



zenon
by COPA-DATA

zenon manual

Installation and updates

v.8.10



COPA-DATA

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1 Welcome to COPA-DATA help

ZENON VIDEO-TUTORIALS

You can find practical examples for project configuration with zenon in our YouTube channel (https://www.copadata.com/tutorial_menu). The tutorials are grouped according to topics and give an initial insight into working with different zenon modules. All tutorials are available in English.

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.

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.

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.

2 Installation and updates

During the first installation of zenon, the installation routine automatically starts and leads you through the whole installation process. If the autostart from media feature has been deactivated, start the installation by executing **START.exe** in the root directory of your zenon installation medium.

Notes for the installation:

- ▶ Before installing zenon:
 - ▶ All current operating system updates must be installed
- Note:** If you always use the latest version (Service Pack) of your operating system, you not only avoid compatibility issues but also security problems.

- ▶ There must not be a restart pending
- ▶ With Windows 7 Embedded Standard, zenon is installed using the normal installation routine. You can find the hardware requirements in the Runtime under Windows Embedded Standard (on page 39) chapter.
- ▶ zenon for Windows CE is installed using the normal installation routine. Version 7.20 of the files for Windows CE are installed. You can find details in chapter Runtime for Windows CE (on page 45).
- ▶ During the installation of zenon, the **COPA-DATA Multiple Network Protocol Driver (cdprotdrv.sys)** is installed. To start the driver, the operating system must be restarted after installation.



Attention

From Version 7.10, zenon cannot be installed on systems on which the **Microsoft SQL Server Data Engine (MSDE)** is already installed. This affects all systems on which zenon 6.01 or 6.20 has been installed.



Information

If you receive an error message during installation stating that a service cannot be started, then:

- ▶ first reboot the computer
- ▶ then start the zenon setup again

3 zenon Standard installation

zenon will automatically start its installation routine and guide you through the whole installation process when the zenon installation medium is connected. Alternatively, it is possible to start the installation by executing **START.exe** in the root directory of your zenon installation medium.

Administrator rights are required for the installation process on the computer!

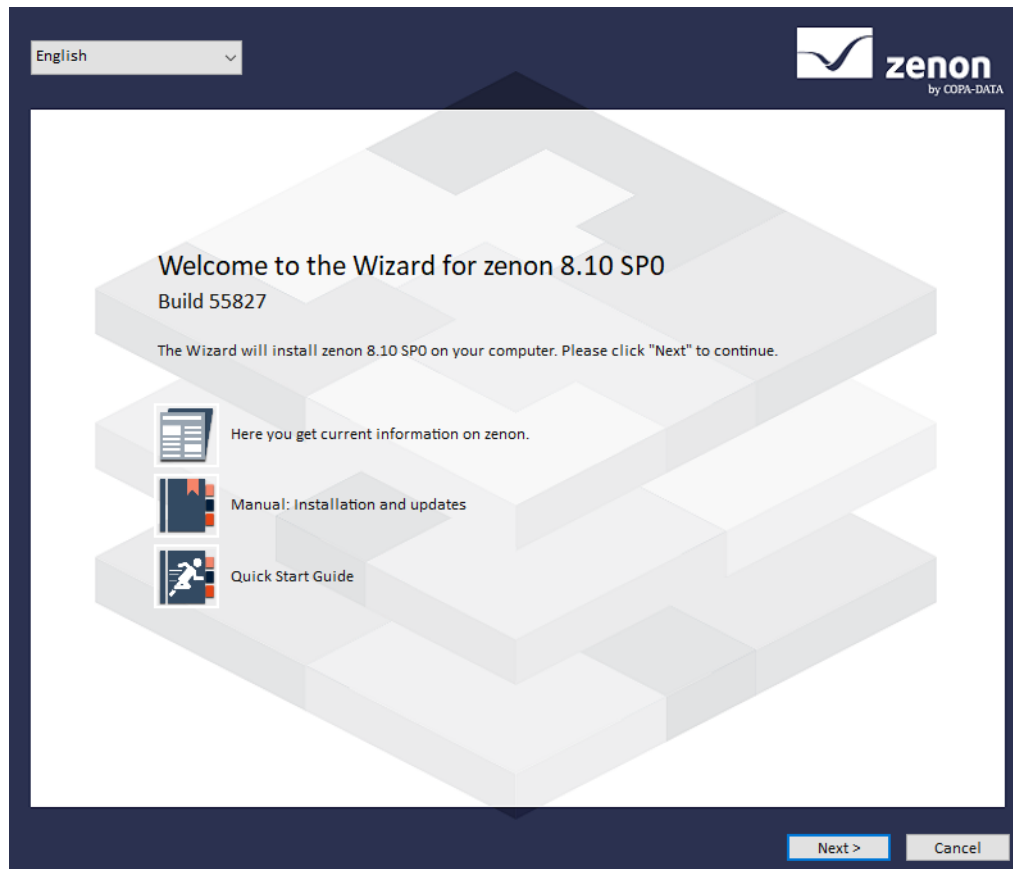


Attention

The computer is automatically restarted during installation if necessary. Close all other programs before installation.

3.1 Start screen

You can see the version to be installed including the build number on the start screen.



1. From the drop-down list at the top left, select the desired language for the installation. The following languages are available for the installation:

- ▶ German
- ▶ English
- ▶ French
- ▶ Italian
- ▶ Spanish

2. You can find information on zenon by clicking on the desired button:



Opens an animation with current information on the zenon version.



Opens the zenon help for installation as a PDF.



Opens the quick-start guide in PDF format with tips for the first project configuration steps in zenon.

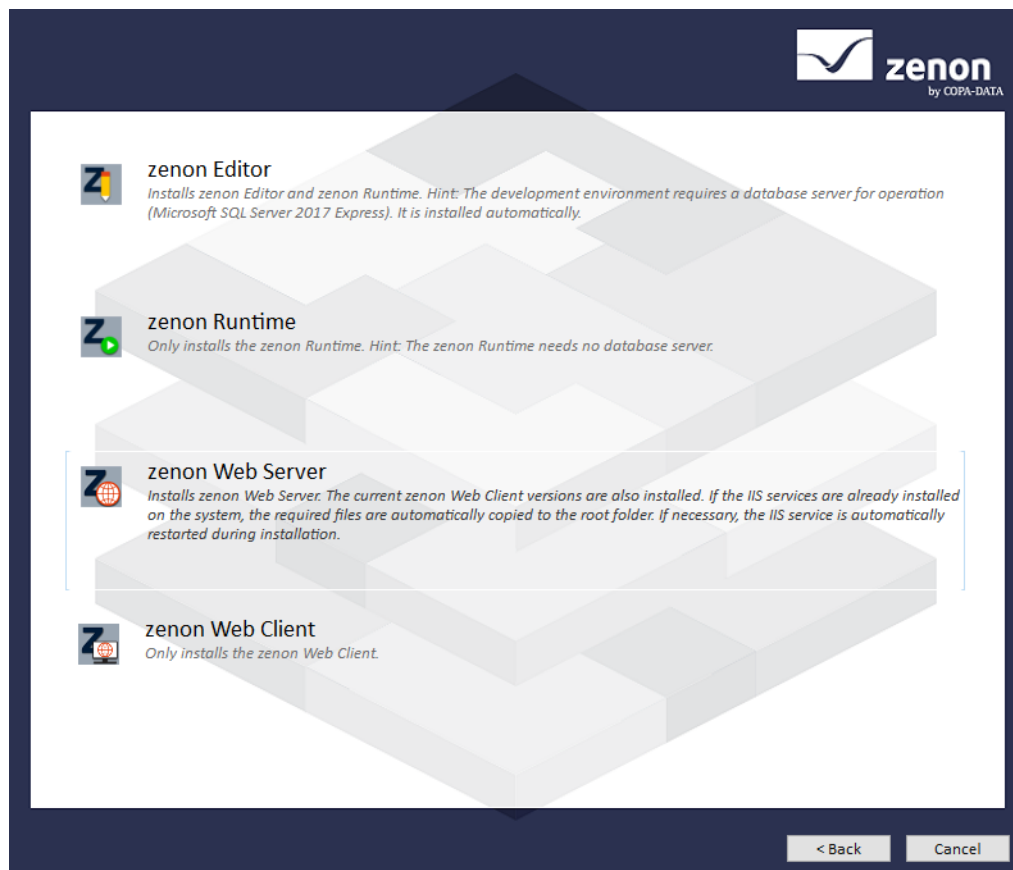
Attention: This page cannot be shown again later. If you need information on the current version or need the manual for installation, open it now.

3. Clicking on the **Next** button opens the window with the license conditions.
4. Confirm the license conditions by activating the corresponding checkbox.
You can also print the license conditions out by clicking on the **Print** button.
5. Clicking on the **Next** button opens the privacy policy.
Read the privacy policy carefully.
You can print out the privacy policy by clicking on the **Print** button.
6. Activate the checkbox for the privacy policy.
This will confirm you have read this.
7. Clicking on the **Next** button opens the window to select the desired product.

Note: The Next button is only available if you have agreed to the license agreement by clicking on the option field.

3.2 zenon Standard installation

Select the desired product. It is only possible to select products that have not already been installed. If you want to reinstall something, you must first uninstall it using the control panel.



- ▶ **zenon Editor:**
Installs the zenon Editor and zenon Runtime. Other components required for the Editor are also installed together automatically.
- ▶ **zenon Runtime:**
Installs the zenon Runtime only.
- ▶ **zenon Web Server:**
Installs zenon Web Server and the respective current zenon Web Clients.
- ▶ **zenon Web Client**
Installs the zenon Web Client only.



Information

The installation starts immediately when **zenon Web Server** or **zenon Web Client** is selected.

By selecting the **zenon Editor** or **zenon Runtime**, the dialog for selecting the Edition will open.

3.3 Selection of the edition - type of installation (user-defined installation)

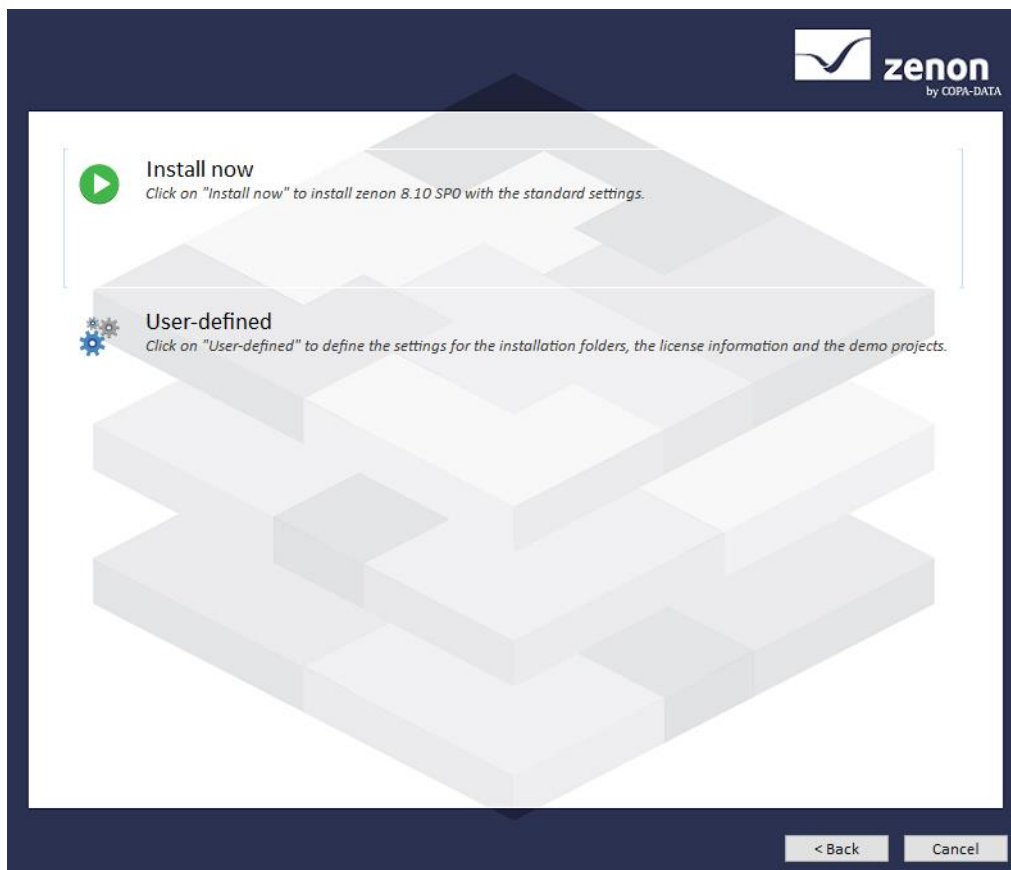
By clicking on the desired product, you open the window to select the edition.

1. Select the licensed version:

- ▶ zenon
- ▶ zenon Energy Edition

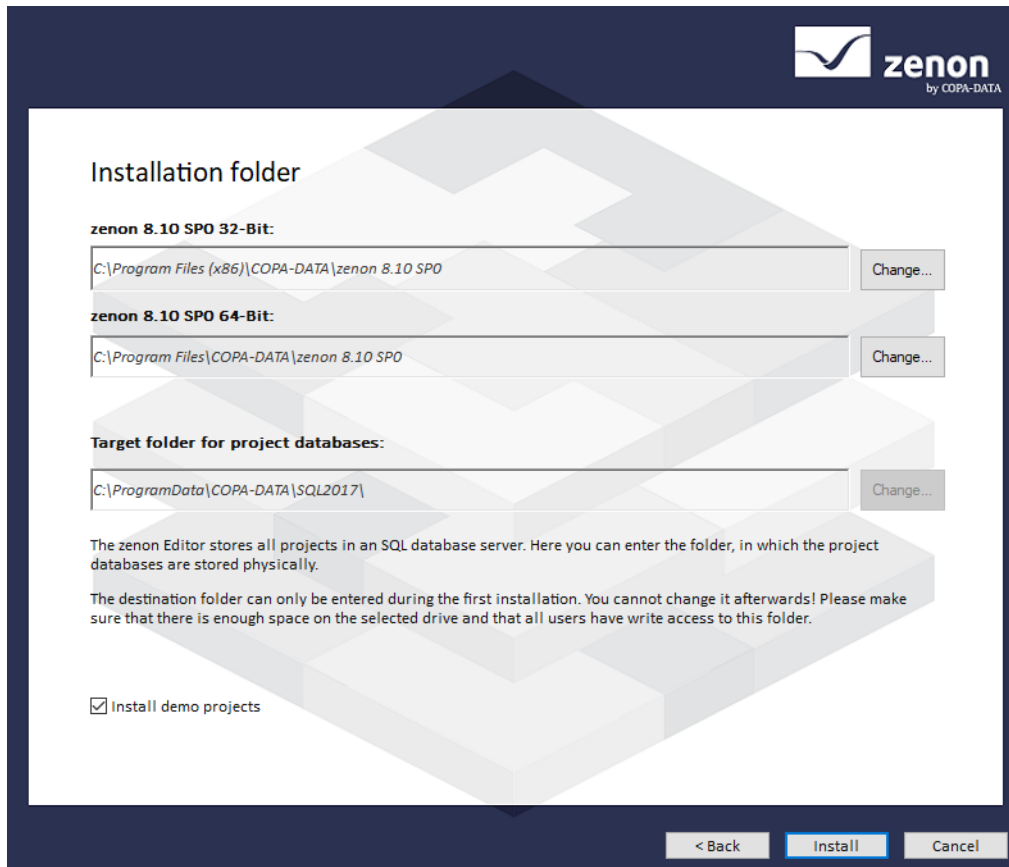


2. Click on the desired edition to open the window to select the type of installation:



- ▶ **Install now:**
Starts the installation of the selected edition.
The computer may be restarted automatically during installation. Follow the instructions of the wizard
- ▶ **User defined:**
Opens other windows for individual installation.
Here, you can change the installation path and decide whether you want to install demo projects.

- Clicking on the **Next** button opens the window to amend the installation folders.



Installation folder

zenon 8.10 SPO 32-Bit:
C:\Program Files (x86)\COPA-DATA\zenon 8.10 SPO Change...

zenon 8.10 SPO 64-Bit:
C:\Program Files\COPA-DATA\zenon 8.10 SPO Change...

Target folder for project databases:
C:\ProgramData\COPA-DATA\SQL2017\ Change...

The zenon Editor stores all projects in an SQL database server. Here you can enter the folder, in which the project databases are stored physically.

The destination folder can only be entered during the first installation. You cannot change it afterwards! Please make sure that there is enough space on the selected drive and that all users have write access to this folder.

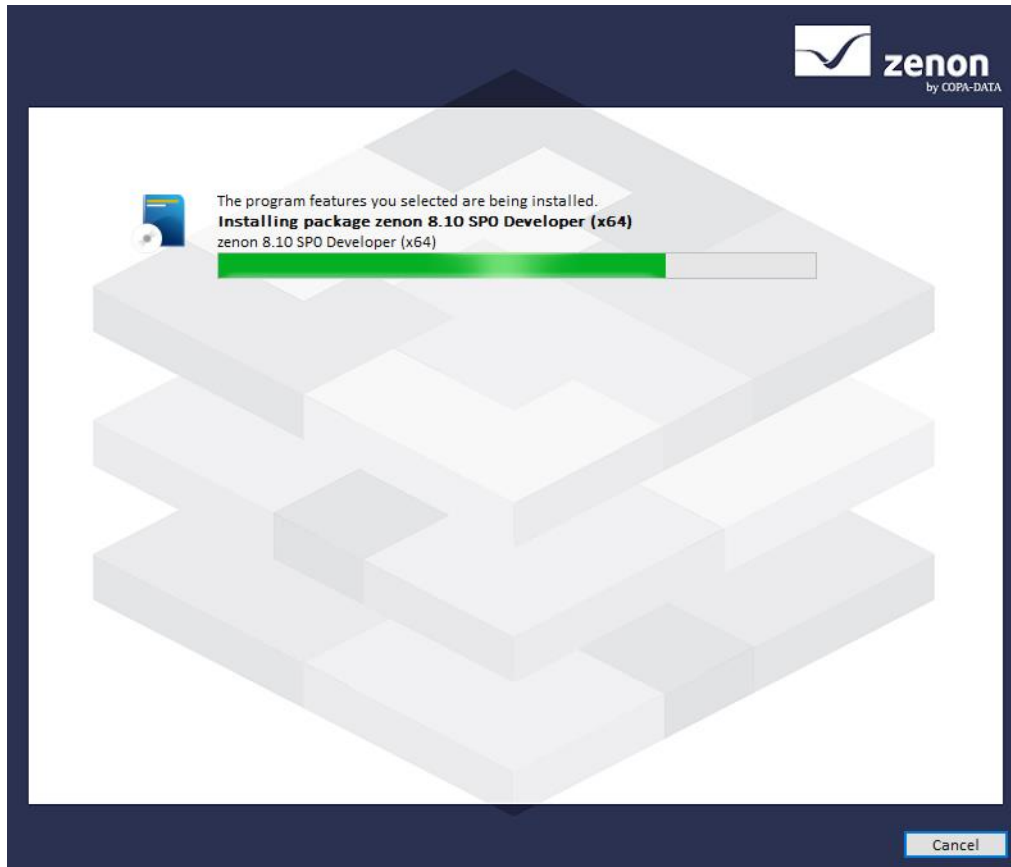
☒ Install demo projects

< Back Install Cancel

- ▶ If necessary, define your individual folder for the 32-bit version and the 64-bit version of the program.
To do this, click on the **Change...** button
 - ▶ Define the target folder for the project database.
Note: The save location selected here must have sufficient memory space. All users need write authorization.
 - ▶ If you would also like to install the demo project, activate the corresponding checkbox.
The demo project provides examples of possible usage scenarios in different industries.
- Click on the **Install** button.
Installation of the selected edition is started.
The computer may be restarted automatically during installation. Follow the instructions of the wizard

3.4 Installation and finishing

During installation you are informed about the installation progress and the current installation stage in the progress bar.



The installation process may take some time. Do not turn your computer off in this time. Please also ensure that your computer is not automatically put into sleep mode.

CANCEL INSTALLATION

You can terminate the installation by clicking on the **Cancel** button. Before canceling the installation there is a security query. Possible actions:

- ▶ **Yes:** The installation is canceled.
The dialog for an invalid installation is shown.
- ▶ **No:** The installation is continued.

INSTALLATION IS COMPLETED

The successful installation will be displayed via a dialog.

1. Click on the **Finish** button to complete installation.
2. Restart the setup to install further products, such as the **zenon Web Server**.

CANCELED OR INCORRECT INSTALLATION

If an error occurs during installation or the installation was canceled, this is shown in a dialog.

1. Click on the **Finish** button to exit setup.
2. Try the installation again.
One reason for a termination could be a pending installation of an update to the Windows operating system.

4 zenon Logic Runtime for Windows (standalone installation)

On the installation medium, in the directory *%AdditionalSoftware%\COPA-DATA zenon Logic Runtime* you will find the installation packages for a standalone installation for the **zenon Logic Runtime for Windows**.

CONTENTS OF THE ZENON LOGIC RUNTIME INSTALLATION PACKAGE

With the standalone setup for the **zenon Logic Runtime für Windows**, all components for operating the 61131-3 Runtime are installed on the target system. This includes among other things, components for licensing and diagnostics. No configuration components are installed.

INSTALLATION REQUIREMENTS

Keep in mind the general system requirements for installing the product. Pre-installation of the **zenon Operator/Supervisor** oder **zenon Logic Runtime for Windows (Standalone)** is not permitted.

The product requires software already installed on the target system. You can also find them in the *%AdditionalSoftware%* directory of the installation medium. Therefore, if necessary, manually install the following packages:

- ▶ **Microsoft Visual Studio C++ Redistributables**
- ▶ **WIBU-SYSTEMS CodeMeter Runtime Kit**

After installation, execute the appropriate installation package (x86 or x64) for your target system.



Information

The installation does not include a license for the product. The zenon Logic Runtime thus starts in test mode. Licensing can be done using the general licensing tools.

UPDATE

To update an already installed version, uninstall it and perform a new installation.

5 Silent installation and uninstallation

zenon can also be installed and uninstalled silently (Silent Installation) and (Silent Remove).



Information

Silent installation and uninstallation is possible for all zenon versions from 7.10.

SILENT INSTALLATION FROM ZENON 7.20

Syntax: `scada.exe /silent /language:[number] CDPROP_EDITION=[edition] CDPROP_TYPE=[type] ISFeatureInstall=[features]`

Parameter	Arguments	Description
<code>scada.exe</code>		Call-up of the installation.
<code>/silent</code>		Silent installation.
<code>/language:</code>	<ul style="list-style-type: none"> ▶ 1031: German ▶ 1033: English ▶ 1034: Spanish ▶ 1036: French ▶ 1040: Italian 	Selection of the language. Example: English: language:1033
<code>CDPROP_EDITION=</code>	<ul style="list-style-type: none"> ▶ ENERGY ▶ SUPERVISOR ▶ OPERATOR ▶ PHARMA ▶ SCIENCE 	Selection of the edition. Example: Energy Edition: CDPROP_EDITION=ENERGY Is not needed for zenon Web Server and zenon Web Client.

Parameter	Arguments	Description
CDPROP_TYPE=	<ul style="list-style-type: none"> ▶ ED: Editor and Runtime ▶ RT: Runtime 	<p>Selection of Editor or Runtime.</p> <p>Example: Runtime: CDPROP_TYPE=RT</p> <p>Is not needed for zenon Web Server and zenon Web Client.</p>
ISFeatureInstall=	<ul style="list-style-type: none"> ▶ PREREQUISITES_EDITOR,SCADA: Editor ▶ PREREQUISITES_RUNTIME,SCADA: Runtime ▶ PREREQUISITES_WEBSERVER,WEBSERVER: Web Server ▶ PREREQUISITES_WEBCLIENT,WEBCLIENT: Web Client 	<p>Selection of features to be installed.</p> <p>Example: zenon Editor: ISFeatureInstall=PREREQUISITES_EDITOR,SCADA</p>

Examples:

- ▶ Installation of Editor, German, Energy Edition:
scada.exe /silent /language:1031 CDPROP_EDITION=ENERGY CDPROP_TYPE=ED ISFeatureInstall=PREREQUISITES_EDITOR,SCADA
- ▶ Installation of Runtime, English, Supervisor Edition:
scada.exe /silent /language:1033 CDPROP_EDITION=SUPERVISOR CDPROP_TYPE=RT ISFeatureInstall=PREREQUISITES_RUNTIME,SCADA
- ▶ Installation of zenon Web Server, German:
scada.exe /silent /language:1031 ISFeatureInstall=PREREQUISITES_WEBSERVER,WEBSERVER
- ▶ Installation of zenon Web Client, German:
scada.exe /silent /language:1031 ISFeatureInstall=PREREQUISITES_WEBCLIENT,WEBCLIENT

SILENT UNINSTALLATION FROM ZENON 7.20

The **GUID** is part of the path and depends on the version. The attendant version is visible in the file properties of a **GUID**.

Without LOG file:

- ▶ Path: %ProgramFiles(x86)%\InstallShield Installation Information\{GUID}
Example: C:\Program Files (x86)\InstallShield Installation Information\{9BE6EDFE-3465-486F-87EE-1C439DE5EA9A}

- ▶ Syntax: **SCADA.exe /remove /silent**

With LOG file:

- ▶ Path: %ProgramFiles(x86)%\InstallShield Installation Information\{GUID}
Example: C:\Program Files (x86)\InstallShield Installation Information\{9BE6EDFE-3465-486F-87EE-1C439DE5EA9A}
- ▶ Syntax: **SCADA.exe /remove /silent /log"%TEMP%"**

SILENT INSTALLATION OF ZENON 7.10 AND 7.11

Syntax: **scada.exe /silent /language:[number] CDPROP_EDITION=[edition] CDPROP_TYPE=[type] ISFeatureInstall=[features]**

Parameter	Arguments	Description
scada.exe		Call-up of the installation.
/silent		Silent installation.
/language:	<ul style="list-style-type: none"> ▶ 1031: German ▶ 1033: English ▶ 1034: Spanish ▶ 1036: French ▶ 1040: Italian 	Selection of the language. Example: English: language:1033
CDPROP_EDITION=	<ul style="list-style-type: none"> ▶ ENERGY ▶ SUPERVISOR ▶ OPERATOR ▶ PHARMA 	Selection of the edition. Example: Energy Edition: CDPROP_EDITION=ENERGY Is not needed for zenon Web Server.
CDPROP_TYPE=	<ul style="list-style-type: none"> ▶ ED: Editor and Runtime ▶ RT: Runtime 	Selection of Editor or Runtime. Example: Runtime: CDPROP_TYPE=RT Is not needed for zenon Web Server.
ISFeatureInstall=	<ul style="list-style-type: none"> ▶ WIBU,SCADA,MS,MSALL,SQL,COMMON: Editor ▶ WIBU,SCADA,MS,MSALL,COMMON: 	Selection of features to be installed. Example: zenon Editor: ISFeatureInstall=WIBU,SCADA,MS,MSALL,SQL,COMMON

Parameter	Arguments	Description
	Runtime ▶ WIBU,WS,MSALL,COMMON: Web Server	

Examples:

- ▶ Installation of Editor, German, Energy Edition:
**scada.exe /silent /language:1031 CDPROP_EDITION=ENERGY CDPROP_TYPE=ED
 ISFeatureInstall=WIBU,SCADA,MS,MSALL,SQL,COMMON**
- ▶ Installation of Runtime, English, Supervisor Edition:
**scada.exe /silent /language:1033 CDPROP_EDITION=SUPERVISOR CDPROP_TYPE=RT
 ISFeatureInstall=WIBU,SCADA,MS,MSALL,COMMON**
- ▶ Installation of zenon Web Server, German:
scada.exe /silent /language:1031 ISFeatureInstall=WIBU,WS,MSALL,COMMON

SILENT UNINSTALLATION OF VERSION 7.10 AND ZENON 7.11**ZENON 7.10**

Path: **C:\Program Files (x86)\InstallShield Installation
 Information\{860C41F0-6034-4822-BCF1-88D4849AE897}**

Syntax: **SCADA.exe /remove /silent**

ZENON 7.11

Path: **C:\Program Files (x86)\InstallShield Installation
 Information\{ED00D319-77B8-4C58-8D67-2DA2D48E90DB}**

Syntax: **SCADA.exe /remove /silent**

6 Error treatment**CHECK BEFORE INSTALLATION:**

The system requirements are checked before installation. If the requirements are not met, you are shown these on a separate page with notices on how to rectify this.

ERROR DURING INSTALLATION

You will receive an error message if there are errors during installation.

If you need help from the Technical Consulting department of COPA-DATA:

1. If possible, create a screenshot of the error message
2. Navigate to the folder called %Temp%/SCADALOG.
3. Here you can find the log files of the installation.
4. Create a ZIP file with the content of the folder.
5. Forward the file and the screenshot to support@copadata.com

If you have already closed the error message window, you can find the log files with all the installation information for the SQL server in the following folder:

C:\Program Files\Microsoft SQL Server\110\Setup Bootstrap\LOG

Hint: The file **summary.txt** provides information for troubleshooting.



Information

Firewalls: zenon automatically configures the firewall installed with Windows during installation. Firewalls from other providers must be properly configured by the user

FREQUENT SOURCES OF ERROR DURING INSTALLATION:

- ▶ The virus scanner is active and blocks the installation because the scanner thinks it's a virus. Solution: Separate the system from the network, disable the virus scanner, execute the installation again.
- ▶ The firewall was not configured correctly. Solution: Separate the system from the network, disable the firewall, execute the installation again.
- ▶ Erroneous SQL-installation on the system. Solution: Create project backups; if possible, deinstall SQL server, rename the SQL folder, and restart installation.

7 Windows Updates

Attention: Automatic Windows updates influence the installation

If an update of the Windows operating system is carried out while the zenon setup is running, it can cause problems during the zenon installation.

To prevent this:

- ▶ Deactivate the automatic Windows update during the time of installation.
- ▶ carry out the Windows update before starting the zenon installation

8 Virus scan

Anti-virus software can slow down or even prevent the installation of zenon.

Note: If the anti-virus software you use leads to problems during installation, deactivate the anti-virus software for the duration of the installation. The computers concerned can be exposed to higher risks during this time. Activate your anti-virus software immediately after the installation of zenon.

9 File Structure

The special file structure is created or extended during the installation.

The zenon program files are copied to a folder which can be defined during the installation.

Additionally the installation asks for a folder for the SQL databases of the projects. The storage medium for project archiving (SQL, screens etc.) must have enough free space, because all current and future project data is stored there.

Folder	Path
Program folder	32-bit system: %Program Files%\COPA-DATA\zenon7xxx 64-bit system: %Program Files%\COPA-DATA\zenon7xxx %Program Files (x86)%\COPA-DATA\zenon7xxx
Program data folder, e.g. global symbols, print templates, log files etc.	%ProgramData%\COPA-DATA\zenon7xxx
Database folder (SQL)	%ProgramData%\COPA-DATA\SQL
System folder	%ProgramData%\COPA-DATA\System
Settings Editor and profiles	%Users%\UserName\AppData\Local\COPA-DATA\zenon\Edit or
Settings for Diagnosis Viewer	%Users%\UserName\AppData\Local\COPA-DATA\zenon\Diag View

DEFINITION RUNTIME FOLDER AND DATA FOLDER

RUNTIME FOLDER

The Editor creates the Runtime files in the Runtime folder, or they are transferred to this folder by means of Remote Transport. The Runtime folder is created or updated when compiling a project in the Editor. The parameters for this folder can be set in the zenon Editor with the **Runtime folder** project property. With remote transfer, the Runtime folder is defined in Remote Transport settings.

DATA FOLDER

The Runtime saves all data files that were created in Runtime such as alarm files, archive files etc. in the data folder. The data folder is created as a subfolder of the Runtime folder by default. The folder is automatically assigned the name of the computer the Runtime is running on. You can change this save location in the project properties (**General/Data folder**).

Hint: Never set the data folder to a removable device such as an USB stick or a network device. It is recommended that the data is recorded locally and backed up externally.



Attention

If the defined path does not exist or is not available, no more data is written from the Runtime. This means a complete loss of data. The Runtime can still be operated but must be restarted as soon as the path is available again. The availability of the folder can be checked via system driver variable **Runtime folder not available** (SYSDRV.chm::/25965.htm) .

10 Free ports

zenon and zenon Logic need certain communication ports for the communication in the network. If these ports are occupied by other programs like e.g. an already installed SQL server, the communication of zenon can be disturbed. Many ports in zenon can be changed using the **Startup Tool** or properties in the Editor.

This is how you check the port assignments:

1. Enter `netstat -a -n -o` in the command line.

You can reach the command line in Windows:

- ▶ by pressing the Windows-key and R
- ▶ Enter `cmd` and confirm with **OK**.

- ▶ A DOS-window pops up
 - ▶ enter the command *netstat*
2. A list of all currently used TCP and UDP ports will pop up.
 3. Check the listening ports (status: *ABHÖREN LISTEN*) if the process-ID (PID) of the ports needed by zenon and zenon Logic corresponds with the processes of zenon and zenon Logic.

These PIDs can be read in the **Windows Task Manager**. To do this, open the **Windows Task Manager** and switch to the **Services** tab.

4. If another software uses these ports, reconfigure this software.
You can see the ports that zenon and zenon Logic use in the **Port assignment by zenon and zenon Logic** table. Here you can also see if these ports can be amended in these programs.

PORT SETTINGS BY ZENON AND ZENON LOGIC

Application	Description	Ports	Transport log
stratonrt[k].exe	zenon Logic Runtime polling communication and zenon Logic Workbench.	▶ 1200-1210	TCP
stratonrt[k].exe		▶ 4500-4510	TCP
stratonrt[k].exe	zenon Logic redundancy.	▶ 7000-7010	TCP
stratonrt[k].exe	zenon Logic Runtime spontaneous communication.	▶ 9000-9010	TCP
zennetsrv.exe	zenon network service.	▶ 1100-1100	TCP
zensysrv.exe	zenon transport service.	▶ 1101	TCP
zendbsrv.exe	zenon database service.	▶ 1103	TCP
zenAdminsrv.exe	zenon administration service.	▶ 50777	TCP
zenLogSrv.exe	zenon logging service.	▶ 50780	TCP
zenvnc.exe	zenon Remote Desktop service	▶ 5600 (set) ▶ 5610 (set)	TCP
CodeMeter.exe	Code Meter Dongle service.	▶ 22350 (changeable but must not be changed)	TCP

Application	Description	Ports	Transport log
WkSvW32.exe	WibuKey Network service.	► 22347 (set)	TCP
Zenrt32.exe	Message Control with Voice over IP.	► 5060: SIP ► 4000: RTP ► 4001: RTCP (fixed) SIP and RTP can be configured using the Editor. RTCP is automatically set by the system.	UDP

11 Installation of an older version after installation of zenon 8.10 (64-bit operating system)

If, on a 64-bit operating system, after installation of zenon 8.10, a version of zenon with version number lower than 7.10 is installed, the 64-bit services of version 7.10 must be re-registered afterwards using the command line. Registration can be carried out using a batch file or manually.

Registration with a batch file:

1. Copy the file named **Register.bat** from the zenon installation medium.
2. You can find this in the following folder: ... \AdditionalSoftware\Register Admin Service and Log Service (x64)\
3. Execute the file on the respective computer as an administrator.

manual registration:

1. Run the command line with administrative rights
2. navigate to the folder %Program Files%\Common Files\COPA-DATA\zenAdminSrv
3. Start the service **zenAdminSrv.exe** with the parameter **-service**
4. navigate to folder %Program Files%\Common Files\COPA-DATA\zenLogSrv
5. Start the service **zenLogSrv.exe** with the parameter **-service**

Example

zenAdminSrv:

- ▶ Folder: *C:\Program Files\Common Files\COPA-DATA\zenAdminSrv*
- ▶ Command: **zenAdminSrv.exe -service**

zenLogSrv:

- ▶ Folder: *C:\Program Files\Common Files\COPA-DATA\zenLogSrv*
- ▶ Command: **zenLogSrv.exe -service**

12 Installation of version 7.x and version 6.51 on the same computer

If a version 7.x is installed on a system that already has zenon 6.51 installed, the **Multiple Network Protocol Driver** must be reinstalled after a reboot.

FOR X64 SYSTEMS

For new installation:

1. Restart the system.
2. On the installation medium, open the following path: *AdditionalSoftware\COPA-DATA Multiple Network Protocol Driver*.
3. Execute the file called **MNDPx64Setup.bat**.

This means that the driver is reinstalled and properly linked to the network adapters.

FOR X86 SYSTEMS

For new installation:

1. Restart the system.
2. On the installation medium, open the following path: *AdditionalSoftware\COPA-DATA Multiple Network Protocol Driver*
3. Execute the file called **MNDPx86Setup.bat**

This means that the driver is reinstalled and properly linked to the network adapters.

13 System requirements

zenon 8.10 can be used on all current Microsoft operating systems. zenon is always tested with the most up-to-date version of the operating systems with the newest available Service Packs and Hotfixes.

Changes due to Service Packs, Hotfixes or Patches from Microsoft can cause incompatibilities and affect the functionality of the software. In this case, COPA-DATA will provide an updated version of zenon as soon as possible. In this case you can get more information from COPA-DATA support: support@copadata.com.



Attention

Note when configuring the project:

- ▶ For the optimal display of zenon in the Runtime, the standard setting (corresponds to 100%) is recommended for the Windows **display**. Higher values can lead to graphic elements, symbols, texts, etc. not being displayed correctly.
- ▶ Windows themes can overlay elements in Runtime. Ensure, when configuring a project, that there is an appropriate distance from the elements to the screen edge.



13.1 Desktop operating systems

Supported desktop operating systems and minimum required Windows Service Pack/version:

Operating system	zenon Editor	zenon Runtime	zenon Web Server	zenon Web Client	zenon HTML Web Engine	zenon Logic Runtime	zenon Analyzer Server
Windows 7 (Professional, Enterprise and Ultimate version, x86 and x64 versions).	Cannot run	SP 1	SP 1	SP 1	SP 1	SP 1	Cannot run
Windows Embedded Standard 7 (if all necessary operating system components exist).	Cannot run	SP 1	SP 1	SP 1	SP 1	SP 1	Cannot run
Windows 8 and 8.1 (Standard, Professional, Enterprise version, x86 and x64 versions)	Only x64 from SP 0	SP 0	SP 0	SP 0	SP 0	SP 0	Only x64 with SP 0
Windows Embedded 8 Standard (if all necessary operating system components exist).	Cannot run	SP 0	SP 0	SP 0	SP 0	SP 0	Cannot run
Windows 10 (Home, Pro, Enterprise, Education, Pro Education, Enterprise LTSB, IoT Enterprise, Pro for Workstations)	Only x64 from 1507	1507	1507	1507	1507	1507	Only Home, Pro and Enterprise (each x64) from 1507

13.2 Server operating system

Supported server operating systems and minimum required Windows Service Pack/version:

[illegible]

13.3 Server and desktop operating systems up to Windows 8.1

Overview of supported servers and desktop operating systems up to Windows 8.1

	Windows Embedded 7/8 Standard	Windows Embedded 8.1 Pro/Industry	Windows 7 SP1/Windows 8 and 8.1/ Server 2008 (R2) SP1, 2012 and 2012 R2	Windows CE
Editor	--	X	X	--
Runtime	X	X	X	--
Runtime for Windows CE	--	--	--	X
Web Server	X	X	X	X (Web Server Pro Light)
Web Client	X	X	X	--
HTML Web Engine	X	X	X	--

Key:

- ▶ X: supported
- ▶ --: not supported

Attention: Windows CE is no longer supported from version 7.50.

zenon CE version 7.20 is installed. To use this, the Runtime files for version 7.20 must be created.

13.4 Windows CE and Windows Embedded

Supported operating systems:

Operating system	zenon Editor	zenon Runtime	zenon Web Server	zenon Web Client	zenon HTML Web Engine	zenon Logic Runtime	zenon Analyzer Server
Windows CE 6.0 (ARM and x86) Attention: Is only supported up to version 7.20. From version 7.50, Runtime files for 7.20 must be created.	Cannot run	zenon Operator only	Pro Light only	Cannot run	Cannot run	executable	Cannot run
Windows Embedded Compact 7 (ARM and x86) Attention: Is only supported up to version 7.20. From version 7.50, Runtime files for 7.20 must be created.	Cannot run	zenon Operator only	Pro Light only	Cannot run	Cannot run	executable	Cannot run

13.5 Windows 10

Overview of supported desktop operating systems for Windows 10

Windows version	zenon Supervisor/Operator	Everywhere by zenon	zenon Logic Runtime
Windows 10 Home	X	X (PC)	X
Windows 10 Mobile	--	X (Mobile)	--
Windows 10 Pro	X	X (PC)	X
Windows 10 Enterprise	X	X (PC)	X
Windows 10 Education	X	X (PC)	X
Windows 10 Mobile Enterprise	--	X (Mobile)	--
Windows 10 IoT Core	--	--	--
Windows 10 IoT Enterprise (Windows 10 Enterprise LTSC)	X	X (PC)	X

Key:

- ▶ X: available
- ▶ --: cannot run

13.6 System requirements when using DirectX

The following minimum requirements must be met when using *DirectX hardware* or *DirectX software*:

Note: For extensive projects or several projects loaded at the same time you will need accordingly faster/stronger hardware. The minimum requirements can increase as a result of this.

Parameter	Minimum requirements	Recommended
CPU:	Single core with SSE2 support.	Quad Core or more cores
Graphics card: (DirectX hardware only)	DirectX 11 mainstream graphics card. Note: When an integrated graphics chip is used in particular, it is possible, depending on the	Dedicated DirectX 11 AMD or nVidia high-end graphics card

Parameter	Minimum requirements	Recommended
	driver used, that there are impairments to the display quality.	
Graphics memory: (DirectX hardware only)	1 GB VRAM Note: The size that is actually needed depends on the number of screens called up and the elements displayed.	2 GB VRAM
Driver graphics card: (DirectX hardware only)	The graphics card manufacturer's most recent driver.	
Operating system:	<p><i>DirectX hardware and DirectX software only works on operating systems that support DirectX11.1.</i></p> <p>If the system does not support <i>DirectX 11.1</i>, it automatically switches to <i>Windows Enhanced</i>.</p> <p>The current <i>DirectX</i>- Runtime must be installed. For zenon it is installed together with the setup. For the zenon Web Client it must be installed manually.</p>	

You can check the DirectX hardware compatibility of the graphics card and the driver with the Windows operating system tool **dxdiag.exe**.

Up to Windows 7: Check the **DDI version** value under **Display**. The value *11* for example means DirectX 11.

From Windows 8: All supported versions of DirectX are displayed in the **Display** tab under **Feature Levels**. For example, DirectX 11 is displayed as *11.0*.

13.7 Additional software

SQL SERVER

zenon Editor works with an SQL database. This is also installed when zenon is installed.

- ▶ Up to version 6.20 SP4: **SQL-Server 2000 (MSDE)**
- ▶ From version 6.21 SP0 on: **SQL Server 2005 Express**
- ▶ From version 7.00 SP0 on: **SQL Server 2008R2 SP1 Express**
- ▶ From version 7.10 SP0: **SQL Server 2012 SP1 Express**
- ▶ From version 7.20 SP0 on: **SQL Server 2012 SP2 Express**

- ▶ From version 7.50 SP0 on: **SQL Server 2012 SP3 Express**
- ▶ From version 7.60 SP0: **SQL Server 2012 SP3 Express**
- ▶ From version 8.00 SP0: **SQL Server 2012 SP3 Express**
- ▶ From version 8.10 SP0: **SQL Server 2017 Express**



Attention

When changing the version or installing a service pack update, note the SQL Server: Projects must be backed up and exported in the original version and then imported back in the new version.

Note: If a zenon version with the same SQL Server version but a different service pack is already present, this service pack is not updated by the new zenon installation. The service pack update can either be installed manually or by means of Windows Update.

DONGLE

- ▶ The CodeMeter software required for dongle protection is always installed automatically too.
- ▶ The WibuKey software is available on the installation medium in the path:
... \AdditionalSoftware\WIBU-SYSTEMS CodeMeter Runtime Kit

13.8 User authorization

Windows administrator rights are required for installation.

Standard Windows user rights are required for ongoing operation. The user account control (UAC) can be activated at the highest security level.

13.9 Hardware requirements

PC version and CE version of zenon have different requirements concerning the needed hardware. In this chapter, you can find hardware requirements for the individual versions of Editor and Runtime, as well as zenon Web Server and zenon Web Client.

The Editor uses a Microsoft SQL Server as SQL Server and has higher hardware requirements than the Runtime. If Editor and Runtime shall be running on a system simultaneously, the requirements add up.



Attention

Graphics cards with their own graphics memory and DirectX support are recommended. Shared-memory graphics cards may require too much working memory and may thus lead to performance impairments. Note the system requirements when using DirectX (on page 33) chapter. The recommended configuration from this chapter is to be noted for the use of Multi-Touch.

PERFORMANCE OPTIMIZATION

Note that all information stated only constitutes the minimum requirements for your system. Better hardware equipment improves the performance of zenon considerably.

- ▶ Equip your hardware - both clients and most of all the server - with sufficient memory (RAM).
- ▶ Optimize the hardware for data backup, for example with fast SSD data storage.
- ▶ Match the hardware of the clients and the network to one another. A system is only as powerful as its weakest component.
- ▶ Optimize your network architecture, for example with the use of cabling with a high data transfer rate and corresponding devices (switches and routers).
- ▶ When using a virtual environment, ensure that the virtual system is correspondingly configured with performance optimization.

13.9.1 Editor

The minimum requirements are based on a complete installation of the Editor. For extensive projects or several projects loaded at the same time you will need accordingly faster/stronger hardware. The minimum requirements can increase as a result of this.

Hardware	Minimum requirements	Recommended
CPU	Single core with SSE2 support.	Quad Core
RAM memory	From 4 GB Note: The more projects you have simultaneously available in memory, the more memory you need.	8 GB
Harddisk	At least 4 GB free space for a complete installation plus additional space for the projects.	
Monitor resolution	Extended VGA with 1024 x 768 pixels.	Double monitor setup:

Hardware	Minimum requirements	Recommended
	Attention: Some dialogs, e.g. the filter of the AML/CEL image, are difficult to operate or possibly non-operable at a height of less than 850 pixels.	2 times 1920 x 1080.
Graphics adapter	64 MB dedicated memory. Cards with shared memory can lead to performance loss. Note the System requirements when using DirectX (on page 33) chapter.	
Input devices	Standard keyboard or standard mouse.	
USB interface or DVD drive	For the installation, regardless of installation medium. The installation is also possible via network. Installation files can also be downloaded from the customer area of the COPA-DATA website.	
Parallel or USB interface	In case of dongle licensing required for dongle. For network dongle only required for the dongle server.	
Network connection (optional)	Recommended 10 Mbit/s with TCP/IP protocol for Remote Transport, network dongle, project backups on central file server, multi-user capable Editor, etc.	1000 MBit/s

Note: When using comprehensive multi-user projects, note the information in the hardware requirements chapter.

13.9.2 Runtime

The minimum requirements are based on a complete installation of Runtime. For extensive projects or several projects loaded at the same time you will need accordingly faster/stronger hardware. The minimum requirements can increase as a result of this.

Hardware	Minimum requirements	Recommended
CPU	Single core with SSE2 support.	Quad Core
RAM memory	From 512 MB. Note: Projects with big amounts of data, Network projects, multiple projects simultaneously and projects in redundance	4096 MB

Hardware	Minimum requirements	Recommended
	mode need more memory.	
Harddisk	<p>2 GB free space for the Runtime-installation plus additional space for the projects.</p> <p>Attention: If you log historical data (e.g. Archive data or Alarm-/CEL-Data), you need sufficient harddrive space or you have to make sure during engineering that the historical data is evacuated or deleted.</p>	
Monitor resolution	<p>1024 x 768.</p> <p>Note also the information in the infobox under the table.</p>	
Graphics adapter	<p>64 MB dedicated memory. Cards with shared memory can lead to performance loss. Note the System requirements when using DirectX (on page 33) chapter in relation to this.</p>	
Input devices	<p>Keyboard and/or mouse. Operation via touchscreen is also possible. Many individual, customizable softkeyboards for the touchscreen are available for you. In addition, there is the possibility of Multi-Touch operation.</p>	
USB interface (optional)	<ul style="list-style-type: none"> ▶ For installation. Installation also possible via network or other storage media. ▶ For dongle. Network dongle also available. 	
Network connection (optional)	<p>64 kBits/s for standard Client/Server projects.</p> <p>100 Mbit/s full duplex for redundant operation.</p>	<p>1000 kBits/s full duplex for standard Client/Server projects.</p>
Remote connection (optional)	<p>Minimum requirements: Dial-up modem with 9600 Bit/s.</p>	<p>1 Mbit/s full duplex.</p>
WAN connection (optional)	<p>Any desired connection via router, e.g. per ISDN or DSL Data transfer is slower in a WAN than in a local network for technical reasons. Be sure to check the possible data transfer</p>	

Hardware	Minimum requirements	Recommended
	rates of your WAN technology already at the time when you create the project.	
Message Control (optional):	Please refer to chapter Message Control for the requirements.	
Interfaces (optional)	The necessary interfaces depend on the requirements of the PLC and/or the bus connection, for example serial RS232 or RS422/485 interfaces, ISA/PCI slots, etc.	



Information

The minimum recommended resolution in Runtime is 1024 x 768 pixels. Smaller resolutions can also be configured. However it may then not be possible to operate some online dialogs. If these are not used, the resolution can be selected as lower.

13.9.3 Runtime under Windows Embedded Standard

The minimum requirements relate to an installation of Runtime adapted to the Windows Embedded Standard 7 SP1 operating system with platform update. The hardware must be accordingly more powerful for extensive projects.

This table only states the figures that are different to the standard installation. The other parameters correspond to the figures described in the Hardware requirements for Runtime (on page 37) chapter.

Hardware	Minimum requirement	Recommended
RAM memory	<ul style="list-style-type: none"> ▶ 512 MB. <p>Note: Projects with big amounts of data, Network projects, multiple projects simultaneously and projects in redundancy mode need more memory.</p>	<ul style="list-style-type: none"> ▶ 2048 MB
Storage medium	<ul style="list-style-type: none"> ▶ 2 GB of free memory on C:\ drive before the installation of .NET Framework 3.5 and 4.5 ▶ 800 MB of free memory after the installation of the .NET Framework ▶ Plus memory space for the projects, archives, etc. 	<ul style="list-style-type: none"> ▶ 80 GB

Attention: If you log historical data (e.g. Archive data or Alarm-/CEL-Data), you need sufficient harddrive space or you have to make sure during engineering that the historical data is evacuated or deleted.

13.9.4 Runtime for Windows CE

The minimum requirements are based on a complete installation of the Runtime for Windows CE. The hardware must be accordingly more powerful for extensive projects.

Hardware	Minimum requirement	Recommended
CPU	At least 400 MHz	1 GHz
RAM memory	64 MB	1024 MB for Windows CE 6.0.
Storage medium	64 MB free harddrive space. Permanent recordable remanent storage medium for project data	256 MB free harddrive space or more.
Network connection	For standard Client/Server projects: 10 Mbit/s full duplex.	



Attention

Windows CE is no longer supported from version 7.50. zenon CE version 7.20 is installed. To use this, the Runtime files for version 7.20 must be created.

13.9.5 Web Server

The minimum requirements are based on a complete installation of the Web Server. For extensive projects or several projects loaded at the same time you will need accordingly faster/stronger hardware. The minimum requirements can increase as a result of this.

Hardware	Minimum requirements	Recommended
CPU	Single core with SSE2 support.	
RAM memory	From 1024 MB	
Harddisk	256 MB free harddrive space.	1 GB free harddrive space.

Hardware	Minimum requirements	Recommended
Network connection	10 Mbit/s full duplex.	1000 Mbit/s full duplex.
Remote connection (optional)	Minimum requirements: Dial-up modem with 9600 Bit/s.	1 Mbit/s full duplex.

13.9.6 Web Client

The minimum requirements are based on a complete installation of the zenon Web Client. For extensive projects or several projects loaded at the same time you will need accordingly faster/stronger hardware. The minimum requirements can increase as a result of this.

Hardware	Minimum requirements	Recommended
CPU	Single core with SSE2 support.	Quad Core
RAM memory	From 1024 MB	
Harddisk	64 MB free space for zenon Web Client plus additional space for the projects.	80 GB free harddrive space.
Network connection	10 Mbit/s full duplex.	1000 Mbit/s full duplex.
Remote connection (optional)	Minimum requirements: Dial-up modem with 9600 Bit/s.	1 Mbit/s full duplex.
Graphics adapter	64 MB dedicated memory. Cards with shared memory can lead to performance loss. Note the System requirements when using DirectX (on page 33) chapter in relation to this.	

14 Paths for installation and operation

Paths for zenon:

- Installation

- ▶ Editor
- ▶ Runtime

Info

You can display many default paths with the help of the **set** command:

- ▶ start the command line (enter **cmd** in the Windows start area)
- ▶ enter command **set**
- ▶ By pressing the **Enter** key, the default folder for Windows and zenon are displayed.

Note: As absolute paths differ in different operating system, the paths are displayed as Windows environment variable in this chapter. For example *%ProgramData%* instead of *C:\ProgramData*.

INSTALLATION

During installation, paths are set for:

- ▶ zenon Editor
- ▶ zenon SQL folder

Only the paths for zenon Editor and zenon SQL folder can be customized.
The setup needs administrator rights. This is also true for changing the installation paths.

REQUIREMENTS

The installation paths of the required third-party software match the standard paths of the respective manufacturer and cannot be changed during setup.

The additional software packages that need to be installed depend on the type of installation:

- ▶ zenon Editor
- ▶ zenon Runtime
- ▶ zenon Web Client
- ▶ zenon Logic Runtime

Requirements	Editor	Runtime	Web client	zenon Logic Runtime
Microsoft .NET Framework 4.6.2	+	+	+	-
Microsoft SQL Server 2017 Express (x64)	+	-	-	-

Requirements	Editor	Runtime	Web client	zenon Logic Runtime
Microsoft Visual C++ 2010 Redistributable	+	+	+	+
Microsoft Visual C++ 2013 Redistributable	+	+	-	-
Microsoft Visual C++ 2017 Redistributable	+	+	+	+
Microsoft .NET Core Hosting Bundle 2.1.5	-	-	-	-
CodeMeter Runtime Kit 6.80	+	+	-	+
Microsoft Visual Studio Tools for Applications VSTA 2.0	+	+	+	-
Microsoft Visual Studio 2008 Remote Debugger	+	+	-	-
Microsoft Web Deploy 3.6	-	-	-	-
Visual Basic for Applications VBA 7.1	+	+	+	-
Visual Basic for Applications Language Pack VBA 7.1	+	+	+	-
COPA-DATA Multiple Network Protocol Driver	+	+	-	+

ZENON

The installation of zenon Editor requires two paths:

- ▶ zenon Editor:
 - ▶ 32 bit systems: %ProgramFiles(x86)%\COPA-DATA\zenon [Version]
 - ▶ 64 bit systems: %ProgramFiles%\COPA-DATA\zenon [Version]

These paths can be customized during the installation.

- ▶ zenon SQL folder:
 - ▶ From version 8.10: %ProgramData%\COPA-DATA\SQL2017\

These paths can be customized manually via zenDB.ini.

ZENON EDITOR

In the zenon Editor the following paths are used as default:

Object	Path
Workspace	%CD_USERDATA% For example: C:\Users\Public\Documents\zenon_Projects
Projects	%CD_USERDATA% For example: C:\Users\Public\Documents\zenon_Projects Hint for short cuts: highlight the project -> Ctrl+Alt+D
SQL folder of the project	%ProgramData%\COPA-DATA\SQL-Ordner\[UID]\FILES Hint for short cuts: highlight the project -> Ctrl+Alt+E
project.ini	%ProgramData%\COPA-DATA\SQL-Ordner\[UID]\FILES\zenon\system
zenon6.ini	%ProgramData%\COPA-DATA\System For example: C:\ProgramData\COPA-DATA\System
Backup	%ProgramData%\COPA-DATA\SQL-folder\UID\BACKUP %ProgramData%\COPA-DATA\SQL-Ordner\UID\FILES\[Projekte]
Compiled files	%CD_USERDATA%\[Workspace]\[Project]\RT
External files	%CD_USERDATA%\[Workspace]\[Project]\RT\FILES\... Note: Can be set in the project using the file storage property.
System files	Windows system folder.

ZENON RUNTIME

In the zenon Runtime the following paths are used as default:

Object	Path
Projects	%CD_USERDATA%\[Workspace]\[Project]\RT
External files	%CD_USERDATA%\[Workspace]\[Project]\RT\FILES\...
Exported archives, Chronological Event List and Alarm Message List	%CD_USERDATA%\[Workspace]\[Project]\Export Note: Is created at the first export.
System files	Windows system folder.

ZENON LOGIC

Paths for zenon Logic are created analogous to the zenon paths.

15 zenon for Windows CE

COMPONENTS

The CE version of zenon consists of the following components:

- ▶ zenon CE Runtime
- ▶ Language DLLs
- ▶ Network DLL
- ▶ Driver DLLs
- ▶ zenon6.ini
- ▶ Transport service



Attention

Windows CE is no longer supported from version 7.50. zenon CE version 7.20 is installed. To use this, the Runtime files for version 7.20 must be created.

PREREQUISITE FOR THE INSTALLATION OF THE RUNTIME ON REMOTE SYSTEMS

- ▶ Either the transport service (**SysSrvCE.exe**) of zenon must be installed and started on the CE terminal or an ActiveSync-connection is needed. Tips for the manual installation via storage media can be found in chapter Manual Installation and Runtime-Update (on page 54).
- ▶ The CE terminal to which the data shall be transported has to have at least 8 megabytes free "Program Memory", so that we can guarantee correct transport. This parameter can be adapted via the Control Panel **System properties**.

COURSE OF ACTIONS

Details about compatibility, installation and update can be found in chapters:

- ▶ CE versions / supported processors (on page 46)
- ▶ Update of the Windows CE Runtime (on page 47)

Info

If, when starting **zenonrce.exe**, the **syssrvce.exe** file is also executed, then it can be ensured that a TCP connection can always be established. Thus only one file is necessary for the autostart functionality. However a time delay between both starts must be configured.

Reason: When starting **zenonRCE**, **zenLogSrvCE** also starts automatically. However when starting **syssrvce**, **zenLogSrvCE** is also started.

If **zenonRCE** and **syssrvce** are started within a very short period of time, both attempt to start **zenLogSrvCE**. This leads to an error message.

Solution: To avoid this, configure a time delay between the start of **zenonRCE** and **zenLogSrvCE**. To do this, you can set the **STARTDELAY=** entry in **zenon6.ini**. Runtime (**zenLogSrvCE**) is thus started later. A check is then made to see whether **zenLogSrvCE** is already running and this does not start again.

15.1 CE - versions and supported processors

In the current zenon version 8.10 the following Windows CE versions and processors are supported:

- ▶ CE 6.00 for x86
- ▶ CE 6.00 for ARM V4/V5

Information

You can find information about the supported CE versions and processors for earlier zenon versions in the corresponding documentation or you can contact the COPA-DATA support.

15.2 System files

The Windows CE Runtime requires the existence of certain system files. In case one of these files is missing, the operating system sends an error message during Runtime start, that one or various components have not been found. The following system files are required:

File	Description
mfc90u.dll	Necessary for the Runtime. On startup, an error message pops up if this file does not exist.

File	Description
msvcr90.dll	Necessary for the Runtime. On startup, an error message pops up if this file does not exist.
atl90.dll	Not necessary for starting the Runtime but for the use of drivers with network connections or the use of zenon in a network. If this file does not exist, the device will not work as a client or TCP/IP driver connections will not work.
IMGDECOMP.dll	Not necessary for starting the Runtime but necessary for displaying Transparency if Alpha Blending is not integrated in the operating system. Animation of GIF files is not possible with Windows CE.
VBSCRIPT.dll + JSCRIPT.dll	Not necessary for starting the Runtime. This file is needed for the PCE (Process Control Engine).

Some of these system files are installed together with the installation of zenon for CE and can be transferred to the CE device using the **UpdateCE** Tool. All these system files should be integrated in the operating system image of the CE device by the manufacturer.



Attention

For manufactures of Windows CE OS-images:

CE versions older than 6.0 need the file **toolhelp.dll**. Activate the following option in **Platform Manager** in order for the file to be available on the CE device and for Toolhelp to also be available in SDK.**Core OS -> Display Based Device ->Core OS Services -> Debugging Tools -> Toolhelp API**. Thus the *Toolhelp.dll* is part of the image.

Hint: Always use the most up-to-date Servicepack of the **Platform Builder**.

Note: The **toolhelp.dll** is not required for Windows CE 6 and should not be used with CE 6.

15.3 Update of the Windows CE Runtime

To perform an update of Windows CE Runtime:

- ▶ Make sure that the zenon Transport Service (**SysSrvCE.exe**) runs in the CE device
- ▶ Make sure that you do not have established a remote connection via the zenon Editor to the device
- ▶ In the zenon **Extras** menu, select the **Update Windows CE Runtime** command.

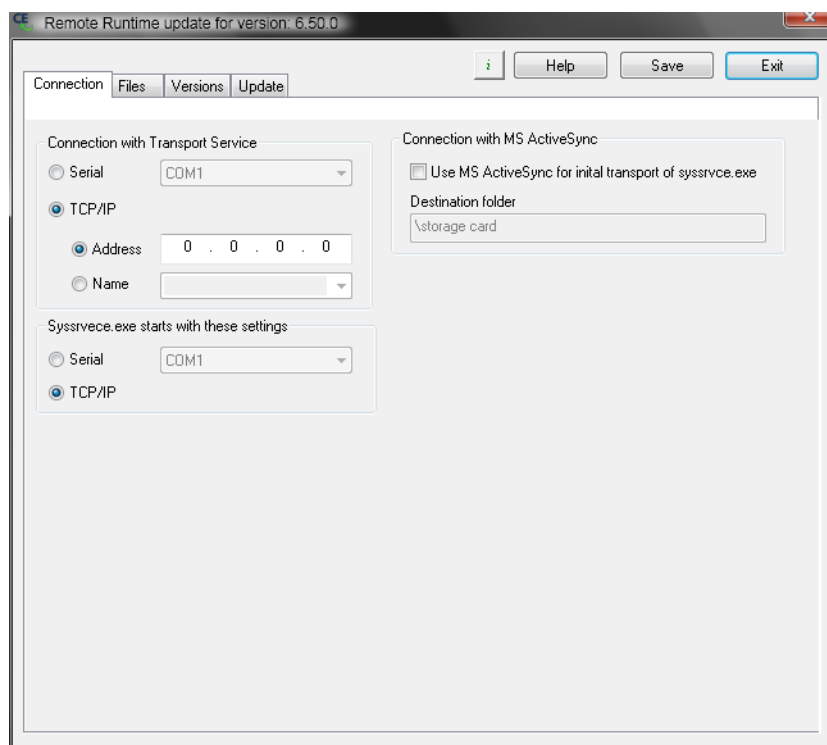
The dialog for transfer of Runtime files opens.

- ▶ Configure the connection.
- ▶ Define the data you want to transfer.
- ▶ Select the appropriate version.
- ▶ Start the update.

Note: If you are transferring/installing Runtime for the first time, note the information in the **Manual installation and Runtime update** (on page 54) chapter. (on page 54)

CONFIGURE CONNECTION

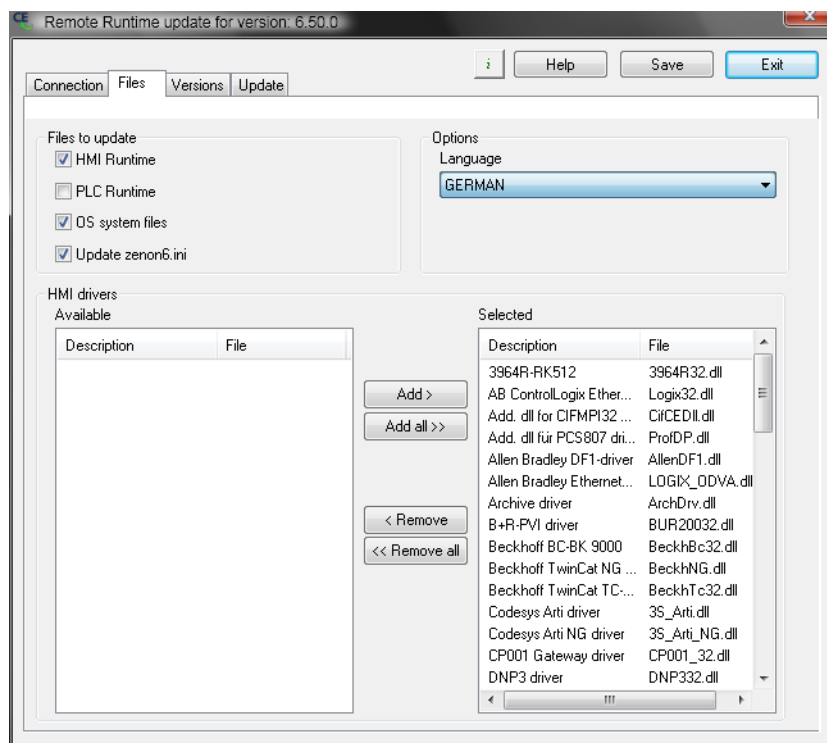
You can configure the connections to the Windows CE device in the tab **Connection**.



Parameter	Description
Serial	Settings for serial connection with Windows CE device, you have to select a port.
TCP/IP	Settings for TCP/IP-connection to the Windows CE device.
Address	IP address.
Name	Computer name

Parameter	Description
Syssrvce.exe starts with these settings	Settings for starting syssrvce.exe .
Serial	<i>Active::</i> serial connection selected, port must be selected.
TCP/IP	<i>Active:</i> TCP/IP-connection selected.
Connection with MS ActiveSync	Settings for connection via MS ActiveSync
Use MS ActiveSync for initial transport of syssrvce.exe	Active: syssrvce.exe is transferred during the first transport via MS ActiveSync.
Destination folder	Target folder.
Help	Opens online-help
Save	Saves all changes.
Exit	Closes the update CE-tool and reminds you before to save unsaved changes.

DEFINE FILES YOU WANT TO TRANSFER

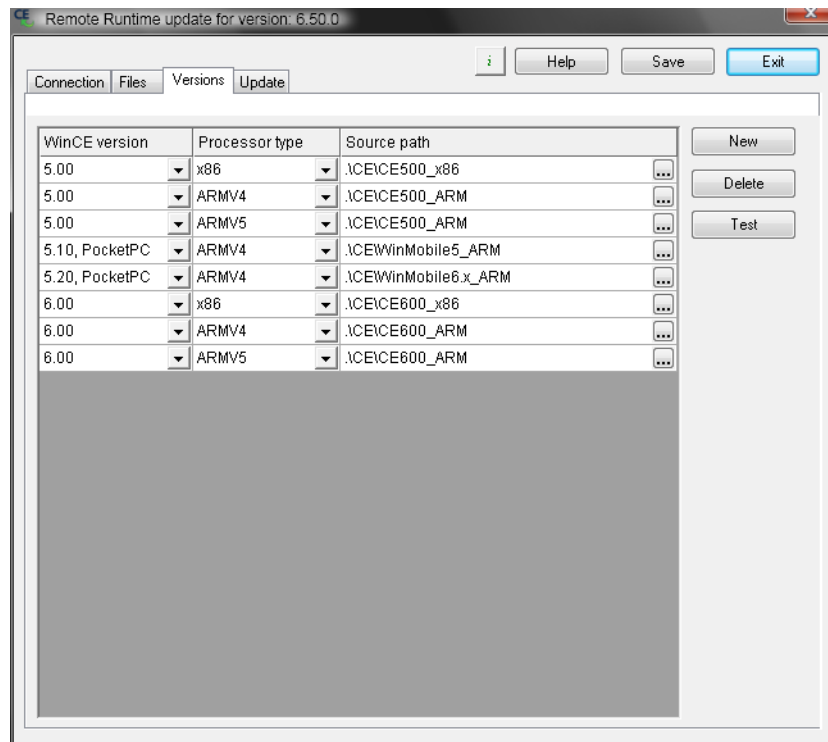


Parameter	Description
Files to update	Files to be transferred.

Parameter	Description
HMI Runtime	Active: Transfers zenon files to the target device. Default: <i>active</i>
PLC Runtime	Active: Transfers zenon Logic files to the target device. Default: <i>inactive</i>
OS system files	Active: Transfers necessary files for the OS. Default: <i>active</i>
Update zenon6.ini	Transfers zenon6.ini to the target device. This way, the license information of the target device is also changed.
Options	
Language	Desired target system language. Default: <i>English</i>
HMI drivers	Selection of HMI drivers for transfer.
Available	List of available drivers.
Selected	List of selected drivers.
Add	Adds chosen drivers to the list of selected drivers.
Add all	Adds all drivers to the list of selected drivers.
Remove	Removes chosen drivers from the list of selected drivers.
Remove all	Removes all drivers from the list of selected drivers.
Help	Opens online-help
Save	Saves all changes.
Exit	Closes the update CE-tool and reminds you before to save unsaved changes.

SELECT VERSION

Select the correct version in the tab **Versions** if it wasn't automatically recognized.

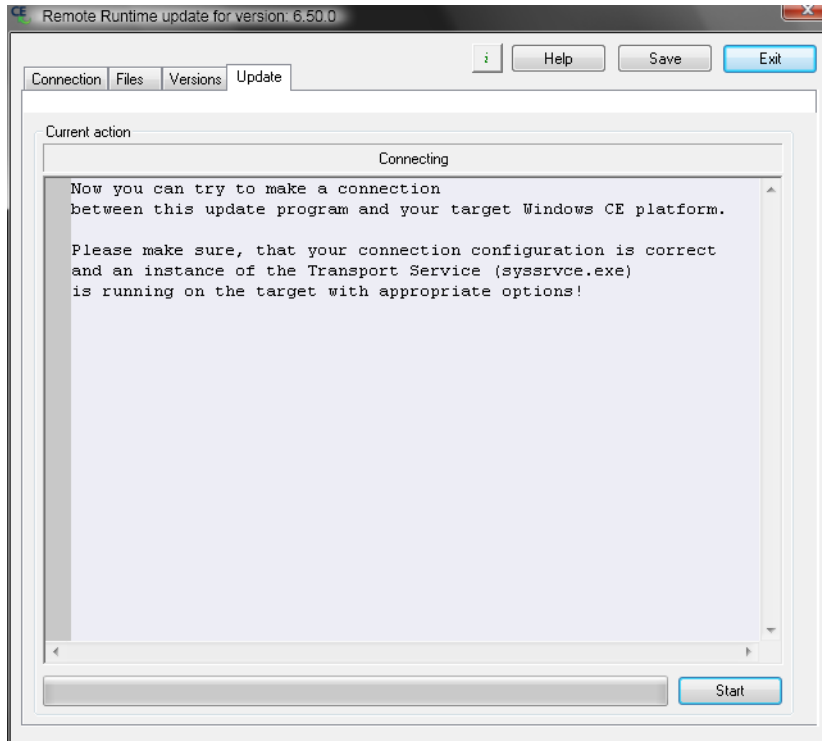


Parameter	Description
WinCE version	Version of the target device Windows CE OS. Click the button to open a drop-down list for selection.
Processor type	Processor of the device.
Source path	Path to the folder that contains the files. Click the button ... and a dialog opens to select a folder.
New	Inserts a new, empty entry in the list.
Delete	Deletes the selected entry from the list
Test	Verifies settings.
Help	Opens online-help
Save	Saves all changes.
Exit	Closes the update CE-tool and reminds you before to save unsaved changes.

START UPDATE

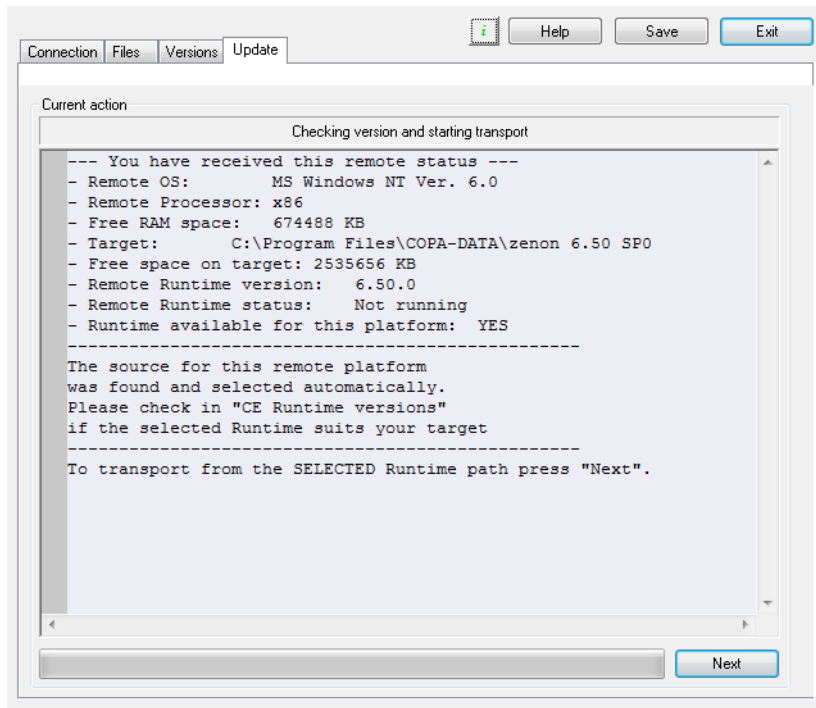
To establish a connection:

1. Click on the button **Start** on the tab **Update**.



The data that shall be transferred is verified and displayed in a window.

2. Start the transfer to the target device by clicking on the button **Next**.



If the transfer cannot be initiated because files are missing, an error message with a list of missing files pops up:



If you get the error message **The current update was not completed**, the update was interrupted or not executed properly.



Information

If you want to replace zenVNCSrv.exe via update, it is terminated and restarted after the update. For this the file **zenVNCSrvCE.exe** in the

UpdateCE.ini file in the **[SOURCES_FILES_GENERAL]** must contain the following entries (available per default):

- ▶ zenVNCSrvCE.exe
- ▶ zenVNCCfgCE.exe

15.4 Manual installation and Runtime-update

Installation and update are also possible without remote transport and ActiveSync. You have to copy the needed files manually on a storage card for the CE device. You have to know CE version and processor type.

It is mandatory to copy the following files from the according folder for the correct platform to a storage card for the CE device:

- ▶ **zenonRCE.exe** (Runtime)
- ▶ **LogCliLibCE.dll** (Diagnose-DLL)
- ▶ **zenon6.ini** (Configuration file)
- ▶ **Cd_tooCE.dll** (Help DLL)
- ▶ **ZenNetSrvCE.dll** (Network)
- ▶ **CDHelper.dll** (Help DLL)
- ▶ One of the following language dlls: **RGhineCE.dll**, **RCzechCE.dll**, **REngliCE.dll**, **RFrancCE.dll**, **RGermaCE.dll**, **RIaliCE.dll**, **RRussiCE.dll**, **RSpaniCE.dll** (the selected language is stipulated in the **zenon6.ini** file.)
- ▶ **sysrvce.exe** (Transport service and Diagnosis Server)
- ▶ **atl90.dll** (System file, possibly part of the operating system)
- ▶ **mfc90u.dll** (System file, possibly part of the operating system)
- ▶ **msvcr90.dll** (System file, possibly part of the operating system)

Further files, for example the driver or the remote desktop software (**zenVNCCfgCE.exe** and **zenVNCSrvCE.exe**), are optional.

15.5 Pocket PCs (PDA - Handheld PC)

Pocket PCs are no longer supported from version 7 on.

15.6 Error handling

Possible errors:

Error	Possible solution
Connection error when updating via COM.	Windows Explorer being open delays the access time. Closing Explorer rectifies the problem.
Transport service does not work.	Check the version of the transport service. At least: Version 5.21 SP3 or higher or version 5.50 SP1 or higher.
Runtime update program cannot establish a connection.	Close open connections of the Editor to the CE transport service.

16 zenon Logic Runtime for Windows CE

The installation of the zenon Logic Runtime (PLC Runtime) on a CE system is similar to the installation of the Runtime for Windows CE (on page 45).

Requirement: Executable transport service under CE

The CE version of the zenon Logic Runtime consists of the following components:

- ▶ zenon Logic Runtime
- ▶ Language DLLs
- ▶ zenon Logic IO driver
- ▶ zenon6.ini

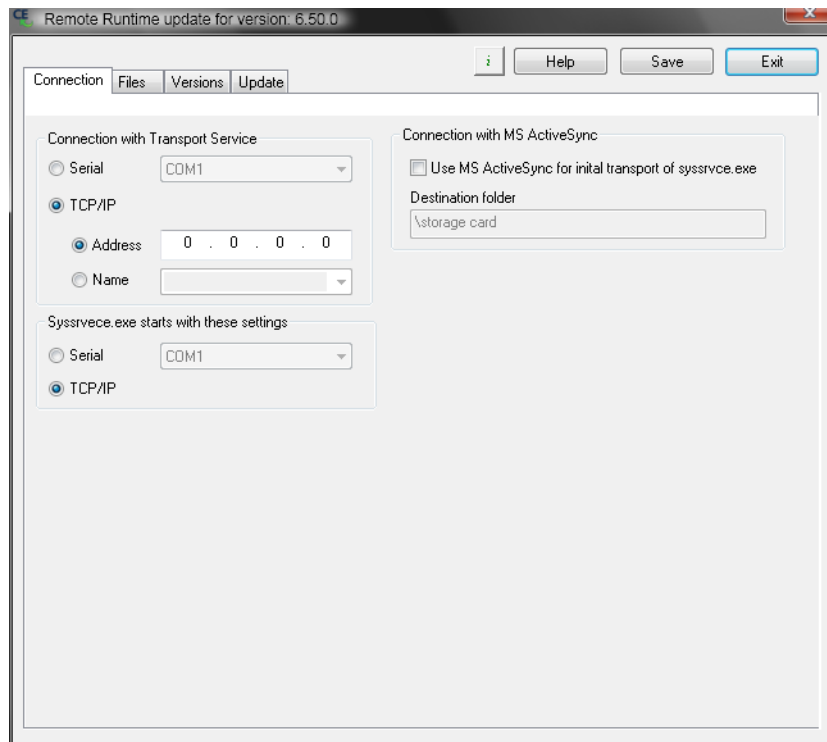
INSTALLATION

- ▶ In the zenon Menu, select **Extras/Update Windows CE Runtime**.

The dialog for transfer of Runtime files opens.

- ▶ Activate the Checkbox PLC Runtime in the Files window to copy the files zenon Logic needs to the CE execution directory.

- Switch to tab Connection.



- Define the connection to the Windows CE device. Enter the IP-address or the serial port.
- If zenon6.ini shall also be transferred, select update zenon6.ini. This way, the license information of the target device is also changed.
- Select the proper version in the window CE Runtime versions, if it wasn't automatically recognized.

UPDATE

Works as described in chapter Update of Windows CE Runtime (on page 47).

Attention: You have to activate the option PLC Runtime in the tab "Files" !



Information

The MFC files are always transferred using Windows CE 6.0.

17 zenon Web Server

To install **zenon Web Server** or **zenon Web Server Pro**:

1. Activate the WWW services on the computer.
Folder `C:\inetpub\wwwroot` must exist.
2. Start the zenon installation medium. The start screen is displayed
If you have deactivated the autostart feature, execute **start.exe** from the installation medium.
3. Select zenon Web Server.
According to the operating system version, the 32-bit or 64-bit version of the zenon Web Server is automatically installed.
4. Follow the installation routine.
5. Restart the computer.

After installation, You can find the setup files for the web client in subfolders of the zenon Web Server installation path (xxx stands for the respective version of zenon), for example: `C:/Program Files (x86)/COPA-DATA/zenonWebserver/zenon/controlversions/Versionxxx/zenon_Webclient_Setup_ENGLISH.EXE`
or

`C:/inetpub/wwwroot/zenon/controlversions/Versionxxx/zenon_Webclient_Setup_ENGLISH.EXE`

The website examples (index*.html and init*.html) are also installed. These can be found in the subfolder zenon of the zenon Web Server installation path, for example:

`C:/Programs/zenonWebserver/zenon/index.htm`

or

`C:/inetpub/wwwroot/zenon/index.html`



Information

The **zenon Web Server** service is started automatically only in the licensed version. In demo mode, you have to start the zenon Web Server manually via zenon Web Server console in the Control Panel.

ADDITIONAL INFORMATION

You can find details about the zenon Web Server in the manual zenon Web Server and Web Server Pro, about the licensing in manual Licensing.

18 zenon Web Client

The zenon Web Client is mainly an ActiveX control displaying the information in a browser. The display is 1:1, as in a **zenon Runtime client**. The connection to the **Runtime Server** is implemented via the **zenon Web Server** using TCP/IP communication.

After installation, You can find the setup files for zenon Web Client in subfolders of the zenon Web Server installation path (xxx stands for the respective version of zenon), for example:

%Programfiles%/COPA-DATA/zenon Web

Server/zenon/controlversions/Versionxxx/zenon_Webclient_Setup_GERMAN.EXE

or

C:/Inetpub/wwwroot/zenon/controlversions/Versionxxx/zenon_Webclient_Setup_ENGLISH.EXE

All zenon Logic Web Client setups are digitally signed and can also be provided for download from the Internet without any problems.

The **zenon Web Client Starter** is also installed with the COPA-DATA Web Client. This makes it possible to open the zenon Web Client from any desired browser.

Info

The zenon Web Client sends error files and LOG files. The application Diagnosis Server (necessary for the evaluation of these files) is included in the installation of the zenon Web Client.

19 Updates (Build Setups)

UPDATE (BUILD SETUP)

An update is installed over the existing installation; it replaces only changed files with the new version. All projects and individual settings will remain unchanged. Build setups are never 100% quality assured. Only the bug fixes are tested. If unwanted side effects should occur because of a bug fix, it might be possible that these side effects will not be noticed during testing. COPA-DATA therefore always recommends using Service Packs. They always have to pass the whole quality-assurance process.

Note:

- ▶ Build setups can only be installed locally. Installation on network paths (UNC) is not possible.
- ▶ zenon Web Client: To install an update for the zenon Web Client, zenon Web Client must be uninstalled beforehand.

SWITCH TO A NEW VERSION

If you want to install a new version of zenon, start the installation routine. The new version is being installed parallel to the old one. All projects and individual settings will remain unchanged. Projects aren't converted to the new version during installation. The respective project is converted when it's being opened for the first time in the Editor. A dialog box notifies you about this procedure. The old

version is automatically backed up. If you want to use only the most up-to-date version, use the Windows control panel software deinstallation routine to remove the old version.



Attention

If an installation involves changing the SQL server (for example, from zenon 7.00 to zenon 7.10 or higher), you must back up all projects or the workspace must be backed up before the installation. This backup is read back after the installation. For details see also section **Multi-user projects/Update with change of SQL servers**.

If you want to use multiple versions of zenon simultaneously, you have to manage them using the **Startup Tool**. You can start only one version at a time. You can select which version you want to run using the **Startup Tool** that automatically adjusts all necessary settings. You can find details in chapter **Startup Tool**.



Information

New versions always bring about structural changes. Projects and settings remain untouched during installation. If you open the Editor for the first time, projects are converted to the new version. Simultaneously, an automatic backup of the old version is created.

Converted projects cannot be edited in legacy versions. From version 6.2 on, the Editor is able to create projects for different Runtime versions.

Important tips for converting projects can be found in the revision text. This is supplied on the installation medium and is available to you online.

MULTI-USER PROJECTS

To ensure a change to a new zenon version in multi-user projects without data loss:

1. Check in all checked out elements on all Clients -> *Accept changes*. Nothing must be checked out. This is true for all projects.
2. Install the new zenon version on the Server.
3. Convert all Server projects to the new version: For this load all projects in the Editor on the Server computer.
4. Install the new zenon version on the Client computers.
5. Load projects on the Clients and check them out again.

UPDATE WITH CHANGE OF THE SQL SERVER

If an installation involves changing the SQL server (e.g. from zenon 7.00 to zenon 8.10), additional steps are needed. These steps are carried out:

- ▶ after all projects are checked in
- ▶ before the new version is installed

Procedure when changing the SQL Server:

1. Check in all checked out elements on all Clients -> *Accept changes*.
2. Open the Editor in the starting version on the multi-user Server.
3. Create backups of all projects which you want to edit or open with the new version:
 - ▶ either as single project backups
 - ▶ or as backup of the complete workspace
4. Install the new version on the Server.
5. Convert all Server projects to the new version by loading the previously created project backups in the Editor once.
6. Install the update on every Client.
7. Transfer the projects from the multi-user Server to the Clients
Keep in mind the new name of the SQL instance.

The projects are converted, synchronized and ready for use

Attention: Make sure that the settings of the firewall allows the data traffic between the multi-user Server and the Clients.

COMPATIBILITY

The zenon Editor can open projects from the previous versions in each new version. These can be edited further in the new version. If adjustments are required by the user, information can be found in the current revision text and in the **Project conversion** manual. When opening a project with a lower version number in a higher Editor version:

- ▶ the project is automatically converted
- ▶ a backup of the project is automatically created



Attention

Converted projects can no longer be opened in an editor with a lower version number. The project backup created during conversion can still be opened and edited.

Also avoid transferring projects via XML import from newer to older versions. This can lead to undesirable results. Drivers in particular can perform differently than expected.

COMPATIBILITY BETWEEN THE EDITOR AND RUNTIME:

With the zenon Editor, Runtime files can be created for different versions of Runtime. The Runtime version therefore does not need to correspond to the Editor version. This backward compatibility is particularly suited for use of mixed systems. For example: A project that was planned with the editor for version 8.00 can also be started with Runtime 6.20 SP4.



Attention

If, in a project with a later version of the Editor, properties are shown that are not available in the earlier version, these are not available. This can lead to unwanted results in the Runtime. When creating Runtime files for older versions, check for changed project configurations, in particular the driver configurations.

CREATING RUNTIME FILES

To create Runtime files in the editor for earlier versions:

1. Select the project in the project tree.
2. Navigate to the **General** section in project properties.
3. Open the **Create Runtime files for** property drop-down list.
4. Select the desired version from the drop-down list

Attention: In order to ensure consistency of Runtime files, all Runtime files must be newly created each time this property is changed. The configurations for all drivers are converted. Settings that do not exist in the respective version are set to the default setting.

ERROR CREATING RUNTIME FILES AND MICROSOFT OFFICE 365

In a certain configuration, an error may occur when generating Runtime files:

- ▶ You can create Runtime files on a computer with:

- ▶ Windows 10 operating system and
- ▶ Office 365.
- ▶ Creating Runtime files has failed and is terminated with an error message.

This is caused when an incorrect version of a program library by VBA is loaded.

Solution:

1. Navigate to the folder: %AppData%\Microsoft\FORMS.
2. Delete the file **zenone32.box**.
3. This file is created new automatically by the zenon.

Creating Runtime files is possible again.

XML

Data exported in XML is then available for import into later Editor versions.

Exception: If data from the RGM is saved in the Runtime directly as an XML file using the export function, this cannot be reimported.

20 FAQ

Errors during the installation mostly occur when the replacement or creation of files is prevented by a virus scanner or by existing installations. Here you can find the most frequent reasons for installation errors and their solution.

ZENON

Problem	Solution
Installation is terminated. Typical error message: Error 1304. Error writing to file...	Deactivate the virus scanner. Close unnecessary programs.
Demo projects were installed but are not displayed. New projects cannot be created.	Check the computer name. The computer: <ul style="list-style-type: none"> ▶ must not consist of more than 15 characters ▶ must be in accordance with the convention of the NetBIOS computer name
Error message that a service cannot be	<ul style="list-style-type: none"> ▶ first reboot the computer

Problem	Solution
started.	▶ then start the zenon setup again

SQL SERVER

GENERAL

Problem	Solution
The installation is unsuccessful because the password does not meet the requirements.	If the minimum password length is changed from a default 8 to a value <i>greater than 10</i> via the local Windows security guideline, then the installation of the SQL Server will be unsuccessful because the zenon SQL password consists of 10 characters.

21 Technical support

BASIC SUPPORT

If you need support for the installation, our employees in Technical Consulting would be happy to help you.

User with basic support can reach the hotline at the following e-mail address: support@copadata.com.

ADVANCED AND PREMIUM SUPPORT

If you have an Advanced or Premium service agreement, please use the telephone number or email address provided in that. Our sales employees (sales@copadata.com) will gladly assist you, if you want to upgrade your free basic service agreement to an Advanced or Premium service agreement.

22 License information in relation to open-source software

COPA-DATA products use the following open-source software.

Note: This information is only available in English.

22.1 zenon Open Source licences for several features

- ▶ The SNMP driver (SNMPNG32.exe) uses OpenSSL and NetSNMP.
- ▶ The DNP3 driver, the IEC 60870 driver, the OPC UA driver, the Message Control and the Web Server Client are using the OpenSSL 1.1.1 Long Term Support with the Open SSL License.
- ▶ The LicenseManager uses the JSON and the zlib Library.
- ▶ The OPC UA Process Gateway (AccessOPCUA.dll) and the OPC UA driver (OPCUA32.exe) use OpenSSL.
- ▶ The Message Control uses MIMEEmail and OpenSSL (zenon32.dll).
- ▶ The HTML Web Engine –Web Application uses ANTLRv3, Bootstrap, jQuery UI, jQuery, Json.NET, NLog, Owin, jQuery.SVG, WebGrease.
- ▶ The HTML Web Engine – Deployment Tool uses Extended WPF Toolkit, Newtonsoft.Json, NLog, WPF Application Framework (WAF).
- ▶ The HTML Web Engine – Compiler uses Newtonsoft.Json, NLog.Windows.Forms, NLog.
- ▶ The JavaScript library jQuery 3.3.1 uses the MIT License.
- ▶ The Everywhere Essentials QR Code Generator Wizard uses QrCode.Net.
- ▶ The Message Control VoiceOverIP Extension (MsgCtrlVoip.dll) uses libSRTP, Speex, PortAudio, Alaw/Ulaw Converter, GSM Codec 06.10 and iLBC Codec.
- ▶ The 3D Configuration Tool uses DWF Toolkit License, the MIT License (MIT), the SharpDX - Alexandre Mutel License.
- ▶ The 3D Integration uses the zlib Library.
- ▶ The 3D Integration uses the Intel® Threading Building Blocks (Intel® TBB) (Version 2018, 0, 2017, 0919) under the Apache 2.0 License.
- ▶ The 3D Integration uses the liblzma under the XZ Utils License 5.2.2.
- ▶ The GIS-Control uses the Gmap-Control with the MIT License (MIT).
- ▶ The System.Data.SQLite and the System Window Interactivity WPF are using the Microsoft Public License (MS-PL).
- ▶ As framework for .NET the Newtonsoft.Json 11.0.2 software uses the MIT License (MIT).
- ▶ The NLog.Extensions.Logging 1.0.1 uses the BSD 2-Clause "Simplified" License.
- ▶ The NLog 4.4.0 uses the NLog / License.
- ▶ The NLog 4.5.3 uses the BSD 3-Clause "New" or "Revised" License.
- ▶ The NLog.Web.AspNetCore 4.5.3 software, which contains targets and layout-renderers specific to ASP.NET (Core), MVC and IIS, uses the BSD 3-Clause "New" or "Revised" License.
- ▶ The Predictive Analytics and the Analyzer Management Studio use Math.Net Numerics 4.4.0 with the MIT/X11 License.

- ▶ The Add-In Framework uses the SharpDevelop 5.1.0 with the MIT License, the Mono.AddIns 1.3 with the MIT License, the Mono.Cecil 0.9.6.4 with the MIT/X11 License, the WPF Application Framework (WAF) 3.2.0 with the Microsoft Public License (MS-PL).
- ▶ The zenon Analyzer Management Studio uses the Castel.Core 4.2.1 with Apache License.
- ▶ The *.ini-file handling is using a ini-parser with the MIT License (MIT).
- ▶ The Drag&Drop functionality is using package with the BSD 3-Clause License.
- ▶ The Toggle Switch Control Library is using the Microsoft Public License (MsPL).
- ▶ Process Gateway uses cpprestsdk (cpprestsdk.v120.winxp.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v120.winphonesl.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v120.windesktop.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v120.winphone.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v120.winapp.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v140.winapp.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk.v140.windesktop.msvcstl.dyn.rt-dyn 2.9.1; cpprestsdk 2.9.1.1) with the MIT License.
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- ▶ The popper.js 1.14.3 software, a library used to position poppers in web applications, uses the MIT License (MIT).
- ▶ The bootstrap 4.1.0 software, a toolkit for developing with HTML, CSS and JS, uses the MIT License (MIT).
- ▶ The @types/cryptojs 3.1.29 software, which contains type definitions for CcryptoJS 3.1.2, uses the MIT License (MIT).
- ▶ The OPC Foundation UA ANSI C Stack 1.03.341 software, which is used as Ansi C Stack of the OPC Foundation, uses the Reciprocal Community License (RCL).
- ▶ The OpenSSL 1.10h software, which is a toolkit for Transport Layer Security (TLS) and Secure Sockets Layer (SSL) protocols, uses the Open SSL License and the SSLeay License.
- ▶ The Chromium Embedded Framework (CEF), which is a framework for embedding Chromium-based browsers in other applications, uses the Chromium Embedded Framework (CEF) License.
- ▶ The zenon Analyzer and the zenon Supervisor uses the mosquitto 1.4.12 MQTT Broker with the Eclipse Public License - v 1.0.
- ▶ The zenon Supervisor uses the phao MQTT C client 1.2.1 with the Eclipse Public License - v 1.0
- ▶ The Web Server - Client Modul uses System.Configuration.ConfigurationManager 4.4.1 with the MIT License (MIT).
- ▶ The Command Line Parser 2.3 uses the MIT License (MIT).

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- ▶ The Web Server - Client Modul uses Microsoft.Extensions.FileProviders.Physical 2.1.1 with the Apache License 2.0.
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- ▶ The Web Server - Client Modul uses Microsoft.Extensions.DependencyInjection.Abstractions 2.1.1 with the Apache License 2.0.
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- ▶ The Web Server - Client Modul uses Microsoft.AspNetCore.Hosting.Abstractions 2.1.1 with the Apache License 2.0.
- ▶ The Mono.Posix.NETStandard 1.0.0, which is a component that is used to figure out, if an application is running as Administrator under linux, uses the MIT and BSD License (for Mono distribution).
- ▶ The zenon Supervisor uses the libzip 1.5.1 library with the 3-clause BSD license.
- ▶ The zenon Supervisor uses the Angular 7.1.3 User Interface Framework with the MIT License (Copyright (c) 2010-2019 Google LLC. <http://angular.io/license>).
- ▶ The zenon Supervisor uses the Angular Material 7.3.1 Component Framework for Angular with the MIT License (Copyright (c) 2019 Google LLC).

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22.1.1 Alaw/Ulaw Converter

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22.1.2 ANTLRv3

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22.1.3 Apache License 2.0

Apache License

Version 2.0, January 2004

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22.1.5 bootstrap 4.1.0

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22.1.7 Castle.Core 4.2.1

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22.1.14 GSM Codec 06.10

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22.1.16 IdentityModel2 3.0.0

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22.1.18ini Parser

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22.1.21jQuery 3.3.1

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22.1.27 Mono.AddIns 1.3

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22.1.28 Mono.Cecil 0.9.6.4

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22.1.32 NLog.Extensions.Logging 1.0.1

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22.1.44 popper.js 1.14.3

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Based on the Open Source API proposed by Ross Bencina

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22.1.51 Toggle Switch Control Library

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zlib.h -- interface of the 'zlib' general purpose compression library version 1.2.11, January 15th, 2017

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Version 1.1

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Version 3, 29 June 2007

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- ▶ The zenon Logic Workbench uses the following libraries:
 - ▶ CxImage Library (on page 195)
 - ▶ Gong-wpf-dragdrop Library (on page 196)
 - ▶ Jasper Library (on page 197)
 - ▶ JPEG Library (on page 198)
 - ▶ Libpng Library (on page 205)
 - ▶ Math.NET Numerics Library (on page 207)
 - ▶ MNG Library (on page 208)
 - ▶ PCap Library (on page 208)
 - ▶ SQLite Library (on page 209)
 - ▶ Tiff Library (on page 210)
 - ▶ Tinyxml Library (on page 210)
 - ▶ Zlib Library (on page 211)

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CxImage version 6.0.0 02/Feb/2008

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22.3.4 JPEG Library

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DOCUMENTATION ROADMAP

This file contains the following sections:

Section	Description
OVERVIEW	General description of JPEG and the IJG software.
LEGAL ISSUES	Copyright, lack of warranty, terms of distribution.
REFERENCES	Where to learn more about JPEG.
ARCHIVE LOCATIONS	Where to find newer versions of this software.
RELATED SOFTWARE	Other stuff you should get.
FILE FORMAT WARS	Software *not* to get.
TO DO	Plans for future IJG releases.

Other documentation files in the distribution are:

User documentation:

Documentation	Description
install.doc	How to configure and install the IJG software.
usage.doc	Usage instructions for cjpeg, djpeg, jpegtran, rdjpgcom, and wrjpgcom.
*.1	Unix-style man pages for programs (same info as usage.doc).
wizard.doc	Advanced usage instructions for JPEG wizards only.
change.log	Version to version change highlights.

Programmer and internal documentation:

Documentation	Description
libjpeg.doc	How to use the JPEG library in your own programs.
example.c	Sample code for calling the JPEG library.
structure.doc	Overview of the JPEG library's internal structure.
filelist.doc	Road map of IJG files.
coderrules.doc	Coding style rules - please read if you contribute code.

Please read at least the files install.doc and usage.doc. Useful information can also be found in the JPEG FAQ (Frequently Asked Questions) article. See ARCHIVE LOCATIONS below to find out where to obtain the FAQ article.

If you want to understand how the JPEG code works, we suggest reading one or more of the REFERENCES, then looking at the documentation files (in roughly the order listed) before diving into the code.

OVERVIEW

This package contains C software to implement JPEG image compression and decompression. JPEG (pronounced "jay-peg") is a standardized compression method for full-color and gray-scale images. JPEG is intended for compressing "real-world" scenes; line drawings, cartoons and other non-realistic images are not its strong suit. JPEG is lossy, meaning that the output image is not exactly identical to the input image. Hence you must not use JPEG if you have to have identical output bits. However, on typical photographic images, very good compression levels can be obtained with no visible change, and remarkably high compression levels are possible if you can tolerate a low-quality image. For more details, see the references, or just experiment with various compression settings.

This software implements JPEG baseline, extended-sequential, and progressive compression processes. Provision is made for supporting all variants of these processes, although some uncommon parameter settings aren't implemented yet. For legal reasons, we are not

distributing code for the arithmetic-coding variants of JPEG; see LEGAL ISSUES. We have made no provision for supporting the hierarchical or lossless processes defined in the standard.

We provide a set of library routines for reading and writing JPEG image files, plus two sample applications "cjpeg" and "djpeg", which use the library to perform conversion between JPEG and some other popular image file formats. The library is intended to be reused in other applications.

In order to support file conversion and viewing software, we have included considerable functionality beyond the bare JPEG coding/decoding capability; for example, the color quantization modules are not strictly part of JPEG decoding, but they are essential for output to colormapped file formats or colormapped displays. These extra functions can be compiled out of the library if not required for a particular application. We have also included "jpegtran", a utility for lossless transcoding between different JPEG processes, and "rdjpgcom" and "wrjpgcom", two simple applications for inserting and extracting textual comments in JFIF files.

The emphasis in designing this software has been on achieving portability and flexibility, while also making it fast enough to be useful. In particular, the software is not intended to be read as a tutorial on JPEG. (See the REFERENCES section for introductory material.) Rather, it is intended to be reliable, portable, industrial-strength code. We do not claim to have achieved that goal in every aspect of the software, but we strive for it.

We welcome the use of this software as a component of commercial products.

No royalty is required, but we do ask for an acknowledgement in product documentation, as described under LEGAL ISSUES.

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ansi2knr.c is NOT covered by the above copyright and conditions, but instead by the usual distribution terms of the Free Software Foundation; principally, that you must include source code if you redistribute it. (See the file ansi2knr.c for full details.) However, since ansi2knr.c is not needed as part of any program generated from the IJG code, this does not limit you more than the foregoing paragraphs do.

The Unix configuration script "configure" was produced with GNU Autoconf. It is copyright by the Free Software Foundation but is freely distributable. The same holds for its supporting scripts (config.guess, config.sub, ltconfig, ltmain.sh). Another support script, install-sh, is copyright by M.I.T. but is also freely distributable.

It appears that the arithmetic coding option of the JPEG spec is covered by patents owned by IBM, AT&T, and Mitsubishi. Hence arithmetic coding cannot legally be used without obtaining one or more licenses. For this reason, support for arithmetic coding has been removed from the free JPEG software. (Since arithmetic coding provides only a marginal gain over the unpatented Huffman mode, it is unlikely that very many implementations will support it.) So far as we are aware, there are no patent restrictions on the remaining code.

The IJG distribution formerly included code to read and write GIF files. To avoid entanglement with the Unisys LZW patent, GIF reading support has been removed altogether, and the GIF writer has been simplified to produce "uncompressed GIFs". This technique does not use the LZW algorithm; the resulting GIF files are larger than usual, but are readable by all standard GIF decoders.

We are required to state that "The Graphics Interchange Format(c) is the Copyright property of CompuServe Incorporated. GIF(sm) is a Service Mark property of CompuServe Incorporated."

REFERENCES

We highly recommend reading one or more of these references before trying to understand the innards of the JPEG software.

The best short technical introduction to the JPEG compression algorithm is:

Wallace, Gregory K. "The JPEG Still Picture Compression Standard",
Communications of the ACM, April 1991 (vol. 34 no. 4), pp. 30-44.

(Adjacent articles in that issue discuss MPEG motion picture compression, applications of JPEG, and related topics.) If you don't have the CACM issue handy, a PostScript file containing a revised version of Wallace's article is available at <ftp://ftp.uu.net/graphics/jpeg/wallace.ps.gz>. The file (actually a preprint for an article that appeared in IEEE Trans. Consumer Electronics) omits the sample images that appeared in CACM, but it includes corrections and some added material. Note: the Wallace article is copyright ACM and IEEE, and it may not be used for commercial purposes.

A somewhat less technical, more leisurely introduction to JPEG can be found in "The Data Compression Book" by Mark Nelson and Jean-loup Gailly, published by M&T Books (New York), 2nd ed. 1996, ISBN 1-55851-434-1. This book provides good explanations and example C code for a multitude of compression methods including JPEG. It is an excellent source if you are comfortable reading C code but don't know much about data compression in general. The book's JPEG sample code is far from industrial-strength, but when you are ready to look at a full implementation, you've got one here...

The best full description of JPEG is the textbook "JPEG Still Image Data Compression Standard" by William B. Pennebaker and Joan L. Mitchell, published by Van Nostrand Reinhold, 1993, ISBN 0-442-01272-1. Price US\$59.95, 638 pp. The book includes the complete text of the ISO JPEG standards (DIS 10918-1 and draft DIS 10918-2). This is by far the most complete exposition of JPEG in existence, and we highly recommend it.

The JPEG standard itself is not available electronically; you must order a paper copy through ISO or ITU. (Unless you feel a need to own a certified official copy, we recommend buying the Pennebaker and Mitchell book instead; it's much cheaper and includes a great deal of useful explanatory material.) In the USA, copies of the standard may be ordered from ANSI Sales at (212) 642-4900, or from Global Engineering Documents at (800) 854-7179. (ANSI doesn't take credit card orders, but Global does.) It's not cheap: as of 1992, ANSI was charging \$95 for Part 1 and \$47 for Part 2, plus 7% shipping/handling. The standard is divided into two parts, Part 1 being the actual specification, while Part 2 covers compliance testing methods. Part 1 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 1: Requirements and guidelines" and has document numbers ISO/IEC IS 10918-1, ITU-T T.81. Part 2 is titled "Digital Compression and Coding of Continuous-tone Still Images, Part 2: Compliance testing" and has document numbers ISO/IEC IS 10918-2, ITU-T T.83.

Some extensions to the original JPEG standard are defined in JPEG Part 3, a newer ISO standard numbered ISO/IEC IS 10918-3 and ITU-T T.84. IJG currently does not support any Part 3 extensions.

The JPEG standard does not specify all details of an interchangeable file format. For the omitted details we follow the "JFIF" conventions, revision 1.02. A copy of the JFIF spec is available from:

Literature Department

C-Cube Microsystems, Inc.

1778 McCarthy Blvd.

Milpitas, CA 95035

phone (408) 944-6300, fax (408) 944-6314

A PostScript version of this document is available by FTP at <ftp://ftp.uu.net/graphics/jpeg/jfif.ps.gz>. There is also a plain text version at <ftp://ftp.uu.net/graphics/jpeg/jfif.txt.gz>, but it is missing the figures. The TIFF 6.0 file format specification can be obtained by FTP from <ftp://ftp.sgi.com/graphics/tiff/TIFF6.ps.gz>. The JPEG incorporation scheme found in the TIFF 6.0 spec of 3-June-92 has a number of serious problems. IJG does not recommend use of the TIFF 6.0 design (TIFF Compression tag 6). Instead, we recommend the JPEG design proposed by TIFF Technical Note #2 Straton3dPartySoftware-(Compression tag 7). Copies of this Note can be obtained from <ftp.sgi.com> or from <ftp://ftp.uu.net/graphics/jpeg/>. It is expected that the next revision of the TIFF spec will replace the 6.0 JPEG design with the Note's design. Although IJG's own code does not support TIFF/JPEG, the free libtiff library uses our library to implement TIFF/JPEG per the Note. libtiff is available from <ftp://ftp.sgi.com/graphics/tiff/>.

ARCHIVE LOCATIONS

The "official" archive site for this software is <ftp.uu.net> (Internet address 192.48.96.9). The most recent released version can always be found there in directory [graphics/jpeg](ftp://ftp.uu.net/graphics/jpeg/). This particular version will be archived as <ftp://ftp.uu.net/graphics/jpeg/jpegsrc.v6b.tar.gz>. If you don't have direct Internet access, UUNET's archives are also available via UUCP; contact help@uunet.uu.net for information on retrieving files that way.

Numerous Internet sites maintain copies of the UUNET files. However, only <ftp.uu.net> is guaranteed to have the latest official version.

You can also obtain this software in DOS-compatible "zip" archive format from the SimTel archives (<ftp://ftp.simtel.net/pub/simtelnet/msdos/graphics/>), or on CompuServe in the Graphics Support forum (GO CIS:GRAPHSUP), library 12 "JPEG Tools". Again, these versions may sometimes lag behind the <ftp.uu.net> release.

The JPEG FAQ (Frequently Asked Questions) article is a useful source of general information about JPEG. It is updated constantly and therefore is not included in this distribution. The FAQ is posted every two weeks to Usenet newsgroups comp.graphics.misc, news.answers, and other groups. It is available on the World Wide Web at <http://www.faqs.org/faqs/jpeg-faq/> and other news.answers archive sites, including the official news.answersarchive at rtfm.mit.edu:

<ftp://rtfm.mit.edu/pub/usenet/news.answers/jpeg-faq/>. If you don't have Web or FTP access, send e-mail to mail-server@rtfm.mit.edu with body

send usenet/news.answers/jpeg-faq/part1

`send usenet/news.answers/jpeg-faq/part2`

RELATED SOFTWARE

Numerous viewing and image manipulation programs now support JPEG. (Quite a few of them use this library to do so.) The JPEG FAQ described above lists some of the more popular free and shareware viewers, and tells where to obtain them on Internet.

If you are on a Unix machine, we highly recommend Jef Poskanzer's free PBMPLUS software, which provides many useful operations on PPM-format image files. In particular, it can convert PPM images to and from a wide range of other formats, thus making cjpeg/djpeg considerably more useful. The latest version is distributed by the NetPBM group, and is available from numerous sites, notably <ftp://wuarchive.wustl.edu/graphics/graphics/packages/NetPBM/>.

Unfortunately PBMPLUS/NETPBM is not nearly as portable as the IJG software is; you are likely to have difficulty making it work on any non-Unix machine.

A different free JPEG implementation, written by the PVRG group at Stanford, is available from <ftp://havefun.stanford.edu/pub/jpeg/>. This program is designed for research and experimentation rather than production use; it is slower, harder to use, and less portable than the IJG code, but it is easier to read and modify. Also, the PVRG code supports lossless JPEG, which we do not. (On the other hand, it doesn't do progressive JPEG.)

FILE FORMAT WARS

Some JPEG programs produce files that are not compatible with our library. The root of the problem is that the ISO JPEG committee failed to specify a concrete file format. Some vendors "filled in the blanks" on their own, creating proprietary formats that no one else could read. (For example, none of the early commercial JPEG implementations for the Macintosh were able to exchange compressed files.)

The file format we have adopted is called JFIF (see REFERENCES). This format has been agreed to by a number of major commercial JPEG vendors, and it has become the de facto standard. JFIF is a minimal or "low end" representation. We recommend the use of TIFF/JPEG (TIFF revision 6.0 as modified by TIFF Technical Note #2) for "high end" applications that need to record a lot of additional data about an image. TIFF/JPEG is fairly new and not yet widely supported, unfortunately.

The upcoming JPEG Part 3 standard defines a file format called SPIFF. SPIFF is interoperable with JFIF, in the sense that most JFIF decoders should be able to read the most common variant of SPIFF. SPIFF has some technical advantages over JFIF, but its major claim to fame is simply that it is an official standard rather than an informal one. At this point it is unclear whether SPIFF will supersede JFIF or whether JFIF will remain the de-facto standard. IJG intends to support SPIFF once the standard is frozen, but we have not decided whether it should become our default output format or not. (In any case, our decoder will remain capable of reading JFIF indefinitely.)

Various proprietary file formats incorporating JPEG compression also exist. We have little or no sympathy for the existence of these formats. Indeed, one of the original reasons for developing

this free software was to help force convergence on common, open format standards for JPEG files. Don't use a proprietary file format!

TO DO

The major thrust for v7 will probably be improvement of visual quality. The current method for scaling the quantization tables is known not to be very good at low Q values. We also intend to investigate block boundary smoothing, "poor man's variable quantization", and other means of improving quality-vs-file-size performance without sacrificing compatibility.

In future versions, we are considering supporting some of the upcoming JPEG Part 3 extensions --- principally, variable quantization and the SPIFF file format.

As always, speeding things up is of great interest.

Please send bug reports, offers of help, etc. to jpeg-info@uunet.uu.net.

22.3.5 Libpng Library

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A "png_get_copyright" function is available, for convenient use in "about" boxes and the like:
`printf("%s",png_get_copyright(NULL));`

Also, the PNG logo (in PNG format, of course) is supplied in the files "pngbar.png" and "pngbar.jpg" (88x31) and "pngnow.png" (98x31).

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Glenn Randers-Pehrson

glennrp at users.sourceforge.net

December 14, 2007

22.3.6 Math.NET Numerics Library

The Math.NET Numerics Library uses the License MIT/X11.

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22.3.7 MNG Library

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Parts of this software have been adapted from the libpng package. Although this library supports all features from the PNG specification (as MNG descends from it) it does not require the libpng package. It does require the zlib library and optionally the IJG jpeg library, and/or the "little-cms" library by Marti Maria (depending on the inclusion of support for JNG and Full-Color-Management respectively).

This library's function is primarily to read and display MNG animations. It is not meant as a full-featured image-editing component! It does however offer creation and editing functionality at the chunk level (future modifications may include some more support for creation and or editing).

22.3.8 PCap Library

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22.3.9 SQLite Library

2001 September 15

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This header file defines the interface that the SQLite library presents to client programs. If a C-function, structure, datatype, or constant definition does not appear in this file, then it is not a published API of SQLite, is subject to change without notice, and should not be referenced by programs that use SQLite.

Some of the definitions that are in this file are marked as "experimental". Experimental interfaces are normally new features recently added to SQLite. We do not anticipate changes to experimental interfaces but reserve the right to make minor changes if experience from use "in the wild" suggest such changes are prudent.

The official C-language API documentation for SQLite is derived from comments in this file. This file is the authoritative source on how SQLite interfaces are supposed to operate.

The name of this file under configuration management is "sqlite.h.in".

The makefile makes some minor changes to this file (such as inserting the version number) and changes its name to "sqlite3.h" as part of the build process.

22.3.10 Tiff Library

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22.3.11 Tinyxml Library

www.sourceforge.net/projects/tinyxml

Original code (2.0 and earlier) copyright (c) 2000-2006 Lee Thomason (www.grinninglizard.com)

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22.3.12 Zlib Library

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zlib.h -- interface of the 'zlib' general purpose compression library version 1.2.11, January 15th, 2017

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