



**COPADATA**  
do it your way

# zenon manual

## Project simulation

v.7.20





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# Contents

<b>1. Welcome to COPA-DATA help .....</b>	<b>4</b>
<b>2. Project simulation .....</b>	<b>4</b>
<b>3. General .....</b>	<b>5</b>
3.1 Switching to simulation mode .....	6
3.2 Switching in hardware mode .....	6
3.3 Create simulation image .....	7
3.4 Activate/deactivate project simulation function .....	8
3.4.1 Initialize with process image .....	10
3.4.2 Initialize with process image and Runtime files (without archive files) .....	11
3.4.3 Initialize with process image and Runtime files (with archive files) .....	11
3.4.4 Initialize with existing simulation image .....	12
3.4.5 Activate process connection .....	12
3.4.6 Activate process connection and transfer simulation image to the server .....	13
3.4.7 Create simulation image (RT in simulation mode) Transfer simulation image to server (RT in hardware mode) .....	13
<b>4. System driver variable - Runtime status (simulation) .....</b>	<b>14</b>
<b>5. Scripts .....</b>	<b>14</b>
<b>6. Features specific to simulation mode .....</b>	<b>15</b>
<b>7. Online language translation .....</b>	<b>15</b>
<b>8. Simulation image.....</b>	<b>16</b>
<b>9. Files in the simulation image.....</b>	<b>16</b>
<b>10. Runtime Command Line parameters .....</b>	<b>17</b>
<b>11. Limitations .....</b>	<b>19</b>

# 1. Welcome to COPA-DATA help

## GENERAL HELP

If you cannot find any information you require in this help chapter or can think of anything that you would like added, please send an email to [documentation@copadata.com](mailto:documentation@copadata.com) (<mailto:documentation@copadata.com>).

## PROJECT SUPPORT

You can receive support for any real project you may have from our Support Team, who you can contact via email at [support@copadata.com](mailto:support@copadata.com) (<mailto:support@copadata.com>).

## LICENSES AND MODULES

If you find that you need other modules or licenses, our staff will be happy to help you. Email [sales@copadata.com](mailto:sales@copadata.com) (<mailto:sales@copadata.com>).

# 2. Project simulation

With the help of the project simulation, you have the possibility of switching between simulation mode and hardware mode. You can simulate processes for test purposes in simulation mode. In this mode, switching actions are executed, recipes are sent, set values are defined etc. without these operations actually being sent to the process (such as to a PLC for example).



### License information

*Must be licensed for Editor and Runtime (single-user, Server, Standby and Client).*

*All projects must have a license. For single-user projects a license for the client is needed. With server projects, the license must be present on the Server/Standby or locally.*

*If the licensing is changed at the server, the clients must be restarted for the license to be applied.*

## SIMULATION OPERATION

In simulation mode:

- ▶ all drivers are started in mode `Driver simulation programmed`
- ▶ no data is saved externally
  - SQL evacuation is not executed
  - Entries for IPA database are not created
  - existing IPA entries cannot be deleted, edited or commented
- ▶ PFS shift data are not saved in the database  
(After starting the Runtime in hardware mode the saving is done.)



### Information

Project simulation is not available for clients at the terminal server.

## 3. General

You can only switch to the project simulation if all projects in Runtime are either single user or client projects. The simulation mode "separates" the computer and Runtime from the network. Furthermore all drivers are started in mode `Driver simulation programmed`. After this, no more drivers are connected to a process.

After switching to simulation mode, Runtime is restarted and acts as though all projects were configured as a single user project.

### 3.1 Switching to simulation mode

The following steps are carried out if you switch to simulation mode:

1. Call up the function to switch to simulation mode.
2. A check is made to ensure that all projects in simulation mode may be switched or are already in simulation mode.
3. The steps from create simulation mode (on page 7) are carried out.
4. For each project, an entry in the respective chronological event list is created, which notes the switch to simulation mode.
5. Runtime ends and starts the zenProcess with additional parametering.
6. zenProcess waits until Runtime has ended and then starts in simulation mode.
7. Runtime recognizes the command line parameter and starts all projects as single user projects.
8. The directory for Runtime data is now the simulation directory. The directory of Runtime data for hardware mode is not changed.
9. The projects are started. The drivers are programmed in driver simulation mode and are loaded with the simulation image from the simulation directory. Local variables obtain their value from the local image. The variable image is applied on the programmed simulation. If in the programmed driver simulation the variable is changed at once in the first cycle of a program, in the zenon Runtime the variable does not have its original value as in the Runtime in hardware mode as first value but the value which was changed in the simulation.
10. The image for the internal drivers is loaded.
11. For each project, an entry in the respective chronological event list is created, which notes the switch to simulation mode.
12. The system driver variable obtains the value for the simulation mode.

These points are executed for all projects in Runtime unless you have explicitly stated otherwise.

### 3.2 Switching in hardware mode

The hardware mode is available each time Runtime is started, even if hardware mode was not switched into in simulation mode. The following steps are carried out:

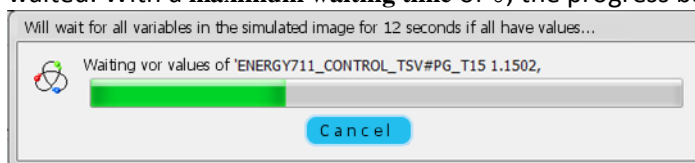
1. Call up the function to switch to hardware mode.
2. The driver image (process driver and internal driver) and the image of zenon Logic simulation are saved.
3. Runtime ends and starts the zenProcess with additional parametering.

4. zenProcess waits until Runtime has ended and then starts with the start parameters for process connection.
5. Runtime starts and load the projects and Runtime data - from the server if necessary.
6. The drivers are initialized with the data from the local variables before simulation.
7. If necessary, the simulation image is transferred to the server. You can activate this with appropriate command line parametering.

### 3.3 Create simulation image

All files and variables that can be changed by Runtime are combined in the simulation image. If you wish to create a simulation image, the following steps are carried out:

1. All data points from all projects are requested in order to supply them with current data.
2. Data that is not required is deleted in the simulation image, according to the mode selected (Exception: **Initialize with existing simulation image**):
  - a) **Initialize with process image and Runtime data (without archive data)**: The local simulation project is completely deleted.
  - b) **Initialize with process image and Runtime data (with archive data)**: All archive files (\*.ARX und \*.ARS) are deleted in the local simulation directory.
3. Depending on the settings you have made for the **Switch on/off simulation** function, the corresponding project data, Runtime data and variable data is obtained from all projects. For AML, CEL and HDD, the current status is saved locally for a single user project and on the server for a server project (Exception: **Initialize with existing simulation image**).
4. The project files that can be changed in Runtime (for example, data for PFS, users etc.) will be copied to the corresponding file in the project directory (exception: **Initialize with existing simulation image**).
5. It waits until all data points have received a value. The progress bar displays the names of the data points. The display is limited to 60 characters and displays the attendant value. The waiting time is not limited.  
Hint: If, in the Activate/deactivate project simulation (on page 8) function, the option **Wait for all variables** is deactivated, only the time that is configured in the **Maximum waiting time** property is waited. With a **maximum waiting time** of 0, the progress bar is not displayed.



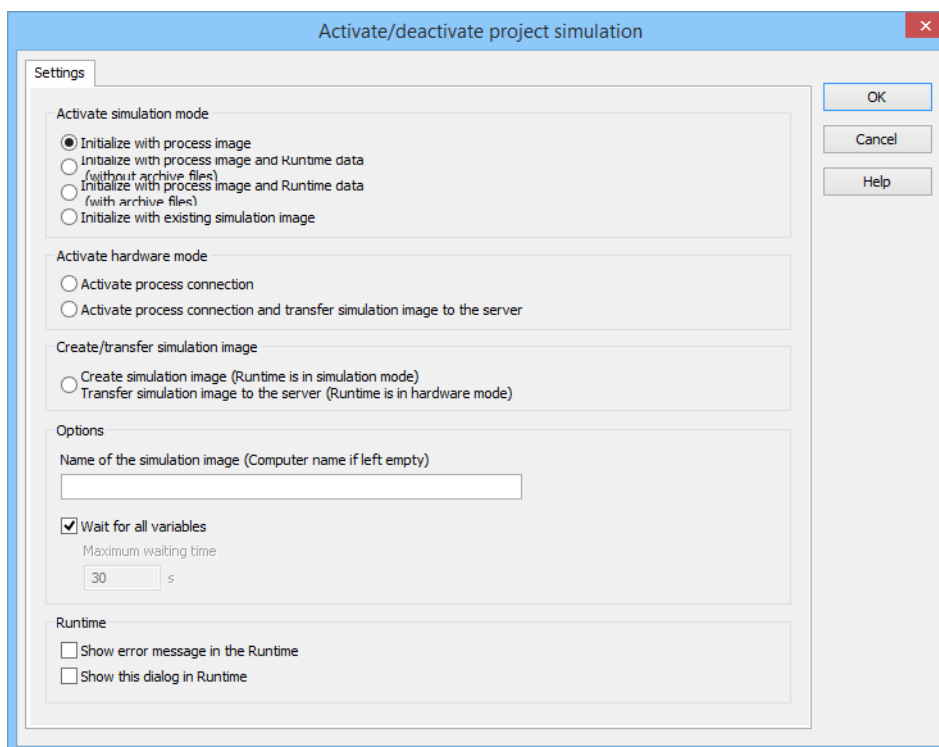
6. A variable image of all drivers is created and the internal drivers save their data. These images are copied in the computer directory. If you create the image in the simulation, it also contains the image of the driver simulation programmed.

7. New transfer of files changed as in point 3 to point 6.
8. The variable image is compared to the local simulation directory.
9. This is because the variable image for local variables is saved except if an image is created in the simulation.

These points are executed for all projects in Runtime unless you have explicitly stated otherwise.

### 3.4 Activate/deactivate project simulation function

You switch between simulation mode and hardware mode using the **Switch on/off simulation** function.



The two modes can be started under different prerequisites. These are explained in the following chapters:

- ▶ Simulation mode active:
  - Initialize with process image (on page 10)
  - Initialize with process image and Runtime files (without archive files) (on page 11)
  - Initialize with process image and Runtime files (with archive files) (on page 11)
  - Initialize with existing simulation image (on page 12)
- ▶ Hardware mode active:



- Activate process connection (on page 12)
- Activate process connection and transfer simulation image to the server (on page 13)
- ▶ Create/transfer simulation image
  - Create simulation image (RT in simulation mode) Transfer simulation image to server (RT in hardware mode) (on page 13)

Furthermore, the following general options are available:

Parameters	Description
<b>Name of simulation image (computer name if empty)</b>	<p>Enter the name of the simulation image here.</p> <p>Note: Only the name of the directory is saved.</p> <p>If you do not explicitly give a name, the name of the computer is used.</p>
<b>Wait for all variables</b>	<p>Deactivate this checkbox if you then also want to switch to simulation mode, if not all variables have a value or are invalid (not recommended!)</p> <p>Not active if <b>Activate process connection</b> is active (activate hardware mode)</p> <p>Default: active</p>
<b>Maximum waiting time [s]</b>	<p>Enter the time that is waited when switching to valid values of the variables.</p> <p>As a result of this, switching to simulation mode is then also possible if not all variables have a value or are invalid.</p> <p>If this timeout is activated, the waiting time is displayed in Runtime in the title of the status dialog. The status display shows the progress of time. Missing variables are always shown. If the time has expired, the simulation is switched to despite missing variables.</p> <p>If a maximum <b>maximum waiting time</b> of 0 seconds is set, the progress dialog is not displayed.</p> <p>Default: 30 seconds Input range: 0 - 3600</p> <p>Note: only active if <b>Wait for all variables</b> is not active.</p>
<b>Show error message in the Runtime</b>	<p>Activate this checkbox if you wish to receive an error message in Runtime if the functions was not executed correctly.</p>
<b>Show this dialog in the Runtime</b>	<p>Activate this checkbox if you you would also like to have this dialog displayed during Runtime.</p> <p>Note: settings for mode selection are locked in Runtime. If you have selected <b>Activate process connection</b>, entering a name for the process screen is also locked.</p>



### Information

*If a project in Runtime is, currently in the process of reloading or is to be reloaded or a dialog is opened in VBA for example, the **Switch on/off simulation** function is not executed immediately. The function is carried out immediately as soon as there is no further reason for delay.*

*If the mode is not **Activate process connection** and the checkbox "**Wait for all variables**" has not been activated, the parameter text is supplemented with `{wait time xxx seconds}`.*

## DIAGNOSIS VIEWER

If there are still variable(s) without value(s) after the timeout, a LOG entry for each connection is created for the Diagnosis Viewer. "simulation image has variables with missing values!" is written in the general text, followed by a list of all variables without a valid value.

### NOTE ON COMPATIBILITY:

The complete functionality of **Wait for variables** was brought in after zenon 7.10 and 7.00. The creation of Runtime files for earlier versions is also possible. However in earlier versions, the new function of **Wait for variables** is not available.

### 3.4.1 Initialize with process image

Here, an image of local variables is created and the project data that can be modified in Runtime is saved. After this, Runtime is restarted in simulation mode.

Is only executed if the project is not already in simulation mode.



### Information

*All existing data in the image is deleted. Only the current variable values are obtained for initialization.*

### 3.4.2 Initialize with process image and Runtime files (without archive files)

Here, an image of all local variables and all files from the computer folder (Exception: archive data) is created and the project data modified in Runtime is saved. After this, Runtime is restarted in simulation mode.



#### Information

*All existing data in the image is deleted. Only the current variable values are obtained for initialization*



#### Information

*Ensure that all historical alarms and CEL files are copied. This procedure can take some time depending on the extent of the files involved.*

### 3.4.3 Initialize with process image and Runtime files (with archive files)

Here, an image of all local variables and all files from the computer directory are created - any archive data that may be present locally in the image is not deleted - and project data modified in Runtime is saved. After this, Runtime is restarted in simulation mode.



#### Info

*All existing data in the image is deleted. Only the current variable values are obtained for initialization*



#### Info

*Ensure that all historical alarms, CEL files and archive data are copied. This procedure can take some time depending on the extent of the files involved.*



### Information

*Here, the archive is kept. Archiving starts filling the missing archives when Runtime is first started if you have configured it to do so. This procedure can take some time depending on the size of the files involved.*

## 3.4.4 Initialize with existing simulation image

Here, an existing simulation image is transferred from the server to the client. No transfer takes place for a single user project. The respective status of local variables is saved and Runtime is restarted on the basis of the simulation image. Runtime is also restarted if it is already in simulation mode. If this was the case, no driver image is saved for the local variables to start in hardware mode.



### Information

*As a result of the possibility to create a simulation image (with the help of create simulation image), you can always start a simulation from precisely the same place and under the same prerequisites. Not only are the variables saved in the screen, but the respective status of the driver simulation is also programmed. Because the server image (if present) is transferred, you also have the possibility of having several clients with the same screen. When Runtime is started, the image from the server is copied across. In doing so, only the changes are transferred.*

## 3.4.5 Activate process connection

Here, you switch from simulation mode to hardware mode. The image of local variables is used for this.

When ending the simulation mode, the simulation mode is saved, so that the last status of the simulation mode can be recreated if necessary. If there is a connection to the server, the simulation image is transferred to the server and saved there.



### Attention

*If the same simulation image is transferred from several clients at the same time, it cannot be guaranteed that the simulation image copied is functional.*

### 3.4.6 Activate process connection and transfer simulation image to the server

With the help of the project simulation, you have the possibility of switching between simulation mode and hardware mode. You can simulate processes for test purposes in simulation mode. In this mode, switching actions are executed, recipes are sent, set values are defined etc. without these operations actually being sent to the process (such as to a PLC for example).



#### License information

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## SIMULATION OPERATION

In simulation mode:

- ▶ all drivers are started in mode **Driver simulation programmed**
- ▶ no data is saved externally
  - SQL evacuation is not executed
  - Entries for IPA database are not created
  - existing IPA entries cannot be deleted, edited or commented
- ▶ PFS shift data are not saved in the database  
(After starting the Runtime in hardware mode the saving is done.)



#### Information

Project simulation is not available for clients at the terminal server.

In addition, the simulation image is transferred to the server and is therefore also available to other clients.

### 3.4.7 Create simulation image (RT in simulation mode) Transfer simulation image to server (RT in hardware mode)

Here you create a simulation image and save it locally under the given name if you are in simulation mode.

The simulation image is transferred to the server in hardware mode if present and saved there under the given name.



### Information

*Here you can create an image of the current statuses and save these. You can then continue at this point with exactly the same requirements.*

## 4. System driver variable - Runtime status (simulation)

The Runtime status (simulation) system driver variable indicates the status that Runtime is currently in. You can find the variables under the `system info` topic. The following statuses are present:

Status	Description
0	Process connection - Runtime is in hardware mode.
1	Switch to process connection in simulation
2	Change to simulation with process connection
3	In simulation - Runtime is in simulation mode

## 5. Scripts

The following scripts are available for simulation mode; they are executed automatically:

Script	Description
AUTOSTART_SIMUL	If Runtime is started in simulation mode, the script with the name <b>AUTOSTART_SIMUL</b> is executed automatically if it is available.
AUTOEND_SIMUL	If Runtime is ended in simulation mode, the script with the name <b>AUTOEND_SIMUL</b> is executed automatically if it is available.

## 6. Features specific to simulation mode

The differences between hardware mode and simulation mode are as follows:

- ▶ The backup directory is not used
- ▶ Archives are not evacuated
- ▶ Archives are only stored in zenon format
- ▶ The `Export archive function` cannot be executed
- ▶ SQL data evacuation is deactivated for various modules
- ▶ Message Control is deactivated
- ▶ zenon Logic Runtimes are not started
- ▶ No data is exchanged with zenon Logic Runtime by means of zenon drivers
- ▶ No simulation at the zenon web client and under Windows CE.
- ▶ Variables from SB remain without value
- ▶ The driver is not switched between hardware and simulation
- ▶ A script may not be executed fully if a function that requires the Runtime to be restarted is executed in the script.
- ▶ The simulation program which is contained in the driver simulation programmed is also used for the project simulation.
- ▶ In the simulation mode function `Save remanent data` does not save values for the following drivers:
  - internal driver
  - mathematics driver
  - system driver

## 7. Online language translation

Define the texts for language translation for all projects in the start project. You define the function in the start project in the same way. This ensures that you have online text in the correct project. Any possible error messages are also entered into the corresponding project.

## 8. Simulation image

to ensure that these are recreated, the values of the driver variables must be saved in the following files:

File name	Description
Drv'Treiber-ID'.sim	In this file, all values of a data point are saved in the respective driver. The files are necessary to recreate all current values in the simulation after Runtime is restarted. If the files were created during simulation mode, an image of the programmable simulation is also contained.
Drv'Treiber-ID'.sim	In this file, the values of the local variables are saved for the respective drivers. If Runtime starts with process coupling and these files were found, the local variables obtain the values from the files. The files are deleted after this. This also happens if Runtime is started manually.
Drv'Treiber-ID'.Issim	saves an image of the local variables that is incorporated into the simulation image.

## 9. Files in the simulation image

If an process image is created for the simulation, files and directories are transferred to the image from various sources. During active simulation, this data is then accessed and no longer on the originals, such as those that are on the computer directory for instance.

The following files are copied to the process image's system directory from the project's system directory:

- ▶ project.mdb
- ▶ rezepturen.cmp
- ▶ rezepturenrt.cmp
- ▶ fpm.cmp
- ▶ password.cmp
- ▶ passwordrt.cmp

and the following directories:

- ▶ system\rgm\_fb
- ▶ system\rt\_profiles
- ▶ system\reports



All files up to those with the ending \*.lsim are taken from the computer directory. For the `simulation without image` mode, the files \*.sim, internvar.bin, sy\_ma32.bin and uservar.bin are transferred. For the simulation without archive mode, all files up to those with the ending \*.arx and \*.ars are transferred.

## 10. Runtime Command Line parameters

Runtime recognizes whether it should be started in simulation mode or in hardware mode. If no parameter has been given, Runtime starts in hardware mode. These parameters can also be given for a manual start.

### COMMAND LINE PARAMETERS

#### ZENPROCESS

The `zenProcess.exe` application is used to restart zenon Runtime when switching between the two modes - `simulation mode` and `hardware mode`.

#### SYNTAX

`zenProcess.exe` is called up with the following syntax:

`zenprocess.exe parameter1 parameter2 parameter3`

- ▶ Parameter 1: **SIM** or empty:
- ▶ Parameter 2: **RESTART=**
- ▶ Parameter 3: **RTPAR=**

## PARAMETERS

Parameters	Description
<b>SIM</b>	<p>Display in dialog title.</p> <p>If this parameter is:</p> <ul style="list-style-type: none"> <li>▶ set: Dialog title shows "Switch in simulation mode".</li> <li>▶ not set: Dialog title shows "Switch in online mode".</li> </ul>
<b>RESTART=</b>	<p>Runtime restart. The path to <code>zenrt32.exe</code> must be provided.</p> <p><u>Procedure:</u></p> <p>The parameter only has an effect after restarting once Runtime has ended. Runtime itself is not ended by this parameter; to do this, a function must be called up in Runtime. There is a wait until all processes have been ended normally. The number and the names of a maximum of 5 ongoing processes, the end of which is being waited for, are displayed this long. Runtime is restarted after this.</p> <p><u>Example:</u> <b>RESTART="d:\zversionen\720_inst\zenrt32.exe"</b></p>
<b>RTPAR=</b>	<p>Restart in simulation mode or in hardware mode.</p> <ul style="list-style-type: none"> <li>▶ <b>SIMUL:</b> Runtime is started in simulation mode with the given image name. The computer name is used if no image name is given. Syntax: <b>SIMUL="name of the simulation image"</b></li> <li>▶ <b>REALMODE:</b> Runtime is started in hardware mode with the given image name. There is no transfer in no image name is given. Syntax: <b>REALMODE="Abbildname"</b></li> </ul> <p><u>Example:</u></p> <p><b>RTPAR="SIMUL=TEST.SIM"</b></p>
<b>CANCEL</b>	<p>You cancel the switching process with this parameter. Runtime is ended but not restarted.</p>

## EXAMPLE

Start Runtime in simulation modus with an existing image:

```
zenprocess.exe SIM RESTART="d:\zversionen\720_inst\zenrt32.exe"
RTPAR="SIMUL=TEST.SIM"
```

## 11. Limitations

The following restrictions are known:

- ▶ Module Batch Control is not supported in the simulation.