

# MVTec MERLIC on Edge

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## Getting started with MERLIC RTE on Industrial Edge Devices of Siemens

MERLIC 5.8.2

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## 1 Introduction and disclaimer

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**MVTec MERLIC on Edge** is an Industrial Edge application developed by MVTec Software GmbH. It provides the MERLIC Runtime Environment (MERLIC RTE) for the usage on Industrial Edge Devices and thus enables running custom MERLIC applications on an Industrial Edge Device.

In addition to the **MVTec MERLIC on Edge** application on the Industrial Edge Device, a client PC with a MERLIC installation is required for the setup of the MERLIC application.

This document describes the necessary configuration including the requirements for using **MVTec MERLIC on Edge** on an Industrial Edge Device. It is assumed that the reader has a basic understanding of installing and working with Industrial Edge Devices via the Siemens Industrial Edge Management. It is also assumed that the reader is familiar with MERLIC.

For comprehensive information on MERLIC, see the [MERLIC documentation](#).

## 2 Concept and components

The basic concept of using **MVTec MERLIC on Edge** consists of using a client PC for the implementation of MVApps, including the respective recipes, and the remote configuration on the Industrial Edge Device via the Siemens Industrial Edge Management. The app **MVTec MERLIC on Edge** installed on the Industrial Edge Device provides the MERLIC RTE component for the communication with the programmable logic controller (PLC) that is typically connected to the Industrial Edge Device. Existing MVApps and recipe files can be transferred to the Industrial Edge Device and configured remotely for the execution. For the communication with the PLC and to control the execution, any communication plugin of MERLIC can be used.

The following figure illustrates the required components for using MERLIC applications on an Industrial Edge Device.

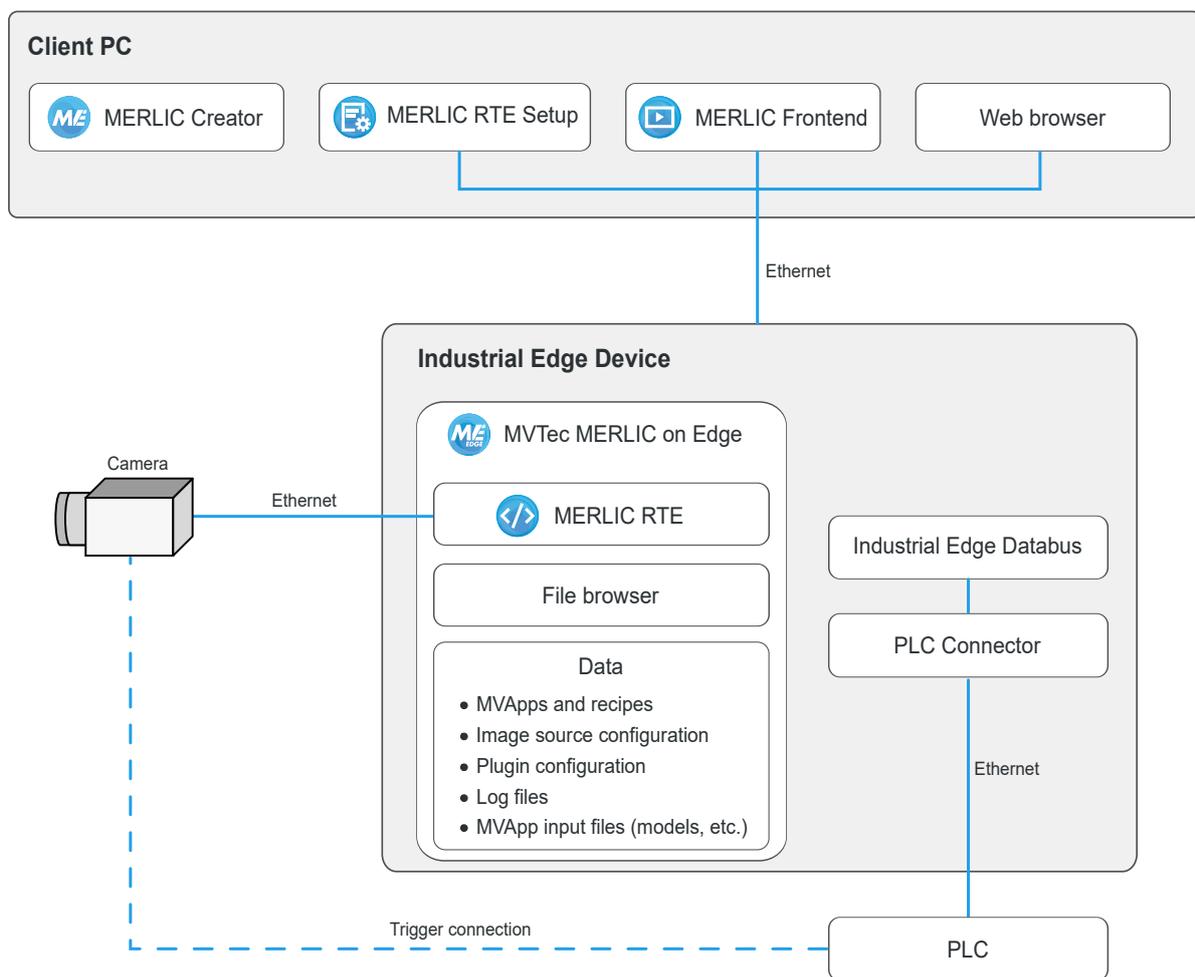


Figure 2.1 Required components for using MVTec MERLIC on Edge on an Industrial Edge Device

On the client PC, basically three MERLIC components are required: MERLIC Creator, MERLIC Runtime Environment Setup (MERLIC RTE Setup), and MERLIC Frontend.

MERLIC Creator is used for the development of the MERLIC Vision Apps (MVApps) and recipes.

The MERLIC RTE Setup and MERLIC Frontend are used to connect the client PC to the Industrial Edge Device to configure the image acquisition on the Industrial Edge Device and to monitor the currently running MVApp, respectively.

The client PC is also used to access the Siemens Industrial Edge Management via a web browser for the configuration and setup of the Industrial Edge Device.

On the Industrial Edge Device, the **MVTec MERLIC on Edge** app is required. It is available in the Industrial Edge Marketplace of Siemens and must be installed on the desired Industrial Edge Device. The app provides MERLIC RTE and an integrated file browser for the transfer and configuration of the MVApps and recipe files.

## 2.1 Components of MVTec MERLIC on Edge

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**MVTec MERLIC on Edge** comes with the following components:

### **MERLIC Runtime Environment (MERLIC RTE)**

MERLIC RTE represents the process integration mode of MERLIC.

### **Integrated file browser**

The file browser enables the setup and configuration of various files for MERLIC applications intended for the use on the Industrial Edge Device. For more information which files are provided via the file browser, see the next section.

### 2.1.1 Installed file structure

After installing **MVTec MERLIC on Edge** on an Industrial Edge Device, the following directories and files are provided:

#### **Communicator**

This directory contains the configuration file for the REST plugin. It also represents the default location for further plugin configurations.

#### **Configurations**

This directory contains the configuration files for the Image Source Manager (ISM) including the "default" image source configuration.

#### **Images**

This directory contains the example images used in the provided example MVApp.

#### **Logs**

This directory contains the MERLIC RTE log files.

#### **MERLIC\_custom\_tools**

This directory represents the location for custom MERLIC tools.

### **merlic\_rte.ini**

This file represents the default configuration file for MERLIC RTE. It can be used to configure MERLIC RTE settings and is crucial for the import of recipe files.

### **read\_barcode.mvapp**

This file represents the example MVApp provided by the app.

### **read\_barcode\_recipe\*.mrcp**

These files represent the example MERLIC recipes provided by the app.

## **2.2 Requirements**

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### **RAM**

For the installation of **MVTec MERLIC on Edge**, at least 5 GB RAM must be available on the Industrial Edge Device.

### **Ports**

The ports from the hardware demand sheet of the Industrial Edge Device must be available.

For more information on the used ports, see the section [Port settings](#) in chapter [Tips and tricks](#).

### **Ethernet connections**

The Industrial Edge Device needs at least two configured Ethernet interfaces:

- one Layer 2 network to connect the camera, and
- one or multiple networks for the communication with the client PC and the PLC

Make sure to configure the Layer 2 network accordingly. For more information on how to configure the Layer 2 network, see the documentation of Siemens.

### **Licensing**

The licensing mechanism for **MVTec MERLIC on Edge** is based on the Industrial Edge Licensing Service of Siemens. Therefore, the license is determined by the selected subscription model when downloading the application.

## **2.3 Tested devices**

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MVTec MERLIC on Edge has been tested with following Industrial Edge Devices:

- SIMATIC IPC227E Industrial Edge Device
- SIMATIC IPC427E Industrial Edge Device
- SIMATIC IPC BX-59A Industrial Edge Device

### 3 Running the example application

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MVTec MERLIC on Edge comes with an example MVApp and some example recipe files. You can use these example files to test how to run an MVApp on an Industrial Edge Device and how to change the recipe.

The INI configuration file "merlic\_rte.ini" provided with the installation is initially configured to use one of the example recipes as default recipe when MERLIC RTE is started. To run the example on your device, you can use a MERLIC communication plugin such as REST to control the execution of the recipe, and you can start a remote MERLIC Frontend to monitor the execution of the MVApp.

After the installation of MVTec MERLIC on Edge, an instance of the REST plugin is already configured and running. Therefore, you can immediately run the example application without the need of any configuration.

1. Connect to the Industrial Edge Device via the Siemens Industrial Edge Management and make sure that the **MVTec MERLIC on Edge** app is running.
2. Start a MERLIC Frontend on the client PC and connect the Industrial Edge Device as described in section [Connecting a MERLIC Frontend](#).
3. Open the built-in web app of the REST plugin in a web browser. The web app is available via the URL "http://<HOST\_IP>:8040/apps/states", by default. It shows the MERLIC RTE state machine and allows monitoring and controlling the current state. MERLIC should now be in "Ready" state when the web app is displayed.

If the built-in web app is not available, the REST plugin might have been stopped. Start the MERLIC RTE Setup, connect to the Industrial Edge Device device via the "Select System" dialog, and ensure that an instance of the REST plugin is running the IP address in the plugin configuration is set accordingly, for example, to " : : " to listen for connections on all IP addresses..



5. In the MERLIC Frontend, you can now monitor the execution of the MVApp.

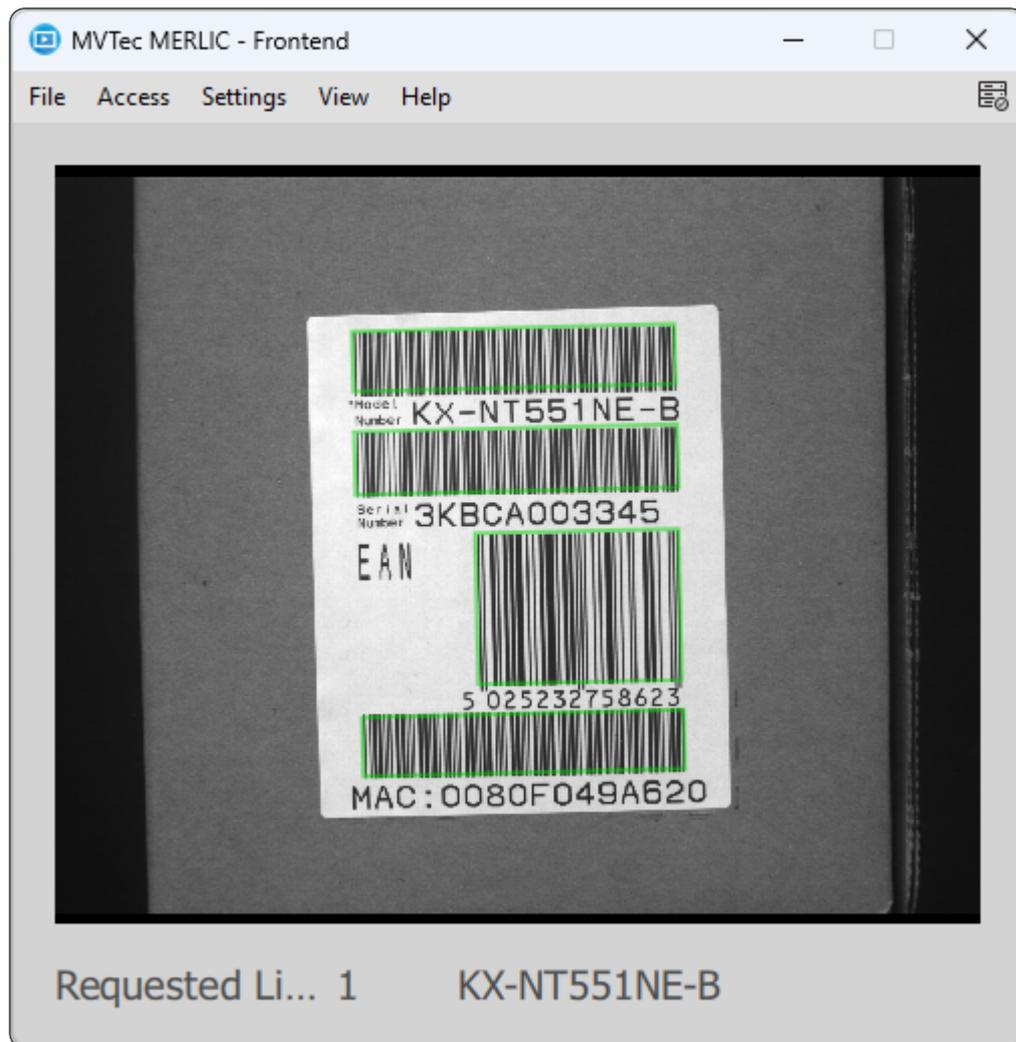


Figure 3.2 MERLIC Frontend of example application

## 4 Setting up custom applications

To use your own MERLIC application on the Industrial Edge Device, you have to perform some configuration steps as depicted in the figure below. For more information on each step, see the respective descriptions in the following sections.

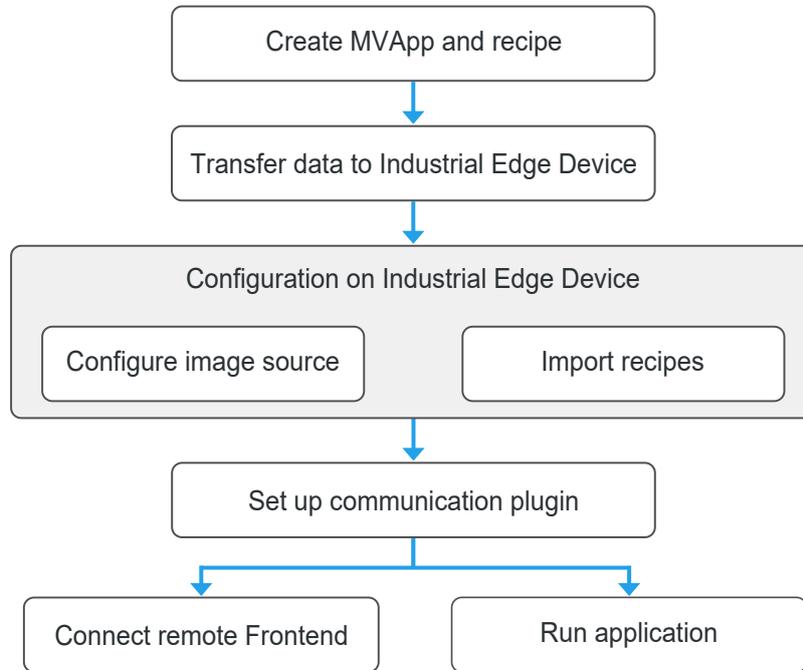


Figure 4.1 Overview of setup steps for custom MERLIC applications

### 4.1 Creating the MVApp and recipes

**Component:** MERLIC Creator

First, you have to create a MERLIC Vision App (MVApp) for the desired image processing task using MERLIC Creator on a client PC.

In addition, you have to create at least one MERLIC recipe for the MVApp. This is required to integrate the MVApp in MERLIC RTE. Make sure to specify the desired MVApp parameters and MVApp results for MERLIC RTE before creating the recipe, especially if you want to query specific results or change specific tool parameters in MERLIC RTE mode.

For more information on creating MVApps and recipe files, see the [MERLIC manual](#).

### 4.2 Transferring the MVApp and recipes

**Component:** File browser of MVTec MERLIC on Edge

If you created the MVApp and the recipes, you have to transfer the files to the Industrial Edge Device:

1. Connect to the Industrial Edge Device via the Siemens Industrial Edge Management and go to the overview of installed apps.

- Click on the **MVTec MERLIC on Edge** app. This opens the integrated file browser in a new tab.

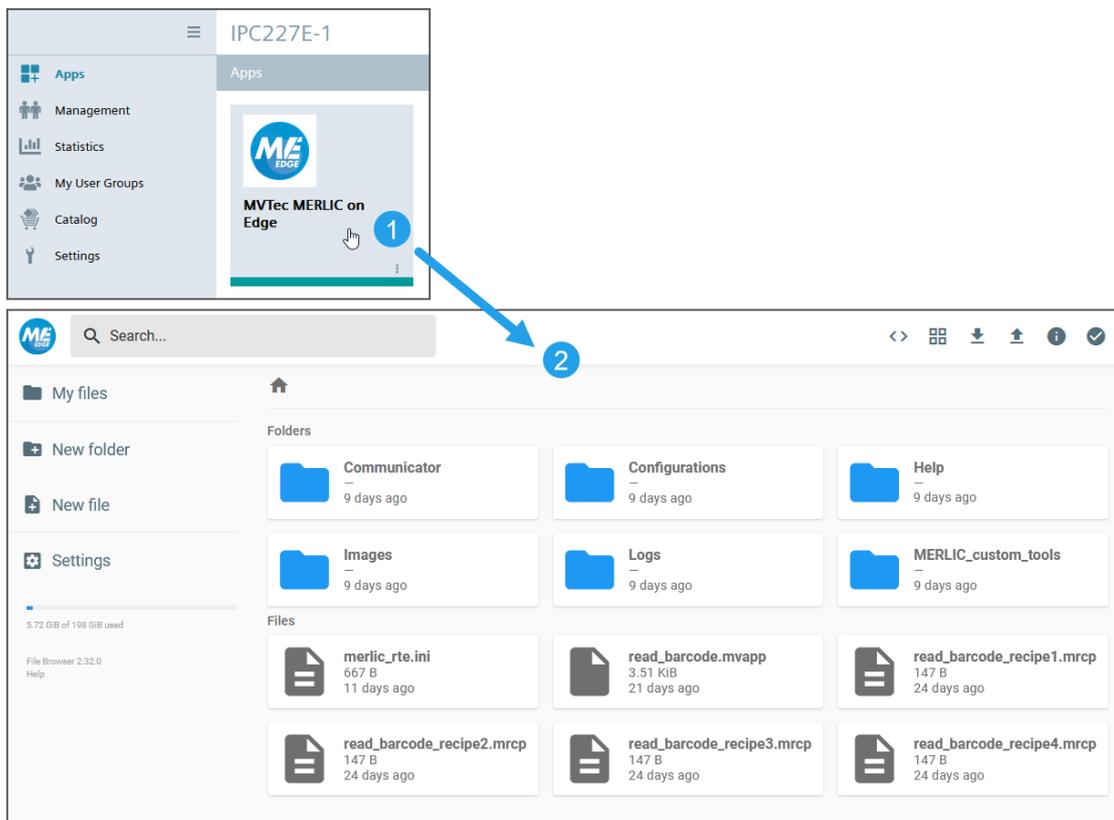


Figure 4.2 Open the integrated file browser

- Move the MVApp and recipes files via drag & drop from the client PC to the file browser on the Industrial Edge Device. In the following example image, the files are moved to the root folder of the app.

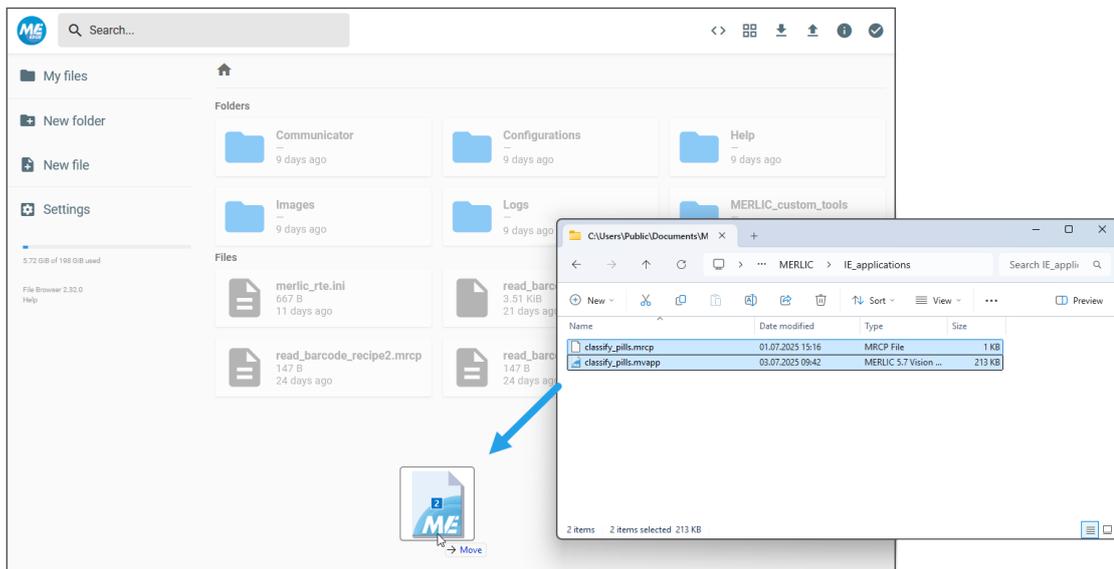


Figure 4.3 Transfer data to the Industrial Edge Device

- Optionally, create a new folder and move the files to the new folder.

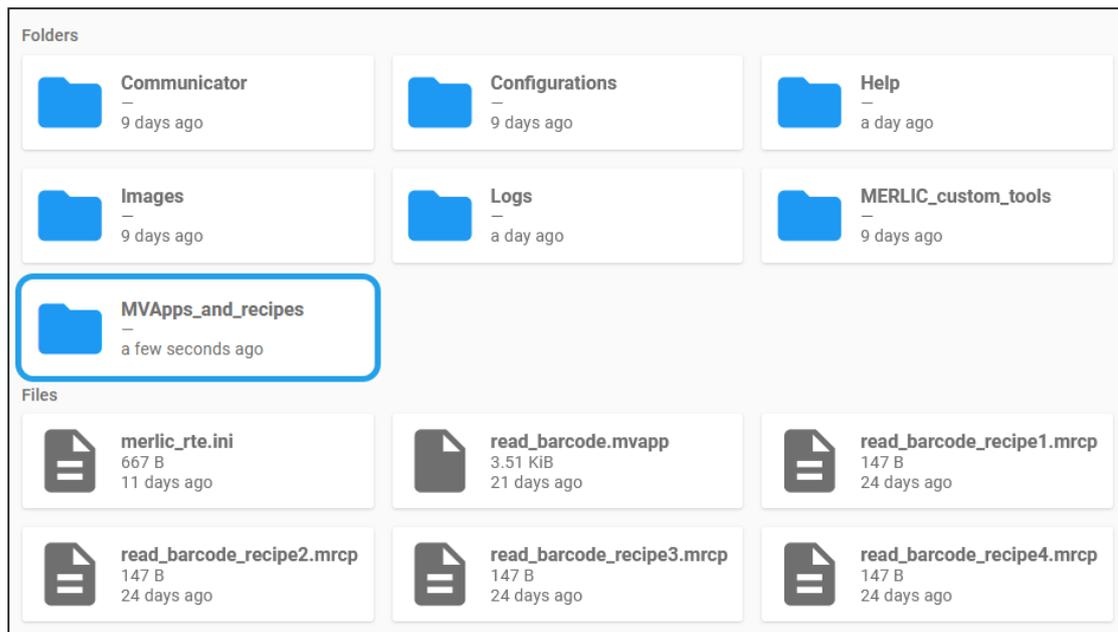


Figure 4.4 Example of custom folder

If the MVApp requires any external files, for example, deep learning models, you also have to transfer these files to the Industrial Edge Device.

## 4.3 Configuring the image source for the Industrial Edge Device

**Component:** Remote MERLIC RTE Setup

Before using your MVApp and recipes via MERLIC RTE on the Industrial Edge Device, you have to make sure the image source is configured for the execution of the MVApp on the Industrial Edge Device.

The default image source configuration that is provided with **MVTec MERLIC on Edge** is initially configured for the provided example files. To configure new image sources or modify existing image sources on the Industrial Edge Device, you can use the MERLIC RTE Setup and connect it to the Industrial Edge Device for remote configuration.

### 4.3.1 Prerequisites

- Make sure the camera device is connected to the Industrial Edge Device.
- If you want to use images from file, make sure to copy the files to the file browser of the **MVTec MERLIC on Edge** app .

Make sure that MERLIC RTE is in one of the following states: **Initialized** or **Preoperational**, for example, via the REST communication plugin and its built-in web app. Otherwise the configuration on the "Image Sources" tab of the MERLIC RTE Setup is not available.

### 4.3.2 Configuring the image source

1. On the client PC, start MERLIC RTE Setup.
2. Connect to the Industrial Edge Device via the "Select system" dialog. If you connect for the first time, you have to enter the IP address of the Industrial Edge Device manually. If it was connected before, the IP address might be available in the drop-down menu.

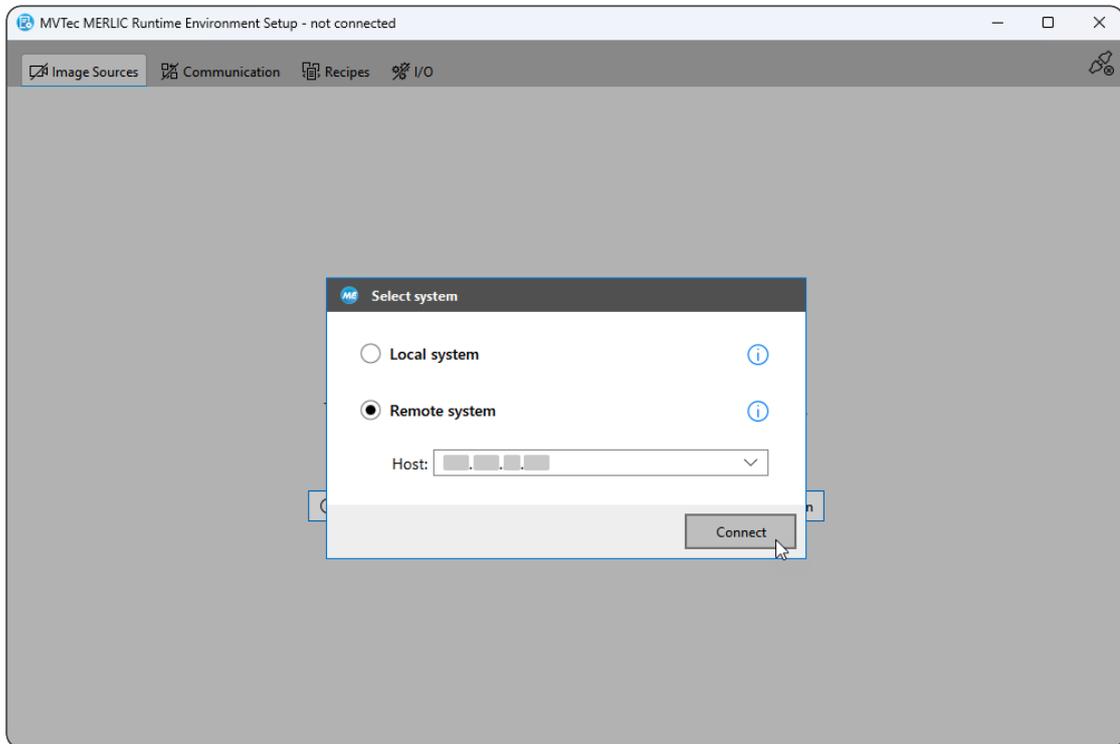


Figure 4.5 Connect MERLIC RTE Setup to Industrial Edge Device

3. Go to the "Image Sources" tab and adjust the configuration. You can add a new image source configuration or extend the provided "default" configuration.

- If you are using a camera device, you can select the device from the drop-down list. If you want to use images from file, you have to enter the file path to the respective directory manually. You can look up the file path in the file browser of the **MVTec MERLIC on Edge** app and copy the path from the respective URL. The path must be given relative to the source folder `/files/`, for example, `/files/Images/`.

You have to ensure that the name of the image source corresponds to the image source name used in the "Image Source" tool of the MVApp.

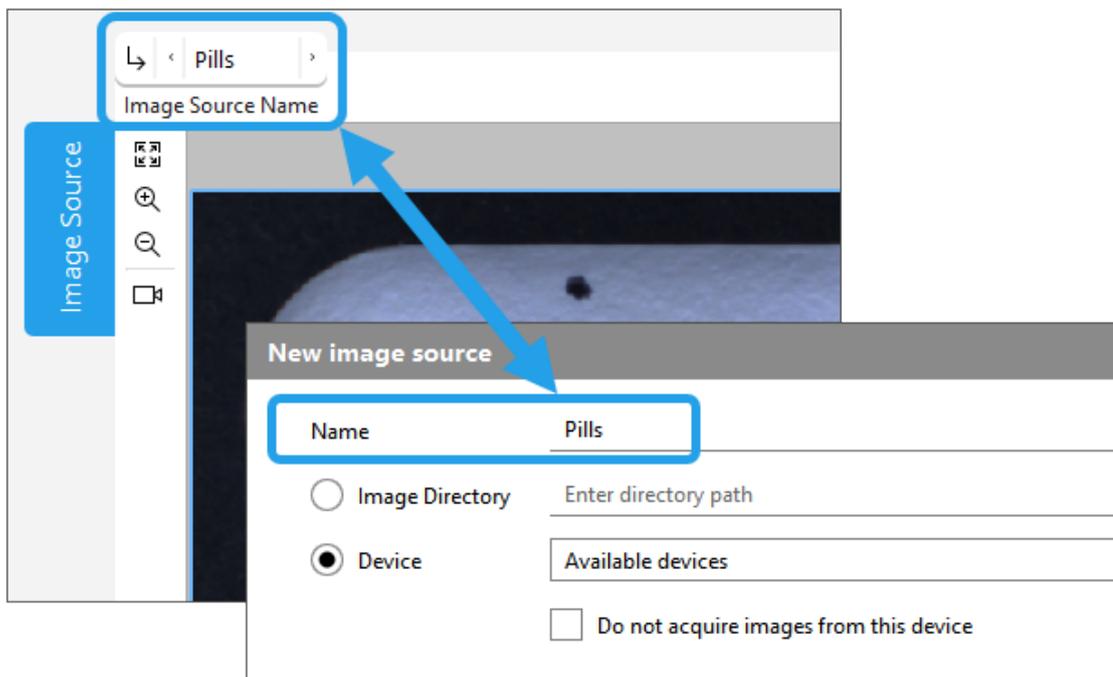


Figure 4.6 Configuration of image source name

- Set the respective image source configuration as **RTE startup configuration**.

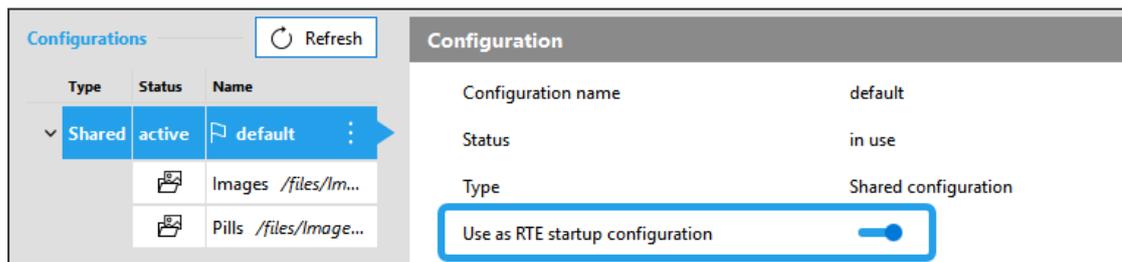


Figure 4.7 RTE startup configuration

For more information on configuring image sources, see [MERLIC Image Source Manager \(ISM\)](#) in the MERLIC manual.

## 4.4 Importing the recipes via the INI file

**Component:** File browser of MVTec MERLIC on Edge

To use MERLIC recipes and the respective MVApps with MERLIC RTE on the Industrial Edge Device, the recipes must be imported manually as follows:

1. Connect to the Industrial Edge Device via the Siemens Industrial Edge Management and go to the overview of installed apps.
2. Click on the **MVTec MERLIC on Edge** app. This opens the integrated file browser in a new tab.
3. Open the INI configuration file "merlic\_rte.ini" via a double-click. The file will be opened in the file browser.

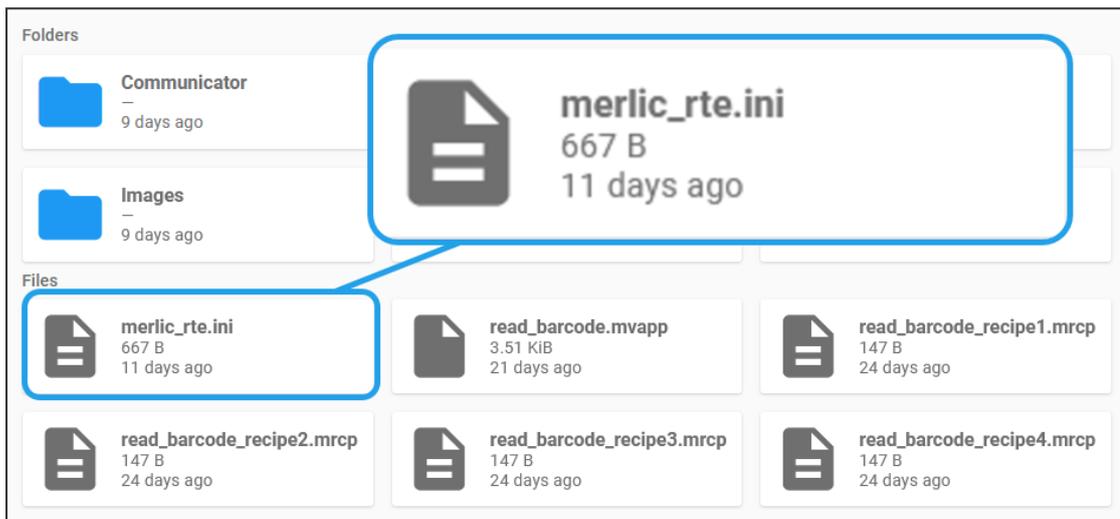


Figure 4.8 Default INI configuration file

4. For each recipe, add a new entry to the section `[ProcessIntegration]` with the following structure:

```
Recipe<ID>=<Path_to_Recipe>/<Filename>.mrcp
```

The "ID" represents the unique recipe ID which is used to identify the respective recipe in MERLIC RTE mode, for example, to change a recipe. The path must be given relative to the source folder `/files/`. If you want to import multiple recipes, you have to define a unique ID for each recipe. Make sure to use forward slashes `/` for file paths in the INI file.

In the example configuration below, the provided example recipes have been removed and a new recipe has been defined instead.

```

merlic_rte.ini
[General]
IniVersion=4
ToolPath=/files/Merlic_custom_tools/
ImageSource=
[Logging]
LogFilePath=/files/Logging/merlic_rte.log
LogFileMaxSize=1024
LogFileCount=10
Threshold=info
UseShortFileNames=true
[Communicator]
PluginDir=/opt/merlic/merlic-5/bin/x64-linux-;/files/Communicator/plugins
ConfigDir=/files/Communicator/conf
PluginConfigurationPorts=10126;10127;10128
[ProcessIntegration]
Recipe0=/files/MVApps_and_recipes/classify_pills.mrcp
DefaultRecipe=0
RestartUpismConfiguration=default
[Frontend]
GuiLanguage=en_US

```

Figure 4.9 Recipe configuration in INI file

- Optionally, change the setting for the default recipe in "DefaultRecipe" if you defined multiple recipe files.
- Save your changes.
- Restart the **MVTec MERLIC on Edge** app to adopt the changes in the INI file.

The port settings for the image source configuration and the plugin configuration should be used as specified in the default setting. It is not advised to changes these settings.

## 4.5 Setting up the communication plugin

**Components:** Remote MERLIC RTE Setup + communication plugin

You also need to set up the communication device for the MERLIC RTE mode, that is, the plugin for the communication with a machine controller such as a programmable logic controller (PLC). You can use any communication plugin provided by MERLIC to control the execution.

While setting up your MERLIC application on the Industrial Edge Device, you can use the REST plugin and the built-in REST web app for testing purposes; just as described for our example application in section [Running the example application](#). However, for the final setup, you have to configure the desired communication plugin as required for your application and PLC.

- On the client PC, start MERLIC RTE Setup and connect to the Industrial Edge Device via the "Select System" dialog.

2. On the "Communication" tab, add the communication plugin you want to use and configure the plugin as required for your application and PLC.
3. Start the communication plugin.

For more information on the available communication plugins and the respective configuration options, see [Communication Plugins](#) in the MERLIC manual.

Depending on the used communication plugin, make sure to set up and configure the communication between MERLIC and the PLC.

## 4.6 Connecting a MERLIC Frontend

**Component:** Remote MERLIC Frontend

To monitor the MVApp execution in the MERLIC Frontend, you can use any client PC with an installed MERLIC Frontend and connect to the Industrial Edge Device.

You can connect the Frontend via the graphical user interface or via the command prompt. In the following, we demonstrate how to establish the connection via the graphical user interface. This option is only available if the menu bar of the MERLIC Frontend is activated.

1. Start a MERLIC Frontend on the client PC.
2. Open the Frontend menu entry "Access" and select "Connect to server...". Alternatively, click on the button on the right of the Frontend menu.

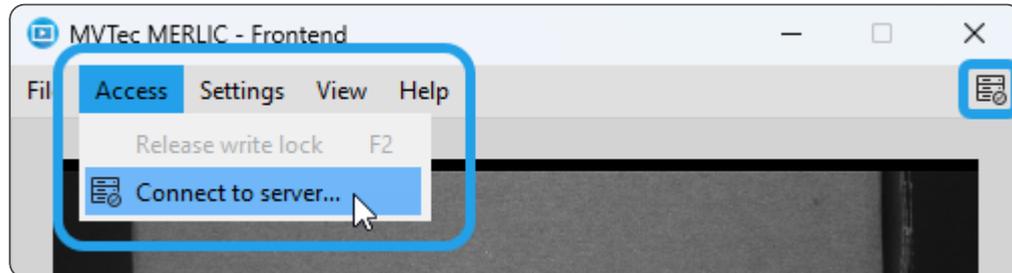


Figure 4.10 Connect through the Frontend menu bar

3. Select the hostname or IP address of the Industrial Edge Device and optionally the desired TCP/IP port. Open the drop-down menu and check if the desired system is provided in the list. It also lists servers on the network on which MERLIC RTE is currently running. If the Industrial Edge Device you want to connect to is not listed, you have to manually enter the hostname or the IP address of the Industrial Edge Device.

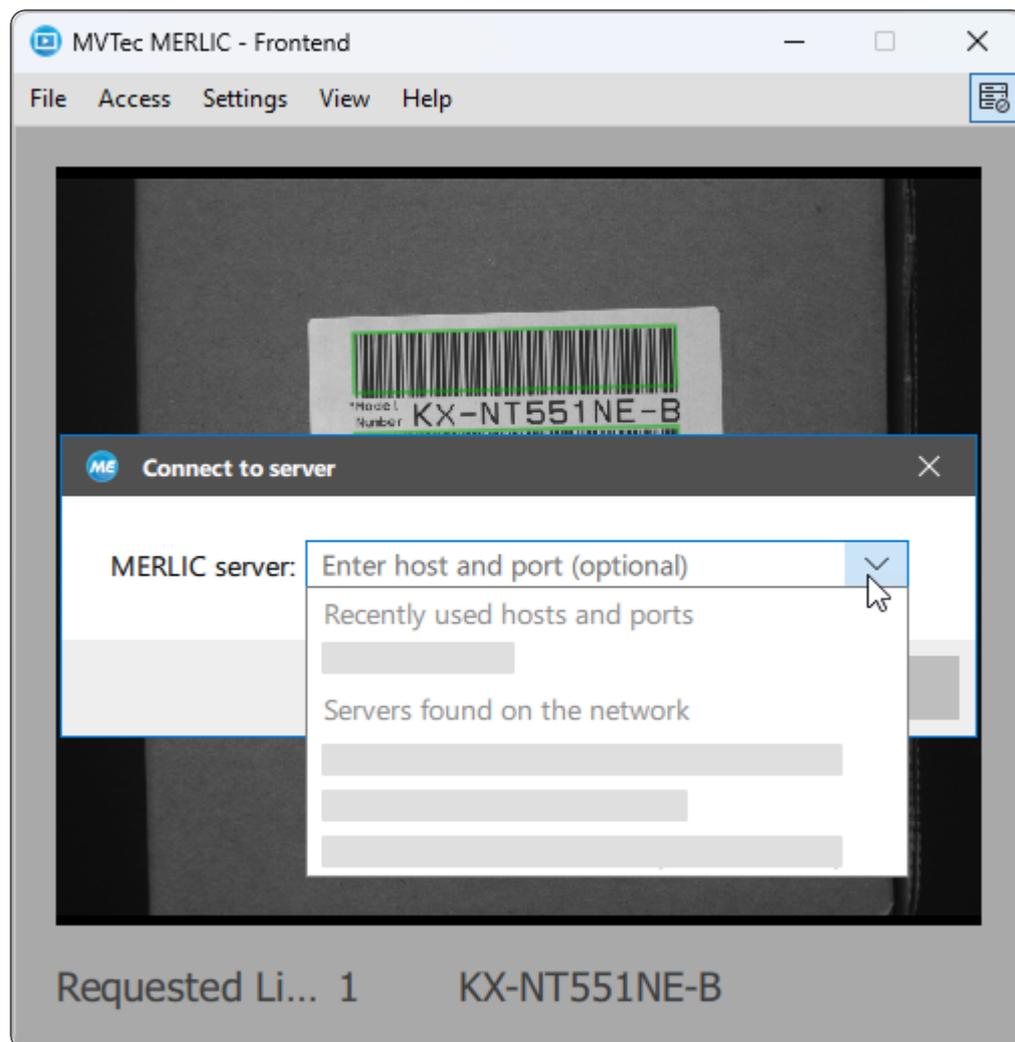


Figure 4.11 Select the IP address of the Industrial Edge Device

For more information, see [Connecting the MERLIC Frontend to a Remote Server](#) in the MERLIC manual.

## 4.7 Running the application

**Components:** MVTec MERLIC on Edge + communication plugin + MERLIC Frontend

If you set up all relevant components, you can start running your application on your Industrial Edge Device.

1. Make sure **MVTec MERLIC on Edge**, and thus MERLIC RTE, is running on your Industrial Edge Device.
2. Make sure the communication plugin is running (via the remote MERLIC RTE Setup).
3. Start running and controlling the application via the respective commands provided by the used communication plugin. In the MERLIC Frontend, you can now monitor the execution of the loaded MVApp.

The MERLIC RTE mode provided by **MVTec MERLIC on Edge** is identical to the MERLIC RTE mode provided for on regular MERLIC installation on a PC. The state machine is the same and thus the available states, commands, and transitions.

For more information on MERLIC's runtime environment mode, see [MERLIC Runtime Environment](#) in the MERLIC manual.

## 5 Logging

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You can find the MERLIC RTE log files of the **MVTec MERLIC on Edge** app in the integrated file browser of the app. They are written to the "Logs" directory by default.

The logging mechanism and options of MERLIC RTE provided with **MVTec MERLIC on Edge** are the same as for the MERLIC RTE component of a regular MERLIC installation on a client PC. This means that a new log file is created when **MVTec MERLIC on Edge** and thus, MERLIC RTE, is restarted on the Industrial Edge Device. Furthermore, you also have the same configuration options for the logging.

For more information, see the respective sections in [Logging](#) and [The MERLIC INI File](#) in the MERLIC manual.

## 6 Tips and tricks

### 6.1 Port settings

In general, the ports from the hardware demand sheet of the Industrial Edge Device must be available.

MVTec MERLIC on Edge uses the following ports by default:

Port	Used for
8040	Communication via the REST plugin
8501	MERLIC file browser
9090	Connection of the remote MERLIC Frontend
9650 - 9654	MERLIC process (Directory Agent) that coordinates the availability of the configuration services on the Industrial Edge Device
10123 - 10125	Configuration services of the Image Source Manager (ISM)
10126 - 10128	Configuration services of communication plugins
22352	CodeMeter, MERLIC's licensing software
48010	Communication via the OPC UA Server plugin
57786	Connection to the HDevelop debug server
65432	Communication via the action-sender plugin
65433	TCP Socket plugin

Table 6.1 Overview of used ports

Ports outside the specified ranges cannot be used!

We recommend using the specified default ports. It is not advised to change the port settings because you can use only ports listed above and you have to make sure that the desired port number is not used for any other component.

### 6.2 Mandatory INI settings

When changing the configuration in the INI file to your application, you have to keep in mind that some settings are required for running MERLIC RTE on the Industrial Edge Device. These settings must not be deleted.

### IniVersion

```
[General]
IniVersion=4
```

This INI setting is required to verify valid keys and values supported for the current MERLIC version.

### ImageSourceConfigurationPorts

```
[General]
ImageSourceConfigurationPorts = "10123;10124;10125"
```

This INI setting is required to enable the remote configuration of the image source connected to the Industrial Edge Device.

### PluginConfigurationPorts

```
[Communicator]
PluginConfigurationPorts="10126;10127;10128"
```

This INI setting is required to enable the remote configuration of the communication plugin such as REST used for the communication with the PLC.

### Logging settings

```
[Logging]
LogFilePath=/files/Logs/
LogFileSizeInBytes=5242880
```

These INI settings are required to make sure the log files are stored in a location where they can be accessed via the file browser of the **MVTec MERLIC on Edge** app.

For more information on available INI settings, see [The MERLIC INI File](#) in the MERLIC manual.

## 6.3 Current state of MVTec MERLIC on Edge

In some cases, MERLIC RTE might already have been stopped even when the current state of the **MVTec MERLIC on Edge** app shows that the app is currently running.

If you encounter problems that the MERLIC application cannot be started although all files are correctly configured and the current state of the app indicates that it is running, you can check the MERLIC RTE log file. If MERLIC RTE is was stopped, you will find the respective information in the log file. In this case, restart the app to trigger a restart of MERLIC RTE on the Industrial Edge Device.

## 6.4 Available RAM

For the installation of **MVTec MERLIC on Edge**, at least 5 GB RAM are required on the Industrial Edge Device.

For the execution of **MVTec MERLIC on Edge** up to 5.5 GB RAM can be used. If more RAM is used while the app is running, the app is stopped automatically by the Siemens Industrial Edge Management. Ensure that the execution of the MVApp requires only up to 5.5 GB RAM, for example, by testing the RAM consumption during the execution on the client PC.

Without further configurations on the Industrial Edge Device, EdgeApps can only be installed if the amount of reserved ram of all Apps does not exceed the installed ram. It is not the ram needed during runtime. But if an app allocates more ram, it will be killed.