

CRICKETS AUTOMATION

Training and Communications

xvisionIOT

Easy Industry 4.0

How to configure a gateway for Industry 4.0

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Abstract

This guide explains how to build a gateway for Industry 4.0, leveraging **xvisionIOT** special features.

The gateway is able to bidirectional data exchange with MES/ERP: Receive Work Order from MES/ERP and send production data back from the machine.

Recipe set is hosted by plc or optionally by MES.

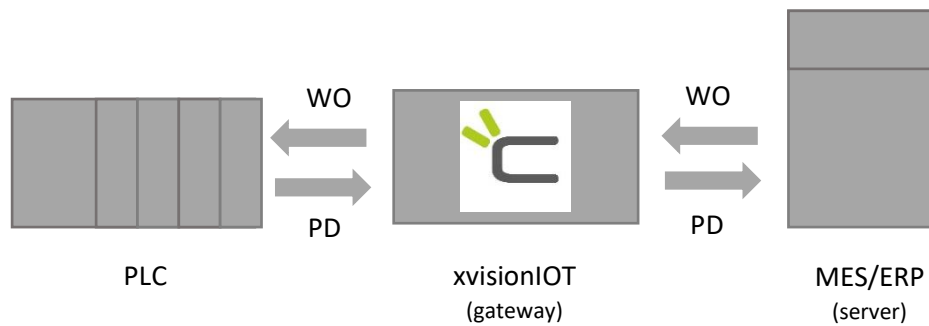


This technical note applies both to xvisionIOT and X Vision product lines.



Architecture

Data exchange is performed by the gateway functionality of xvisionIOT.



- PLC Programmable Logic Controller
- WO Work Order
- PD Production Data
- MES Manufacturing Execution System
- ERP Electronic Resources Planning

Work Order data (typical)

- Work Order ID
- Recipe ID or data
- Quantity to be produced
- Trigger (all WO data sent)

Back warded data (typical)

- Work Order ID
- Start/End production event
- Halt event (Alarm or pause that stops machine)
- Good items count
- Scrap items count



Data flow

How WO reaches the machine (PLC)

MES/ERP sends WO data to the plc, one by one in a receiving area. The trigger is the last data to be sent and it notifies plc/OP that a new WO is available on the plc.

Note: xvisionIOT enqueues serially each write so they are sent to the plc in the same order they arrived. So the last write will be the trigger.

How Operator Panel manages WO

When the current WO has been terminated then the Operator Panel (OP) allows the operator to get the new WO (i.e. pressing a button on the hmi).

The WO data is moved from the receiving area to the plc working area, and the receiving area is reset.

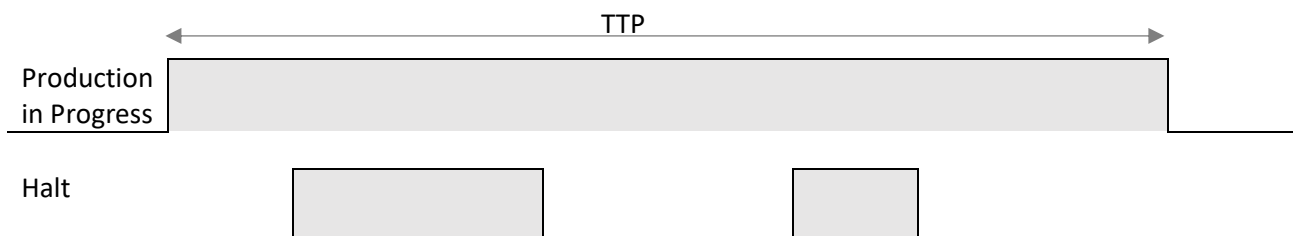
Note: OP may also do some checks about data consistency, i.e. checking a valid recipe ID.

Signals

You can provide a signal that reflects the **production in progress**. This will be high when the job starts and will be reset when the job terminates.

Note this signal states the machine is working the job (WO), so the duration of this signal is the total time of production (TTP).

The **Halt** signal states when the machine is stopped by an alarm condition or by the operator.



You have also to count **good** and **scrap** items produced and update them on regular basis.



Recipes

Recipes can be hosted by the PLC. The Recipe ID of the WO is the index of the recipe you have to use.

Recipe may be edited by your OP or by xvisionIOT.

Using xvisionIOT you can leverage the substitution feature to create a single page that shows each recipe (one at a time).

MES/ERP/Cloud must be manually instructed about available recipes (ID and description).

Alternative solution

You can also receive all recipe data within each WO. MES/ERP/Cloud is responsible to host the recipe database and send related recipe data within the WO.

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Building the project

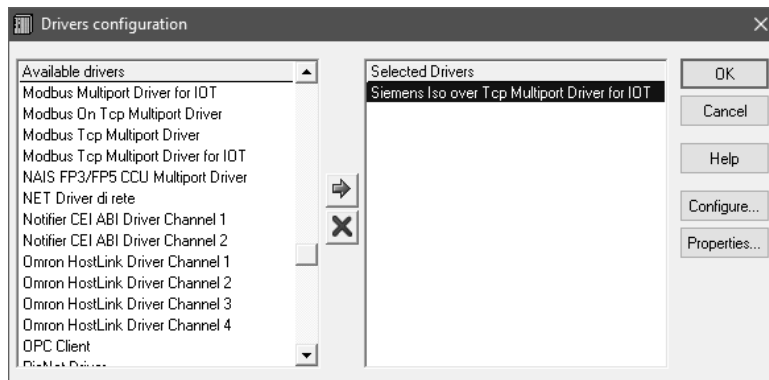
So, let us building the real project in three simple steps!

- **Step 1:** Configure the communication driver
- **Step 2:** Configure the connector
- **Step 3:** Configure items (tags)

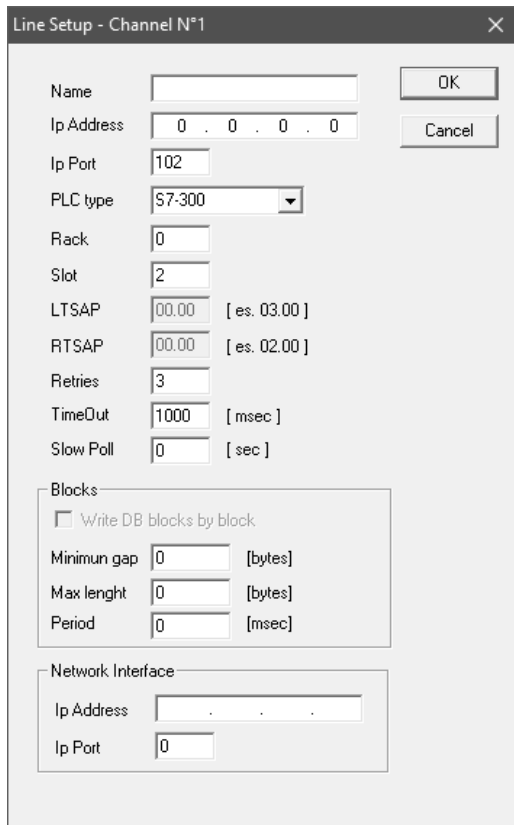
This project shows a two-way data exchange between a plc and an MQTT broker.

Step 1: Configure communication drivers

1. Choose the driver for your plc (go to xEditor: Configure/Drivers...)



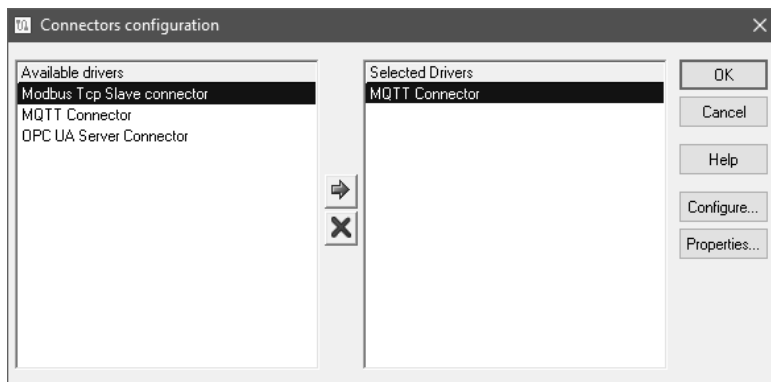
2. Start the configurator (press the *Configure...* button then choose *Configure/Channel*) and configure communication parameters



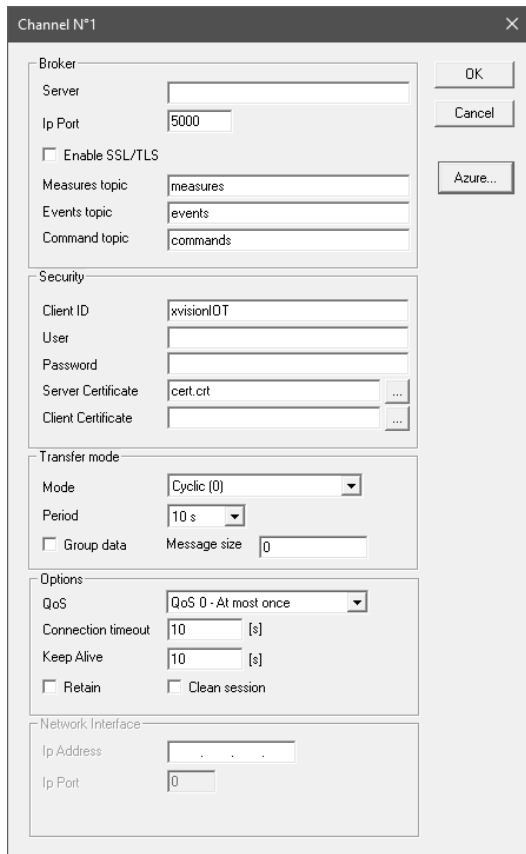
Step 2: Configure connector

This guide shows how to connect to a MQTT broker, but you can also select a different connector of your choice and act the same way.

1. Choose the connector to management system (go to xEditor: Configure/Connectors...)



3. Start the Connector configurator (press the *Configure...* button then choose *Configure/Channel*) and configure communication parameters.



Step 3: Configure items

You have to define the following Rtdb items (tags):

Work Order (host to plc)

Item Name	Item Type	Note
WO_ID	TX	Work Order ID
WO_RECIPE_ID	AO	Recipe ID
WO_QUANTITY	AO	Number of pieces to be produced
WO_TRIGGER	DO	Trigger: set to one after setting all other WO data

Back warded data (plc to host)

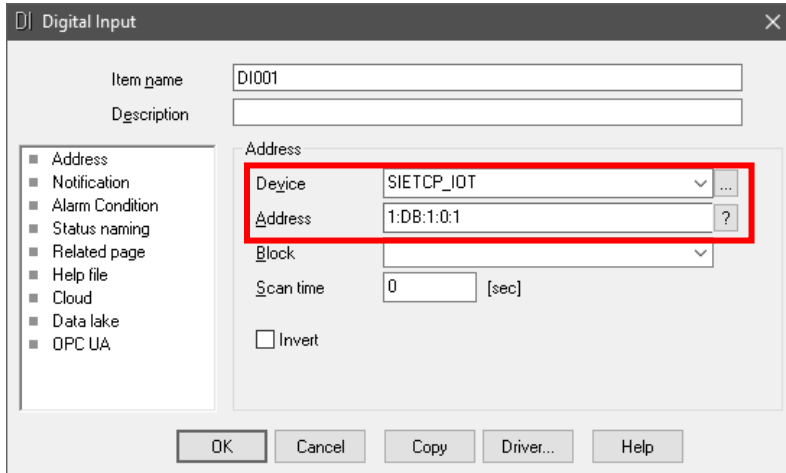
Item Name	Item Type	Note
PD_ID	TX	Work Order ID
PD_ON_PRODUCTION	DI	Machine working on production
PD_ALARM	DI	Machine temporarily halted by an alarm or by operator
PD_GOOD_ITEMS_CTR	AI	Counter of good items produced
PD_SCRAP_ITEMS_CTR	AI	Counter of scrap items produced

You have to repeat the following configuration for each of the above items.

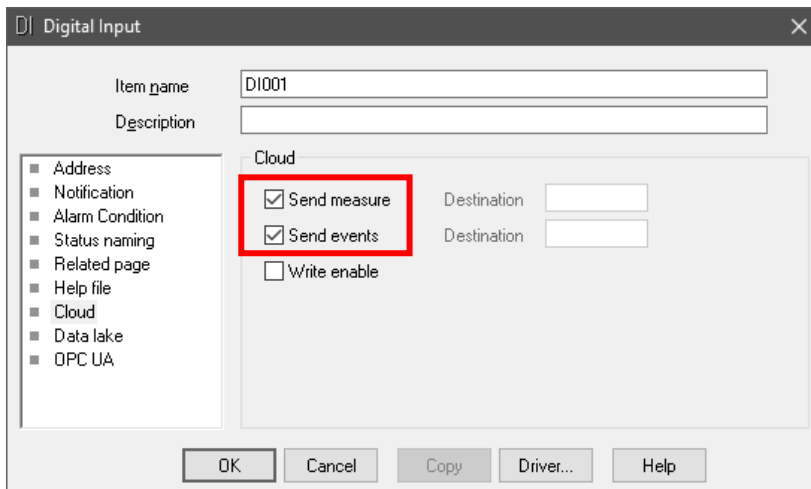
Configure an item for plc to MES data exchange

The Rtdb item (tag) acquires data from the plc and send it to the management system. This configuration applies to TX, DI and AI item types.

- a. Define the source data address. Set *Device* and *Address* in order to link plc data to RTDB item



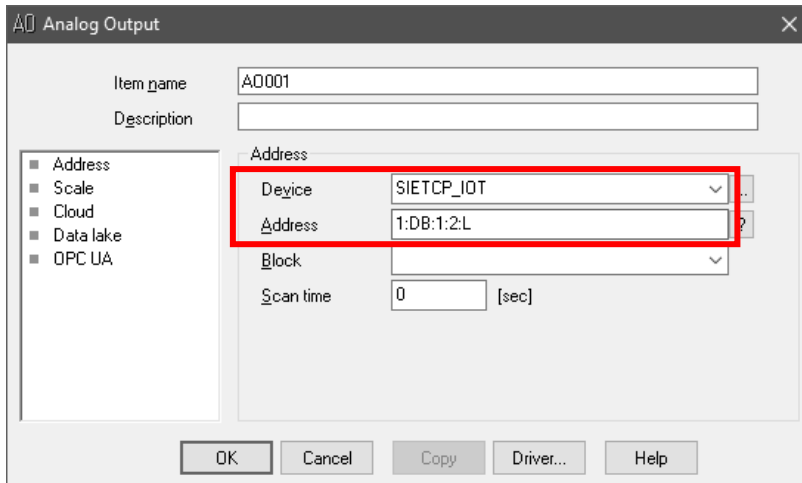
- b. Let source data be routed to MES. Set the Cloud properties in order to *Send measure* and *events* (when the signal changes)



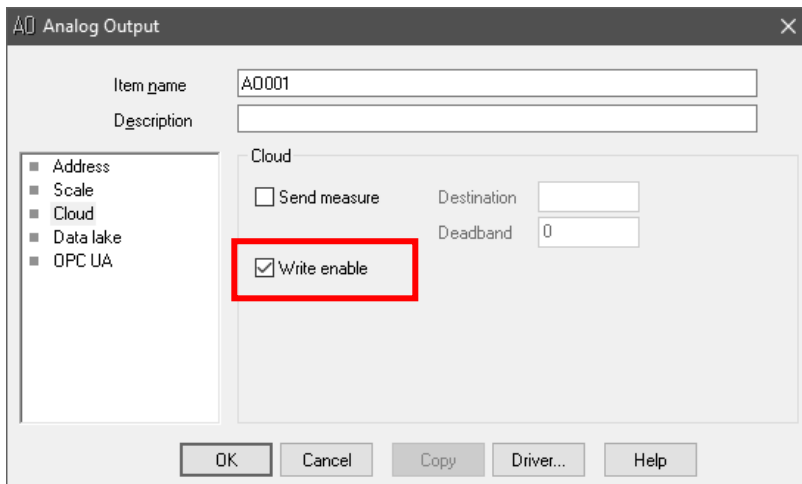
Configure an item for MES to Plc data exchange

The host writes the item and the set value is transferred to the plc. This configuration applies to TX, DO and AO item types.

- a. Define where the received data is routed. Set *Device* and *Address* in order to link plc data with RTDB item



- b. Let the item be writable by MES: set the Write enable property to receive data from MES



List of abbreviations

ERP	Electronic Resources Planning
MES	Manufacturing Execution System
MQTT	MQ Telemetry Transport or Message Queue Telemetry Transport
OP	Operator Panel
PLC	Programmable Logic Controller
PD	Production Data
RTDB	Real Time Database
WO	Work order

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