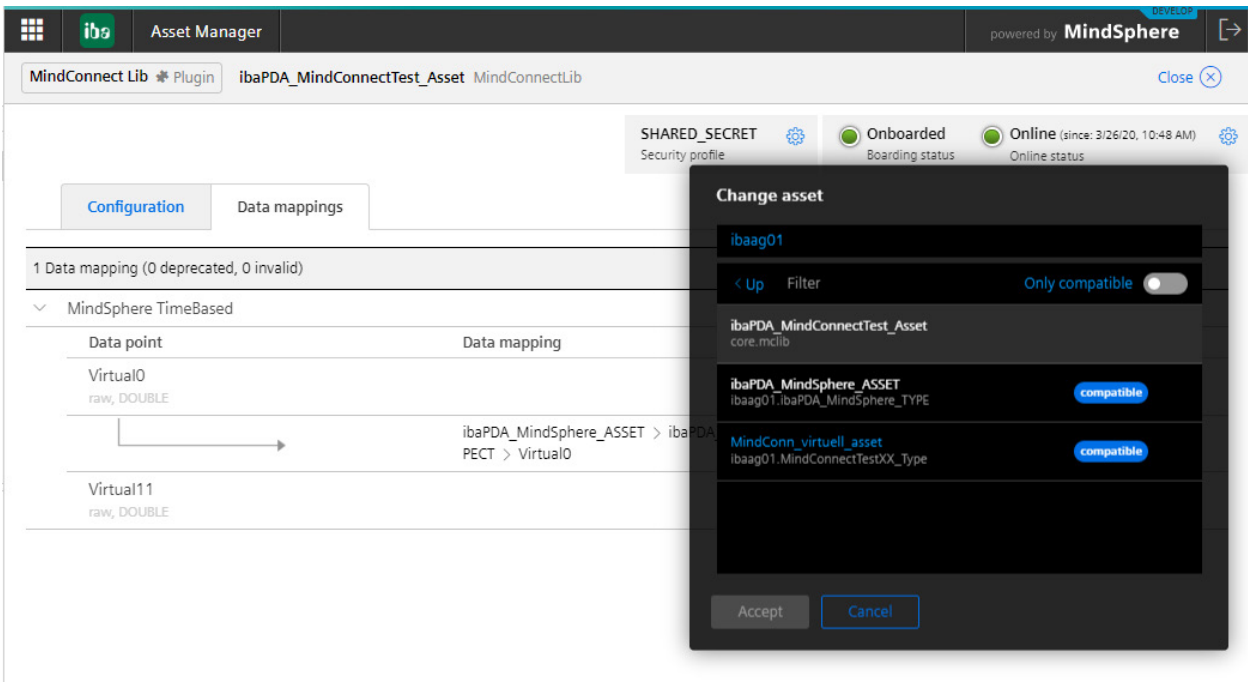


Fig. 30: Select virtual asset

In the next step, select the variables. Those that can be linked are highlighted. It is important that data type and unit match. Confirm the selection with <Accept>.

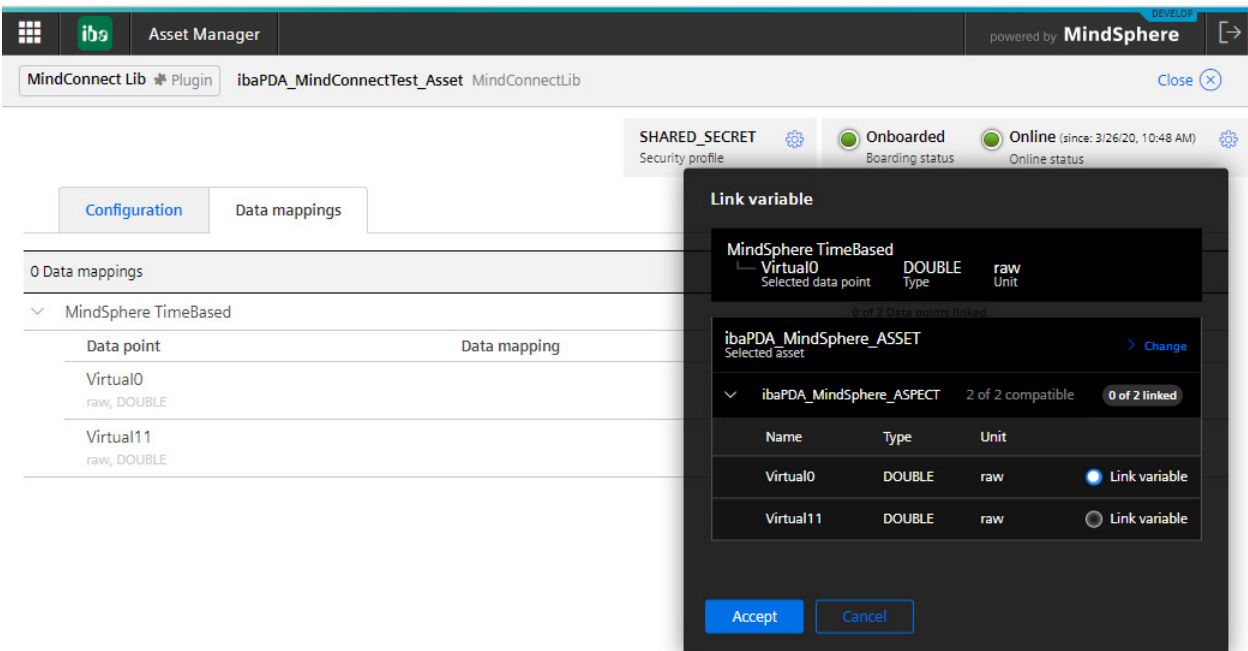


Fig. 31: Link variables

Repeat the procedure for the other variables and the following display will be shown:

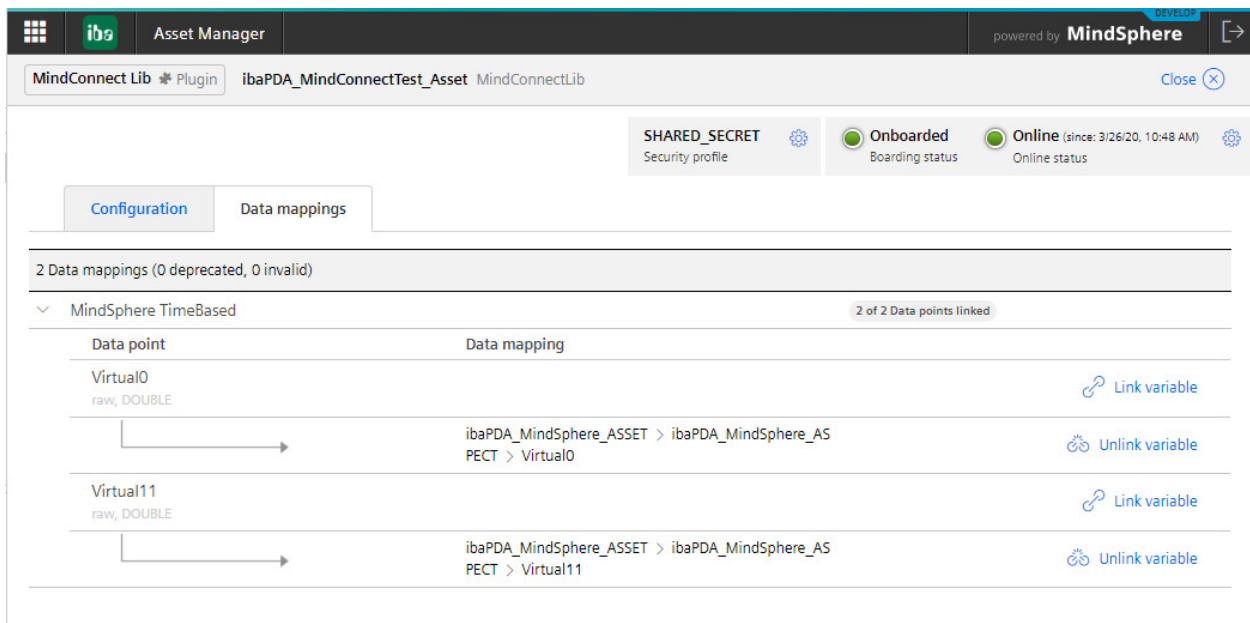


Fig. 32: Display of the mapped variables

Note



If you change the signals selected in *ibaPDA* that are to be stored in MindSphere, the asset data source must be updated by *ibaPDA*. This will automatically remove all signal connections from MindSphere and you will have to link all signals again.

4.5 Display of the data in Fleet Manager

The display in Fleet Manager is only used to check whether data from *ibaPDA* is available in MindSphere.

All defined assets are displayed in Fleet Manager. A trend graph can only be displayed for virtual assets, not for connect assets.

In this view you can filter the visualized signals by unit, you can zoom and pan. The default view is set to UTC time. However, you can change the setting to "browser" time to adapt it to your local time zone.

Here in the example you can see the signal data in *MindConnect_VirtualTest2*.

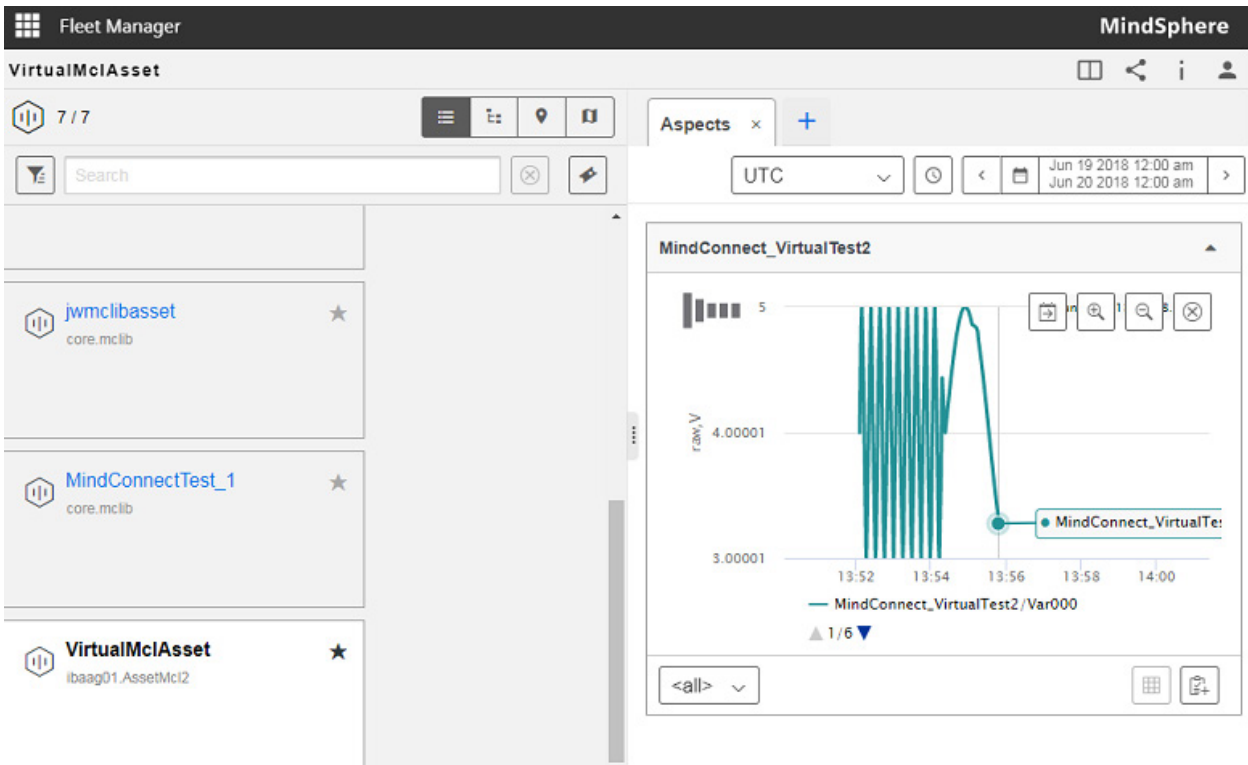


Fig. 33: Display in Fleet Manager

Analog values are displayed as trend graphs, connection status or Boolean values in the table view.

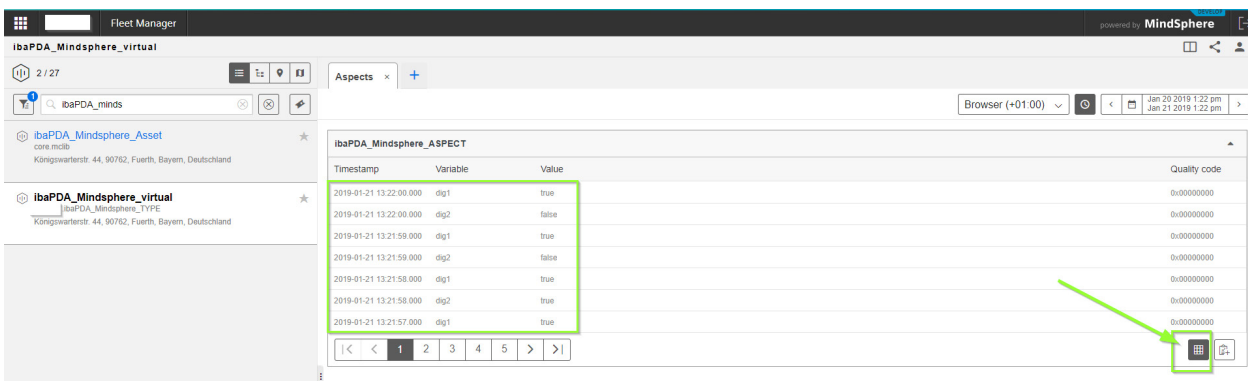


Fig. 34: Display of the Boolean values in the table

Using the timepicker you can select a time range.

To zoom in and out, you can use the magnifying glass buttons or the mouse wheel while holding down the <Ctrl> key. By selecting "ALL" all analog signals are displayed, the digital signals are displayed in the table view.

5 Diagnostics

5.1 Data storage status

The data storage status window shows the current status of the data storage.

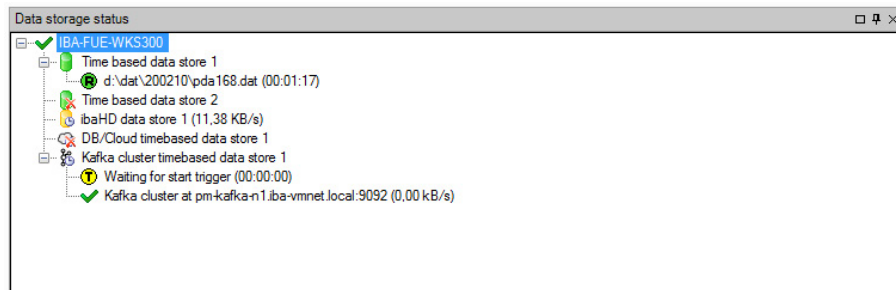





Fig. 35: Example of data storage status window

All defined data storages and their respective status are displayed here, depending on the data storage, with server address, acquisition duration, write speed, etc.

The icon in front of the name indicates the current status of the storage:

-  Wait for the start trigger (only for triggered recording)
-  Recording in progress
-  Post-trigger phase; stop trigger occurred, but acquisition continues until the post-trigger time is over

Disabled or faulty data storage is indicated by a red cross in the data storage icon.

Right-clicking on this node allows you to manually send a start or stop trigger.

5.3 Virtual diagnostics for MindSphere data store

Using the virtual function *DataStoreInfoMindSphere* in *ibaPDA* you can request information about MindSphere data store.

To do this, create a module of type *Virtual* at the *Virtual* data interface in the I/O Manager. Open the expression builder by clicking the <fx> button and select the *DataStoreInfoMindSphere* function.

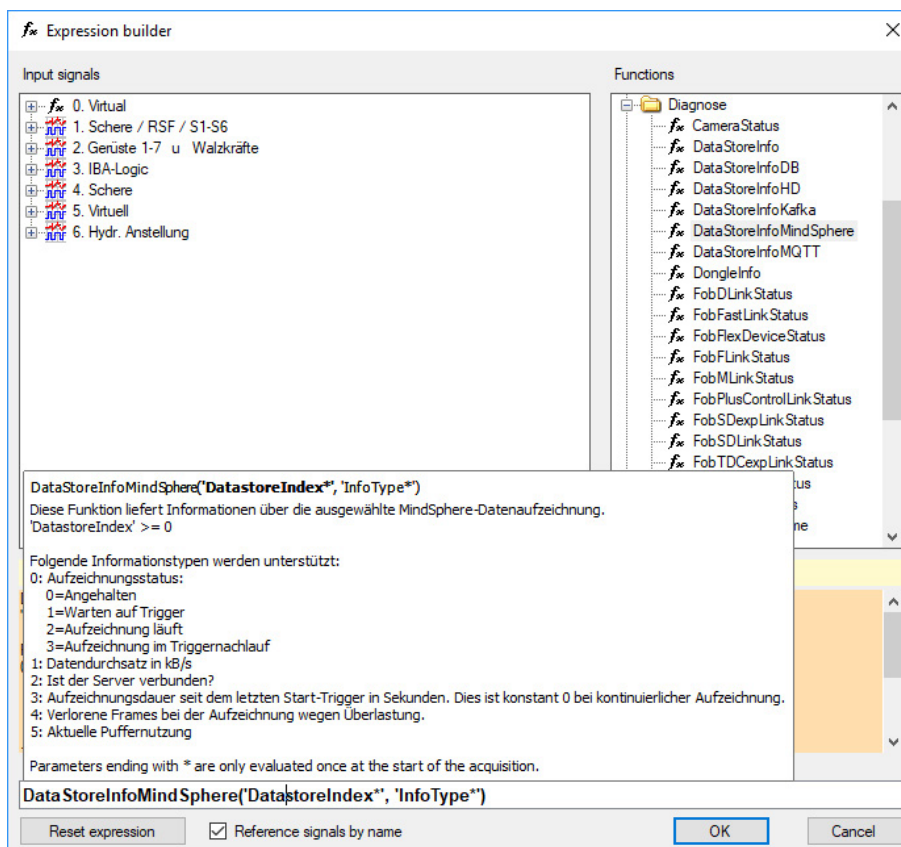


Fig. 37: Diagnostic function in the expression builder

The following information types are supported:

Information types	Possible results
0: Recording status	0 = stopped 1 = waiting for trigger 2 = recording 3 = post-trigger time
1: Data transmission rate in kB/s	
2: Server connected?	
3: Recording time since last start trigger	0 = continuous recording
4: Lost frames during recording due to overload	
5: Current buffer usage	

Table 2: Information types and possible function results

Note on information type 2: “Server connected?”

If you enable *Offboard* in MindSphere, the current data store ID still exists and the data can be written to MindSphere. The data store ID remains valid for several hours. If a new one is created internally after this time, the connected state is lost and no more data is written. When you stop/start the *ibaPDA* acquisition, a new data store ID is requested and the system recognizes that the connection no longer exists.

6 Support and contact

Support

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Note



If you require support, indicate the serial number (iba-S/N) of the product and the license number.

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