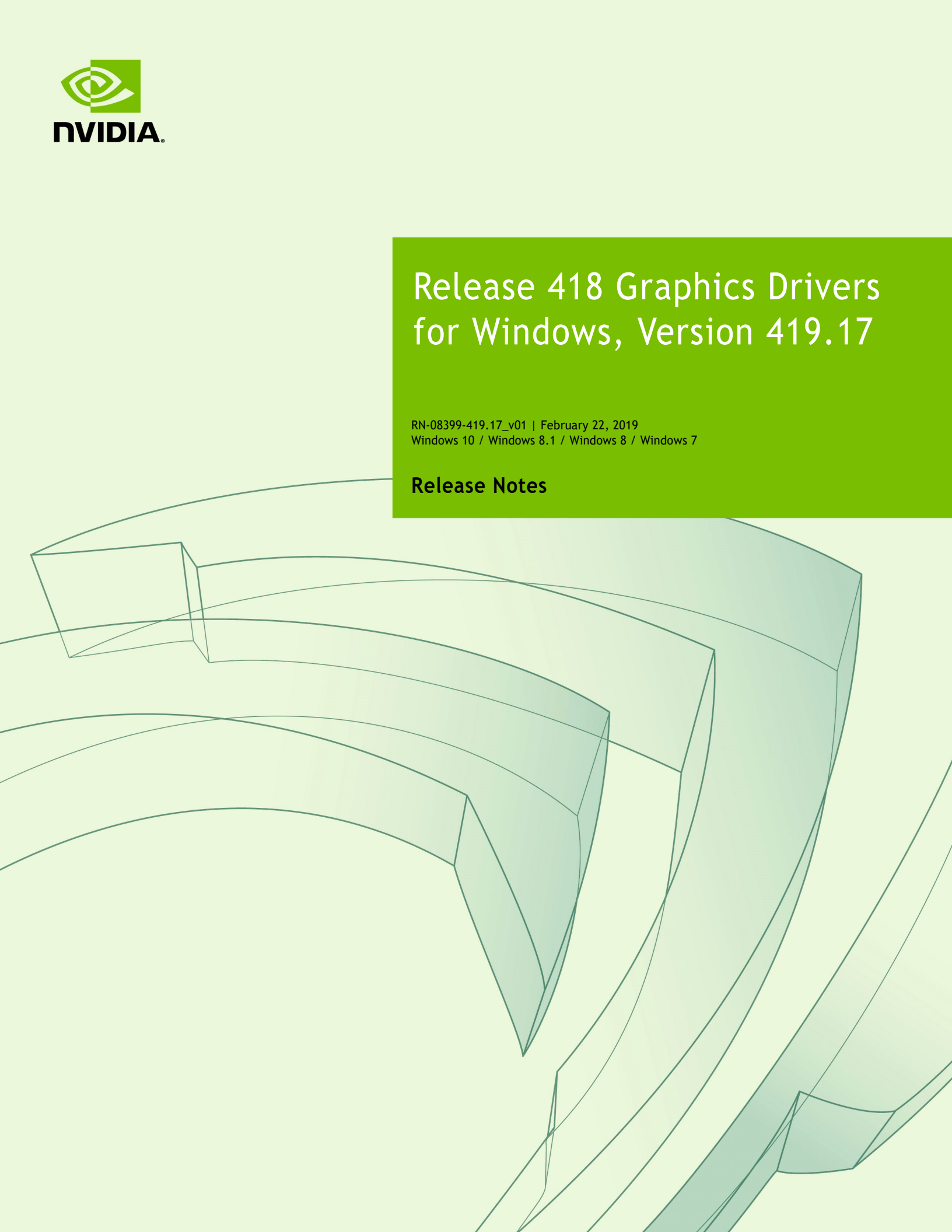

Release 418 Graphics Drivers for Windows, Version 419.17

RN-08399-419.17_v01 | February 22, 2019
Windows 10 / Windows 8.1 / Windows 8 / Windows 7

Release Notes

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1 INTRODUCTION TO RELEASE NOTES

This edition of *Release Notes* describes the Release 418 family of NVIDIA® graphics drivers (versions 418.*xx* to 420.*xx*) for Microsoft® Windows® 7 and later[1]. NVIDIA provides these notes to describe performance improvements and bug fixes in each documented version of the driver.

Structure of the Document

This document is organized in the following sections:

- "Release 418 Driver Changes" on page 2 gives a summary of changes, and fixed and open issues in this version.
- "The Release 418 Driver" on page 24 describes the NVIDIA products and languages supported by this driver, the system requirements, and how to install the driver.

Changes in this Edition

This edition of the *Release Notes* for Windows includes information about NVIDIA graphics driver version 419.17 WHQL and lists changes made to the driver since driver version 417.71. These changes are discussed beginning with the chapter "Release 418 Driver Changes" on page 2.

1. Includes Windows 7, Windows 8, Windows 8.1, and Windows 10.

2 RELEASE 418 DRIVER CHANGES

This chapter describes open issues for version 419.17 WHQL, and resolved issues and driver enhancements for versions of the Release 418 driver up to version 419.17 WHQL.

The chapter contains these sections:

Version 419.17 WHQL Highlights

This section provides highlights of version 419.17 WHQL of the NVIDIA Release 418 Driver for Windows 7, Windows 8, Windows 8.1, and Windows 10[1].

1. Includes support for Windows 10 October 2018 Update (Version 1809) (Redstone 5)

Existing Support

This release supports the following APIs:

- Open Computing Language (OpenCL™ software) 1.2 for NVIDIA® Kepler™ and later GPUs
- OpenGL® 4.6
- Vulkan® 1.1
- DirectX 11
- DirectX 12 (Windows 10)

What's New in Version 419.17 WHQL

Game Ready Drivers provide the best possible gaming experience for all major new releases, including Virtual Reality games. Prior to a new title launching, our driver team is working up until the last minute to ensure every performance tweak and bug fix is included for the best gameplay on day-one.

Game Ready

Provides the optimal gaming experience for Anthem and DiRT Rally 2.0.

Gaming Technology

Includes support for NVIDIA GeForce GTX 1660 Ti graphics cards.

Security Updates

- This driver adds security updates for driver components.

  See the NVIDIA Security Bulletin 4772 for details.

  See also the section "Driver Security" on page 11 for actions to take to mitigate vulnerabilities.

Application SLI Profiles

Added or updated the following SLI profiles:

- **Apex Legends**
- **Far Cry New Dawn**

Software Module Versions

- **nView - 149.34**

- **HD Audio Driver - 1.3.38.13**
- **NVIDIA PhysX System Software - 9.18.0907**
- **GeForce Experience - 3.17.0.126**
- **CUDA - 10.0**

New Features

▶ NVIDIA Control Panel

Updated to version 8.1.950. Added new *Developer->Manage GPU Performance Counters* controls.

▶ Video Codec SDK 9.0 (Released Feb 11, 2019)

Included Features

- Supports NVENC/NVDEC on NVIDIA Turing GPUs
- NVENC API has been updated to support HEVC B-frames on Turing GPUs.
- NVENC API adds the capability to output the encoded bitstream, and motion vectors from Motion-Estimation-only mode to video memory. This avoids the overhead of copying the output from system to video memory for processing pipelines operating directly on video memory.
- NVENC API now accepts CUArray as an input buffer. The SDK contains a sample application to demonstrate how to feed Vulkan surface to NVENC using Vulkan-CUDA interop.

More information: https://developer.nvidia.com/nvidia-video-codec-sdk

▶ Optical Flow SDK 1.0 (Released Feb 11, 2019)

This is a new API for Optical Flow and stereo disparity hardware engine, available on Turing GPUs.

More information: https://developer.nvidia.com/opticalflow-sdk

Fixed Issues and Other Changes

▶ See also "Changes and Fixed Issues in Version 419.17" on page 12.

What's New in Release 418

This section summarizes the driver changes previously introduced in Release 418.

New Features

- Added support for NVIDIA TITAN RTX.
- Implemented performance improvements on multiple titles, such as Witcher 3. when using G-SYNC and SLI on Pascal and Maxwell GPUs.

Application SLI Profiles

Added or updated the following SLI profiles:

- **Anthem**
- **Assetto Corsa Competizione -** ***AFR enabled for Turing GPUs***
- **Battlefleet Gothic: Armada 2 -** ***AFR enabled for Turing GPUs***
- **Life is strange Season 2 -** ***AFR enabled for Turing GPUs***
- **NBA 2K19 -** ***AFR enabled for Turing GPUs***
- **Space Hulk Tactics -** ***AFR enabled for Turing GPU***

Discontinued Support

- 32-bit Operating Systems

  Beginning with Release 396, NVIDIA is no longer releasing Game Ready drivers for 32-bit operating systems for any GPU architecture.

- NVIDIA Fermi GPUs

  Beginning with Release 396, the NVIDIA Game Ready driver no longer supports NVIDIA GPUs based on the Fermi architecture.

Limitations in This Release

The following features are not currently supported or have limited support in this driver release:

Behavior Change in NvEncCreateBitstreamBuffer API of Video Codec SDK

In the NVIDIA driver, Release 415 and later, the behavior of the Video Codec SDK API (NvEncCreateBitstreamBuffer) has been changed to return `NV_ENC_ERR_UNIMPLEMENTED` instead of `NV_ENC_SUCCESS` when the encoder instance is configured to run in the motion estimation-only mode. As an indirect consequence of this change, the AppEncME sample application from the Video Codec SDK prior to SDK version 8.2.16 will crash due to a bug in the NvEncoder class.

The latest version of the SDK fixes this bug that affects the AppEncME sample application. NVIDIA recommends downloading the latest version from https://developer.nvidia.com/nvidia-video-codec-sdk.

Turing GPU Driver Installation on Windows 10

Drivers for Turing GPUs will not be installed on systems with Windows 10 RS2 or earlier. This includes Windows 10 Threshold 1, Threshold 2, Redstone 1, and Redstone 2 operating systems.

Crescent Bay and OSVR Headsets on Multiple GPU Systems

With Release 367 and future NVIDIA drivers, Crescent Bay and Open Source Virtual Reality development kit headsets will not work with VRWorks Direct Mode in systems that contain GPUs from multiple vendors (for example, NVIDIA and Intel). For such systems, please disable the Intel integrated graphics (from the system BIOS) in order to use Direct Mode.

Experimental OpenCL 2.0 Features

Select features in OpenCL 2.0 are available in the driver for evaluation purposes only. The following are the features as well as a description of known issues with these features in the driver:

- **Device side enqueue**
  - The current implementation is limited to 64-bit platforms only.
  - OpenCL 2.0 allows kernels to be enqueued with `global_work_size` larger than the compute capability of the NVIDIA GPU. The current implementation supports only combinations of `global_work_size` and `local_work_size` that are within the compute capability of the NVIDIA GPU.

    The maximum supported CUDA grid and block size of NVIDIA GPUs is available at http://docs.nvidia.com/cuda/cuda-c-programming-guide/index.html#compute-capabilities. For a given grid dimension, the `global_work_size` can be determined by CUDA grid size x CUDA block size.
  - For executing kernels (whether from the host or the device), OpenCL 2.0 supports non-uniform ND-ranges where `global_work_size` does not need to be divisible by the `local_work_size`. This capability is not yet supported in the NVIDIA driver, and therefore not supported for device side kernel enqueues.
- **Shared virtual memory**
  - The current implementation of shared virtual memory is limited to 64-bit platforms only.

Advanced Driver Information

This section contains the following additional information about the driver:

- Differing GPU Voltages in SLI Mode
- 3D Compatibility Mode
- Help for Resizing Your HDTV Desktop
- Understanding the DirectX Information Shown in the NVIDIA System Information Window

Differing GPU Voltages in SLI Mode

When non-identical GPUs are used in SLI mode, they may run at different voltages. This occurs because the GPU clocks are kept as close as possible, and the clock of the higher performance GPU is limited by that of the other. One benefit is that the higher performance GPU saves power by running at slightly reduced voltages.

An end-user gains nothing by attempting to raise the voltage of the higher performance GPU because its clocks must not exceed those of the other GPU.

3D Compatibility Mode

3D Compatibility Mode is an NVIDIA proprietary rendering mode for 3D Vision that improves the 3D experience for many key DirectX 10 and 11 games. NVIDIA continues to add game support with new driver versions.

Requirements and Compatibility

- Games must be run in DirectX 10 or DirectX 11 mode.
- Not compatible with 3D Vision Surround.

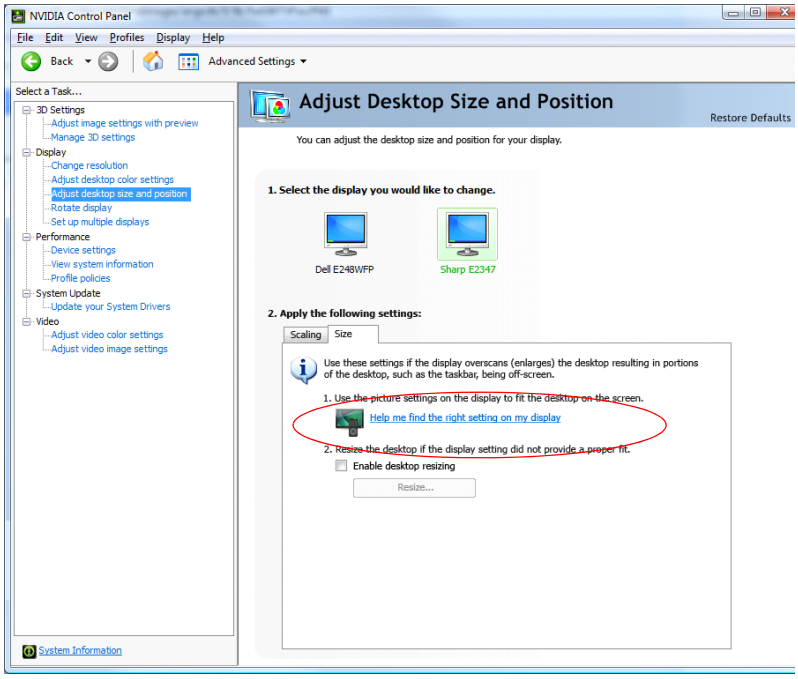
Switching Compatibility Modes

Games with 3D Compatibility Mode will launch in this mode by default. You can switch between 3D Compatibility mode and standard 3D Vision mode as follows:

1. Before starting the game, enable Advanced In-game Settings in the NVIDIA Control Panel:
   a. Open the NVIDIA Control Panel and navigate to the *Stereoscopic 3D->Set up stereoscopic 3D* page and click **Set Keyboard Shortcuts**.
   b. Click the *Show advanced in-game settings* arrow if the section is not expanded, then select **Enable advanced in-game settings.**
   c. Click **OK**.
2. Press Ctrl+Alt+F11 during the game to toggle between 3D Compatibility mode and standard 3D Vision mode.

Help for Resizing Your HDTV Desktop

The best way to resize the screen in order to view the entire content is to use the controls provided by the display hardware. Click the link on the Size tab to view a guide to changing the settings on your display hardware.

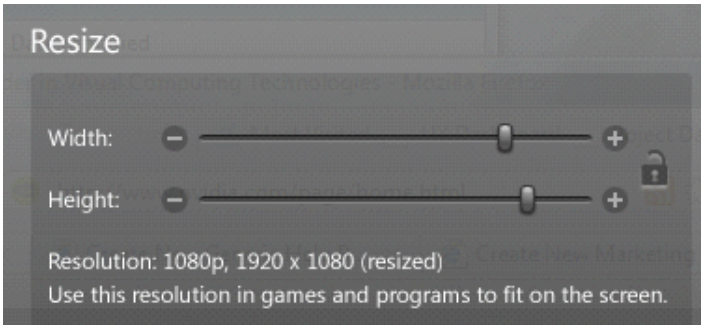


The resize controls on the NVIDIA Control Panel are provided in case satisfactory results cannot be achieved using the controls on the display.

After resizing the HDTV desktop using the NVIDIA Control Panel Resize controls, the new custom resolution created is now added to the list of available resolutions for that display, and also added to the resolution list within the game or application.

The method for resizing the HDTV desktop was improved to provide better image quality when applying underscan. This method results in a new custom resolution being created which needs to be selected from games or applications to apply the resizing. In the example displayed in the following screen shot, the underscan has created a new resolution (1216 × 682). Although this resolution looks different, it is still in HD format.

Remember to select this resolution in your game or other application in order to take advantage of it.



Note: Some games or applications may not support the new resolution.

Understanding the DirectX Information Shown in the NVIDIA System Information Window

The System Information window–accessed by clicking **System Information** at the bottom left corner of the NVIDIA Control Panel–provides technical information about the NVIDIA graphics cards and driver installed in the system.

It also provides the following system information:

- **Operating system**: For example, “Windows 7 Enterprise, 64-bit”
- **DirectX runtime version**: For example, “11.0”

In order to use the version of DirectX reported in the System Information window, the NVIDIA GPU and graphics driver must also support that DirectX version.

This information is provided in the *Graphics card information* section of the System Information window as follows:

- **DirectX support**

  (Provided in previous driver versions)

  This is the DirectX version that is supported by the NVIDIA graphics hardware and driver.

- **Direct3D API version**

  (Provided in later driver versions, for Windows 7 and later.)

  This is the Direct3D version that is supported by the NVIDIA graphics hardware and driver. The API version is expressed in terms of Direct3D – the graphics subsystem component of DirectX.

- **Direct3D feature level**

  (Provided in later driver versions, for Windows 7 and later)

  Direct3D feature levels describe a subset of features within the Direct3D API version that are supported by the NVIDIA graphics hardware and driver.

Driver Security

Follow these safe computing practices:

- Only download or execute content and programs from trusted third parties.
- Run your system and programs with the least privilege necessary. Users should run without administrator rights whenever possible.
- When running as administrator, do not elevate UAC privileges for activities or programs that don't need them.

This section describes additional actions to take to mitigate specific known security issues.

Restricting Access to GPU Performance Counters

The NVIDIA graphics driver contains a vulnerability (CVE-2018-6260) that may allow access to application data processed on the GPU through a side channel exposed by the GPU performance counters. GPU performance counters are needed by developers in order to use NVIDIA developer tools such as CUPTI, Nsight Graphics, and Nsight Compute. In order to address CVE-2018-6260 the driver needs to be updated and additional steps listed below are needed to disable access to non-admin users. For more information about CVE-2018-6260 visit the NVIDIA Security Bulletin 4772.

Access to GPU performance counters should be disabled for non-admin users who do not need to use NVIDIA developer tools.

Restricting access to GPU performance counters can be accomplished through the NVIDIA Control Panel->*Developer->Manage GPU Performance Counters* page (NV Control Panel v8.1.950). Refer to the *Developer->Manage GPU Performance Counters* section of the NVIDIA Control Panel Help for instructions.

Changes and Fixed Issues in Version 419.17

The following sections list the important changes and the most common issues resolved in this version. This list is only a subset of the total number of changes made in this driver version. The NVIDIA bug number is provided for reference.

Fixed Issues in this Release

- [Doom Eternal / Doom 2016]: Decals render as black. [2515006]
- [Battlefield V]: Screen artifacts appear in the game when Texture Filtering is set to High Quality in the NVIDIA Control Panel. [2470649]
- Dynamic Super Resolution (DSR) is not available for monitors with 4k2k timings. [2496987]
- [Iray][OptiX]: Iray GPU acceleration crashes and falls back to CPU acceleration. [2503738]
- Windows 7x64/8.1x64: Fixes random application crash or TDR introduced in previous GeForce display driver 418.81. [2504448]

Open Issues in Version 419.17 WHQL

As with every released driver, version 419.17 WHQL of the Release 418 driver has open issues and enhancement requests associated with it. This section includes lists of issues that are either not fixed or not implemented in this version. Some problems listed may not have been thoroughly investigated and, in fact, may not be NVIDIA issues. Others may have workaround solutions.

For notebook computers, issues can be system-specific and may not be seen on your particular notebook.

Windows 10 Issues

- [G-SYNC]: With a G-SYNC and G-SYNC Compatible display connected in clone mode, flashing occurs on games played on the G-SYNC display with G-SYNC enabled. [200482157]
- [Apex Legends]: DXGI_ERROR_DEVICE_HUNG error message may appear and then the game crashes.[2503360]
- [Hitman 2]: Pixelated corruption appears in the game. [2504274]
- [HDR][Ni no Kuni 2]: Enabling HDR causes the application to crash when launched. [2483952]
- [ARK Survival]: Multiple errors and then blue-screen crash may occur when playing the game. [2453173]
- [Batman: Arkham Origins]: PhysX fog renders incorrectly [2451459]
- [Firefox]: Cursor shows brief corruption when hovering on certain links in Firefox. [2107201]
- Random desktop flicker occurs on some multi-display PCs [2453059]

Issues Not Caused by NVIDIA Drivers

This section lists issues that are not due to the NVIDIA driver as well as features that are not meant to be supported by the NVIDIA driver for Windows 7.

Windows 10 Considerations

Cross-adapter Clone Mode

Under Windows 10, clone mode across graphics processors is handled by the Windows OS, and not by the NVIDIA driver. Consequently, there are no controls for cross-adapter clone mode in the NVIDIA Control Panel under Windows 10.

Functionality of some display controls in the NVIDIA Control Panel may be affected if cross-adapter clone mode is enabled through the Windows Control Panel. In this case, use the Windows Control Panel to adjust display settings.

Optimus Systems

Because cross-adapter clone mode is handled by the Windows 10 OS, there are no display controls in the NVIDIA Control Panel if no display is connected to the NVIDIA GPU on Optimus notebooks.

Windows 7 Considerations

Hotplug Action

Under Windows 7, the default settings are not applied when a new display is hotplugged, and there is no message balloon alert stating that a new display was detected. All display connection and detection events are handled through the Windows 7 Connecting and Configuring Displays (CCD) mechanism.

NVIDIA Control Panel Rotate Display Page

The rotation radio button labels are consistent with the Microsoft panel

Table 2.1 NVIDIA Control Panel Rotation Page Radio Buttons

Clockwise Rotation	Windows 7 Label
0 degrees	Landscape

Table 2.1 NVIDIA Control Panel Rotation Page Radio Buttons

Clockwise Rotation	Windows 7 Label
90 degrees	Portrait
180 degrees	Landscape (flipped)
270 degrees	Portrait (flipped)

Limitation

- When switching the refresh rate from 59 Hz to 60Hz, the refresh rate remains at 59 Hz.

  See the Microsoft KB article KB2006076 at http://support.microsoft.com/kb/2006076.

Operating System Issues

- [Windows 10 Fall Creators Update][HDTV]: 12 bpc is automatically applied even on HDTVs that support only 8 bpc, resulting in a scrambled display. [2007663]

  To work around, open the NVIDIA Control Panel->Change Resolution page, select "Use NVIDIA color settings", then set the Output color depth to 8 bpc.

- When upgrading from Windows 7 to Windows 8, the system fails to retrieve the installed WHQL display driver. [1024416]

  See the Microsoft KB article KB2743349 http://support.microsoft.com/kb/2743349.

Application Issues

Fixed Frame Rate Games

Some games and applications are designed to run at a fixed frame rate, and consequently do not take advantage of NVIDIA G-Sync. To prevent issues, G-Sync may be disabled for those applications.

Known Product Limitations

This section describes problems that will not be fixed. Usually, the source of the problem is beyond the control of NVIDIA. Following is the list of problems and where they are discussed in this document:

GPU Temperature Reported Incorrectly on Optimus Systems

Issue

On Optimus systems, temperature-reporting tools such as Speccy or GPU-Z report that the NVIDIA GPU temperature is zero when no applications are running.

Explanation

On Optimus systems, when the NVIDIA GPU is not being used then it is put into a low-power state. This causes temperature-reporting tools to return incorrect values.

Waking up the GPU to query the temperature would result in meaningless measurements because the GPU temperature change as a result.

These tools will report accurate temperatures only when the GPU is awake and running.

Damaged or Missing WMI Service Prevents NVIDIA Driver Installation

Issue

"Install failed" or "Install Failed, could not find compatible graphics hardware" message may appear during installation, even if the system has a compatible graphics card. This can occur when installing the NVIDIA driver or GeForce Experience software.

Cause

This issue could be the result of a corrupt WMI service on your system. The NVIDIA Installer requires the WMI service to properly install the driver or other NVIDIA software.

Resolution

You must repair the WMI service on your system in order to successfully install NVIDIA drivers. A future driver release will alert the user during installation that there is a problem with the WMI service on the system.

Screen Turns Black During Clean Overinstall of NVIDIA Drivers on Windows 8.1 Optimus Notebook

Issue

After installing a Release 325 driver earlier than version 326.09 on an Optimus notebook running Windows 8.1, a subsequent clean overinstall of a later driver results in a black screen. The screen turns black when the driver uninstalls the older driver.

Typically, you may encounter this when attempting to upgrade the NVIDIA driver after installing Windows 8.1. While installing Windows 8.1, Windows Update installs NVIDIA driver version 326.01, then during the clean overinstall the black screen occurs as the older driver is uninstalled.

Workaround - Prevention

To avoid the issue during the initial installation of Windows 8.1, do not reboot the system after Windows Update installs the NVIDIA driver. Then perform the custom clean overinstall of the newer driver.

Resolution

This issue does not occur after installing an NVIDIA driver version 326.09 or later for Windows 8.1. When driver version 326.09 or later is installed, performing a clean overinstall with a newer driver will not result in a black screen.

Total Available Graphics Memory Reported Incorrectly

Background–TAG Memory

In the Windows Display Driver Model (WDDM), Total Available Graphics (TAG) memory is reported as the sum of

- Dedicated Video Memory (video memory dedicated for graphics use)
- Dedicated System Memory (system memory dedicated for graphics use), and
- Shared System Memory (system memory shared between the graphics subsystem and the CPU).

The values for each of these components are computed according to WDDM guidelines when the NVIDIA Display Driver is loaded.

Issue

Some TAG-reporting APIs represent video memory using 32-bits instead of 64-bits, and consequently do not properly report available graphics memory when the TAG would otherwise exceed 4 gigabytes (GB). This results in under reporting of available memory and potentially undesirable behavior of applications that rely on these APIs to report available memory.

The under reporting can be extreme. For example, 6 GB might be reported as 454 MB, and 8 GB might be reported as 1259 MB.

Driver Action for GeForce-based Graphics Systems

On graphics systems with less than 2.75 GB of advertized physical memory, the NVIDIA display driver typically limits the Shared System Memory to maintain a TAG memory value of less than 4 GB[1].

1. The WDDM guidelines dictate minimum and maximum values for the components, but the display driver may further constrain the values that are reported (within the allowed minimum and maximum).

- This results in reliable reporting of sub-4 GB TAG memory on systems with less than 2.75 GB of advertised physical memory.
- On systems with 2.75 GB or more of advertized physical memory, you may see different reported TAG memory values between the NVIDIA Control Panel and other reporting APIs.

Increasing 4-way SLI/Multi-GPU Performance

Issue

With some games and applications, you may experience little to no performance gain or even a performance drop with 4-way SLI or multi-GPU configurations.

Resolution

1. Open the NVIDIA Control Panel, then click **Manage 3D Settings** from the navigation pane.
2. Click the *Global Settings* tab, then scroll to the *Power management mode* feature, click the corresponding list arrow and select **Prefer maximum performance**, then click **Apply**.

3D Vision USB Driver Does Not Get Installed

Issue

After installing the NVIDIA graphics driver, if the 3D Vision USB emitter was not plugged in, the 3D Vision USB Controller driver does not get installed. If you plug in the emitter after installing the driver, the indicator light on the emitter will flash red and will not turn green.

Resolution

To fix this issue, NVIDIA recommends performing a driver re-install with the 3D Vision USB emitter connected. Please download the latest drivers and follow these steps:

1. Plug in the 3D Vision USB emitter.
2. Re-install the NVIDIA driver.

   Select **Custom (Advanced)** and then select **Perform a clean Installation** during the driver installation.
3. Reboot.

No PhysX Acceleration Using the GPU

If after installing the PhysX System Software you find that there is no PhysX acceleration on supported applications, repeat the PhysX setup as follows:

1. Reboot the PC.
2. Open the NVIDIA Control Panel and then, under 3D Settings, click **Set PhysX configuration** to open that page.
3. Under **Select a PhysX processor**, verify that either **auto-select** or a specific NVIDIA GPU is selected.
4. Click **Apply**.

NVIDIA PhysX System Software Cannot Be Installed or Uninstalled in Windows Safe Mode

Issue

The NVIDIA PhysX System Software is not included in the NVIDIA driver installation/ uninstallation under safe mode.

Explanation

The NVIDIA PhysX System Software installer is not compatible with Microsoft's policy for Windows Safe Mode. Consequently, installation or uninstallation of the PhysX System Software under safe mode would fail. To allow installation or uninstallation of the graphics driver under safe mode, the NVIDIA PhysX System Software is blocked from the process.

3DMark 11 Does Not Run in Stereoscopic 3D Mode

Issue

When attempting to run 3DMark 11 with NVIDIA 3D Vision enabled, the benchmark may hang, present a black screen, or in other ways not appear correctly.

Explanation

3DMark 11 is not compatible with running in stereoscopic 3D. To facilitate running the benchmark, recent drivers will run it in monoscopic mode, even with 3D Vision enabled.

Do Not Use Windows Rollback for Graphics Drivers

To reinstall a previous or older NVIDIA graphics driver, do not use the Windows rollback feature. This method will not reliably restore all the previous driver files.

Instead, use the Windows Add and Remove programs to remove the current driver, and then install the older driver using setup.exe.

Uninstalling Drivers Using Device Manager is Not Supported

Issue

On all supported versions of Microsoft Windows, uninstalling the NVIDIA driver using the Windows Device Manager may not remove associated files or applications.

Explanation

Microsoft has confirmed that this behavior is by design. If you wish to uninstall the NVIDIA driver, it is recommended that you do so using Add and Remove programs.

See the Microsoft KB article 2278714.

Changing Primary Display Across SLI GPUs Slower Than Expected

Issue

On an SLI system, switching the primary (or SLI focus) display when each display in the SLI group is connected to a different GPU takes longer than expected.

Explanation

On an SLI system with each SLI GPU driving a display, the display connected to the slave GPU is the primary display (also the SLI focus display). In order to switch the primary display to the one connected to the other GPU, the master and slave GPU configuration must also switch. In order to reassign which GPU is the master and which is the slave, the driver must be reloaded. It is the process of reloading the driver that takes the additional time.

Using HDMI Audio with Displays That Have a High Native Resolution

To use HDMI audio with some displays that have a native resolution higher than 1920 × 1080, you must set the display to a lower HD resolution.

Some HDMI displays have a native resolution that exceeds the maximum supported HD mode. For example, displays with a native resolution of 1920 × 1200 exceed the maximum supported HD mode of 1920 × 1080.

Applying this native mode results in display overscan which cannot be resized using the NVIDIA Control Panel since the mode is not an HD mode.

To avoid this situation and provide a better user experience, the driver treats certain TVs–such as the Viewsonic VX2835wm and the Westinghouse LVM- 37w3–as a DVI monitor when applying the native mode. Because the driver does not treat the TV as an HDMI in this case, the HDMI audio is not used.

Using HDMI/DisplayPort Audio in Dualview or Clone Mode

Two Audio-enabled Ports

In a multi-display configuration where both HDMI/DisplayPort audio ports are enabled, only the primary display will provide the audio.

One Audio-enabled Port

In a multi-display configuration where only one audio port is enabled, such as when one display is a DVI display, then the HDMI/DisplayPort display can provide the audio whether is it the primary or secondary display.

Flat Panel Scaling Controls Not Functional for Some TV Modes in Some Displays

The NVIDIA Control Panel flat panel scaling controls on the “Adjust Size & Position” page are not intended to be used for TV modes, and normally the controls are not available for TV or HDTV displays.

However, Microsoft requires that certain TV/HDTV modes be available for all digital displays, including DVI and HDMI, even if they are not HDTV.

While the NVIDIA flat panel scaling controls are available for those displays, they will not be functional for the TV modes that appear in compliance with the Microsoft requirements. The affected modes are as follows:

- 1920 × 1080i @ 50/59.94/60 Hz
- 1280 × 720p @ 50/59.94/60 Hz
- 720 × 480p @ 59.94/60 Hz
- 720 × 576p @ 50 Hz

GPU Runs at a High Performance Level (full clock speeds) in Multi-display Modes

This is a hardware limitation with desktop and older notebook GPUs, and not a software bug. When multiple displays are connected and active, the GPU will always operate with full clock speeds in order to efficiently drive multiple displays–even when no 3D programs are running.

Note: NVIDIA notebook GeForce 5xxM series and later GPUs do not have this limitation. For those GPUs the driver can adjust the performance level, depending on demand, even when driving multiple displays.

1280 × 1024 @ 60 Hz Not Available on BenQ FP241W Monitors

Even though the monitor EDID lists 1280 × 1024 @ 60 Hz, the screen turns blank when using an HDMI connection. This is an issue with the monitor and not the NVIDIA driver.

Because of this issue with the monitor, the NVIDIA driver blocks the problem mode (1280 × 1024 @ 60 Hz) and makes it unavailable.

3 THE RELEASE 418 DRIVER

This chapter covers the following main topics:

About the Release 418 Driver

This driver release is from the Release 418 family of drivers (versions 418.*xx* to 420.*xx*). See "Supported NVIDIA Desktop Products" on page 25 and "Supported NVIDIA Notebook Products" on page 27 for current products supported in this release.

As part of the NVIDIA Notebook Driver Program, this is a reference driver that can be installed on supported NVIDIA notebook GPUs. However, please note that your notebook original equipment manufacturer (OEM) provides certified drivers for your specific notebook on their website. NVIDIA recommends that you check with your notebook OEM about recommended software updates for your notebook. OEMs may not provide technical support for issues that arise from the use of this driver.

Hardware and Software Support

Supported Operating Systems

This Release 418 driver includes drivers designed for the following Microsoft® operating systems:

- Microsoft Windows® 10[1], 64-bit
- Microsoft Windows® 8.1, 64-bit
- Microsoft Windows® 8, 64-bit
- Microsoft Windows® 7, 64-bit versions.

Support for OpenCL 1.2

Kepler, Maxwell, Pascal, and Volta GPUs are supported.

Supported NVIDIA Desktop Products

The following table (from http://www.geforce.com/hardware) lists current NVIDIA desktop products supported by version 419.17 WHQL of the Release 418 driver. For information about desktop products not shown, please see http://www.geforce.com/hardware/desktop-gpus.

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
NVIDIA TITAN RTX	Turing
NVIDIA GeForce RTX 2080 Ti	Turing
NVIDIA GeForce RTX 2080	Turing
NVIDIA GeForce RTX 2070	Turing
NVIDIA GeForce RTX 2060	Turing
NVIDIA TITAN V	Volta
NVIDIA TITAN Xp	Pascal
NVIDIA TITAN X	Pascal
GeForce GTX 1660 Ti	Turing
GeForce GTX 1080 Ti	Pascal
GeForce GTX 1080	Pascal
GeForce GTX 1070 Ti	Pascal
GeForce GTX 1070	Pascal
GeForce GTX 1060 6GB	Pascal
GeForce GTX 1060 3GB	Pascal

1. Includes support for Windows 10 October 2018 Update (Version 1809) (Redstone 5)

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
GeForce GTX 1060	Pascal
GeForce GTX 1050 Ti	Pascal
GeForce GTX 1050 3GB	Pascal
GeForce GTX 1050	Pascal
GeForce GT 1030	Pascal
GeForce GTX TITAN X	Maxwell
GeForce GTX TITAN Z	Kepler
GeForce GTX TITAN Black	Kepler
GeForce GTX TITAN	Kepler
GeForce GTX 980 Ti	Maxwell
GeForce GTX 980	Maxwell
GeForce GTX 970	Maxwell
GeForce GTX 960	Maxwell
GeForce GTX 950	Maxwell
GeForce GTX 780 Ti	Kepler
GeForce GTX 780	Kepler
GeForce GTX 770	Kepler
GeForce GTX 760	Kepler
GeForce GTX 760 Ti (OEM)	Kepler
GeForce GTX 750 Ti	Maxwell
GeForce GTX 750	Maxwell
GeForce GTX 745	Maxwell
GeForce GT 740	Kepler
GeForce GT 730	Kepler
GeForce GT 720	Kepler
GeForce GT 710	Kepler
GeForce GTX 690	Kepler
GeForce GTX 680	Kepler
GeForce GTX 670	Kepler
GeForce GTX 660 Ti	Kepler
GeForce GTX 660	Kepler
GeForce GTX 650 Ti BOOST	Kepler
GeForce GTX 650 Ti	Kepler
GeForce GTX 650	Kepler
GeForce GTX 645	Kepler

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
GeForce GT 645	Kepler
GeForce GT 640	Kepler
GeForce GT 635	Kepler
GeForce GT 630	Kepler

Supported NVIDIA Notebook Products

The following table lists current NVIDIA notebook products supported by version 419.17 WHQL of the Release 418 driver. For information about notebook products not shown, please see http://www.geforce.com/hardware/notebook-gpus.

Table 3.2 Supported NVIDIA Notebook GPUs

Consumer Products	Architecture
GeForce RTX 2080	Turing
GeForce RTX 2070	Turing
GeForce RTX 2060	Turing
GeForce MX150	Pascal
GeForce MX130	Maxwell
GeForce MX110	Maxwell
GeForce GTX 1080 for notebooks	Pascal
GeForce GTX 1070 for notebooks	Pascal
GeForce GTX 1060 for notebooks	Pascal
GeForce GTX 1050 for notebooks	Pascal
GeForce GTX 1050 Ti for notebooks	Pascal
GeForce GTX 980 for notebooks	Maxwell
GeForce GTX 980M	Maxwell
GeForce GTX 970M	Maxwell
GeForce GTX 965M	Maxwell
GeForce GTX 960M	Maxwell
GeForce GTX 950M	Maxwell
GeForce 945M	Maxwell
GeForce 940MX	Maxwell
GeForce 940M	Maxwell
GeForce 930MX	Maxwell
GeForce 930M	Maxwell
GeForce 920MX	Maxwell

Table 3.2 Supported NVIDIA Notebook GPUs (continued)

Consumer Products	Architecture
GeForce 920M	Kepler
GeForce 910M	Kepler
GeForce GTX 880M	Kepler
GeForce GTX 870M	Kepler
GeForce GTX 860M	Kepler/Maxwell
GeForce GTX 850M	Maxwell
GeForce 840M	Maxwell
GeForce 830M	Maxwell
GeForce GTX 780M	Kepler
GeForce GTX 770M	Kepler
GeForce GTX 765M	Kepler
GeForce GTX 760M	Kepler
GeForce GT 755M	Kepler
GeForce GT 750M	Kepler
GeForce GT 745M	Kepler
GeForce GT 740M	Kepler
GeForce GT 735M	Kepler
GeForce GT 730M	Kepler
GeForce GTX 680MX	Kepler
GeForce GTX 680M	Kepler
GeForce GTX 675MX	Kepler
GeForce GTX 670MX	Kepler
GeForce GTX 660M	Kepler
GeForce GT 650M	Kepler
GeForce GT 645M	Kepler
GeForce GT 640M LE	Kepler
GeForce GT 640M	Kepler

Supported Languages

The Release 418 Graphics Drivers supports the following languages in the main driver Control Panel:

English (USA)	German	Portuguese (Euro/Iberian)
English (UK)	Greek	Russian
Arabic	Hebrew	Slovak
Chinese (Simplified)	Hungarian	Slovenian
Chinese (Traditional)	Italian	Spanish
Czech	Japanese	Spanish (Latin America)
Danish	Korean	Swedish
Dutch	Norwegian	Thai
Finnish	Polish	Turkish
French	Portuguese (Brazil)	

Driver Installation

Minimum Hard Disk Space

The hard disk space requirement is approximately 1.5x the size of the installation download to accommodate extracted and temporary files.

Before You Begin

nTune

If you have previously installed NVIDIA nTune, NVIDIA recommends that you uninstall nTune before installing this driver. After the driver install is complete, you can reinstall NVIDIA nTune.

Notebooks

- Check to make sure that your notebook has a supported GPU (see "Supported NVIDIA Notebook Products" on page 27).
- It is recommended that you back up your current system configuration.

- If you own a Dell Inspiron 1420, Dell XPS M1330, Dell XPS M1530, or Dell Latitude D630 or D630c, it is highly recommended that you first install this Dell software update.

Installation Instructions

1. Follow the instructions on the NVIDIA.com Web site driver download page to locate the appropriate driver to download, based on your hardware and operating system.
2. From the driver download page, click the **Download** button.

   The *Download Confirmation* page appears.
3. If you agree to the "License For Customer Use of NVIDIA Software", click the **Agree & Download** button to begin the download.

   The *File Download* dialog appears.
4. Either click **Save** to save the file and then run it from your PC, or click **Run.**

   An extraction path dialog appears prompting you to specify where on your PC you want the driver files to be installed.
5. Click **OK** to use the default location, or click the folder icon and specify an alternate location to install the driver files.

   The files are extracted and then the NVIDIA Installer is launched automatically.
6. At the *License Agreement* page of the Installer, click **Agree and Continue**.
7. Follow the instructions in the NVIDIA Installer to complete the installation.

Note: The driver presents game screenshots while the driver is installing. If you are not connected to the internet during the installation, you may see a "Navigation to the webpage was cancelled" message instead. The message can be ignored and does not affect the installation. The message won't appear if the browser cache is cleared.

Note: The NVIDIA PhysX System Software will not be included in the installation if the same version or a later version is already installed.

Note: After the driver installation, Windows 7 may default to 16-bpp color and disable the Desktop Window Manager (DWM). To work around this issue, set the color to 32-bpp and then reboot the PC.

See also the installation/uninstallation considerations explained in "Known Product Limitations" on page 16.

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