Karabo DOOCS Integration Documentation

Release 0.1

European XFEL Controls Group

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CHAPTER 1

DOOCS to Karabo Enhancement Design

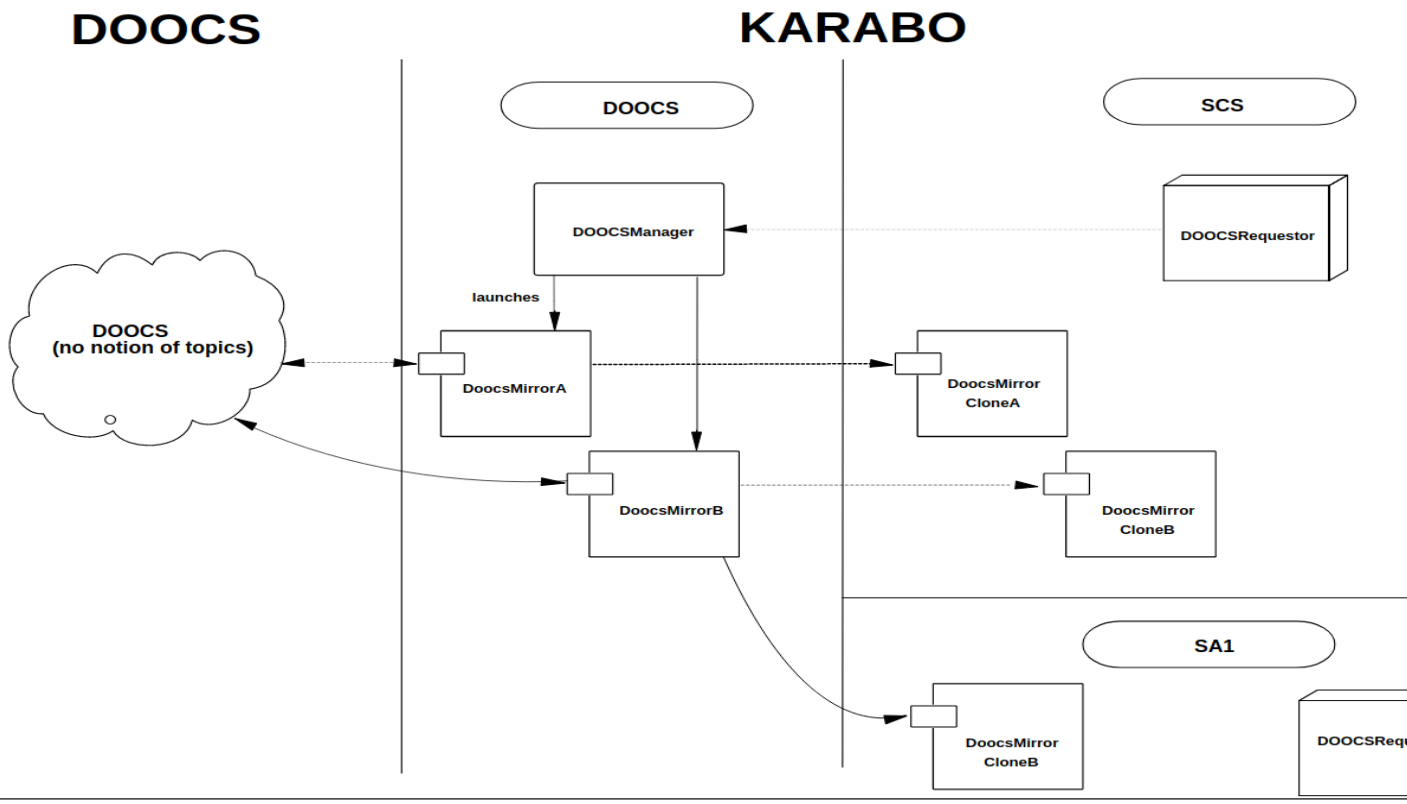
1.1 Motivation

- The main motivation of this enhancement design is to provide user friendly interface to our instrument scientists to import DOOCS data/devices to the Karabo ecosystem without involving much effort from the Controls group side.
- To have one-to-one connection between DOOCS and Karabo which enables load / throughput tuning between the two control systems at the single tuning point.
- To have unified interface which shows the list of all the devices "cloned" in Karabo.

1.2 Implementation overview

Overview of the implemented design is shown in the figure below:

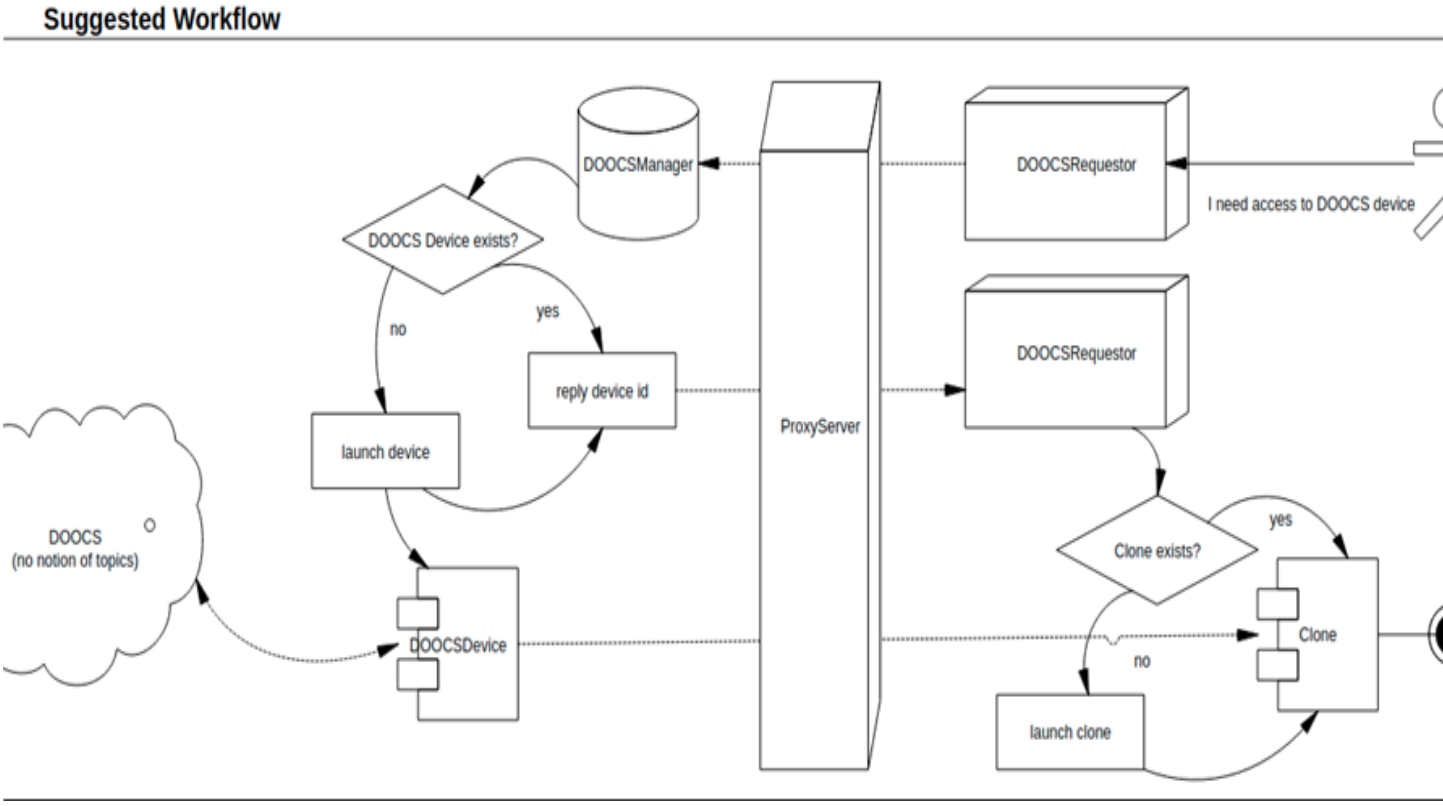
- **Dedicated "DOOCS" topic**: Dedicated "DOOCS" topic has been created to have a one-to-one connection between DOOCS and Karabo, which enables load/throughput tuning between the two control systems at the single tuning point.
- **Devices involved: The concept is surrounded around the following devices:**
  - DOOCS Mirror device: It is a generic DOOCS bridge, which imports DOOCS data(slow or fast data, and images) to Karabo ecosystem.
  - Doocs Manager device: It is responsible for managing and instanating the DoocsMirror device upon the request of DoocsRequestor.
  - Doocs Requestor device: It acts as the request gateway for a DOOCS location and properties, whether or not they have been requested already (whether through the same Karabo topic or another). There is one DoocsRequestor device per Karabo topic.
  - Device Clone: It is used to clone to DoocsMirrors device from one topic to another.



1.3 Workflow

The workflow diagram is shown in the figure below:

- User requests needed "bridge" of the DOOCS location using the interface of the *DoocsRequestor* located in the specific Karabo topic.
- The *DoocsRequestor* passes the request to the *DOOCSManager* device located in the dedicated "DOOCS" topic.
- *DoocsManager* checks if for the requested location/properties corresponding *DoocsMirror* device is already instantiated and instantiate new one if needed.
- *DoocsMirror* devices take care of the communication between DOOCS and Karabo. They are instantiated in the "DOOCS" topic and cloned to the specific Karabo topic.


Suggested Workflow
DOOCSManager
DOOCSRequestor
I need access to DOOCS device
DOOCS Device exists?
yes
no
reply device id
DOOCSRequestor
ProxyServer
launch device
DOOCS
(no notion of topics)
Clone exists?
yes
DOOCSDevice
Clone
no
launch clone

CHAPTER 2

The DOOCS Manager Device

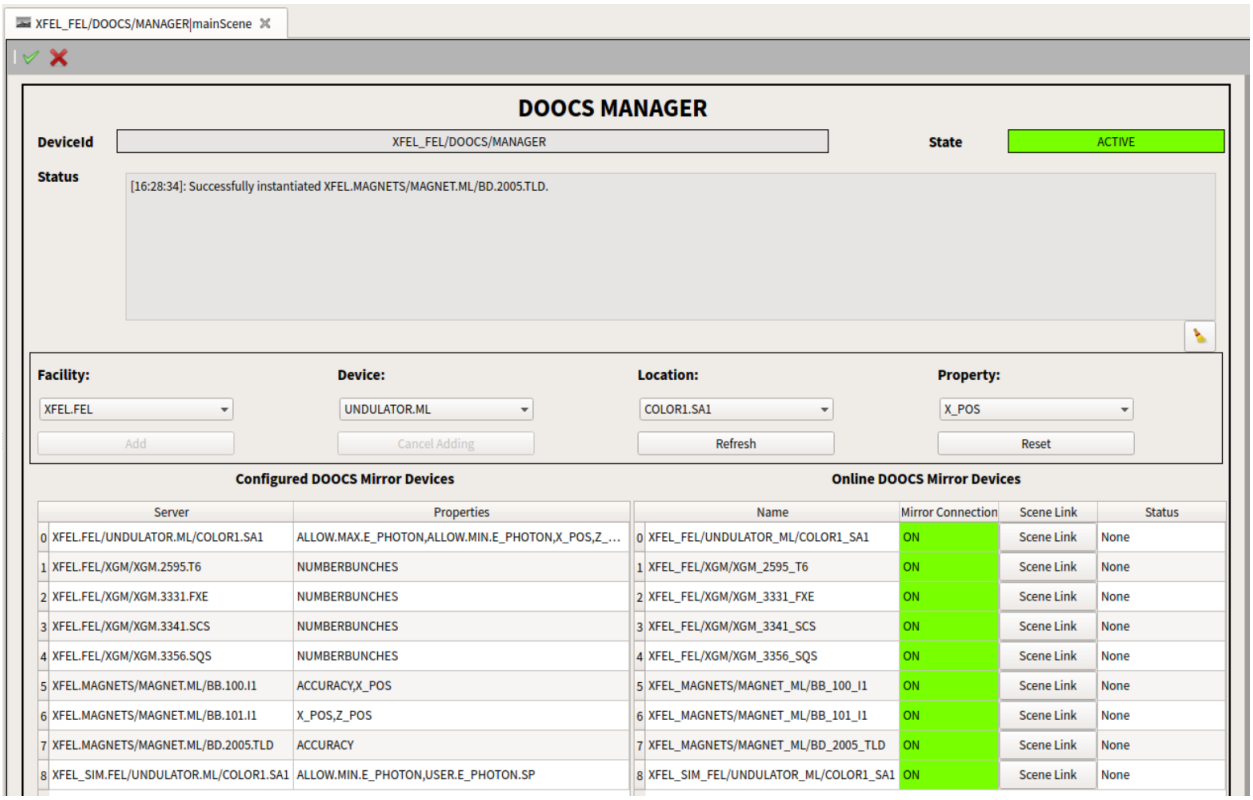
The DOOCS manager device maintains a list of available DOOCS locations, which can be exposed in the Karabo topology as DOOCS mirror devices.

The DOOCS manager takes care of instantiating the needed mirror devices if they are missing, upon request of the DoocsRequestor.

Note that this device is not meant to be exposed to the beamline operators. Users who would like to access DOOCS devices from Karabo should instead use DoocsRequestor.

Note that the DOOCS manager device runs in a dedicated Karabo topic (called DOOCS) and it must be cloned in the instrument topic.

To get started, double click on the device in the topology panel to display the device scene.



A series of drop-down selections following the DOOCS nomenclature (**Facility**, **Device**, **Location**, **Property**) allows the user to browse across for DOOCS locations and select the DOOCS properties that need to be accessed via Karabo.

Once the selection is complete, the DOOCS manager goes into the 'FILLING' state. To confirm the selection, one must press the **Add** button. To abort the operation, press the **Cancel Adding** button.

After hitting **Add**, the property is added to the relevant DOOCS mirror device. If no DOOCS mirror corresponding to the selected DOOCS location is running, one is automatically instantiated. Such events are logged in the upper part of the scene.

The **Refresh** button re-instantiates all the missing DOOCS mirrors that are needed to access the selected properties from the ones listed in **Configured DOOCS Mirror Devices**.

The **Reset** button clears the current selection.

The bottom left table (**Configured DOOCS Mirror Devices**) displays all the DOOCS locations and their associated properties requested since the manager device was instantiated. The bottom right one (**Online DOOCS Mirror Devices**) lists the online DOOCS mirror devices and their status in the current topic.

Note that from the latter table the DOOCS mirror scenes can be easily accessed.

2.1 Troubleshooting

If the device tables do not display in the device scene, you might need to update your GUI extentions:

- Access the XFEL VPN if you are not inside the European XFEL internal network.
- On your GUI menu select Help->Check for updates.

- Click on the ‘refresh’ button
- Click on ‘Update’

CHAPTER 3

The DOOCS Requestor Device

The *DoocsRequestor* device acts as the request gateway for a DOOCS location and properties, whether or not they have been requested already (whether through the same Karabo topic or another). There is one *DoocsRequestor* device per Karabo topic.

The device provides an overview of the available DOOCS locations. The user can browse through the lists of locations according to the DOOCS nomenclature - first through **Facility** then **Device**, **Location**, and finally **Property**.

The *DoocsRequestor* keeps the list of currently "active" requested locations/properties and also the list of locations/properties requested in the past.

After the user has made a request for specific DOOCS location/property an instance of DoocsMirror will be created behind the scenes (or the existing one will be used if the corresponding DOOCS location is already "bridged" in any Karabo topic). DoocsMirror devices act like "bridges" between DOOCS locations and Karabo. They can be added then to the DAQ for storing "bridged" locations/parameters.

Note: There is always a one-to-one correspondence between the requested DOOCS locations and the *DoocsMirror* devices. Each *DoocsMirror* represents ("bridges") only one DOOCS location with a subset of the properties available in the DOOCS location.

This device works with a DoocsManager device behind the scenes.

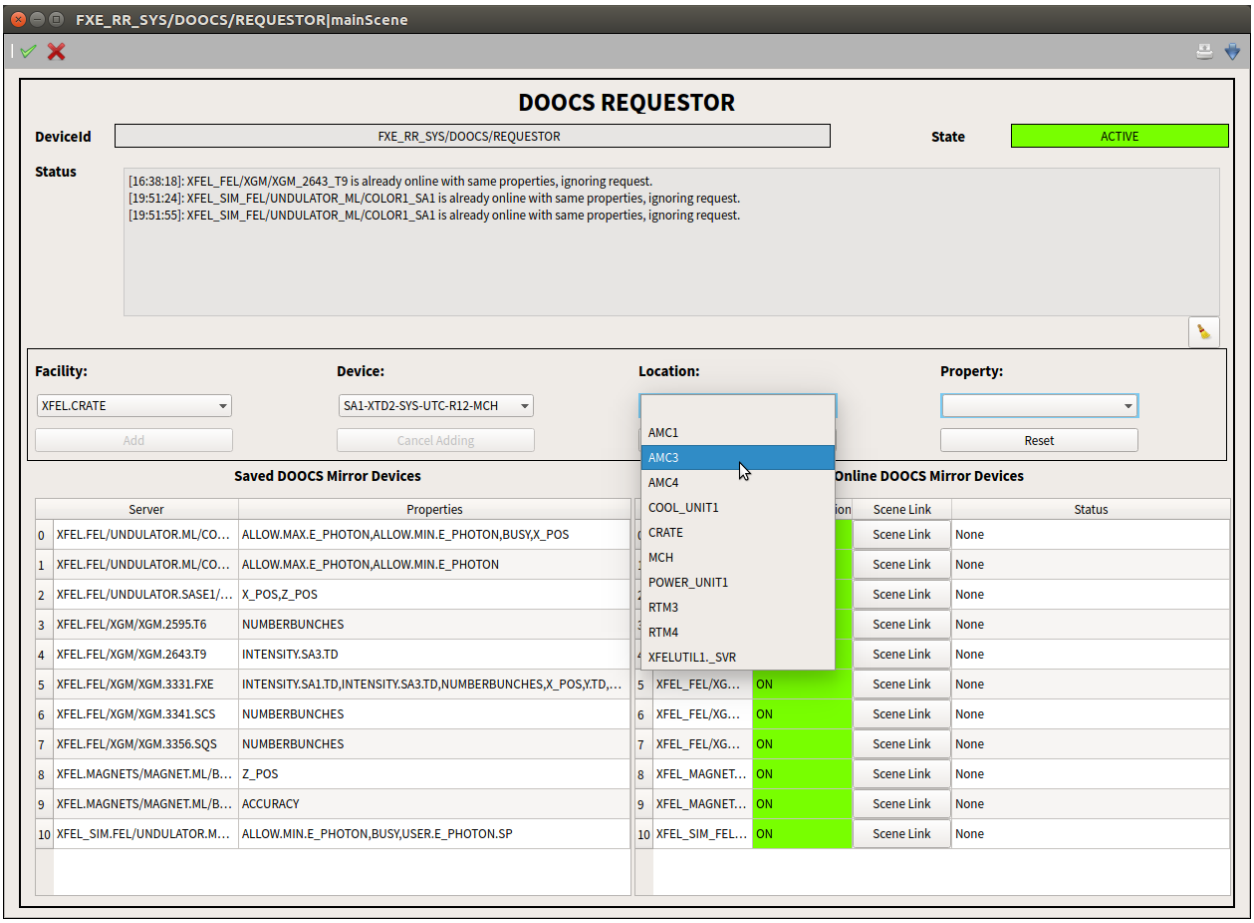
3.1 Instantiation

Normally the *DoocsRequestor* device is instantiated automatically without the need for the user to instantiate it. There is always only one *DoocsRequestor* device in the Karabo topic; if you don't know the exact Karabo project try searching *DoocsRequestor* in the GUI's *System Topology* to find the instantiated device. After instantiation the device should go to the ACTIVE state.

3.2 Requesting DOOCS locations and parameters

In order to add locations using the device generated scene:

- Double click on the device in the *System Topology* or the *Projects* in the Karabo GUI. The auto-generated scene will appear.
- Choose DOOCS location and property according to the DOOCS nomenclature by specifying through a series of drop-down selections **Facility**, **Device**, **Location** and **Property**:

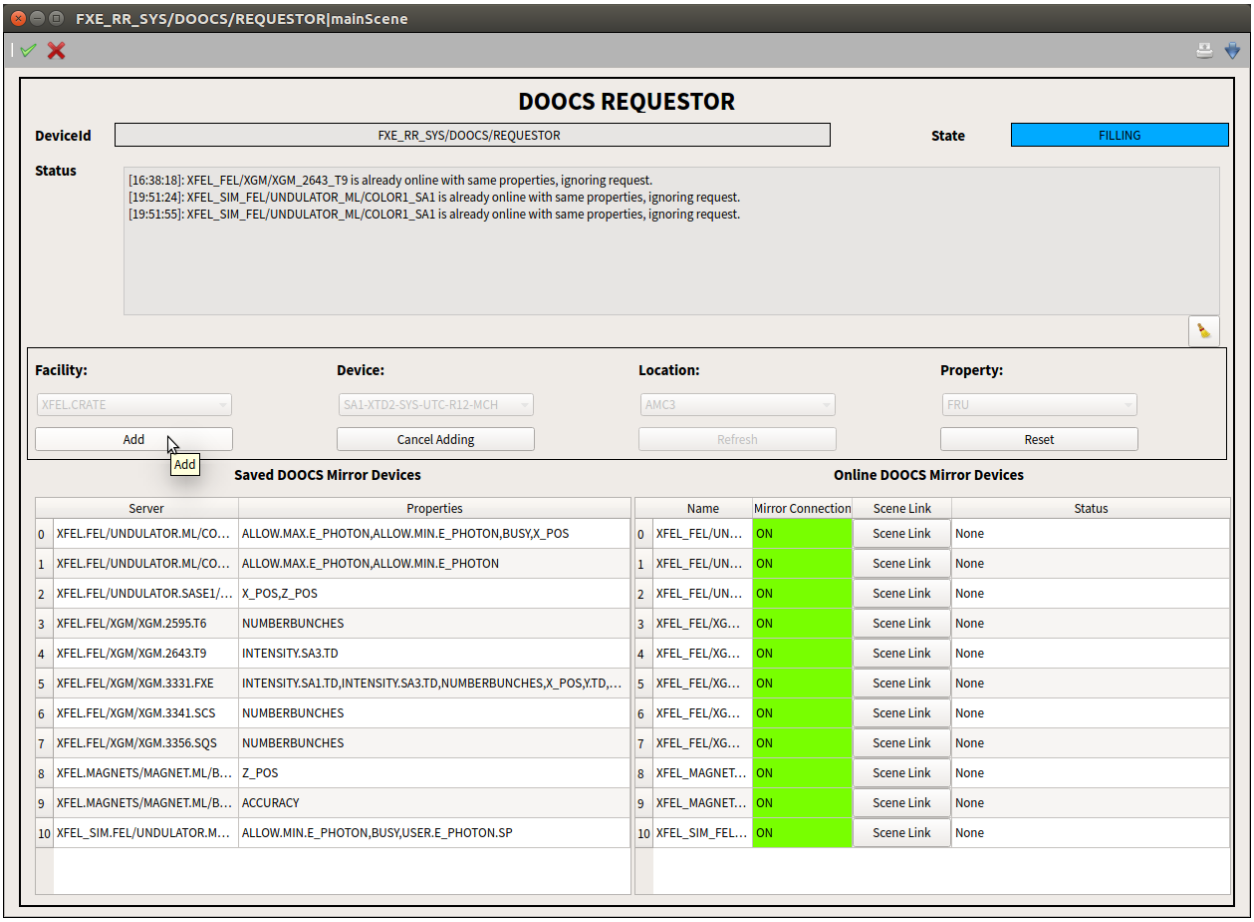


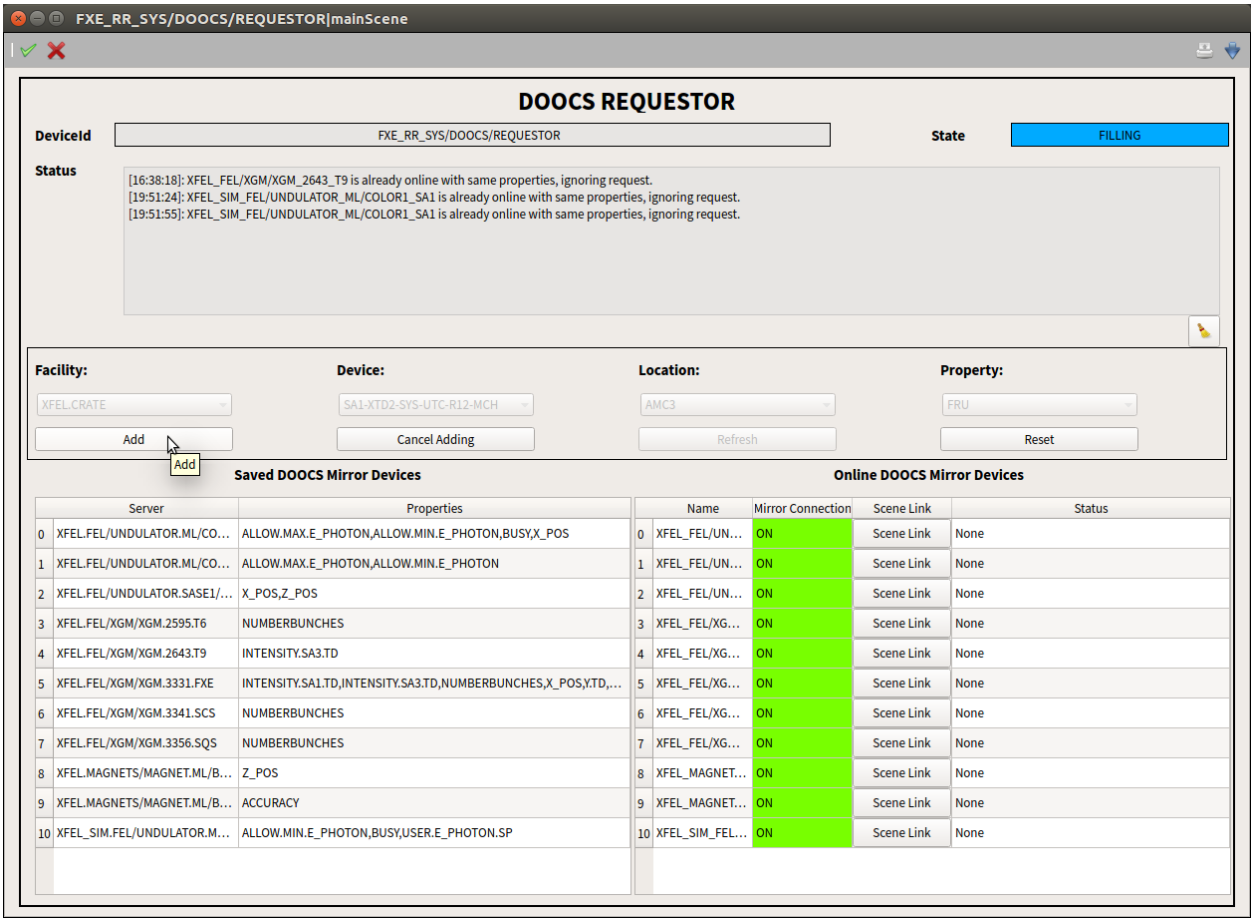
Note that after the selection is made in all of the drop down lists, the device goes to the FILLING state

- Click the **ADD** button (or click **Cancel Adding** to cancel):

The property specified by the user will be then added to the corresponding *DoocsMirror* (to the existing one, or a new one will be automatically instantiated). The Location and Property will appear in the **Saved DOOCS Mirror Devices** widget table on the scene (it corresponds to the table *DOOCS Locations* in device's configuration editor):

Adding Location/Property will automatically create a DOOCS Mirror device (or the existing one will be used) which then appears in the **Online Doocs Mirror Devices** table. Mirror devices are listed with their Karabo name (**Name**), mirror connection (**Mirror Connection**, which can be **on**, **error** or **unknown**), link to the mirror's own scene (**Scene Link**) and actual status of the mirror device (**Status**)


FXE_RR_SYS/DOOCS/REQUESTOR|mainScene
DOOCS REQUESTOR
DeviceId
FXE_RR_SYS/DOOCS/REQUESTOR
State
FILLING
Status
[16:38:18]: XFEL_FEL/XGM/XGM_2643_T9 is already online with same properties, ignoring request.
[19:51:24]: XFEL_SIM_FEL/UNDULATOR_ML/COLOR1_SA1 is already online with same properties, ignoring request.
[19:51:55]: XFEL_SIM_FEL/UNDULATOR_ML/COLOR1_SA1 is already online with same properties, ignoring request.
Facility:
Device:
Location:
Property:
XFEL.CRATE
SA1-XTD2-SYS-UTC-R12-MCH
AMC3
FRU
Add
Cancel Adding
Refresh
Reset
Add
Saved DOOCS Mirror Devices
Online DOOCS Mirror Devices
Server
Properties
Name
Mirror Connection
Scene Link
Status
0 XFEL.FEL/UNDULATOR.ML/CO… ALLOW.MAX.E_PHOTON,ALLOW.MIN.E_PHOTON,BUSY,X_POS
1 XFEL.FEL/UNDULATOR.ML/CO… ALLOW.MAX.E_PHOTON,ALLOW.MIN.E_PHOTON
2 XFEL.FEL/UNDULATOR.SASE1/… X_POS,Z_POS
3 XFEL.FEL/XGM/XGM.2595.T6 NUMBERBUNCHES
4 XFEL.FEL/XGM/XGM.2643.T9 INTENSITY.SA3.TD
5 XFEL.FEL/XGM/XGM.3331.FXE INTENSITY.SA1.TD,INTENSITY.SA3.TD,NUMBERBUNCHES,X_POS,Y.TD,…
6 XFEL.FEL/XGM/XGM.3341.SCS NUMBERBUNCHES
7 XFEL.FEL/XGM/XGM.3356.SQS NUMBERBUNCHES
8 XFEL.MAGNETS/MAGNET.ML/B… Z_POS
9 XFEL.MAGNETS/MAGNET.ML/B… ACCURACY
10 XFEL_SIM.FEL/UNDULATOR.M… ALLOW.MIN.E_PHOTON,BUSY,USER.E_PHOTON.SP
0 XFEL_FEL/UN… ON Scene Link None
1 XFEL_FEL/UN… ON Scene Link None
2 XFEL_FEL/UN… ON Scene Link None
3 XFEL_FEL/XG… ON Scene Link None
4 XFEL_FEL/XG… ON Scene Link None
5 XFEL_FEL/XG… ON Scene Link None
6 XFEL_FEL/XG… ON Scene Link None
7 XFEL_FEL/XG… ON Scene Link None
8 XFEL_MAGNET… ON Scene Link None
9 XFEL_MAGNET… ON Scene Link None
10 XFEL_SIM_FEL… ON Scene Link None


FXE_RR_SYS/DOOCS/REQUESTOR|mainScene
DOOCS REQUESTOR
DeviceId
FXE_RR_SYS/DOOCS/REQUESTOR
State
FILLING
Status
[16:38:18]: XFEL_FEL/XGM/XGM_2643_T9 is already online with same properties, ignoring request.
[19:51:24]: XFEL_SIM_FEL/UNDULATOR_ML/COLOR1_SA1 is already online with same properties, ignoring request.
[19:51:55]: XFEL_SIM_FEL/UNDULATOR_ML/COLOR1_SA1 is already online with same properties, ignoring request.
Facility:
Device:
Location:
Property:
XFEL.CRATE
SA1-XTD2-SYS-UTC-R12-MCH
AMC3
FRU
Add
Cancel Adding
Refresh
Reset
Add
Saved DOOCS Mirror Devices
Online DOOCS Mirror Devices
Server
Properties
Name
Mirror Connection
Scene Link
Status
0 XFEL.FEL/UNDULATOR.ML/CO… ALLOW.MAX.E_PHOTON,ALLOW.MIN.E_PHOTON,BUSY,X_POS XFEL_FEL/UN… ON Scene Link None
1 XFEL.FEL/UNDULATOR.ML/CO… ALLOW.MAX.E_PHOTON,ALLOW.MIN.E_PHOTON XFEL_FEL/UN… ON Scene Link None
2 XFEL.FEL/UNDULATOR.SASE1/… X_POS,Z_POS XFEL_FEL/UN… ON Scene Link None
3 XFEL.FEL/XGM/XGM.2595.T6 NUMBERBUNCHES XFEL_FEL/XG… ON Scene Link None
4 XFEL.FEL/XGM/XGM.2643.T9 INTENSITY.SA3.TD XFEL_FEL/XG… ON Scene Link None
5 XFEL.FEL/XGM/XGM.3331.FXE INTENSITY.SA1.TD,INTENSITY.SA3.TD,NUMBERBUNCHES,X_POS,Y.TD,… XFEL_FEL/XG… ON Scene Link None
6 XFEL.FEL/XGM/XGM.3341.SCS NUMBERBUNCHES XFEL_FEL/XG… ON Scene Link None
7 XFEL.FEL/XGM/XGM.3356.SQS NUMBERBUNCHES XFEL_FEL/XG… ON Scene Link None
8 XFEL.MAGNETS/MAGNET.ML/B… Z_POS XFEL_MAGNET… ON Scene Link None
9 XFEL.MAGNETS/MAGNET.ML/B… ACCURACY XFEL_MAGNET… ON Scene Link None
10 XFEL_SIM.FEL/UNDULATOR.M… ALLOW.MIN.E_PHOTON,BUSY,USER.E_PHOTON.SP XFEL_SIM_FEL… ON Scene Link None

3.3 Refresh

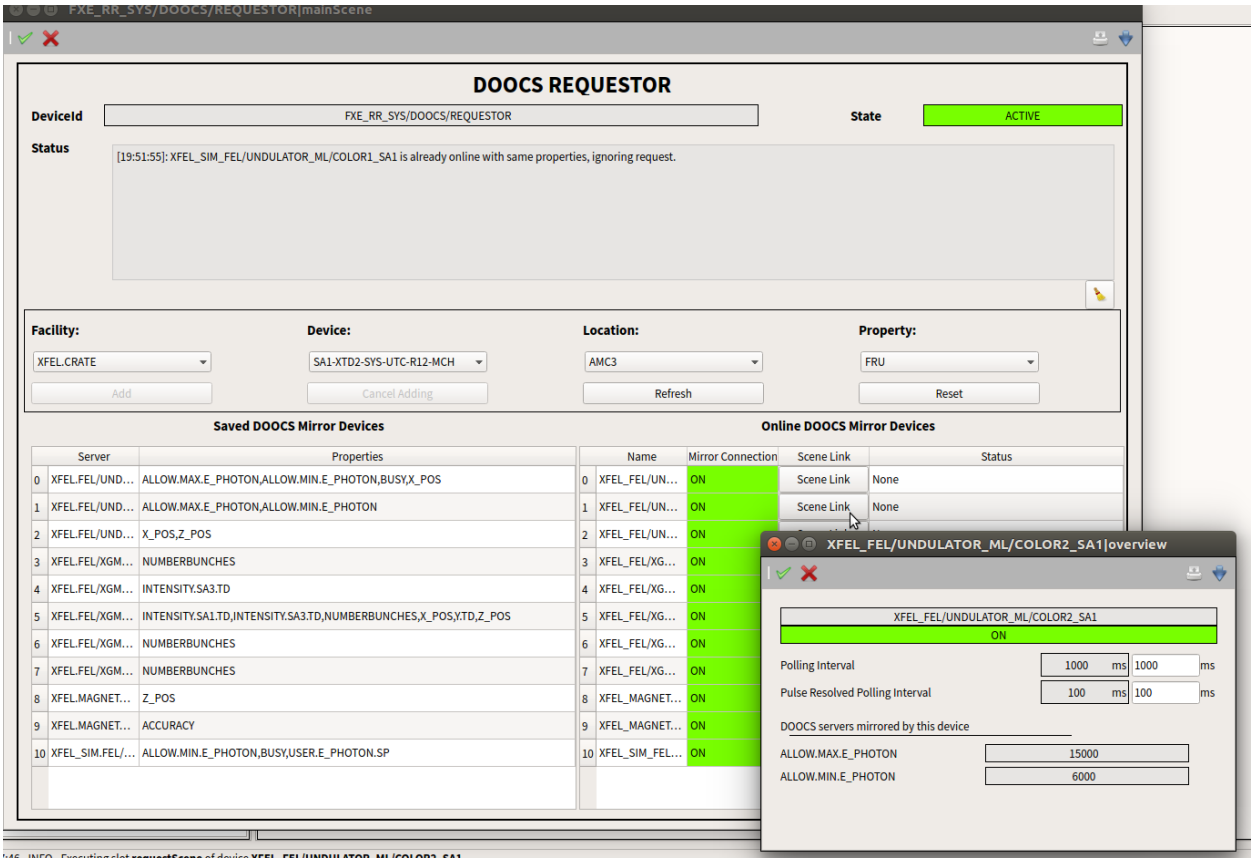
If in the **Online DOOCS Mirror Devices** table, some *DoocsMirror* device is missing for the property/location listed in the **Configured Doocs Mirror Devices** table, it is possible to instantiate it by clicking the **Refresh** button.

3.4 Resetting the selection

To reset the current selection, click **Reset**.

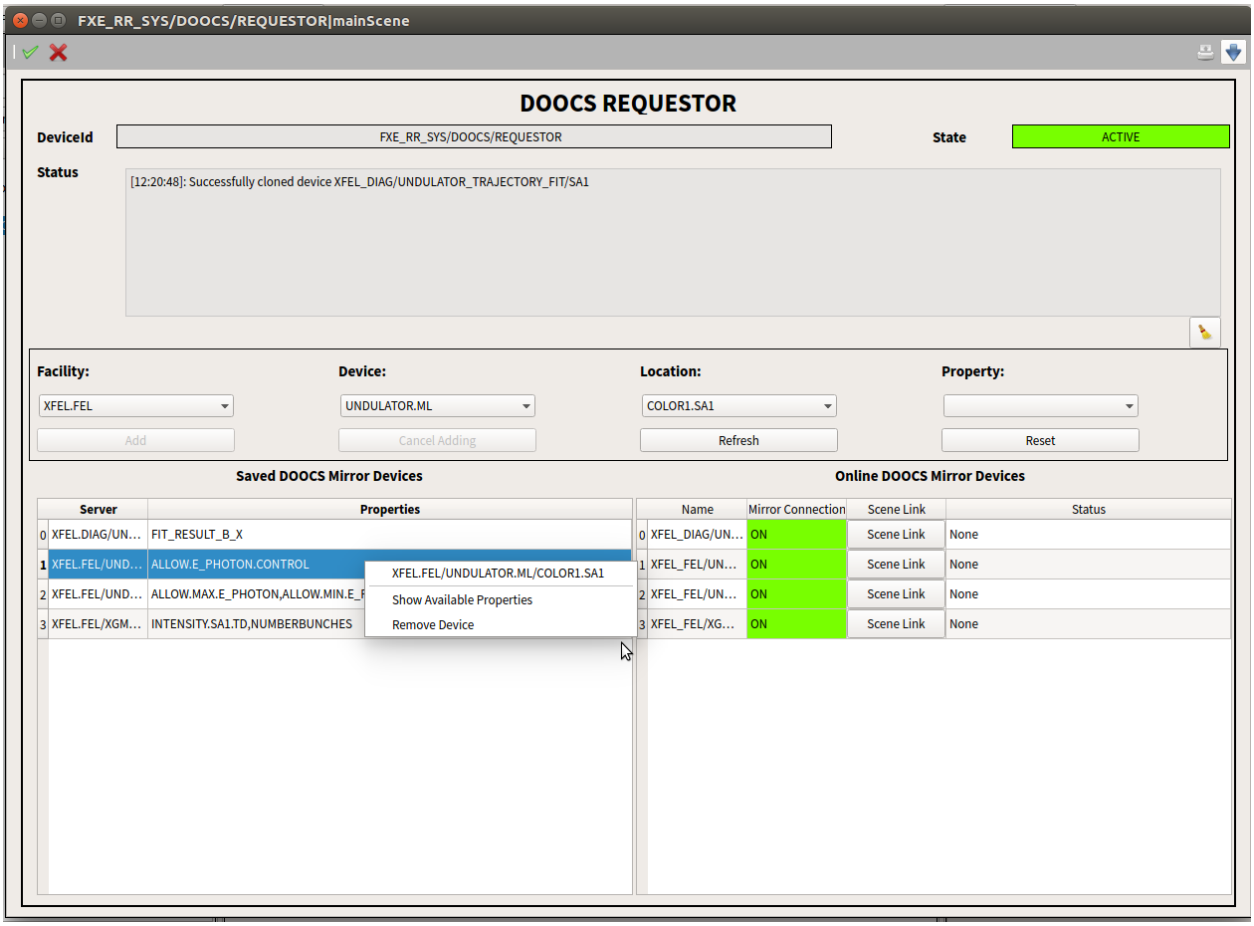
3.5 Opening the auto-generated scene of the DoocsMirror

In order to open directly the autogenerated scene of the *DoocsMirror*, click the corresponding button **Scene Link** on the table **Online DOOCS Mirror devices** as shown in figure below:



3.6 The Saved DOOCS Mirror Devices table popup menu

- Right-click on a row in the **Saved DOOCS Mirror Devices** table. The popup menu will appear as shown in figure below:
- Selecting **Remove Device** in the popup menu will remove a location row from the **Saved DOOCS Mirror Devices** table.


FXE_RR_SYS/DOOCS/REQUESTOR|mainScene
DOOCS REQUESTOR
DeviceId
FXE_RR_SYS/DOOCS/REQUESTOR
State
ACTIVE
Status
[12:20:48]: Successfully cloned device XFEL_DIAG/UNDULATOR_TRAJECTORY_FIT/SA1
Facility:
Device:
Location:
Property:
XFEL.FEL
UNDULATOR.ML
COLOR1.SA1
Add
Cancel Adding
Refresh
Reset
Saved DOOCS Mirror Devices
Online DOOCS Mirror Devices
Server
Properties
Name
Mirror Connection
Scene Link
Status
XFEL.DIAG/UN...
FIT_RESULT_B_X
XFEL_DIAG/UN...
ON
Scene Link
None
XFEL.FEL/UND...
ALLOW.E_PHOTON.CONTROL
XFEL_FEL/UN...
XFEL.FEL/UND...
ALLOW.MAX.E_PHOTON,ALLOW.MIN.E_F
XFEL.FEL/XGM...
INTENSITY.SA1.TD,NUMBERBUNCHES
XFEL_FEL/XG...
XFEL.FEL/UNDULATOR.ML/COLOR1.SA1
Show Available Properties
Remove Device

3.6.1 Troubleshooting

- If a device seems stuck in the FILLING state for too long (and no one seems to be operating it at the moment), try to cancel with the **Cancel Adding** button. The device should return to the ACTIVE state.
- If the device tables do not display in the device scene, you might need to update your GUI extensions:
  - Access the XFEL VPN if you are not inside the European XFEL internal network.
  - On your GUI menu select Help->Check for updates.
  - Click on the 'refresh' button .
  - Click on 'Update'.

CHAPTER 4

DOOCS Widget

CHAPTER 5

Indices and tables

- genindex
- modindex
- search