



acontis technologies GmbH

# Real-time Accelerator Windows

User Manual

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# 1 Introduction

## 1.1 Overview

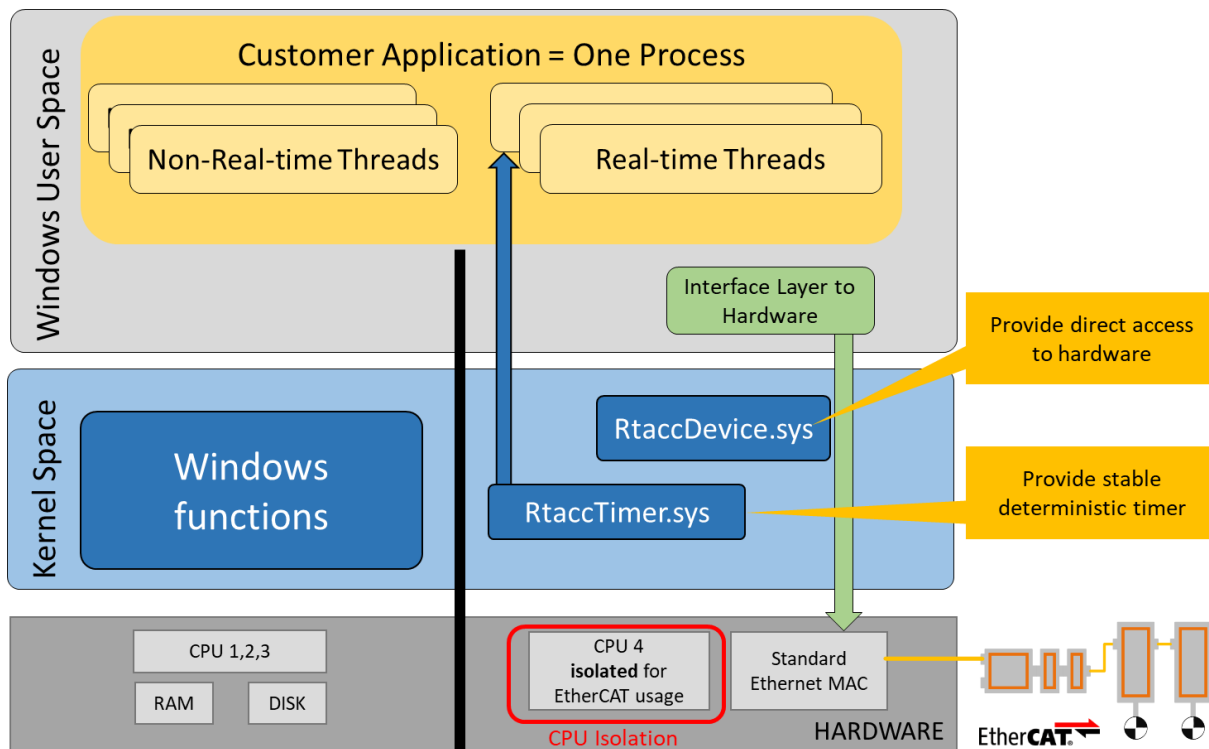
Real-time Accelerator Windows (RtaccWin) makes it possible to run hard real-time capable applications deterministically under Windows. This is accomplished by exclusively reserving one or more CPUs for the real-time application, setting up the proper parameterization of Windows, and utilizing the acontis kernel drivers for precise timing and direct hardware access.

## 1.2 Features

- Fast response times within microseconds
- Hard real-time with Real-Time Accelerator technology using CPU isolation
  - Real-time functions and standard functions in one process on one isolated CPU
  - RtaccTimer driver to generate a precise, stable clock
  - RtaccDevice driver for direct access to hardware without kernel driver
- Measure performance of the system for real-time usage

## 1.3 Architecture

RtaccWin includes a Windows system driver that provides a precise and adjustable clock for the entire application. To ensure deterministic behavior, standard Windows drivers are typically not used for the real-time application. Instead, the kernel driver in RtaccWin allows direct access to hardware, such as network cards, fieldbus cards, etc., from Windows user mode, resulting in lower jitter, significantly lower CPU utilization, and a deterministic behavior.



## 1.4 Requirements

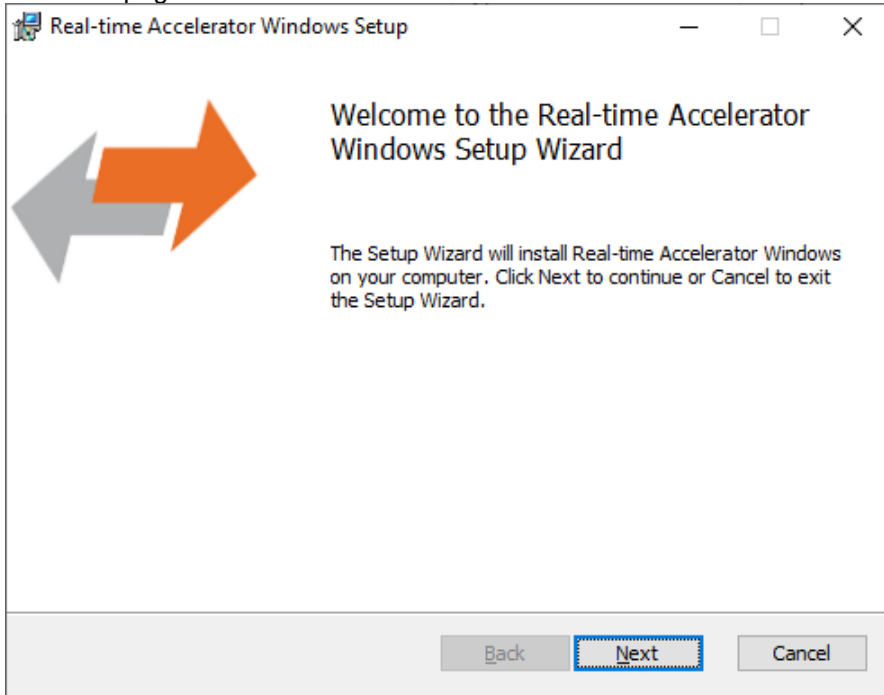
- Microsoft Windows 10 and above
- Microsoft .NET Framework 4 Client Profile
- Screen resolution at least 1024x768 pixel
- Memory as recommended for operating system

## 2 Installation

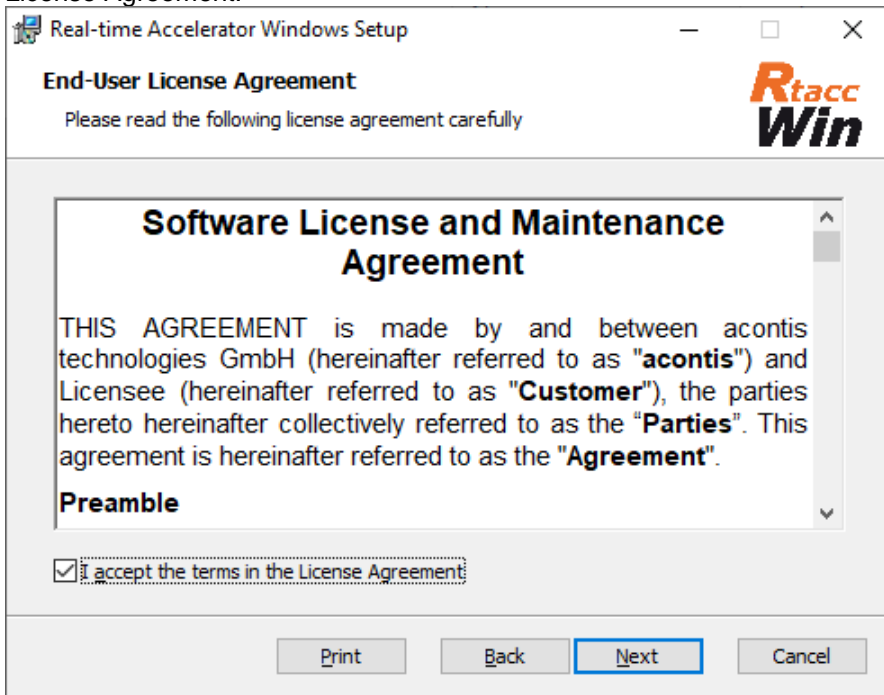
### 2.1 Setup Process

The product can be installed by executing the "setup.exe" (requires administrator privileges) and follow the screen instructions:

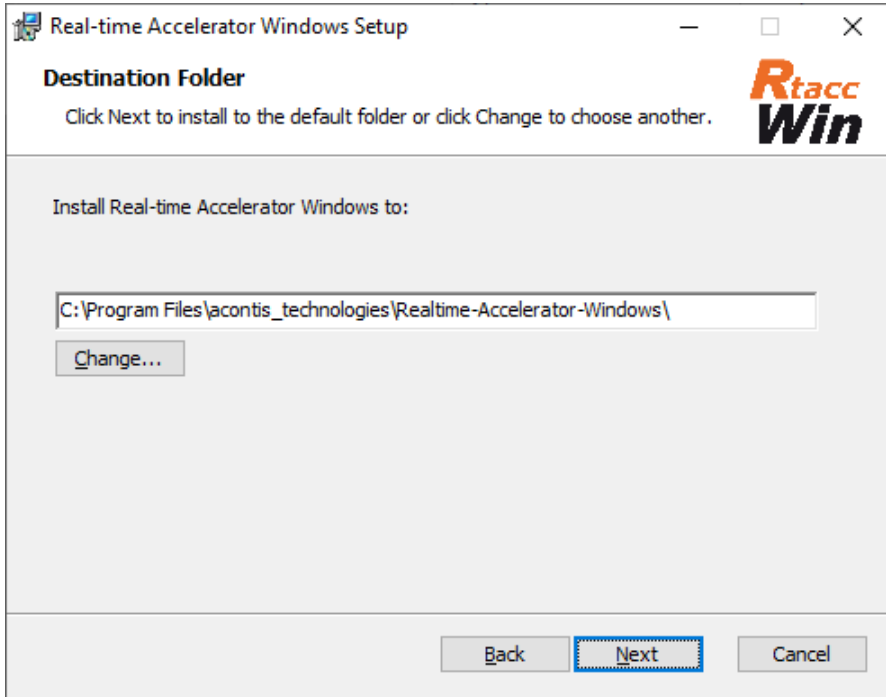
- Welcome page:



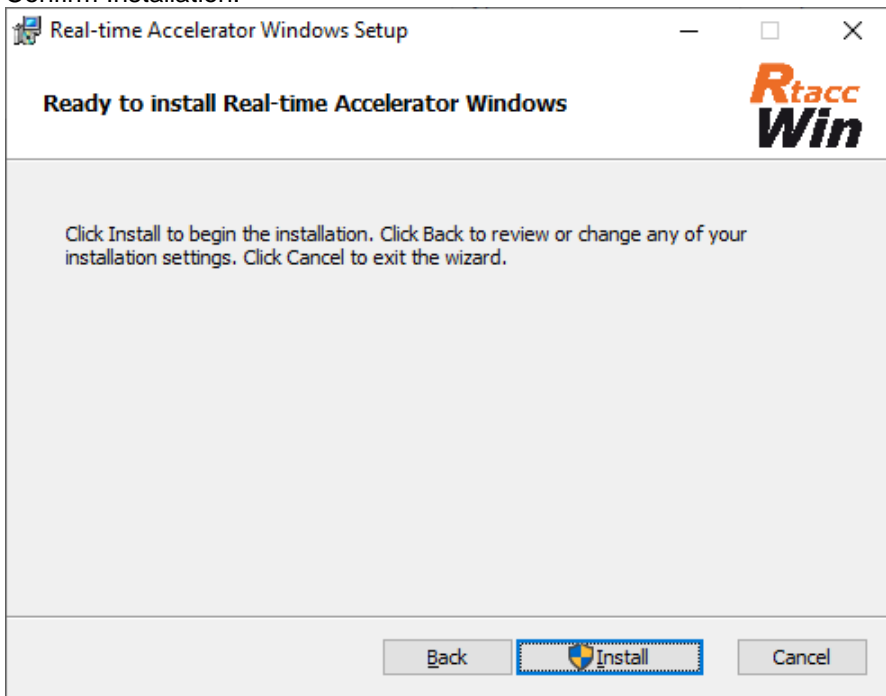
- License Agreement:



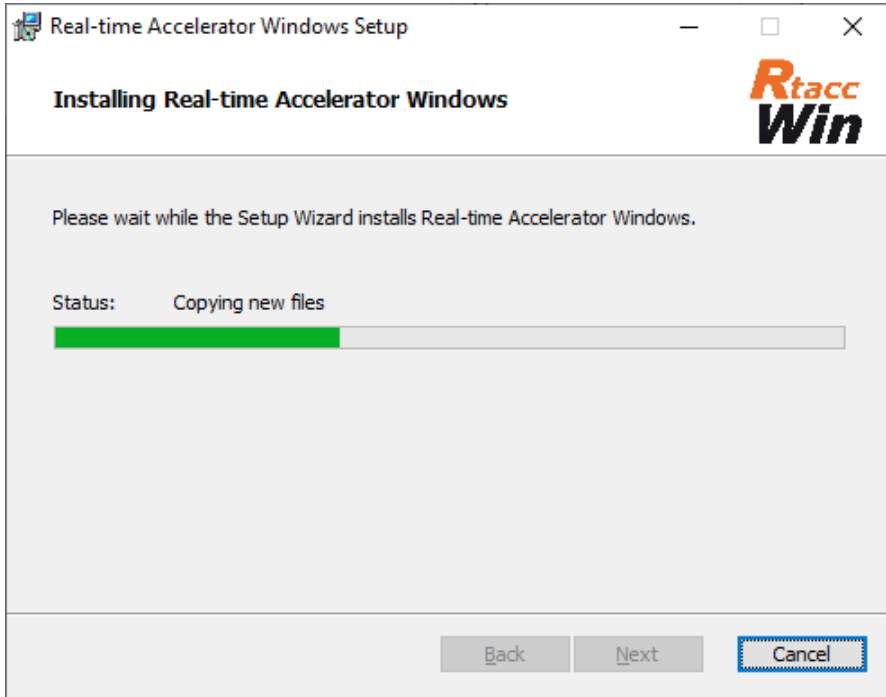
- Select Installation Folder:



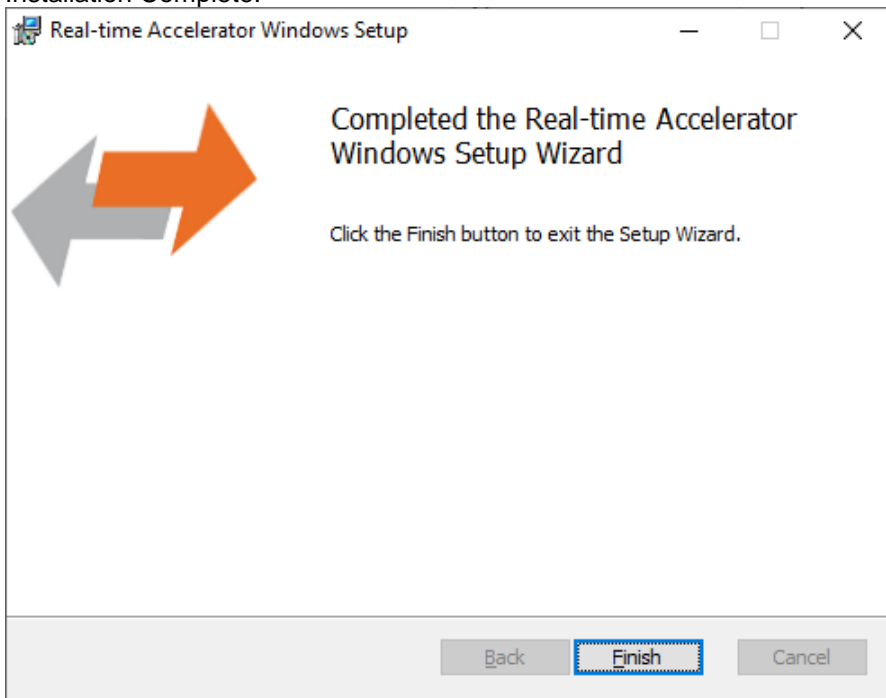
- Confirm Installation:



- Installing Real-time Accelerator Windows:



- Installation Complete:



## 2.2 Silent Installation

The product can be also installed in silent mode by using the command line parameters of "msiexec".

Sample 1: Installs Real-time Accelerator Windows into default installation folder  
`msiexec /i c:\temp\RealtimeAcceleratorWindowsSetup.msi /quiet /qn /norestart /log c:\temp\install.log`

Sample 2: Installs Real-time Accelerator Windows into "C:\Realtime-Accelerator-Windows"  
`msiexec /i c:\temp\RealtimeAcceleratorWindowsSetup.msi /quiet /qn /norestart /log c:\temp\install.log TARGETDIR="C:\Realtime-Accelerator-Windows"`

For more information please refer command line parameters of "msiexec".

**NOTE:**

The system requirements (see section “1.4”) will be not checked!

## 2.3 File and Folder Structure

The setup process will copy all necessary files into the following folder:

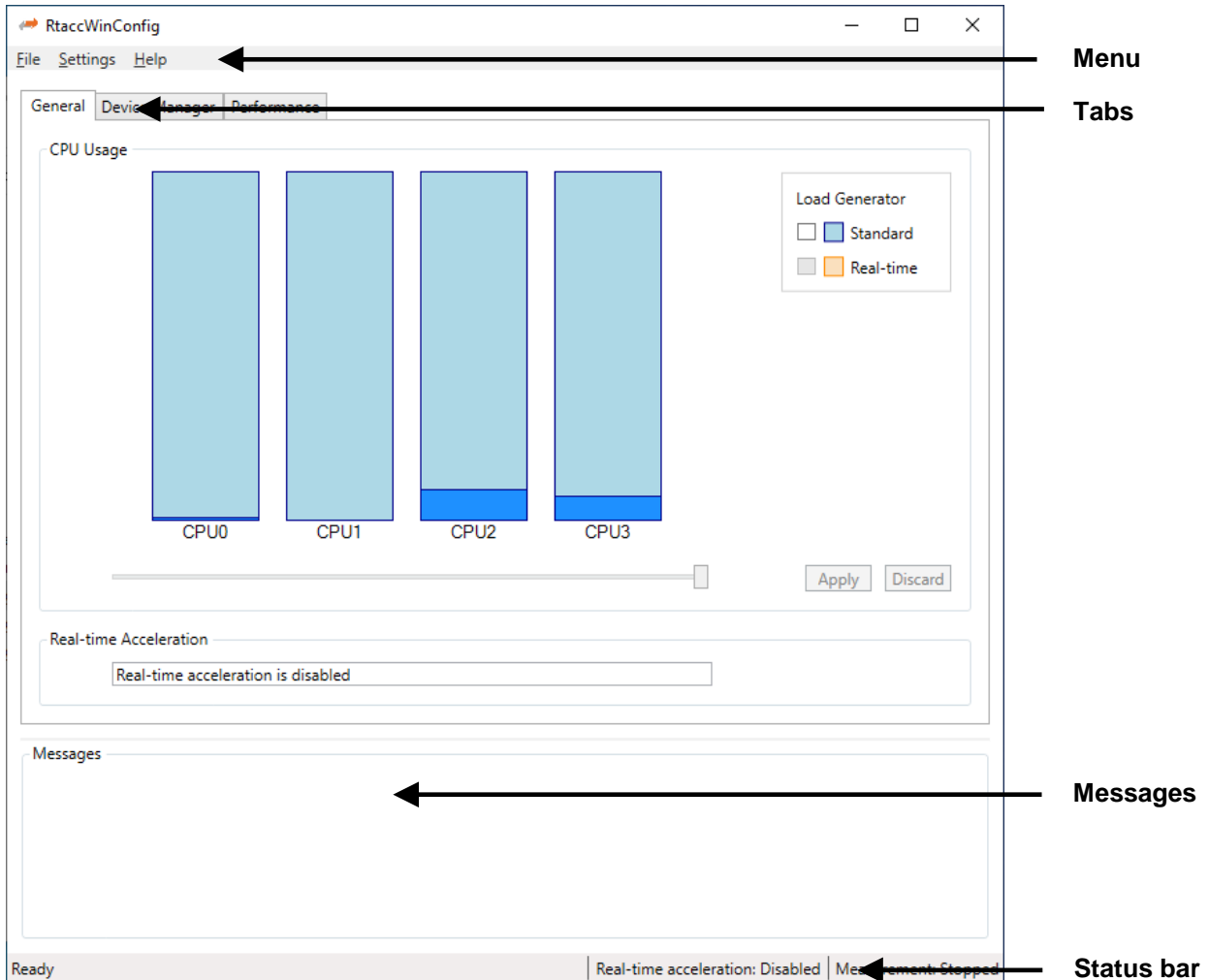
- Installation directory: (Default: “%ProgramFiles%\acontis\_technologies\Realtime-Accelerator-Windows”)
  - \Doc
    - Manuals
  - \Drivers
    - Drivers required for kernel access
  - \Logs
    - Log files
  - \Scripts
    - Scripts
  - \Tools
    - 3rd party tools
  - License.rtf
    - License Agreement
  - RtaccWinConfig.exe
    - RtaccWin Configuration Tool



## 3 Graphical user interface

### 3.1 Overview

This section gives an overview about the graphical user interface:



The graphical user interface is divided into four parts:

- **Menu**  
Main menu.
- **Tabs**  
Shows different views for core isolation, device management or performance management.
- **Messages**  
Shows messages e.g. on core isolation or on assigning a device to real-time.
- **Status bar**  
Shows current status.

## 3.2 Menu

### 3.2.1 File

- **Exit**  
Closes the application

### 3.2.2 Settings

- **Message Level**  
Change the current message level
- **System Restore**  
Runs system restore to revert all changes

### 3.2.3 Help

- **Show User Manual**  
Shows this user manual
- **Show Log File**  
Shows the log file
- **About ...**  
Show the about dialog

## 3.3 Tabs

Shows different views for core isolation, device management or performance management:



## 3.4 Message Window

Shows messages e.g. on core isolation or on assigning a device to real-time:

Messages

```
Assign timer ...  
Assign timer ... done
```

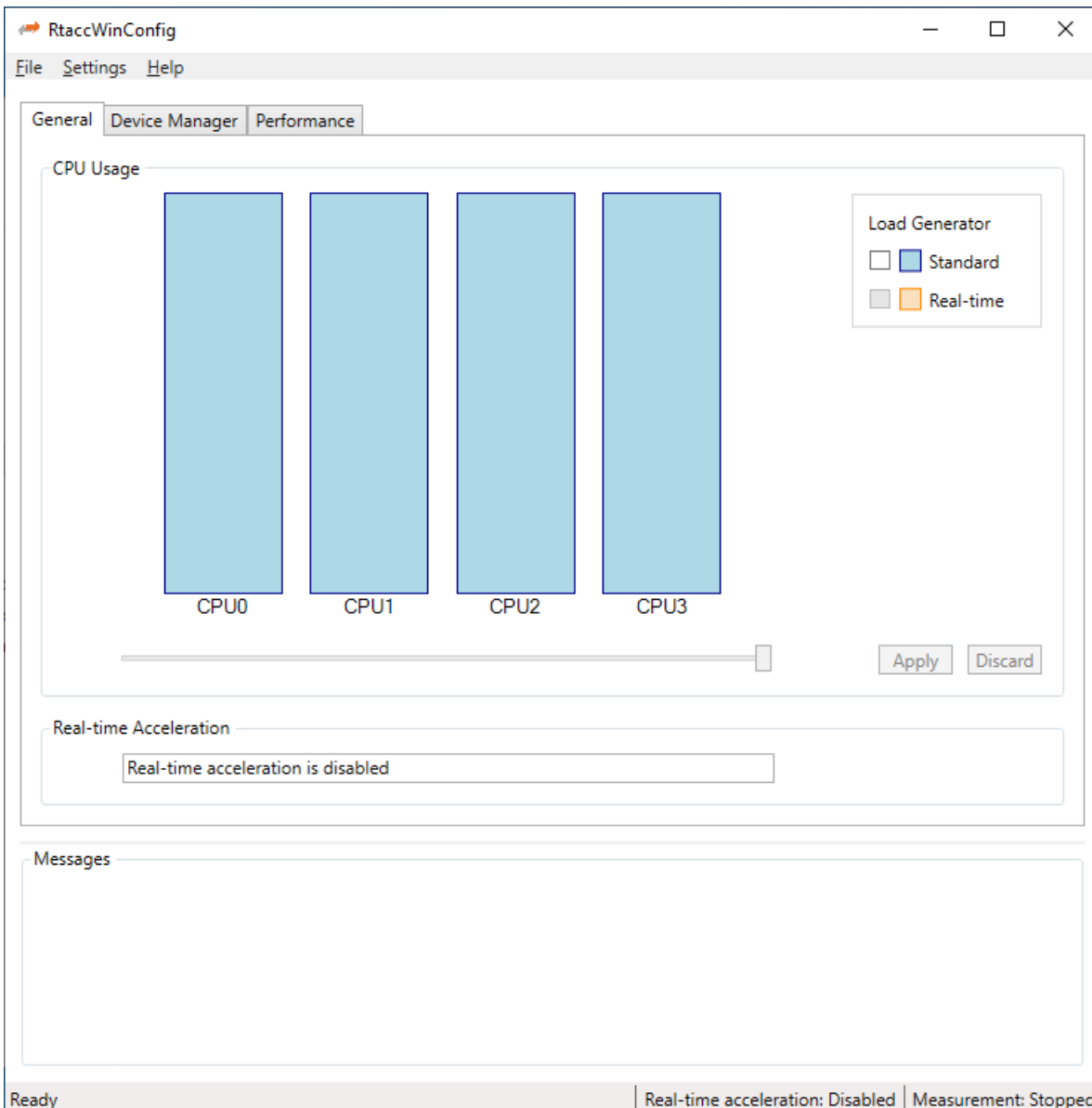
## 4 Configuration

### 4.1 Overview

The software configuration tool, RtaccWinConfig, is used to prepare the Windows system for real-time applications.

### 4.2 General

This tab is used to isolate at least one CPU, which means that regular Windows processes and services no longer use that CPU. The isolated CPU is then made exclusively available for real-time applications.



### CPU Usage

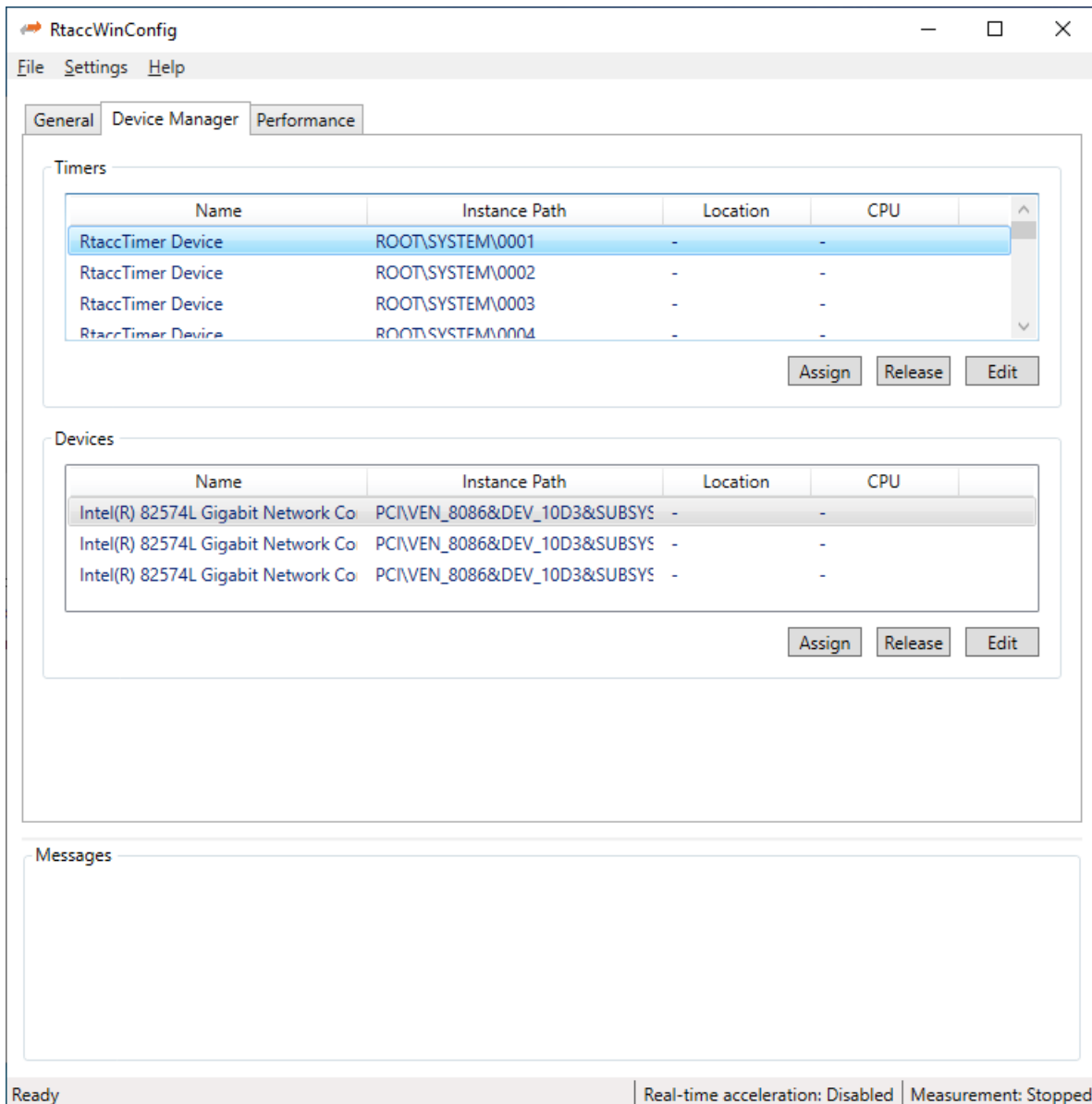
- Load Generator
  - Standard
    - Check this to generate load for standard CPUs
  - Real-time
    - Check this to generate load for real-time CPUs
- CPU Slider
  - Adjust amount of CPUs which should be isolated for real-time usage
- Buttons
  - Apply or discard CPU settings

### Real-time Acceleration

- Current real-time acceleration status

## 4.3 Device Manager

This tab is used to assign hardware to a real-time application. This means the regular Windows driver is unloaded, and the hardware can be accessed from the Windows user space. The acontis kernel driver enables fast and direct access to all memory areas of the assigned hardware.



**Timers**

Name	Instance Path	Location	CPU
RtaccTimer Device	ROOT\SYSTEM\0001	-	-
RtaccTimer Device	ROOT\SYSTEM\0002	-	-
RtaccTimer Device	ROOT\SYSTEM\0003	-	-
RtaccTimer Device	ROOT\SYSTEM\0004	-	-

**Devices**

Name	Instance Path	Location	CPU
Intel(R) 82574L Gigabit Network Co	PCI\VEN_8086&DEV_10D3&SUBSYS	-	-
Intel(R) 82574L Gigabit Network Co	PCI\VEN_8086&DEV_10D3&SUBSYS	-	-
Intel(R) 82574L Gigabit Network Co	PCI\VEN_8086&DEV_10D3&SUBSYS	-	-

Ready | Real-time acceleration: Disabled | Measurement: Stopped

---

**Times**

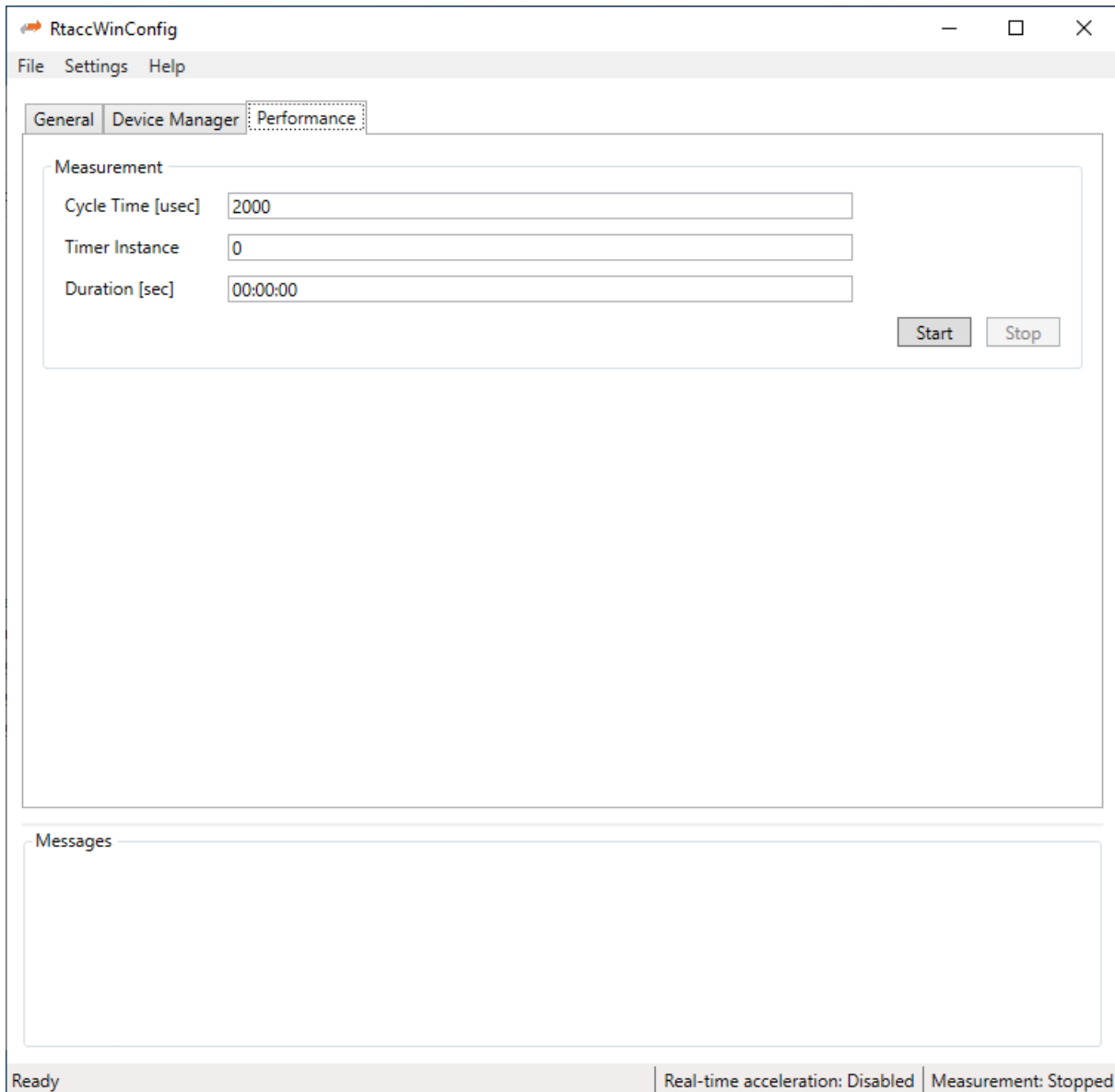
- List
  - Show list of available timers
- Buttons
  - Assign the selected timer
  - Release the selected timer
  - Edit the selected timer to change the CPU assignment

**Devices**

- List
  - Show list of available devices which can be used from real-time
- Buttons
  - Assign the selected device
  - Release the selected device
  - Edit the selected device to change the CPU assignment

## 4.4 Performance

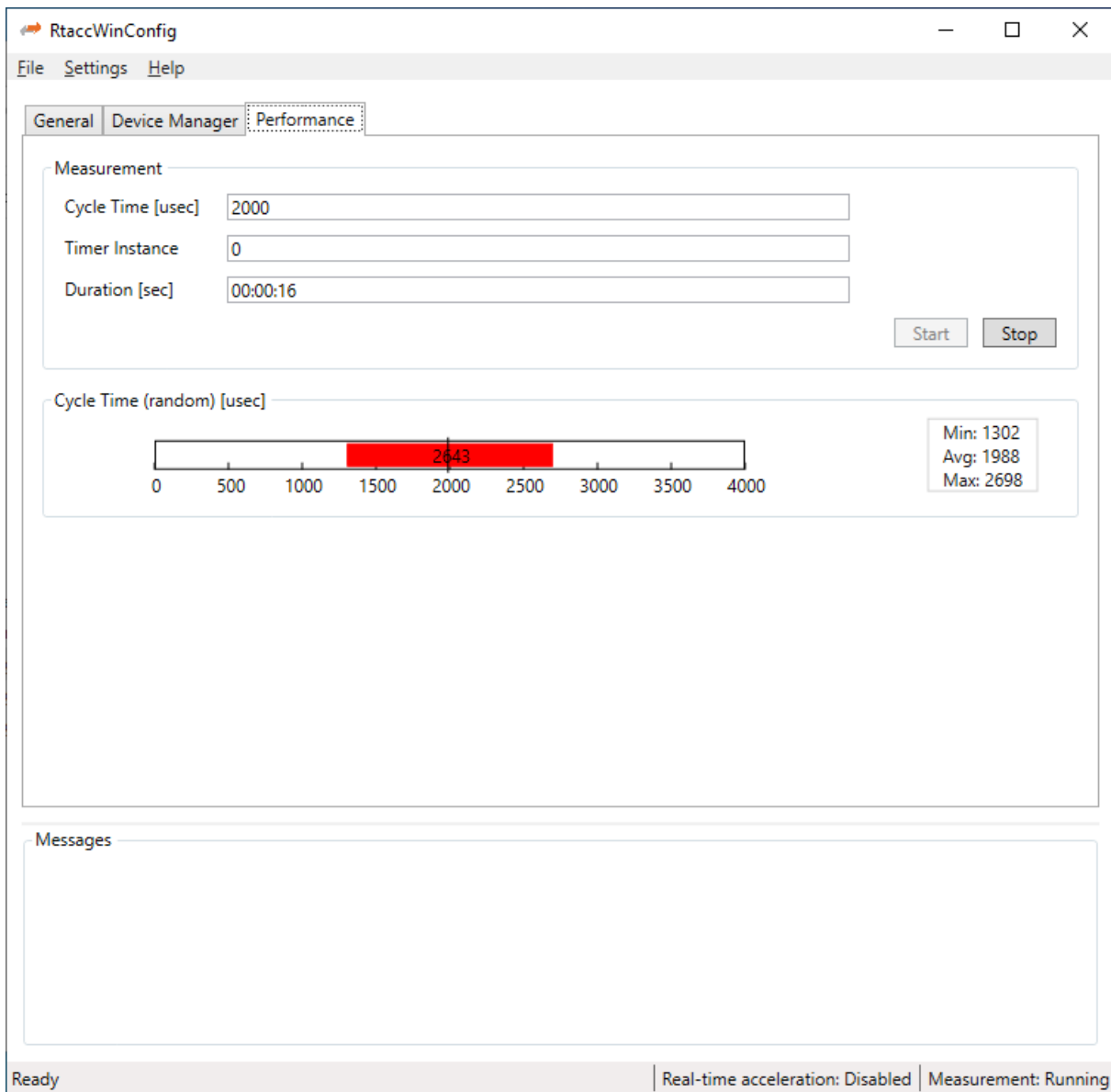
This tab is used to measure performance on an isolated CPU with a specific cycle time. It displays graphical representations of the maximum and minimum deviation values. The maximum jitter allowed depends on the application, but a deviation of up to 10% of the cycle time is generally acceptable. For instance, with a cycle time of 1000 microseconds, the minimum value should be no less than 900 microseconds, and the maximum value should be no greater than 1100 microseconds.



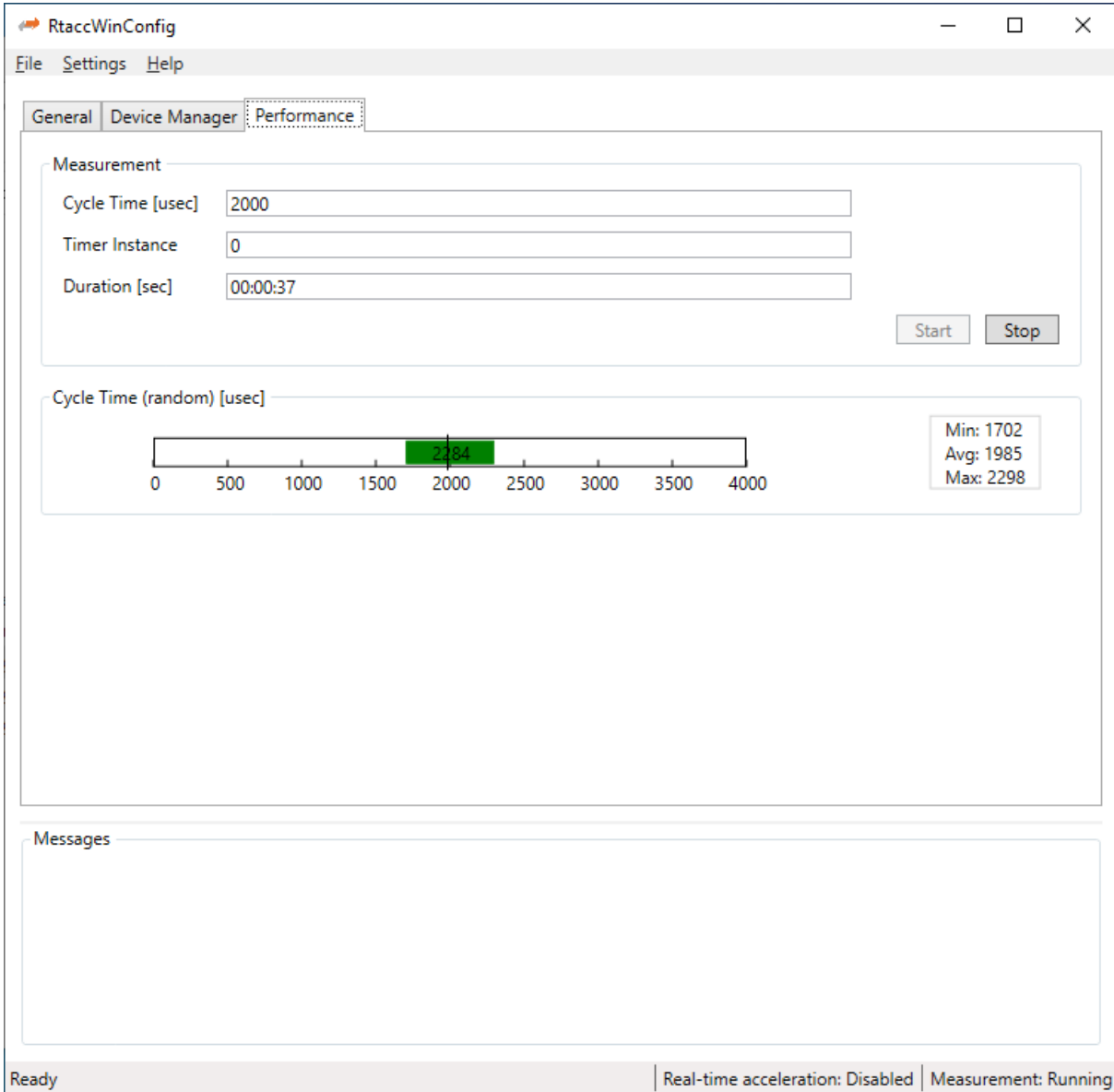
#### Measurement

- Cycle Time [usec]
  - Cycle time which should be used in seconds
- Timer Instance
  - Instance of the timer which should be used
- Duration [sec]
  - Duration of the measurement in seconds
- Buttons
  - Start or stop the measurement

Without the Real-Time Accelerator technology, the cycle time can fluctuate significantly:



Enabling Real-Time Accelerator technology, however, guarantees a precise clock with minimal deviations:



**NOTE:**

A stable and precise clock with low jitter is crucial for real-time applications, particularly for executing control loops every millisecond. While an application should ideally be triggered precisely every 1000 microseconds, deviations can occur in practice, leading to longer or shorter intervals. With the acontis Real-time Accelerator technology, these deviations, also known as jitter, can be significantly reduced under Windows.



## 5 Diagnosis

### 5.1 Overview

In case of the performance measurement shows bad values, the user can tune up the system by changing some BIOS settings or changing some specific hardware parts or try start some monitoring tools to find the problem.

### 5.2 Hardware

Before replacing the whole system, many real-time problems can be solved by optimizing the pc:

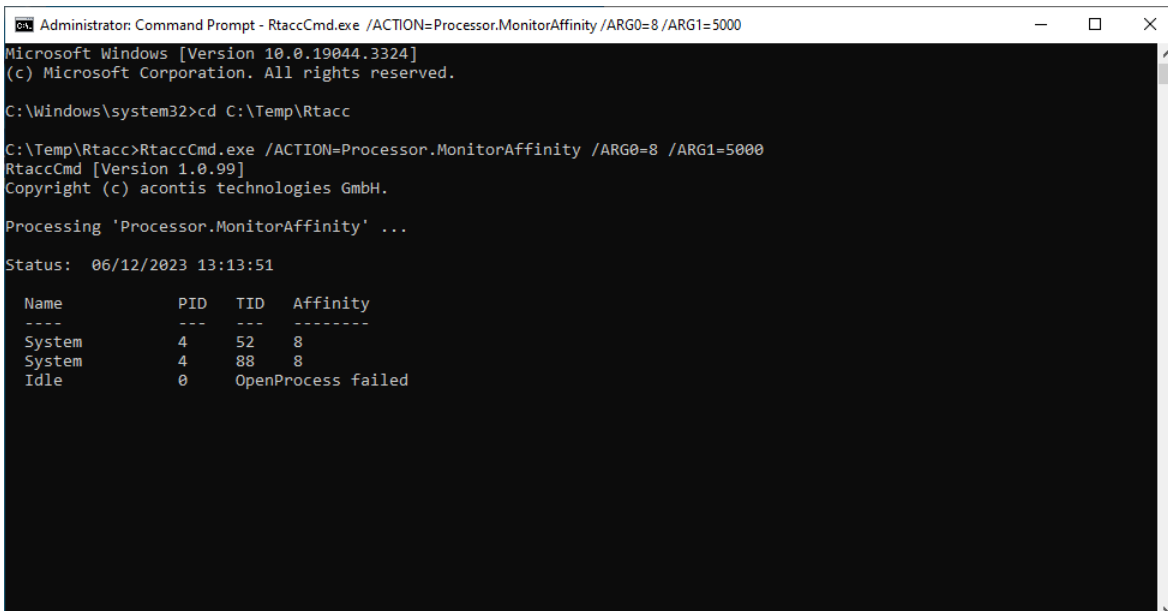
- BIOS & Hardware Settings
  - Disable "Legacy USB Support"
  - Disable "Hyper-Threading"
  - Disable "Intel C-STATE tech"
  - Disable "Intel SpeedStep tech"
  - Disable Active State Power Management
- Windows Real-time Optimization
  - Microsoft Basic Display Adapter Driver
    - Exchange the original display driver by the default Windows driver
  - Power Options Settings
    - Set "Turn off hard disk after" to "Never"
    - Deactivate link state power management under PCI Express
  - Performance Options Settings
    - Set visual effects to "Adjust for best performance"
    - Disable all unused Windows Services

Fore more information please refer:

<https://developer.acontis.com/pc-optimization.html>

### 5.3 Affinity Monitor

This command line tool monitors affinity of processes or affinity of threads of processes to validate that core isolation works as estimated:



```

Administrator: Command Prompt - RtaccCmd.exe /ACTION=Processor.MonitorAffinity /ARG0=8 /ARG1=5000
Microsoft Windows [Version 10.0.19044.3324]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>cd C:\Temp\Rtacc

C:\Temp\Rtacc>RtaccCmd.exe /ACTION=Processor.MonitorAffinity /ARG0=8 /ARG1=5000
RtaccCmd [Version 1.0.99]
Copyright (c) acontis technologies GmbH.

Processing 'Processor.MonitorAffinity' ...

Status: 06/12/2023 13:13:51

Name      PID  TID  Affinity
----  ---  ---  -
System    4    52    8
System    4    88    8
Idle      0    0    OpenProcess failed
  
```

**RtaccCmd.exe /ACTION=Processor.MonitorAffinity /ARG0=8 /ARG1=5000**

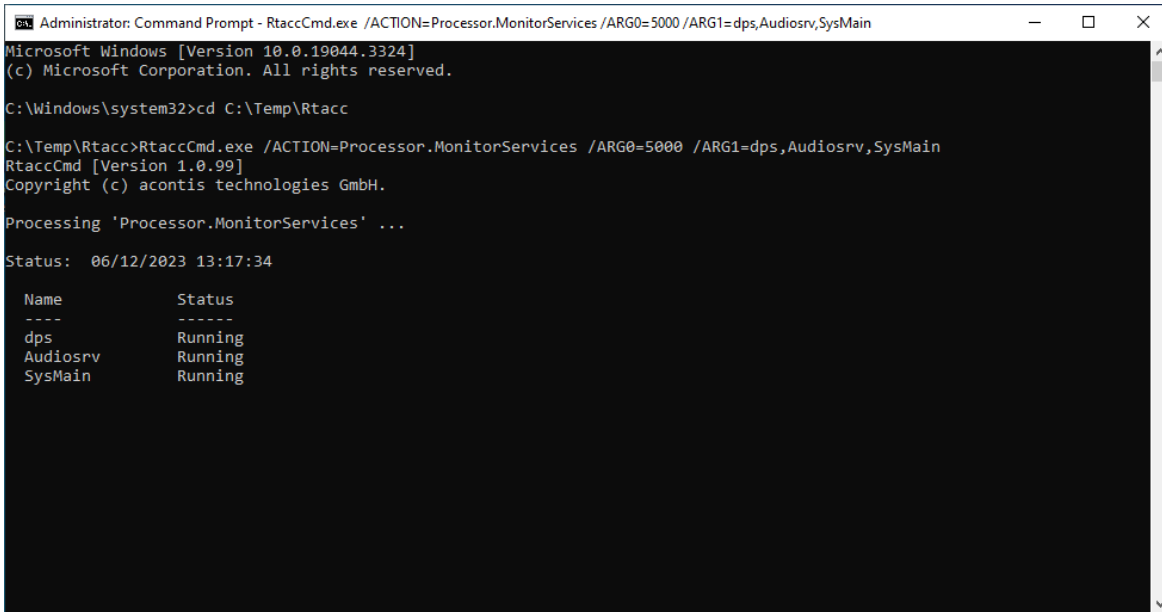
Arguments

- ARG0
  - Affinity mask of which cores should be monitored (decimal).
  - E.g.

- Value “8” (0x8) monitors the last core of a system with 4 cores
  - Value “14” (0xE) monitors the last 3 cores a system with 4 cores
- ARG1
  - Wait interval in milli seconds
  - E.g.
    - Value “5000” will monitor the system every 5 seconds

## 5.4 Services Monitor

This command line tool monitors services which should be disabled or stopped after core isolation:



```

Administrator: Command Prompt - RtaccCmd.exe /ACTION=Processor.MonitorServices /ARG0=5000 /ARG1=dps,Audiosrv,SysMain
Microsoft Windows [Version 10.0.19044.3324]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>cd C:\Temp\Rtacc

C:\Temp\Rtacc>RtaccCmd.exe /ACTION=Processor.MonitorServices /ARG0=5000 /ARG1=dps,Audiosrv,SysMain
RtaccCmd [Version 1.0.99]
Copyright (c) acontis technologies GmbH.

Processing 'Processor.MonitorServices' ...

Status: 06/12/2023 13:17:34

Name      Status
----      -
dps       Running
Audiosrv  Running
SysMain   Running
  
```

**RtaccCmd.exe /ACTION=Processor.MonitorServices /ARG0=5000 /ARG1=dps,Audiosrv,SysMain**

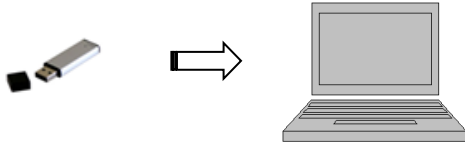
### Arguments

- ARG0
  - Wait interval in milli seconds
  - E.g.
    - Value “5000” will monitor services every 5 seconds
- ARG1
  - Comma separated list of all services which should be monitored

## 6 Licensing

### 6.1 Overview

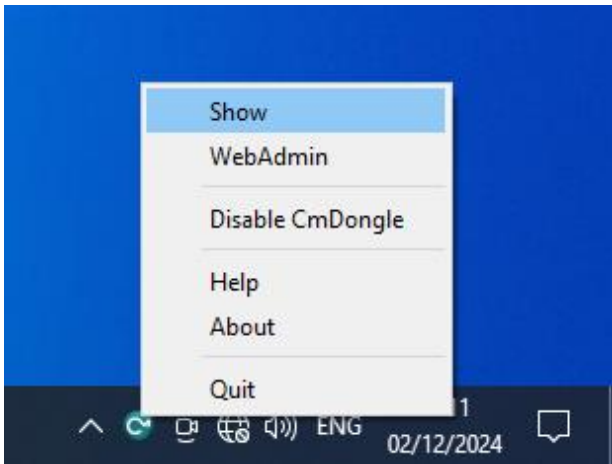
For RtaccWin you need an USB dongle for every single computer. This dongle must be plugged into the computer where you want to use RtaccWin.



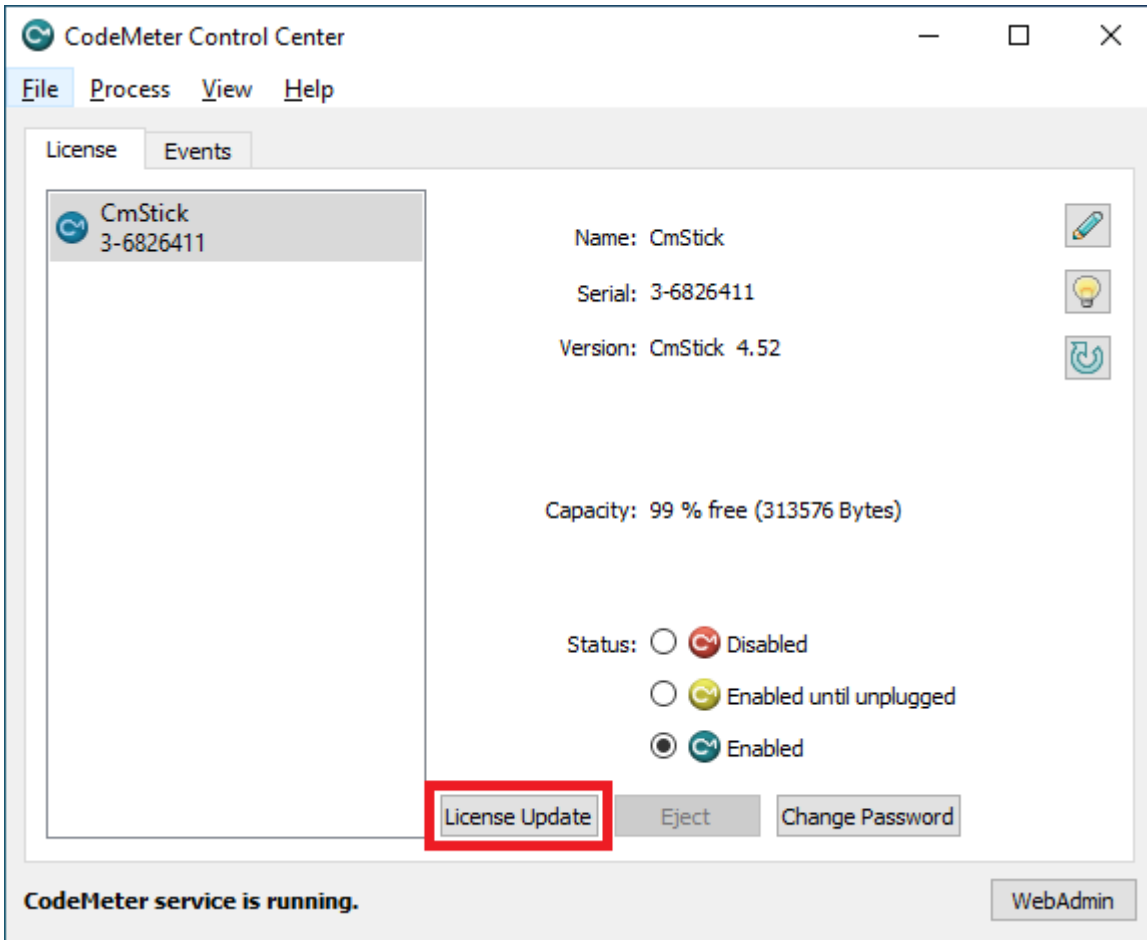
### 6.2 License Update

#### 6.2.1 Request License Update

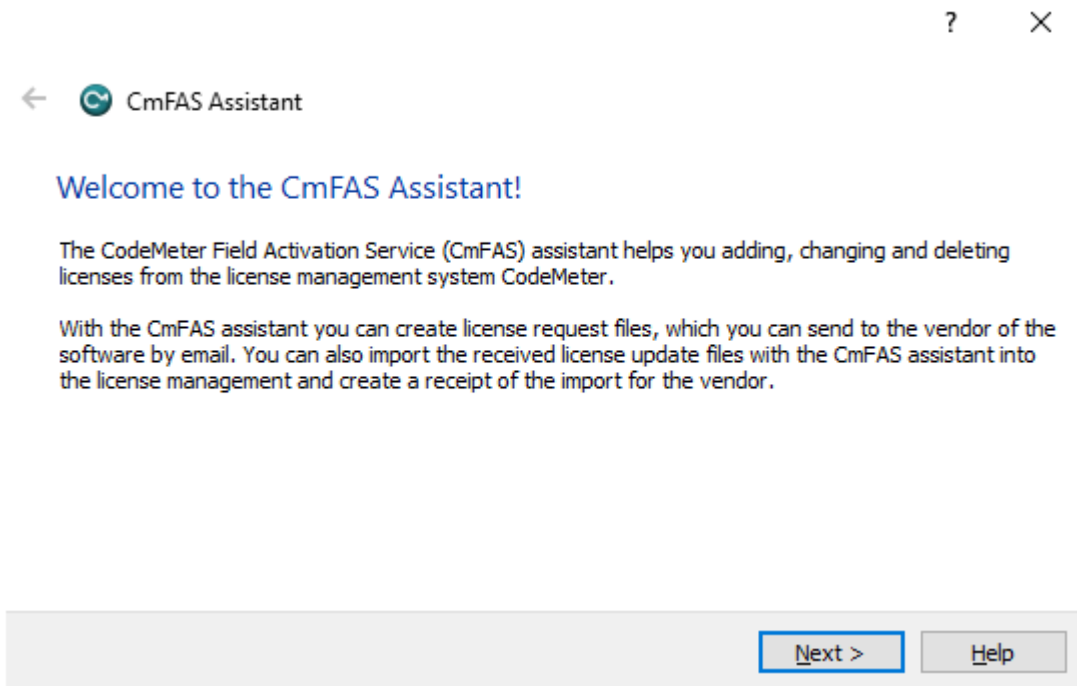
**Step 1:** Install the “Dongle-Version” of RtaccWin and open the “CodeMeter Control Center”:



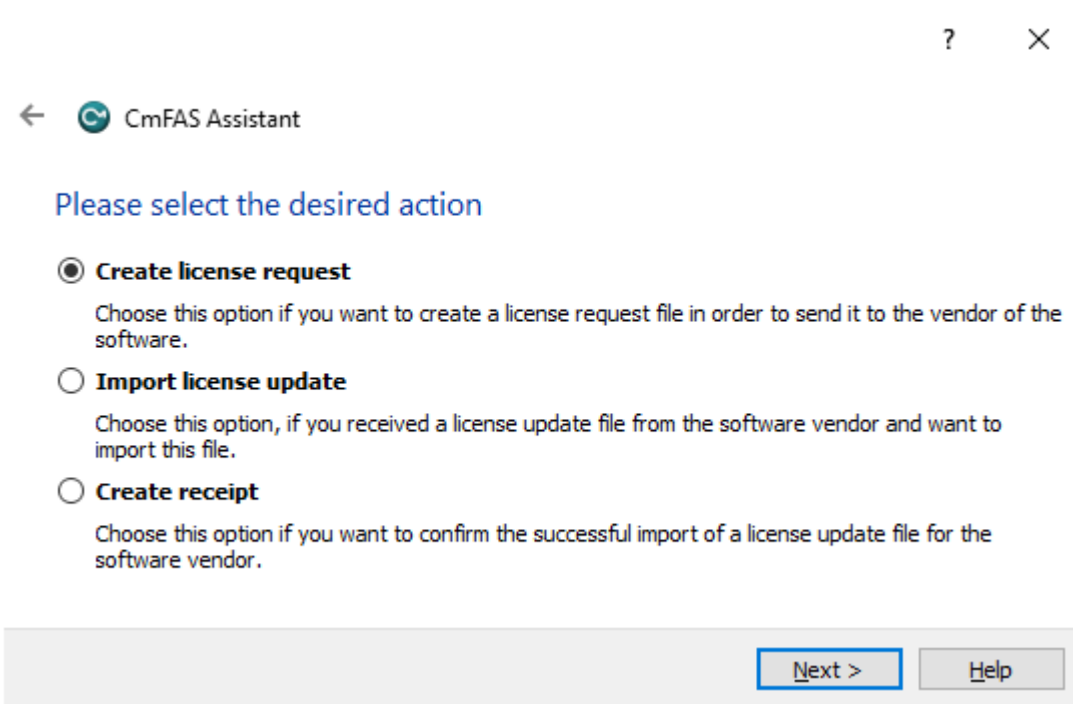
**Step 2:** In the “CodeMeter Control Center” open the “CmFAS Assistant” by clicking on “License Update”:



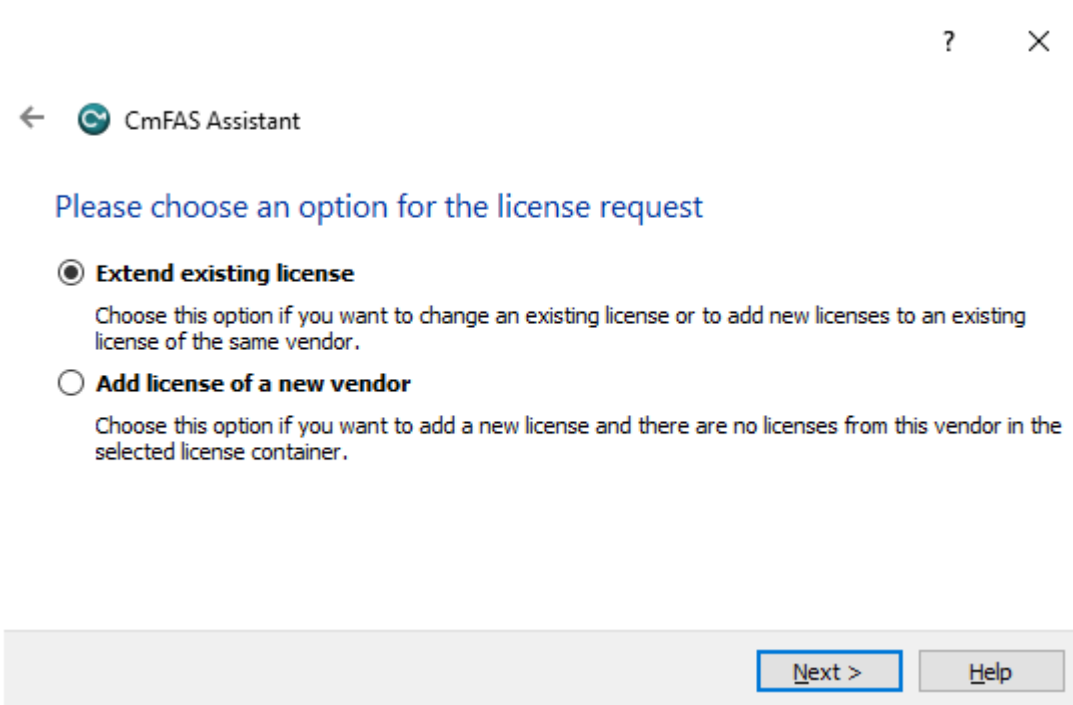
**Step 3:** Now, follow the assistant until you can select a file name:



**Step 4:** Select “Create license request”:



**Step 5:** Select “Extend existing license”:



**Step 6:** Keep the selected the vendor:

← CmFAS Assistant

### Please choose the vendor

- acontis technologies GmbH (101409)
- acontis technologies GmbH (6001978)

Select the software vendor to which you want to send the license request file. The vendor will only see the data which you select here. So you can ensure that the vendor doesn't see which other licenses from other vendors you have.

Next > Help

**Step 7:** Select the file name:

← CmFAS Assistant

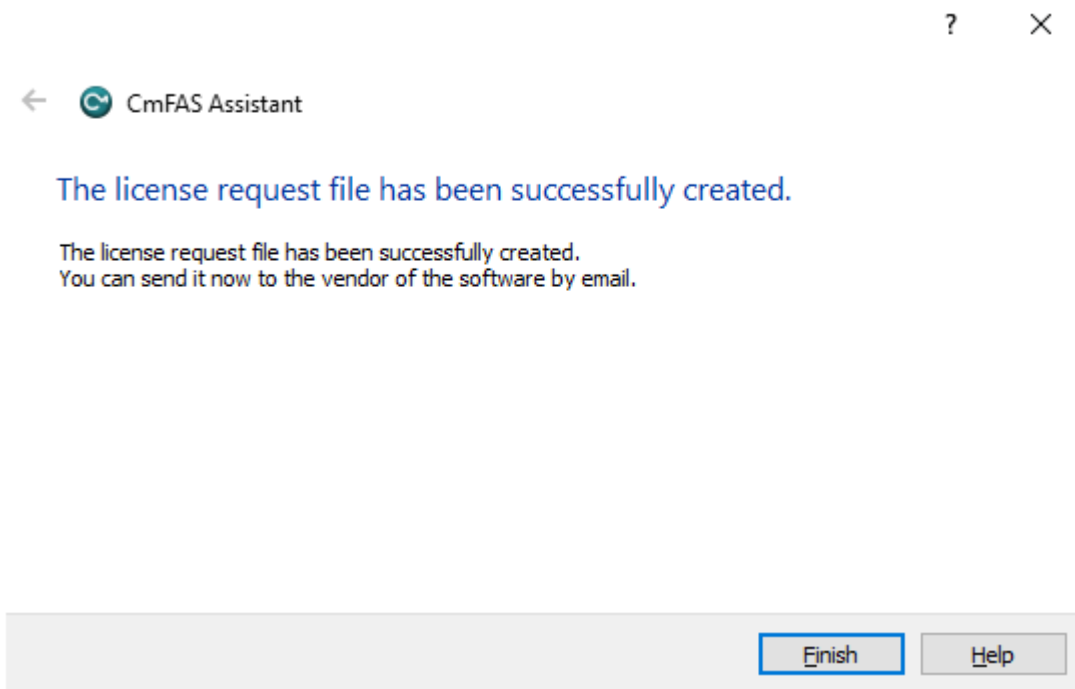
### Please select the file name

C:\Users\testadmin\3-6826411.WibuCmRaC ...

Select a file name for storing the license request file. Then click on 'commit' to create the file. You can then send this file to the vendor by email.

Commit Help

**Step 8:** Finish the assistant:



**Step 9:** Your license request file (\*.WibuCmRaC) has been successfully created. Please send it to [sales@acontis.com](mailto:sales@acontis.com).

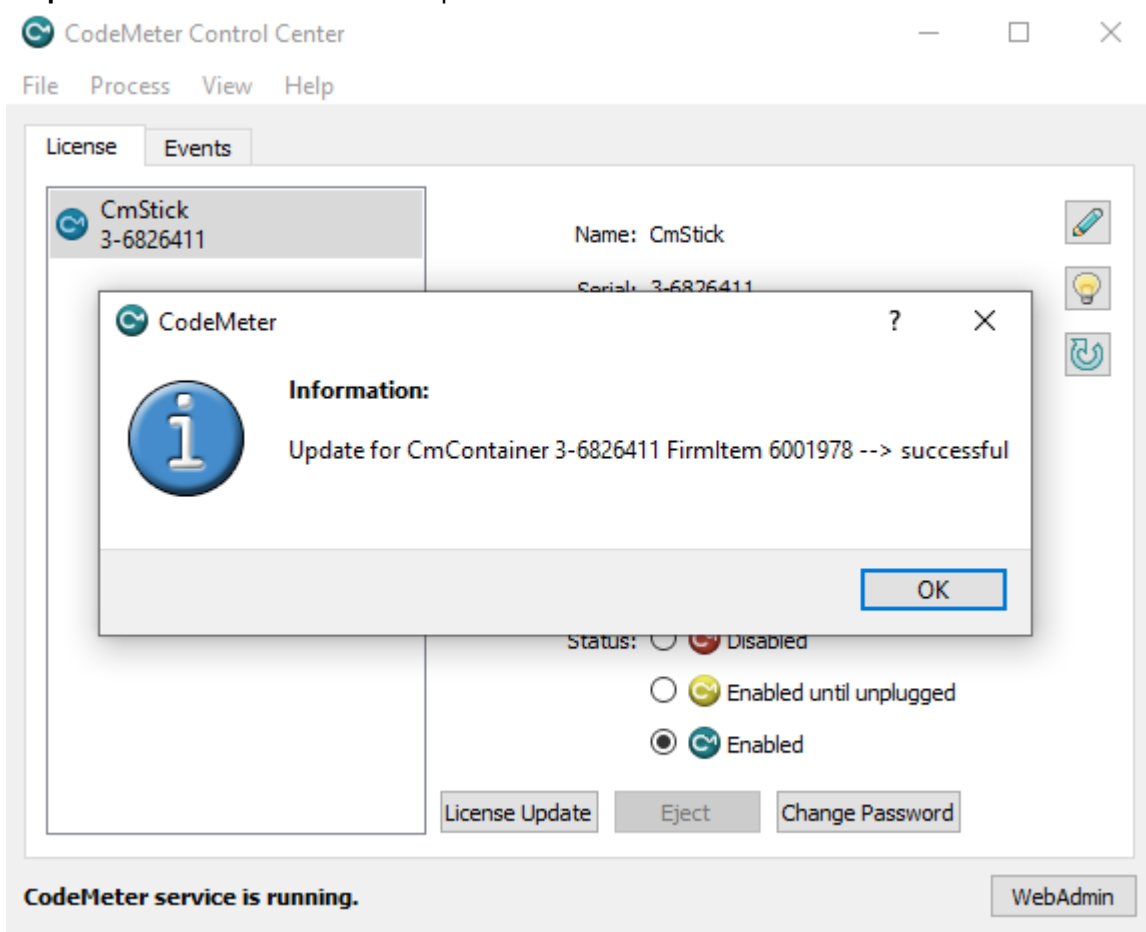
### 6.2.2 Install License Update

After you have been sent your license request file you will receive the license update file (\*.WibuCmRaU).

**Step 1:** Connect your dongle.

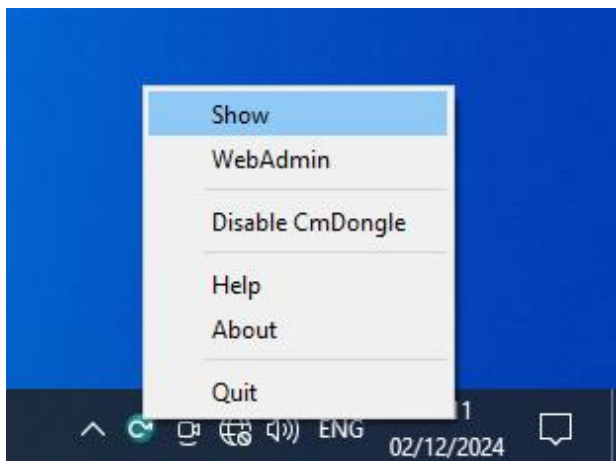
**Step 2:** Copy the license update file to your desktop.

**Step 3:** Double-click on the license update file:



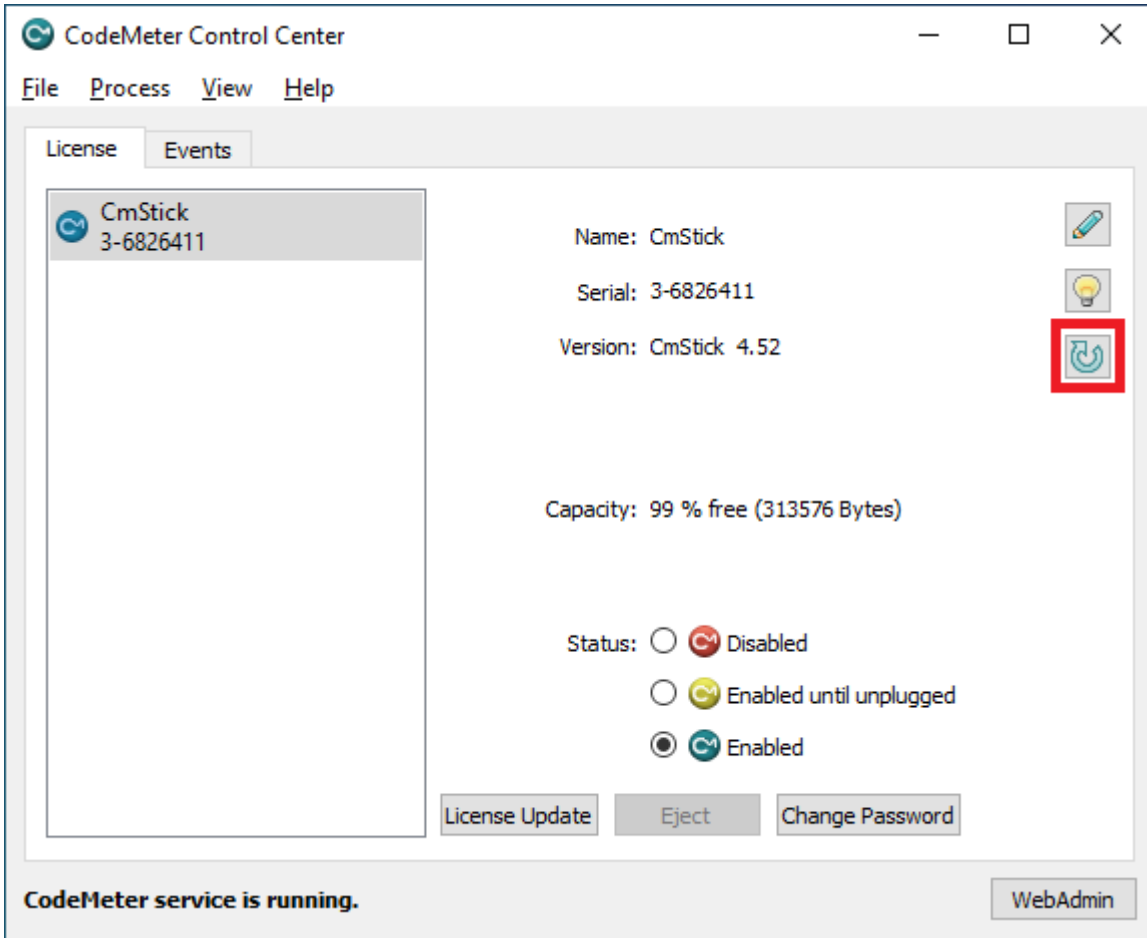
### 6.3 Dongle Firmware Update

**Step 1:** Install the “Dongle-Version” of RtaccWin and open the “CodeMeter Control Center”:

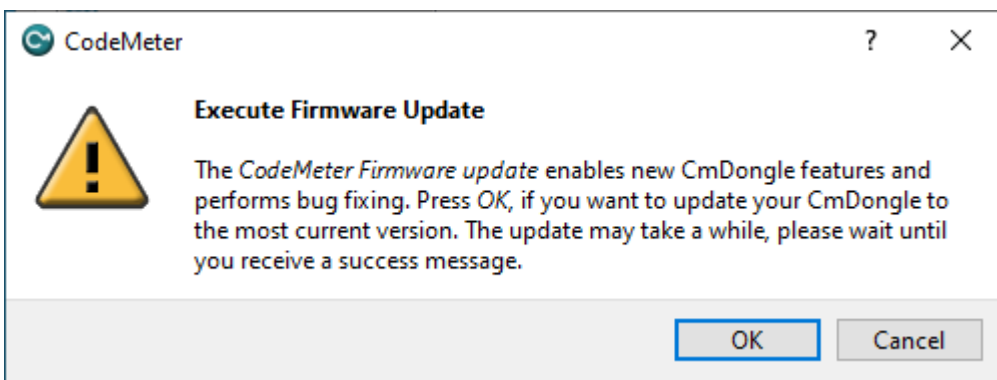




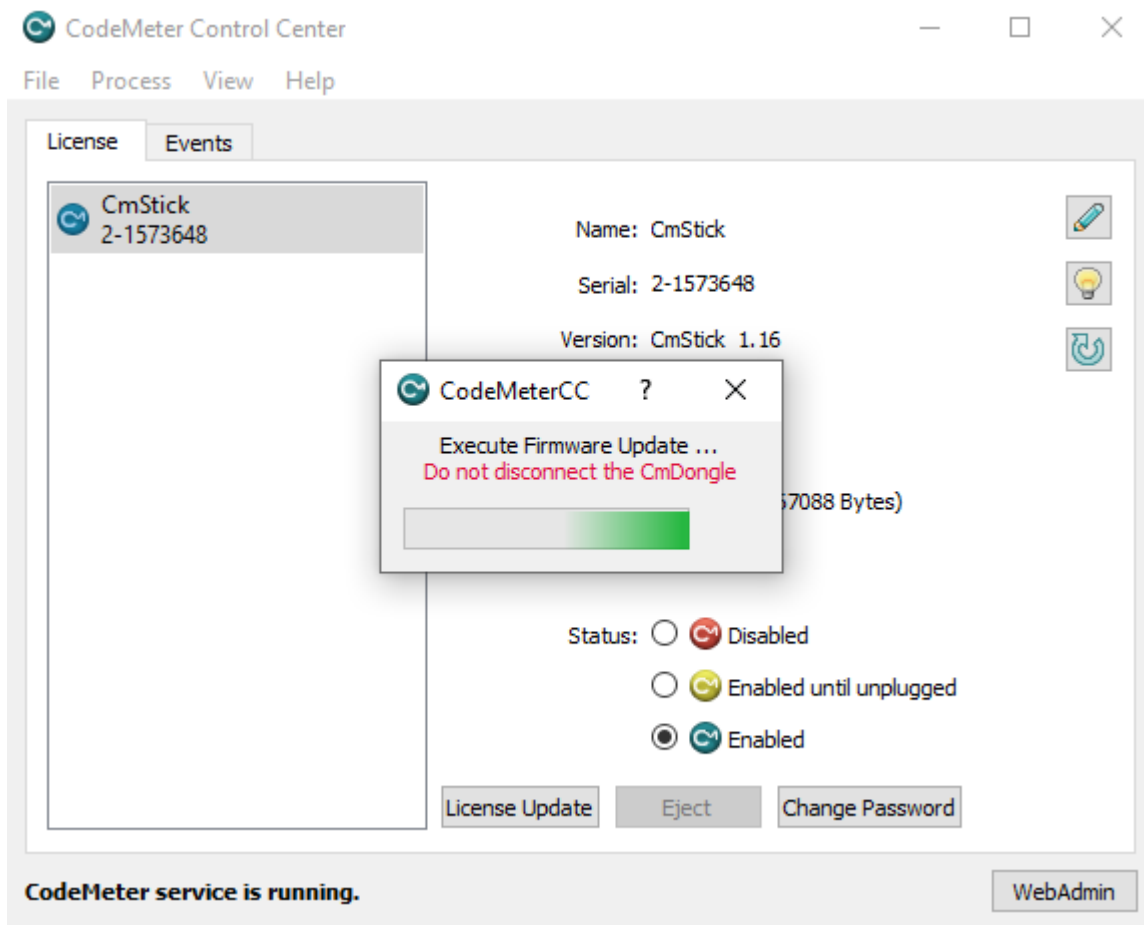
**Step 2:** In the “CodeMeter Control Center” click on “Update Firmware of selected Cm Dongle”:



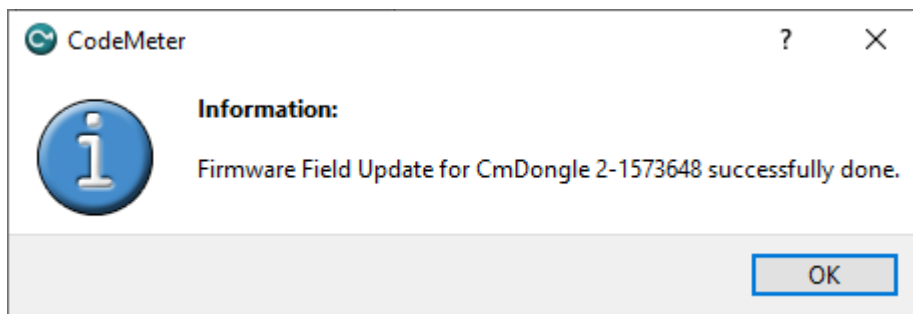
**Step 3:** Execute firmware update by pressing “OK”:



**Step 4:** Wait until firmware update was executed:

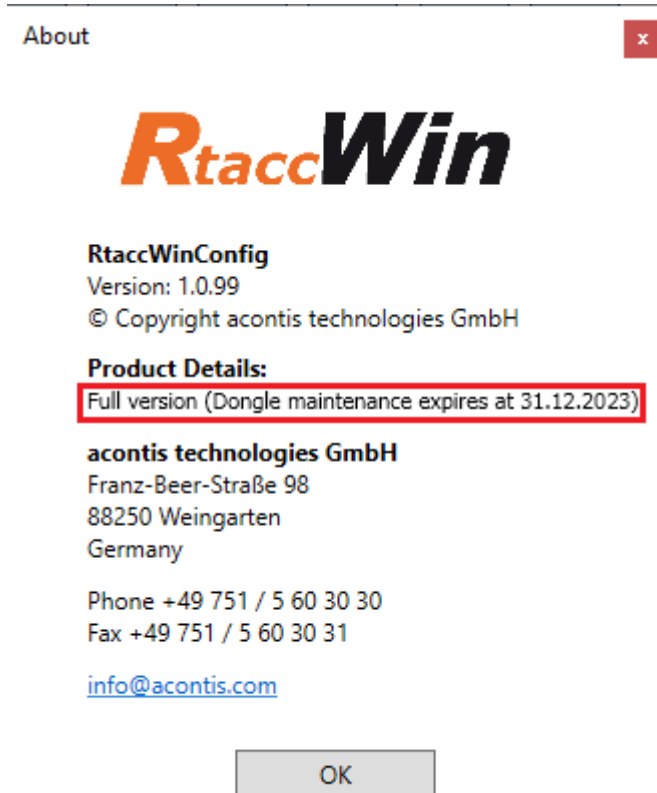


**Step 5:** Firmware update was done and dongle can be removed:



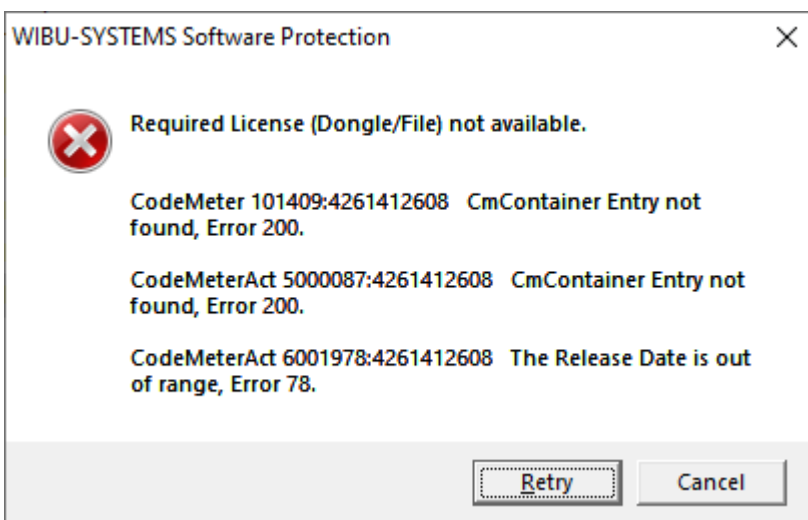
## 6.4 Expiration Date Dongle

If you chose a expiration dongle you can find your expiration date in the 'About Dialog'. If you have an unlimited dongle you will not see a date in the dialog.



If you see this date you can not use an RtaccWin which was released after the expiration date, but all older ones are possible.

If you try to start an RtaccWin which is newer than the expiration date, you will get the following error:



## 7 FAQ, Tips

### 7.1 Help in case of a problem

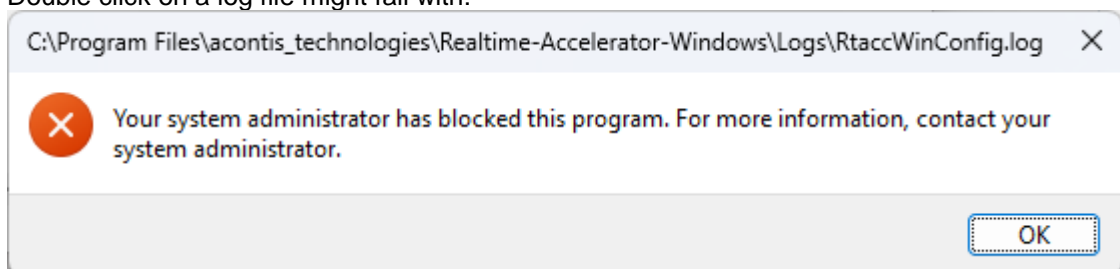
If you have a problem with RtaccWin or something does not run as expected, please try first the following things:

- Read messages in message window
- Increase message level (Menu → Settings → Message Level → All Messages)
- Read log file for more information (Menu → Help → Show Log File)
- Restart RtaccWin, reboot system and try to do it again
- Contact support by sending a mail to [rtsupport@acontis.com](mailto:rtsupport@acontis.com) and attach the following information
  - RtaccWin Version (Menu → Help → About)
  - Log file (Menu → Help → Show Log File)
  - Short description how the reproduce it

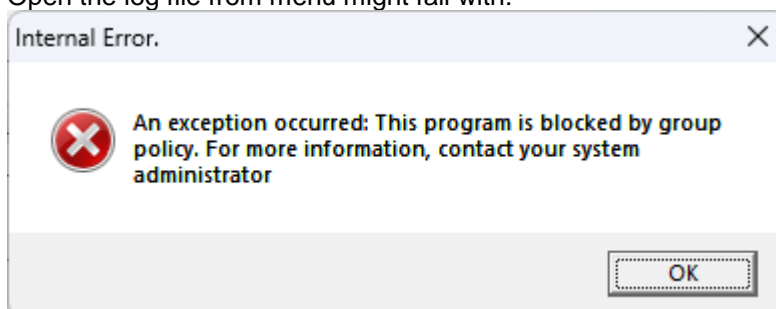
### 7.2 Known Issues

Here you can find known issues of some features:

- **“After enable real-time acceleration the Windows Task Managers shows 100% CPU load”**
  - The display is wrong. The CPU load is normal. We recommend to use Process Explorer instead. It can be downloaded from: <https://learn.microsoft.com/en-us/sysinternals/downloads/process-explorer>
- **“After enable real-time acceleration the remote desktop, network share and Windows Update will no longer work”**
  - This is correct. Those features are disabled by default to get better real-time performance. The can be enabled in performance options dialog (Menu → Settings → Performance Options)
- **“After enable real-time acceleration with “Restrict Windows Network Traffic” on Windows 11 sometimes you might receive the following error message”**
  - Double click on a log file might fail with:



- Open the log file from menu might fail with:

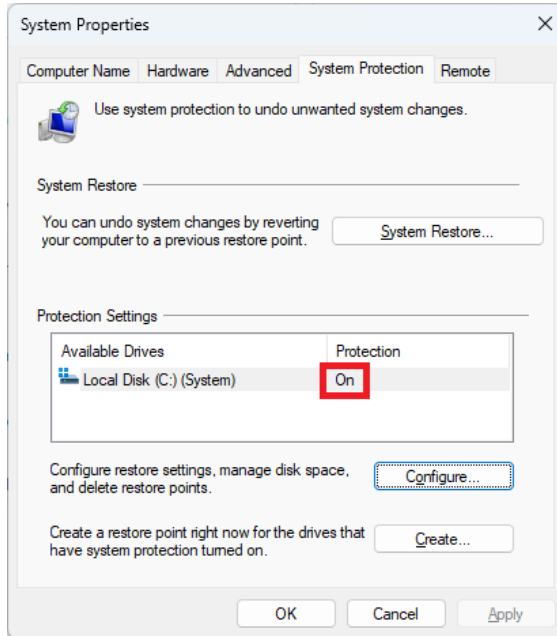


- Try to use real-time acceleration without “Restrict Windows Network Traffic” on Windows 11.

### 7.3 FAQ

Here you can find solutions of possible problems:

- **“Creating system restore point failed during enabling real-time acceleration”**
  - Open “Control Panel → System → Allow remote access → System Protection” and validate that protection on the specific drive is enabled and configured with enough disc space:

**NOTE:**

The system restore should be always triggered from Menu "Settings → System Restore". Otherwise it will be not detected.

- **Why is it sometimes necessary to enable "Restrict Windows Network Traffic" to real-time performance?**
  - Windows is sending periodically telemetry data and other data with high priority. This can violate your real-time performance. In that case you should turn it off.