



Virtualization of a robot cell with a real controller – module basic setup guide

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Contents

Virtualization of a robot cell with a real controller – module basic setup guide	2
Pre-requisites.....	3
Overview of the module features	4
Pre-installation tasks	5
Installation procedure	5
Configuration.....	5
Maintenance, error messages and troubleshooting.....	6

Pre-requisites

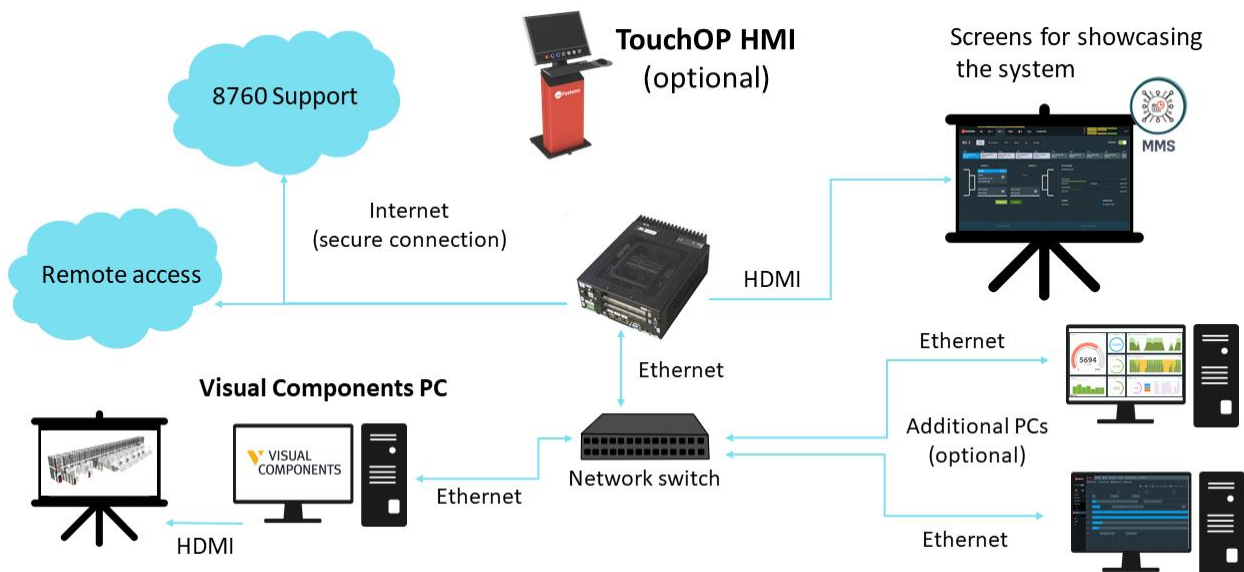


Figure 1 Overview of the system configuration

As Fastems will handle the configuration, installation & commissioning of the system the user doesn't require any specific knowledge about these topics. This basic guide aims to help the user to prepare for the installation of the system and also helps the user to make minor configuration changes if they are necessary later. Fastems will provide additional training during the commissioning phase.

Software:

- Windows 10
- Fastems MMS 7 control software (or later)
- Visual Components 4.2 or later & the model file of the Fastems robot cell
- Python 2.7 & WebSocket-library (provided by Fastems)

Hardware:

- PC capable of running Visual Components:
- Fastems TouchOP HMI
- Additional screens (seen in the picture)
- Internet connectivity

Minimum specifications

CPU	equivalent to Intel i5-3xxx processor
RAM	of 8GB
HDD	with 3GB of available space
Graphics card similar to	Intel HD Graphics 4400 (integrated)
Graphics display resolution	of at least 1280 x 1024
Mouse	with three buttons (left, middle, right)
64-bit operating system	of Windows 8.1 or Windows 10

Figure 2 Minimum requirements for Visual Components

Connection:

- Network switch & at least two Ethernet-cables

Overview of the module features

This module enables the control of simulated manufacturing hardware using a real controller. The simulated hardware is represented in a real-time 3D-environment which can be used for demonstrating actual system functionality, training employees, virtual commissioning and testing production operations for new parts. These activities can be done before the system even exists or after commissioning, when they can be done without disturbing the ongoing production. This way changes can be made and tested without losing valuable production time. It also means that the layout design can be iterated multiple times before committing to the final one. Since the control software used is identical to the real-world control software all master data created with the virtual system can be transferred to the real one which speeds up the ramp-up phase of the system.

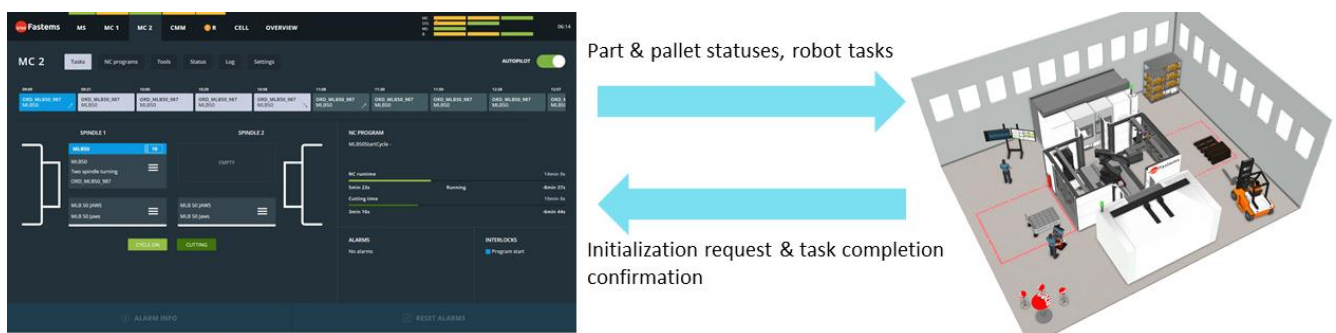


Figure 3 Communication between the virtual model and the control software

The key element with this module is that the control software thinks that it is controlling a physical system. This way the behavior of the system stays identical between the physical and virtual counterparts. It also means that all of the skills learned with one version will directly translate to the other one. The main goal of this module is to simulate production on a flow/process level and it is not interested in what actually happens inside the machines. This is due to the fact that these devices aren't provided by Fastems and therefore simulating the actual machining operations isn't currently feasible.

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Pre-installation tasks

Acquire licenses for Visual Components and Fastems' MMS.

Prepare the PC by installing Windows 10, Visual Components 4.2 or later, Python 2.7 and ensure Internet-access for license validation purposes.

Installation procedure

The installation and configuration process for MMS 7 control software is handled by Fastems.

The preparation and modeling for the Visual Components robot system model is done by Fastems.

Configuration

This section assumes that the virtual cell model is already setup and configured by Fastems. You can open the virtual model by double clicking the delivered VCMX-file or by opening Visual Components and selecting "File" -> "Open" -> "Computer" and opening the delivered VCMX-file. While the model is loading make sure that you are connected to the MMS via Ethernet or if you are using a cloud-based MMS make sure that your Internet-connection is working properly. **Before connecting the model to the MMS it is recommended to have the robot Autopilot OFF. It is also recommended to always keep the robot Autopilot OFF while the model is not connected. Check that the model isn't in Offline mode (described below)**

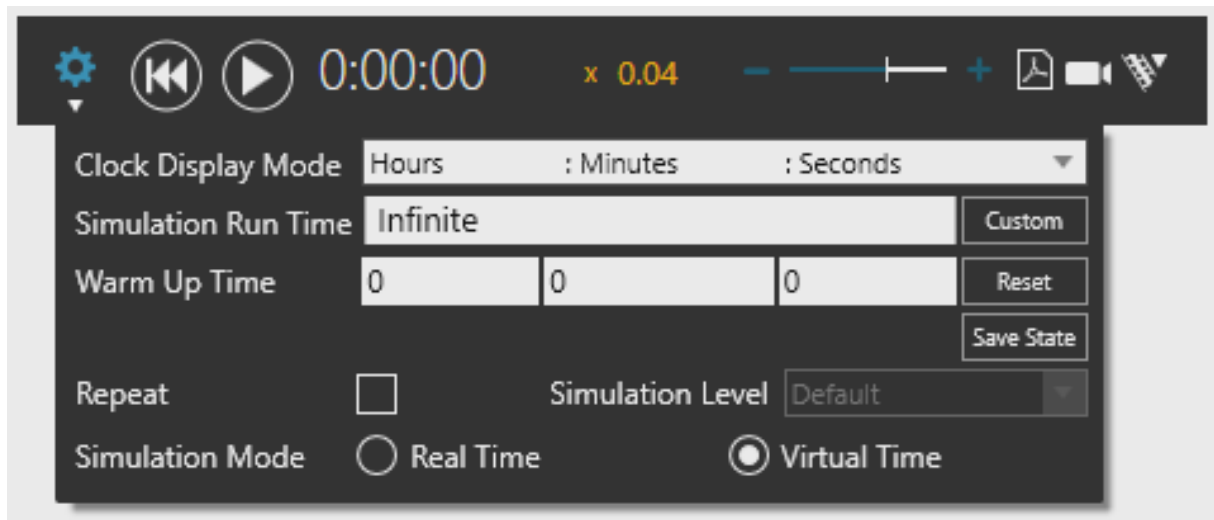


Figure 4 Visual Components settings and control bar

1. The model can be connected to the MMS by clicking on the Play-button

If you don't see the yellow "x 0.04" and instead see a blue "x 1.00" click on the Settings-icon and select "Virtual time" as the Simulation mode

2. You will know that the connection succeeded if the model initializes the correct resources into the 3D-world. If the model fails to connect to the MMS server, you can retry by first pressing the Reset-button (left button) and then the Play-button again.

3. Once the connection is successful you can turn the robot Autopilot ON and the production can start.

4. When you wish to stop the virtual model it is recommended to first turn all devices of (Autopilot OFF) and then wait until the robot stops moving. At this point you can press the Reset-button which disconnects the model.

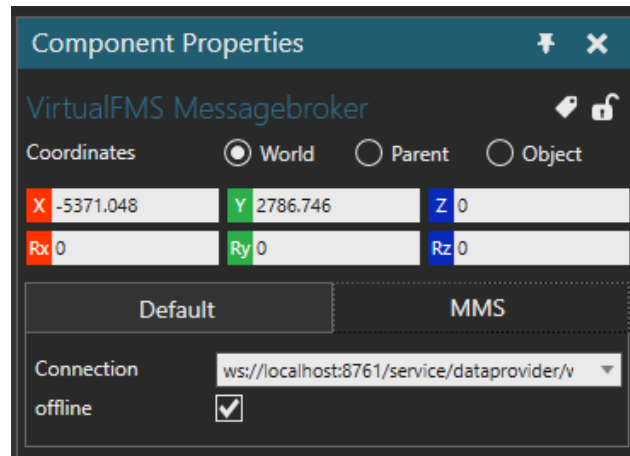


Figure 5 MessageBroker-object and settings

The model can also be set to an Offline mode where it doesn't attempt to connect to the MMS. This mode can be enabled/disabled from the MessageBroker-object (shown below).

From the MMS-tab you can enable/disable the Offline-mode and change the connection-address. It is not recommended to change the connection address after initial setup is done by Fastems.

Maintenance, error messages and troubleshooting

If the model fails to connect to the MMS server (you cannot see the resources appearing), you can retry by first pressing the Reset-button (left button) and then the Play-button again.

In case of any problem or question please contact
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Thank you