RTX64 4.5.1 Runtime

INSTALL GUIDE

IntervalZero

RTX64

RTX64 Runtime Install Guide

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Editions and Requirements

This guide describes system requirements and provides installation and setup instructions for RTX64 Runtime.

Product Editions

There are six different Runtime editions of the RTX64 product, listed below.

The edition...	Includes support for real-time operations on...
Solo	One dedicated RTSS processor in a multicore/multiprocessor environment.
Entry	Up to two dedicated RTSS processors in a multicore/multiprocessor environment.
Basic	Up to three dedicated RTSS processors in a multicore/multiprocessor environment.
Professional	Up to seven dedicated RTSS processors in a multicore/multiprocessor environment.
Premium	Up to 15 dedicated RTSS processors in a multicore/multiprocessor environment.
Ultimate	Up to 63 dedicated RTSS processors in a multicore/multiprocessor environment.

Hardware Requirements

This section lists hardware requirements for RTX64 Runtime.

Supported Network Adapters

The RTX64 real-time network provides support for several network adapters. For the most up-to-date list, see the *RTX64 Supported NICs* document available from the Customer Center.

Hardware Considerations

RTX64 requires a multiprocessor platform that supports 64-bit Windows 11 or Windows 10. Uniprocessor systems are not supported, since at least one core must be dedicated to Windows and one to RTX64 Runtime. Multiprocessor systems can have as many as 64 cores and as few as 2 cores.

General Considerations

- Windows 11 and Windows 10 may boot into x2APIC mode if the system supports x2APIC. To use RTX64 on these systems, you must either disable x2APIC in the BIOS or select xAPIC if allowed to choose between xAPIC and x2APIC.
- Some hardware configurations are not supported by RTX64 Runtime installations. When the RTX64 Runtime can detect these unsupported configurations, they are indicated with a pop-up error message.
- Windows 11 and Windows 10 may launch Hypervisor if software security features require Virtual Secure Mode (VSM) in Hypervisor. To use RTX64 on these systems, you must disable virtualization in the BIOS.

Hyper-Threading

- We recommend you disable Hyper-Threading. If Hyper-Threading remains enabled, it is recommended that you assign an even number of processors between Windows and RTX64. The Windows logical processor and RTSS logical processor must not share the same physical processor, or Windows processes could impact real-time performance on the shared physical processor.

Intel® Resource Director Technology (RDT)

- Intel® Resource Director Technology (RDT) functionality will only be available if the hardware supports it.
- For systems where Intel® Resource Director Technology (RDT) functionality is supported and enabled, we recommend that you disable Hyper-Threading in the system BIOS when MBA is set to *Priority-based*.

Processor Support

Although RTX64 Runtime runs on most x64 platforms, unique attributes of some processors require special consideration before selecting them as a target system.

- See the *RTX64 Processor Compatibility* document for an outline of supported RTX64 versions and tested system processors, available from the Customer Center.
- You will experience latency when running programs such as SRTM on Skylake and Kaby Lake systems with Integrated graphics, which shares resources with CPU and system memory. This creates a burden on CPU and system memory, causing high latency in APIC Timer interrupt delivery. Such latency is not encountered on Skylake or Kaby Lake systems with Discrete graphics. For more information, see the TechNote *Understanding the Effects of Discrete and Integrated Graphics on RTX64/RTX Performance*.
- For a comprehensive list of system requirements on Windows 11, see the Windows 11 System Requirements web page:

  https://www.microsoft.com/en-us/windows/windows-11-specifications?r=1

- For a comprehensive list of system requirements for Windows 10, see the Windows 10 System Requirements web page:

  https://www.microsoft.com/en-us/windows/windows-10-specifications#sysreqs

Software Requirements

This section lists software requirements for RTX64 Runtime.

Operating System Requirements

RTX64 Runtime is supported on the 64-bit multi-processor configurations of these operating systems:

- Windows 11 (up to version 24H2)
- Windows 11 IoT Enterprise LTSC (Long Term Servicing Channel, up to version 2024)
- Windows 10 (up to version 22H2)
- Windows 10 IoT Enterprise LTSC (Long Term Servicing Channel, up to version 2021)

NOTE: RTX64 Runtime is supported on machines running Windows 10 IoT Enterprise on IoT deployed systems (deferred activation).

NOTE: RTX64 Runtime cannot be installed on a 32-bit operating system. Attempts to do so will result in the following Windows error: "This installation package is not supported by this processor type. Contact your product vendor."

Microsoft .NET Support

RTX64 supports the following versions under .NET Standard 2.0:

.NET Implementation	Version Support
.NET and .NET Core	2.0, 2.1, 2.2, 3.0, 3.1, 5.0, 6.0, 7.0
.NET Framework	4.6.1, 4.6.2, 4.7, 4.7.1, 4.7.2, 4.8, 4.8.1

NOTE: While NuGet considers .NET Framework 4.6.1 as supporting .NET Standard 1.5 through 2.0, there are several issues with consuming .NET Standard libraries built for those versions from .NET Framework 4.6.1 projects.

NOTE: RTX64 does not support other implementations of .NET Standard 2.0 that involve multiplatform support.

NOTE: When building an application using .NET 6.0 or above, RtUtilityManaged.dll and MessageBusManaged.dll must be provided in the project. These DLLs can be found in the following directory: `C:\Program Files\IntervalZero\RTX64 SDK\4.5\bin`

Managed RTX64 DLLs are not placed in the GAC. When deploying an executable built with the above project, you must package the dependent DLL with that executable.

NOTE: When building an application using .NET Framework, Microsoft.Win32.Registry.dll may need to be provided in the project. This DLL can be found in the following directory: `C:\Program Files\IntervalZero\RTX64 SDK\4.5\bin`

Managed RTX64 DLLs are not placed in the GAC. When deploying an executable built with the above project, you must package the dependent DLL with that executable.

VMware

RTX64 4.5.1 supports VMware Workstation 15.x.

NOTE: RTX64 Runtime may run on a Virtual Machine but it is not supported for Real-Time applications.

NOTE: To run RTX64 Runtime on a Virtual Machine, you must select **Enable virtual machine support** during installation.

Administrator Privileges

Administrator privileges are required for installing and uninstalling the RTX64 product.

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End User Installation

Before You Begin

Before you begin the installation, do the following:

- Verify that your configuration meets the requirements described earlier in this document.
- You must have administrator privileges on your system.
- Exit all Windows programs.
- IntervalZero recommends that you de-select the Windows "Automatically reboot" option. You can find this option under **Start > Control Panel > System and Security > System > Advanced System Settings > Startup and Recovery > Automatically Restart**. Clearing selection of this parameter allows you to view blue screen information.
- RTX64 Runtime is not compatible with the Windows *Memory integrity* security feature. You must turn it off before you install RTX64 Runtime. You can do this in the Windows Security app under **Device security / Core isolation / Core isolation details**. If the *Memory integrity* feature is enabled when you attempt to install RTX64 Runtime, a warning will appear, and the installer will terminate.
- If a device has been converted to RTX64 control, and RTX64 Runtime is uninstalled, that device becomes unusable following a system reboot. A warning icon will appear with the device in Windows Device Manager. To ensure converted devices are usable following uninstall of the Runtime, you must either:
  - Re-convert the device to RTX64 when the Runtime is re-installed.
  - Convert the device back to Windows when the Runtime is uninstalled.
- The RTX64 Runtime installer automatically disables *Fast Startup* on Windows 11 and Windows 10 machines. When RTX64 is uninstalled, *Fast Startup* remains disabled.

NOTE: A valid current boot configuration must be present on the system.

Installation Instructions

NOTE: You can also install RTX64 Runtime silently. For instructions, see Installing RTX64 Runtime from the Command Line.

NOTE: When upgrading from one major RTX64 Runtime version to another, you will not be able to cancel installation once it begins.

NOTE: When upgrading from one major RTX64 Runtime version to another, the Installer will run the RTX64Settings tool to save your RTX64 settings to a log file in the following location: `%Programdata%/IntervalZero/ExportedSettings`.
If the upgrade is unsuccessful, you can use the standalone RTX64Settings tool available from the Customer Center to revert your settings back to the values set before the upgrade.

NOTE: The RTX64 Virtual Network Interface is now an optional feature during installation. It is selected by default during installation.

TO INSTALL RTX64:

1. Download the zip file `RTX64_4.5.1_Runtime_Setup.zip` from the IntervalZero Customer Center.
2. Extract the contents of the zip file.
3. Double-click the self-extracting executable `RTX64_4.5.1_Runtime_Setup.exe`.
4. Click **Next** in the IntervalZero RTX64 Runtime installation Welcome window.
5. Read the End User License Agreement, select **I accept the terms of the license agreement** and then click **Next**.
6. Optionally, on the Destination Folder screen, change to a destination location. The default is: `C:\Program Files\IntervalZero\RTX64`.
7. Click **Next** in the Destination Folder screen.

8. In the Custom Setup screen, optionally select the components you want to install. Note that the RT-TCP/IP stack requires a separate activation key. Click **Next** when finished.
9. On the Virtual Machine Support screen, select **Enable virtual machine support** if you plan to run RTX64 Runtime on a Virtual Machine. Otherwise, leave this check box cleared. Click **Next** when finished.
10. In the Ready to Install the Program screen, click **Install**.
11. Click **Finish** in the installation Completed screen.
12. Activate and configure your product. See Product Activation and Configuration.
13. Reboot your computer, and then choose the RTX64 boot configuration at system startup:

    [Operating System] - RTX64

> **IMPORTANT!** If you boot into a non-RTX64 configuration during startup, you will encounter a warning message and RTX64 may not behave as expected.

Product Activation and Configuration

The Activation and Configuration dialog appears once RTX64 Runtime has been successfully installed. You must activate your RTX64 product and configure the Subsystem through this utility before you can run a real-time application.

You can activate and lock your RTX64 product components to a specific machine or IntervalZero-provided dongle. RTX64 4.5.1 does not support standard dongles. Only small form factor dongles can be used.

NOTE: Licenses for RTX64 3.x and previous versions will not work with RTX64 4.5.1. You must purchase a new license to activate RTX64 4.5.1.

This warning symbol appears in the Activation and Configuration utility whenever an issue is encountered. When the warning symbol appears, hover the mouse over it for more information.

Activating Product Components to a Machine

Follow the appropriate steps below to license RTX64 components to a specific machine.

NOTE: The steps required to activate the components will depend on whether the machine is connected to the Internet.

TO ACTIVATE RTX64 PRODUCT COMPONENTS TO A MACHINE:

1. Launch the **RTX64 Activation and Configuration** utility from **Start > All Programs > RTX64 4.5.1 Runtime > RTX64 Activation and Configuration**. The product components activated by your current key are indicated by a check mark.
2. Choose the appropriate activation option:

Activate over the network — Activate immediately using a valid activation key. This option requires a network connection with access to the IntervalZero License Server.

Generate a fingerprint file	Create a fingerprint file with a valid activation key which you can then convert to a license file and import using the Activate with a license file option.
Activate with a license file	Activate by importing a valid license file.

Activate Over the Network

Use this option to activate immediately using a valid activation key.

NOTE: This option requires a network connection with access to the IntervalZero License Server.

TO ACTIVATE OVER THE NETWORK:

1. Click **Activate over the network**.

2. Make sure your machine is connected to the Internet with access to the IntervalZero License Server.

Network connection established	Unable to establish a network connection
Continue with activation	Make sure all network cables are plugged in and click the Network icon to refresh. If a network connection cannot be established, you can do one of the following: • Try to configure a Proxy Server. • Follow the steps under Generate a fingerprint file.

3. Enter a valid activation key.

> **NOTE:** Your activation key is in the email you received from IntervalZero when you purchased RTX64.

4. Click **Activate**. The product components activated by this key are added to the Components box on the right side of the Activation and Configuration dialog.
5. Create an RTSS boot configuration if one has not already been created. See Setting the RTSS Boot Configuration for more information.

> **IMPORTANT!** You must set an RTSS boot configuration before you can use RTX64.

Configuring a Proxy Server

Follow the steps below to configure a proxy server. You may need to do this if a network connection cannot be established.

TO CONFIGURE A PROXY SERVER:

1. Under **Activate over the network**, click **Configure proxy server**.

2. Provide the requested settings:
    - Server
    - Port
    - User Name
    - Password

NOTE: This information can be provided by your IT department.

3. Click **OK**.

Generating a Fingerprint File

Use this option to create a fingerprint file with a valid activation key which you can then import using the Activate with a license file option.

TO GENERATE A FINGERPRINT FILE:

1. Click **Generate a fingerprint file**.

2. Enter a valid activation key and then click **Save As**.

NOTE: Your activation key is in the email you received from IntervalZero when you purchased RTX64.

3. In the **Save As** dialog, name the file `fingerprint.rfp`. By default, the file will be saved to the desktop.
4. Navigate to the desktop, and then copy and paste the file `fingerprint.rfp` to an external device.
5. Connect the device to a machine with Internet connectivity.
6. Launch a web browser and navigate to http://Activation.IntervalZero.com.
7. Browse for and open the file `fingerprint.rfp`.
8. Click **Activate** to generate a license (`.lic`) file.
9. Click **Save** if your browser prompts you to save the license file. Some browsers automatically save the downloaded license file without prompting.
10. Copy the file `License.lic` to the external device and transfer it to the machine on which RTX64 is installed.
11. Activate with a license file (see below).

NOTE: Once a fingerprint file is saved, the **Activate with a license file** section expands automatically.

Activate with a License File

Use this option to activate by importing a valid license file, such as a license file created from a fingerprint file created by the above option.

TO ACTIVATE WITH A LICENSE FILE:

1. Click **Activate with a license file**.

2. Click **Import...** and then browse for and open the file `License.lic`.
3. Create an RTSS boot configuration if one has not already been created. See Setting the RTSS Boot Configuration for more information.

IMPORTANT! You must set an RTSS boot configuration before you can use RTX64.

Activating Product Components to a Dongle

This topic walks you through the steps required to activate RTX64 product components to an IntervalZero-provided dongle. This is a small form factor dongle on which the license resides.

NOTE: The steps required to activate the components will depend on whether the machine is connected to the Internet.

NOTE: RTX64 4.5.1 does not support standard dongles. Only small form factor dongles can be used.

Activation Options

You have three options when purchasing an IntervalZero-provided dongle and a product license at the same time:

- **Option 1 (default)** – IntervalZero activates the dongle for you when you purchase the software and a small form factor dongle. Simply plug in the dongle to use RTX64.
- **Option 2** – Request that IntervalZero not activate the dongle for you when you purchase the software and a small form factor dongle. You will then need to activate the product to the dongle yourself, following the steps below.
- **Option 3** – Use an existing small form factor dongle. You will need to activate the product the dongle yourself, following the steps below.

NOTE: You can also license RTX64 components to an IntervalZero-provided dongle using the Dongle Activation Utility. The IntervalZero-provided Dongle Activation Utility can be used to activate licensed components on other machines like the pre-activation service you can request from IntervalZero. You can download the Dongle Activation Utility from the IntervalZero Support Site.

IMPORTANT! You cannot license RTX64 components to a dongle when more than one dongle is connected to the machine.

Follow the appropriate steps below to license RTX64 components to an IntervalZero-provided dongle. If you have a dongle that has already been activated, jump to step Using a Pre-Activated Dongle.

TO ACTIVATE RTX64 PRODUCT COMPONENTS TO A DONGLE:

1. Launch the **RTX64 Activation and Configuration** utility from **Start > All Programs > RTX64 4.5.1 Runtime > RTX64 Activation and Configuration**.
2. Check the status of the dongle icon in the **Activation and Configuration** dialog:

		
Dongle connected and active	**Dongle not connected / not active**	**Multiple dongles detected**
Choose the appropriate activation option to lock the RTX64 component(s) to the dongle.	Make sure it is securely connected to your machine. If the dongle still isn't recognized, the RTX64 component(s) will be locked to the machine. Choose the appropriate activation option only if you want to license to the machine.	You cannot license RTX64 components to a dongle when more than one dongle is connected to the machine. Remove all additional dongles until there is only one connected to the machine.

IMPORTANT! Once components are locked to a dongle, that dongle must be connected in order to use RTX64 components on that machine.

3. Choose the appropriate activation option:

	Activate over the network	Activate immediately using a valid activation key. This option requires a network connection with access to the IntervalZero License Server.
	Generate a fingerprint file	Create a fingerprint file with a valid activation key which you can then convert to a license file and import using the Activate with a license file option.
	Activate with a license file	Activate by importing a valid license file.

Activate Over the Network

Use this option to activate immediately using a valid activation key.

NOTE: This option requires a network connection with access to the IntervalZero License Server.

TO ACTIVATE OVER THE NETWORK:

1. Click **Activate over the network**.

2. Make sure your machine is connected to the Internet with access to the IntervalZero License Server.

Network connection established	**Unable to establish a network connection**
Continue with activation	Make sure all network cables are plugged in and click the Network icon to refresh. If a network connection cannot be established, you can do one of the following: • Try to configure a Proxy Server. • Follow the steps under Generate a fingerprint file.

3. Enter a valid activation key.

> **NOTE:** Your activation key is in the email you received from IntervalZero when you purchased RTX64.

4. Click **Activate**. The product components activated by this key are added to the Components box on the right side of the Activation and Configuration dialog.
5. Create an RTSS boot configuration if one has not already been created. See Setting the RTSS Boot Configuration for more information.

IMPORTANT! You must set an RTSS boot configuration before you can use RTX64.

IMPORTANT! Once components are locked to a dongle, that dongle must be connected in order to use RTX64 components on that machine.

Configuring a Proxy Server

Follow the steps below to configure a proxy server. You may need to do this if a network connection cannot be established.

TO CONFIGURE A PROXY SERVER:

1. Under **Activate over the network**, click **Configure proxy server**.

2. Provide the requested settings:
    - Server
    - Port
    - User Name
    - Password

NOTE: This information can be provided by your IT department.

3. Click **OK**.

Generate a Fingerprint File

Use this option to create a fingerprint file with a valid activation key which you can then import using the Activate with a license file option.

TO GENERATE A FINGERPRINT FILE:

1. Click **Generate a fingerprint file**.

2. Enter a valid activation key and then click **Save As**.

> **NOTE:** Your activation key is in the email you received from IntervalZero when you purchased RTX64.

3. In the **Save As** dialog, name the file `fingerprint.rfp`. By default, the file will be saved to the desktop.
4. Navigate to the desktop, and then copy and paste the file `fingerprint.rfp` to an external device.
5. Connect the device to a machine with Internet connectivity.
6. Launch a web browser and navigate to http://Activation.IntervalZero.com.
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8. Click **Activate** to generate a license (`.lic`) file.
9. Click **Save** if your browser prompts you to save the license file. Some browsers automatically save the downloaded license file without prompting.
10. Copy the file `License.lic` to the external device and transfer it to the machine on which RTX64 is installed.
11. Activate with a license file (see below).

> **NOTE:** Once a fingerprint file is saved, the **Activate with a license file** section expands automatically.

Activate with a License File

Use this option to activate by importing a valid license file, such as a license file created from a fingerprint file created by the above option.

TO ACTIVATE WITH A LICENSE FILE:

1. Click **Activate with a license file**.

2. Click **Import...** and then browse for and open the file `License.lic`.
3. Create an RTSS boot configuration if one has not already been created. See Setting the RTSS Boot Configuration for more information.

> **IMPORTANT!** You must set an RTSS boot configuration before you can use RTX64.

> **IMPORTANT!** Once components are locked to a dongle, that dongle must be connected to use RTX64 components on that machine.

Using a Pre-Activated Dongle

If the dongle you have received has been pre-activated, follow the steps below:

TO USE A DONGLE THAT HAS ALREADY BEEN ACTIVATED:

1. Plug in the dongle (the license file is already on the dongle).
2. Connect the dongle to a USB port on the machine.

3. Open the **Activation and Configuration** dialog. This dialog appears once RTX64 has been installed. You can also launch it from **Start > All Programs > RTX64 4.5.1 Runtime > RTX64 Activation and Configuration**.
4. Make sure the Activation and Configuration utility recognizes the dongle:



Dongle connected and active	Dongle not connected / not active	Multiple dongles detected
Choose the appropriate activation option to lock the RTX64 component(s) to the dongle.	Make sure it is securely connected to your machine. If the dongle still isn't recognized, the RTX64 component(s) will be locked to the machine. Choose the appropriate activation option only if you want to license to the machine.	You cannot license RTX64 components to a dongle when more than one dongle is connected to the machine. Remove all additional dongles until there is only one connected to the machine.

Proceed once you see the Dongle Active icon.

5. Create an RTSS boot configuration, if one has not already been created.

IMPORTANT! You must set an RTSS boot configuration before you can use RTX64.

Setting the RTSS Boot Configuration

You can assign available processors to Windows or RTX64 through the RTX64 Activation and Configuration utility. The RTX64 Activation utility automatically detects the total number of processors on your system.

NOTE: We recommend that you disable Hyper-Threading. If Hyper-Threading remains enabled, we recommend you assign an even number of processors between Windows and RTX64. The Windows logical processor and RTSS logical processor must not share the same physical processor.

This warning icon indicates that the RTSS boot configuration needs to be reconfigured.

TO SET THE RTSS BOOT CONFIGURATION THROUGH THE ACTIVATION AND CONFIGURATION DIALOG:

1. Launch the **RTX64 Activation and Configuration** utility from **Start > All Programs > RTX64 4.5.1 Runtime > RTX64 Activation and Configuration**.
2. In the **Activation and Configuration** dialog, click **Set the RTSS boot configuration**.

3. Assign processors between Windows and RTX64. For example, on a machine with 8 processors, and a Professional Runtime license at minimum, you can assign up to 7 processors for RTX64.

   NOTE: We recommend you do not split Hyper-threaded cores between Windows and RTX64, as it can cause loss of determinism.

4. Click **Apply** to complete configuration.

   NOTE: The Apply button remains grayed-out until a valid configuration is provided.

5. When you are prompted, click **Yes** to reboot your computer.
6. Restart the system. Choose the RTX64 boot configuration at system startup.

NOTE: You must reboot the machine if you change the number of Windows processors. If you change the number of RTSS processors, you must restart the RTX64 Subsystem.

NOTE: Even if you don't reboot immediately, all changes will be saved and will take effect after the next reboot. The RTX64 Subsystem will not work correctly until after the next reboot.

Verifying Installation

Once RTX64 has been installed and you are booted into the RTX64 boot configuration, you can run the System Response Time Measurement (SRTM) utility to verify that the installation was successful.

STEPS:

1. Make sure the Subsystem is running. From the RTX64 Control Panel:

   a. Note the status under **Start/Stop the Subsystem**.

   b. If the status is *Stopped*, click the Start button.

2. Open a command prompt as Administrator and type `RtssRun srtm.rtss`

   You should hear a steady 1 KHz tone for 15 seconds and a histogram of the system's response time measurements should appear on the screen.

   Sample Output from srtm.rtss

```
SRTM v4.0 timer delivery latencies for a periodic RTX64 timer:
  Timer Period = 100 us, Clock Resolution = 0.1 us.
  Sample Period = 15 s, Total Ticks = 149999.

Summary:
  Minimum = 0 us, Average = 0 us, Maximum = 3 us

Histogram:
    0 - 1 us: 29607
    1 - 2 us: 375
    2 - 3 us: 16
    3 - 4 us: 1
    4 - 1000 us: 0 ***
```

Users and Groups

RTX64 provides a number of Windows user groups to allow for granular control of RTX64 permissions.

Group	Permissions
RTX64Administrators	• *Full* access to all RTX64 resources
RTX64Users	• *Read* access to all RTX64 resources • Ability to execute RTSS applications • Ability to terminate RTSS processes

By default, all authenticated users who log on to the system can control, configure, and run the RTX64 Subsystem and RTSS applications. The default RTX64 groups include:

- The Windows group **Authenticated Users**
- The Windows user **SYSTEM** (also known as LocalSystem)

System administrators can control access to the RTX64 resources by configuring members of the *RTX64Administrators* and *RTX64Users* groups.

IMPORTANT! The Windows user SYSTEM must never be removed from any of the RTX64 groups.

When modifying RTX64 groups, remove Authenticated Users from all RTX64 groups, then add individual users to specific groups based on their usage needs.

Notes

- For a member of *RTX64Users* to perform the actions listed in the table above, one of the following scenarios is required:
    - Someone with greater permissions must first start the Subsystem for them. Or,
    - The *RTX64Users* member must elevate the application they wish to run or terminate.

- User Administrator and processes elevated to Administrator will always have the same rights as members of the *RTX64Administrators* group, as well as all rights associated with user Administrator.
- When you make a change to any of the RTX64 groups above, you must log out and then log back in for the change to take effect.

Starting and Stopping the Subsystem

You can view the status of the Subsystem and start/stop it using the RTX64 Control Panel.

NOTE: By default, the Subsystem, NAL, and RT-TCP/IP Stack (if licensed) start automatically when you run an RTSS application. You can change component startup behavior in the Control Panel.

TO START OR STOP THE SUBSYSTEM USING THE RTX64 CONTROL PANEL:

1. Navigate to **Start > RTX64 4.5.1 Runtime > RTX64 Control Panel**.
2. Do one of the following:
    - If the Subsystem is *stopped* and you want to start it – click the start button.
    - If the Subsystem is *running* and you want to stop it – click the stop button

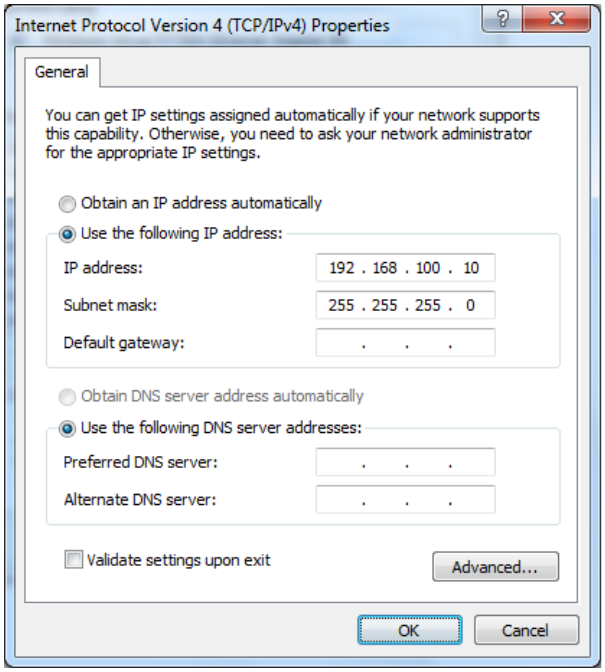
Configuring Your Windows RTX64 Virtual Ethernet Adapter

To use the RTX64 Virtual Network, you must have a valid RT-TCP/IP license and configure IP Address and Subnet mask values for the Windows RTX64 Virtual Ethernet Adapter through Windows Device Manager.

TO CONFIGURE THE IP ADDRESS AND SUBNET MASK:

NOTE: The connection for Internet Protocol Version 4 (TCP/IPv4) must be checked for the Virtual Network to function. Internet Protocol Version 6 (TCP/IPv6) is not supported and can be unchecked.

1. Open the Internet Protocol Version 4 (TCP/IPv4) Properties: Control Panel > Network and Internet > View Network Status and Tasks > Connection: Ethernet > Properties > Internet Protocol Version 4 (TCP/IPv4) > Properties > **Use the following IP address**
2. Set the **IP Address** to the IP address that you wish to use.



NOTE: Leave the **Default gateway** and DNS fields empty.

IMPORTANT! The Subnet mask you specify in Windows *must* match the Subnet mask specified in the RTX64 Control Panel. By default, the RtVirtualNic interface sets the Subnet mask to 255.255.255.0

3. Click **OK**.

Uninstalling

Uninstall Considerations

Keep the following in mind when removing RTX64 from your system:

- After RTX64 Runtime is uninstalled from a system, any devices given to RTX64 will no longer have an associated driver and should be returned to Windows by using the Windows Device Manager.
- The RTX64 Control Panel must be closed before uninstalling RTX64.
- All real-time processes should be stopped, along with the Subsystem.
- All Subsystem settings are removed during uninstall. If you want to save the current configuration of RTX64 Control Panel settings, you can use the RTX64 Settings Utility, available from the Support site, to output your settings to an XML file.
- RTX64 user groups are not removed when the RTX64 Runtime is uninstalled.

Performing the Uninstall

If you need to uninstall any of the RTX64 components, perform the appropriate procedure, as described below, for your version of Windows.

NOTE: If the RTX64 boot configuration is the only boot configuration present on uninstall, it will be retained so that you can boot your system.

STEPS:

1. Stop the Subsystem if it is running.
2. From the *Start* menu, choose **Control Panel**.
3. Under *Programs*, click **Uninstall a Program**.
4. Select the **RTX64 4.5.1 Runtime** program and click **Uninstall**.
5. Click **Yes** to confirm.
6. Click **Finish** when the uninstall process has completed. The machine will now reboot.

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Installing RTX64 Runtime from the Command Line

The silent installer provides the ability to install RTX64 Runtime from the command line. This makes it possible to install RTX64 Runtime within another product installation. Take note of the following information before you begin.

- If a version of RTX64 2013 prior to Service Pack 1 is already installed on the system, you must uninstall it and reboot the system before you can install RTX64 4.5.1.
- **Administrator privileges are required** — Installation must be done from an account that has administrator privileges. This can be done in one of several ways:

Before You Begin

Before you begin the installation, do the following:

- Verify that your configuration meets the requirements described earlier in this document.
- You must have administrator privileges on your system.
- Exit all Windows programs.
- IntervalZero recommends that you de-select the Windows "Automatically reboot" option. You can find this option under **Start > Control Panel > System and Security > System > Advanced System Settings > Startup and Recovery > Automatically Restart**. Clearing selection of this parameter allows you to view blue screen information.
- RTX64 Runtime is not compatible with the Windows *Memory integrity* security feature. You must turn it off before you install RTX64 Runtime. You can do this in the Windows Security app under **Device security / Core isolation / Core isolation details**. If the *Memory integrity* feature is enabled when you attempt to install RTX64 Runtime, a warning will appear, and the installer will terminate.

- If a device has been converted to RTX64 control, and RTX64 Runtime is uninstalled, that device becomes unusable following a system reboot. A warning icon will appear with the device in Windows Device Manager. To ensure converted devices are usable following uninstall of the Runtime, you must either:
  - Re-convert the device to RTX64 when the Runtime is re-installed.
  - Convert the device back to Windows when the Runtime is uninstalled.
- The RTX64 Runtime installer automatically disables *Fast Startup* on Windows 11 and Windows 10 machines. When RTX64 is uninstalled, *Fast Startup* remains disabled.

NOTE: A valid current boot configuration must be present on the system.

Installing the RTX64 Runtime Silently

You can install RTX64 Runtime silently using a response file. The response file contains information on the data and system customizations selected by the user at run time.

NOTE: When upgrading from one major RTX64 Runtime version to another, the Installer will run the RTX64Settings tool to save your RTX64 settings to a log file in the following location: `%Programdata%/IntervalZero/ExportedSettings`.
If the upgrade is unsuccessful, you can use the standalone RTX64Settings tool available from the Customer Center to revert your settings back to the values set before the upgrade.

NOTE: The RTX64 Virtual Network Interface is now an optional feature during installation. It is selected by default during installation.

IntervalZero-Provided Response File

IntervalZero provides a default response file for silent installation of RTX64 Runtime, available from the ResponseFiles folder.

- `RTX64_4.5.1_Runtime_Install_Response_File.iss` – installs RTX64 4.5.1 Runtime product to the default location and includes all features.

Creating a Custom Response File

Follow these instructions to create a new response file called `Setup.iss`. This file is like an INI file.

TO CREATE A NEW RESPONSE FILE:

Run this command:

```
RTX64_4.5.1_Runtime_Setup.exe /r
```

This launches the RTX64 Runtime installer, records the selections and customizations you make, and saves the data to a custom .iss file called `Setup.iss` in the system's Windows folder.

TO SPECIFY A NEW NAME AND LOCATION:

To specify an alternative response file name and location, use the */f1* option.

For example, to create a response file named `RTX64Runtime.iss` in the `C:\temp` directory, you would run:

```
RTX64_4.5.1_Runtime_Setup.exe /r /f1"C:\temp\RTX64Runtime.iss"
```

TO CUSTOMIZE FEATURES:

The sections of a response file must be ordered as follows:

1. Dialog Sequence Section
2. Dialog Data Sections (one per dialog)

Data entries consist of <name=value> pairs, as in the following example:

```
Dlg0={7D178B36-BCD6-4EBE-90B7-92D719136B38}-SdWelcome-0
```

For more information on manually creating a response file, visit https://community.flexera.com/t5/InstallAnywhere-Knowledge-Base/How-to-Create-Response-File-to-Be-Used-as-Silent-Install/ta-p/3530

Installing with a Response File

TO SILENTLY INSTALL WITH THE INTERVALZERO-PROVIDED DEFAULT RESPONSE FILE:

Run `RTX64_4.5.1_Runtime_Setup.exe /s /f1"<path to the ResponseFiles folder>\RTX64_4.5.1_Runtime_Install_Response_File.iss"`

TO SILENTLY INSTALL WITH A CUSTOM RESPONSE FILE:

Run `RTX64_4.5.1_Runtime_Setup.exe /s /f1"<path to your custom response file>"`

For example:

```
RTX64_4.5.1_Runtime_Setup.exe /s /f1"C:\temp\RTX64Runtime.iss"
```

NOTE: The InstallShield icon appears on the system Task Bar during silent installation.

Log Files

When running an RTX64 installation in silent mode (using the */s* option), the log file `Setup.log` is created in the same directory as the response file. To specify an alternative log file location and/or file name, use the */f2* option.

For example:

```
RTX64_4.5.1_Runtime_Setup.exe /s /f2"C:\Setup.log"
```

Silent Activation and Configuration

You can activate your product and configure the RTX64 boot configuration. You can activate and lock your product to a specific machine or IntervalZero-provided USB dongle.

TO ACTIVATE YOUR PRODUCT (INTERNET CONNECTION REQUIRED):

1. Navigate to the `C:\Program Files\IntervalZero\Common\bin` directory and run `RTX64ActivationUtil.exe` as Administrator.
2. Type the `-a` flag, and then provide your activation key. For example:

   ```
   RTX64ActivationUtil.exe -a IZRTX64-111-2222-3333-4444-5555-IZTCP64-111-2222-3333-4444-5555
   ```

   NOTE: You can find your activation key in the email you received from IntervalZero Sales.

3. If running from a command prompt, the activated components are displayed.
4. If you want to force activation to an IntervalZero-provided dongle, you can use the `-dongle` flag. If you want to force activation to ignore a dongle, use the `-nodongle` flag. For example:

   `RTX64ActivationUtil.exe -a IZRTX64-111-2222-3333-4444-5555-IZTCP64-111-2222-3333-4444-5555 -dongle` (forces activation to dongle)

   `RTX64ActivationUtil.exe -a IZRTX64-111-2222-3333-4444-5555-IZTCP64-111-2222-3333-4444-5555 -nodongle` (forces activation to machine)

5. `RTX64ActivationUtil.exe -a IZRTX64-111-2222-3333-4444-5555-IZTCP64-111-2222-3333-4444-5555` (attempts to locate an IntervalZero-provided dongle first, and activates to the machine if a dongle is not found)

SETTING THE BOOT CONFIGURATION:

1. Navigate to the `C:\Program Files\IntervalZero\Common\bin` directory.
2. Run `RTX64ActivationUtil.exe` as Administrator. You must license the product before you configure the system.
3. Provide the number of Windows `-w` and RTSS `-r` processors. For example, to assign 3 processors to Windows and 5 processors to RTX64 on a dedicated system, you would type:

   ```
   RTX64ActivationUtil.exe -w 3 -r 5
   ```

4. Restart the system.

BATCH FILE EXAMPLE

You can install RTX64 components silently via a batch (`.bat`) file. Below are examples of typical commands that might be used:

Command	Result
`RTX64_4.5.1_Runtime_Setup.exe /s ”C:\ResponseFiles\RTX64_4.5.1_Runtime_ Install_Response_File.iss"`	Installs the RTX64 Runtime silently
`cd C:\Program Files\IntervalZero\Common\bin`	Changes the directory to the location where `RTX64ActivationUtil.exe` resides
`RTX64ActivationUtil.exe -a <license number>`	Activates the components included in the activation key
`RTX64ActivationUtil.exe -w 2 -r 2`	Sets the boot configuration. In this example, 2 processors are assigned to Windows and 2 processors are assigned to RTX64.

Uninstalling the RTX64 Runtime Silently

You can uninstall RTX64 Runtime silently using a response file. The response file contains information on the data and system customizations selected by the user at run time.

IntervalZero-Provided Response File

IntervalZero provides a default response file for silent uninstall of RTX64 Runtime, available from the ResponseFiles folder.

- `RTX64_4.5.1_Runtime_Uninstall_Response_File.iss` – uninstalls RTX64 4.5.1 Runtime and reboots the system.

Uninstalling with a Response File

TO SILENTLY UNINSTALL WITH THE INTERVALZERO-PROVIDED DEFAULT RESPONSE FILE:

Run `RTX64_4.5.1_Runtime_Setup.exe /s"<path to the ResponseFiles folder>\RTX64_4.5.1_Runtime_Uninstall_Response_File.iss"`

NOTE: The system will reboot after RTX64 4.5.1 Runtime is silently uninstalled using the IntervalZero-provided response file. If you want to suppress the reboot, create an alternative response file. See *Creating a Custom Response File* earlier in this guide.

TO SILENTLY UNINSTALL WITH A CUSTOM RESPONSE FILE:

Run `RTX64_4.5.1_Runtime_Setup.exe /s /f1"<path to your custom response file>"`

For example:

```
RTX64_4.5.1_Runtime_Setup.exe /s /f1"C:\temp\RTX64Runtime.iss"
```

NOTE: The InstallShield icon appears on the system Task Bar during silent installation.

The same system configuration changes will result when performing a silent install as would occur when using the Windows Add/Remove program utility. For more information, see Uninstalling.

NOTE: Silent uninstall of RTX64 results in an automatic reboot of the system. To install silently without forcing a reboot of the system, use the `/norestart` command.

For a list of the format strings for previous versions of pre-4.x RTX64 Runtimes, see the TechNote *RTX64 Runtime Uninstall IDs*.

Next Steps

- Once you've successfully installed RTX64 4.5.1, we recommend you review the RTX64 documentation available from the RTX64 Control Panel.
- The RTX64 installation creates two user groups: *RTX64Users*, and *RTX64Administrators*. A user must belong to a group to use RTX64. To add a user to a group:

  a. From the **Start** menu, right-click on **Computer**, and then click **Manage**. The Computer Management window appears.

  b. Click **Local Users and Groups** > **Groups**.

  c. Click the group name. **Add** users in the Properties window that appears.

  See Users and Groups for more information.

Support

For help with RTX64, contact IntervalZero Technical Support by phone or access the online support resources available at https://www.intervalzero.com/en-support/en-customer-service/

Contacting Technical Support by Phone

NOTE: If you are a customer who purchased an IntervalZero product through a third-party reseller, contact the reseller for support.

Location	Number	Hours
United States	1-781-996-4481 At the prompt, press 3 for Support.	Monday - Friday, 8:30 a.m. – 5:30 p.m. US Eastern Time (GMT-500), excluding holidays.
R.O.C. Taiwan	+ 886-2-2556-8117	Monday - Friday, 9:00 a.m. – 5:00 p.m. Taipei Standard Time (GMT+8), excluding holidays.

Before Calling Technical Support

Please have the following information ready before calling IntervalZero Technical Support:

- **Your Support ID**: Customers who purchase direct support receive an e-mail address and password for accessing the IntervalZero Customer Support Portal.
- **The Version Number of Your RTX64 Software**: You can find the RTX64 version number on the RTX64 Control Panel home screen (**Start > RTX64 4.5.1 Runtime > RTX64 Control Panel**).

NOTE: Make sure you have a valid maintenance contract.

Online Resources

Visit https://www.intervalzero.com/en-support/en-customer-service/ to log in to the Customer Support Portal (requires valid credentials), access online product Help, and view Support and Lifecycle policies and Product Release Notices.

Appendix A

System Modifications During Installation

RTX64 Power Plan on Machines

RTX64 does not support Windows hibernation or hybrid sleep. These features must be disabled to provide real-time performance. To facilitate this process, the installer clones your machine's existing power plan and creates and enables a new power plan called *RTX64-Recommended*. We strongly advise that you modify this new power plan to match the settings detailed below.

Basic Settings

Category	Settings
Sleep	Sleep After = Never Allow hybrid sleep = Off Hibernate after = Never

Advanced Settings

Category	Settings
Hard disk	Turn off hard disk after = Never
Sleep	Sleep After = Never Allow hybrid sleep = Off Hibernate after = Never
PCI Express	Link State Power Management = Off
Processor power management	Minimum processor state = 100% Maximum processor state = 100%

Recommended Laptop Settings

On laptops, both AC and DC behaviors are set for all the above settings.

We also recommend the following settings when running RTX64 on a laptop:

Category	Settings
Processor power management	System cooling policy
On battery	Active
Plugged in	Passive

NOTE: For optimal performance when running RTX64 on a laptop, we recommend that you convert Display adapters to Microsoft Basic Display Adapter in the Windows Device Manager. If you choose not to convert display adapters, you may experience latency.

Battery Power Settings on Laptops Running Windows 10 Anniversary

The *RTX64-Recommended* power plan implements these battery power settings on laptops running Windows 10 Anniversary:

Setting	Value
Critical Action	0 - Do nothing
Low Battery Level	10
Critical Battery Level	5
Low Level Battery Notify	1 - Display notification
Low Level Battery Action	0 - Do nothing
Reserve Battery Level	15

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