

# **MSI Afterburner v4.0.0**

MSI Afterburner is ultimate graphics card utility, co-developed by MSI and RivaTuner teams. Please visit <http://event.msi.com/vga/afterburner> to get more information about the product and download new versions

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## System requirements:

- Windows XP, Windows Vista, Windows 7 or Windows 8 (both x86 and x64 versions) with full administrative rights
- NVIDIA GeForce 6 or newer series graphics card with NVIDIA ForceWare 96.xx or higher drivers<sup>1</sup>
- AMD RADEON HD 2000 or newer series graphics card with AMD Catalyst 9.3 or higher drivers<sup>2</sup>
- Any graphics card can be used to start application in limited functionality mode<sup>3</sup>

## Features:

- Based on RivaTuner core, Afterburner contains the mix of the most popular and frequently used RivaTuner's technologies exposed in new simple and effective user interface
- Unified features for both AMD and NVIDIA graphics cards. You no longer need to change your favorite graphics card utility software when migrating from NVIDIA graphics card to AMD and vice versa. Afterburner provides you almost the same functionality for hardware manufactured by both leading GPU vendors and makes migration process really easy. Just keep overclocking and monitoring your GPU like you are used to do, no need to change your preferences and search for other utility after graphics card upgrade!
- User extendable architecture. You may express your creativity and design your own skins for MSI Afterburner, develop external applications interacting with MSI Afterburner (e.g. sidebar gadgets or smartphone applications remotely controlling your hardware), create localization for your native language and many, many more!
- Basic overclocking and fan control features including full multi-GPU support, independent shader clock adjustment (NVIDIA GeForce 8, 9 and 200 series cards<sup>4</sup>), overclocking and fan control profiles with hotkey based activation abilities
- Power limit control via AMD PowerTune and NVIDIA GPU Boost technologies
- Desktop and in-game screen capture features support. BMP, PNG and JPG formats are supported<sup>5</sup>
- Realtime desktop and in-game video capture support via Predator™ technology<sup>6</sup>. Uncompressed, high-performance custom RTV1 and native MJPG video encoding, encoding with third-party external VFW compatible codecs (e.g. Lagarith or x264vfw) and hardware accelerated encoding via Intel QuickSync, NVIDIA NVENC and AMD VCE are supported in conjunction with wide range of additional video capture related options, multisource stereo and multichannel (for Window Vista and newer) audio capture with Push-To-Talk support. The functionality of expensive commercial video capture products is now available to everyone absolutely for free! There is no need to buy dedicated video capture software anymore!
- Advanced fan control. Most of fan control tools allow you to use either fixed manual fan speed mode or default automatic fan speed mode, where the fan speed automation is performed either by dedicated hardware chip or by display driver depending on graphics card model. In addition to these traditional fan control modes Afterburner also provides user defined software automatic fan speed mode allowing you to define your own fan speed curve. New mode combines flexibility of RivaTuner's fan speed scheduling technology with new and really easy to use graphical interface for visual fan speed curve editing
- Hardware health monitoring features including popular tray icon, Logitech LCD and On-Screen Display<sup>7</sup> monitoring modes and history logging in native RivaTuner hardware monitoring log file format
- Automatic profiles management system allows experienced users to define their own dynamic downclocking rules on the systems with no hardware downclocking support or program different fan control modes for 2D and 3D applications<sup>8</sup>
- Core<sup>9</sup>, auxiliary VDDCI/PEXVDD and memory<sup>10</sup> voltage control gives more freedom to hardcore overclockers. Please refer to your retail MSI graphics card box to find MSI Afterburner voltage control compatibility logos

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<sup>1</sup> Integrated and mobile graphics cards are not officially supported

<sup>2</sup> Integrated and mobile graphics cards are not officially supported

<sup>3</sup> Limited functionality mode restricts overclocking, hardware control and monitoring features, but allows you to use hardware independent features like high-performance Predator™ video capture module

<sup>4</sup> Independent shader clock control is outdated technology, which is supported via special legacy UI skin only

<sup>5</sup> Additional RivaTuner Statistics Server application installation is required for this functionality

<sup>6</sup> Additional RivaTuner Statistics Server application installation is required for this functionality

<sup>7</sup> Additional RivaTuner Statistics Server application installation is required for this functionality

<sup>8</sup> Additional RivaTuner Statistics Server application installation is required for this functionality

<sup>9</sup> Reference design PCB and original reference VGA BIOS are required for proper core voltage control on the majority of reference design graphics cards. Core voltage control may function improperly when voltage control circuit on the PCB or voltage table in VGA BIOS are modified by graphics card vendor or by end user

<sup>10</sup> Auxiliary and memory voltage control is supported only on some custom design MSI graphics card models

## Known limitations:

- Additional RivaTuner Statistics Server process is required to provide some functionality including framerate monitoring, On-Screen Display, screen capture, video capture and automatic profiles management. The server will be automatically launched by MSI Afterburner as soon as you enable any of the features listed above. You will not be able to shut down the server manually while these features are in use, that is by design of MSI Afterburner
- Framerate monitoring, On-Screen Display, screen capture, video capture and automatic profiles management functionality can be incompatible with some third-party On-Screen Display software (e.g. XFire or Steam In-Game Chat). The limitation is not specific to our product, many third-party products are designed to be the only On-Screen Display products in the system and to block their own functionality when any other On-Screen Display software is running
- Anticheat systems of some online games may restrict On-Screen Display usage and block connection to the server when RivaTuner Statistics Server is running

## Revision history:

### Version 4.0.0

- Added AMD Tonga graphics processors family support
- Added core voltage control for reference design AMD RADEON R9 285X series graphics cards with NCP81022 voltage regulators
- Added official overclocking limits extension support for AMD Tonga graphics processors. Please take a note that unofficial overclocking mode is currently not supported for AMD Tonga graphics processors family
- Various parts of hardware monitoring module have been pumped up to improve hardware monitoring usability and flexibility:
  - Added layered monitoring graphs rendering mode. Now you may right click source graph in monitoring window, select *"Attach"* in the context menu then point to destination graph to attach source graph to it and create a group of layered graphs. This feature allows you to render as many layered graphs on the same grid as you wish. The colors of graphs in layered rendering mode can be customized independently of each other so you can easily identify them
  - Added multi-column monitoring graphs rendering mode. Now you can adjust the number of graph columns in *"Active monitoring graphs"* section in *"Monitoring"* tab
  - Added *"Override graph name"* option to *"Monitoring"* tab. Now you can rename the graphs displayed in hardware monitoring window
  - Monitoring history buffer size is no longer defined by monitoring window width. Now pre-history buffer size is fixed and stores the last 3600 samples (1 hour for 1000ms polling period) for each graph
  - Improved tray icon monitoring module:
    - Now you can select either text mode or bargraph indicator mode for each value displayed in tray icon. Bargraph indicator mode can be extremely useful for visualizing data like GPU / CPU usage
  - Improved Logitech keyboard LCD monitoring module:
    - Ported to new Logitech API to provide support for newer Logitech LCD displays
    - Added support for color LCD display of Logitech G19/G19s keyboards
    - Added graph mode support for color LCD display of Logitech G19/G19s keyboards. Now in addition to previously available text mode you can optionally select graph mode and see exact copy of MSI Afterburner's monitoring graphs displayed directly inside the keyboard LCD. You can also press *"Menu"* soft button on your Logitech G19/G19S keyboard to toggle between text and graph modes dynamically in realtime
    - Added acceleration support to LCD scrolling implementation
    - Added larger 8x12, 10x12, 12x12 and 12x16 fonts support for text mode
- Added *"Regional settings"* section to *"User Interface"* tab:
  - Temperature format settings allow you to switch between Celsius and Fahrenheit format for monitored temperatures. Please take a note that this setting affects temperature readouts only. Hardware related temperature adjustments (e.g. fan speed to temperature mapping curve for all cards or temperature target adjustment for NVIDIA Kepler series) are always being displayed and adjusted in Celsius for maximum unification, safety and compatibility
  - 12 hours / 24 hours time format settings allow you to configure time format for On-Screen Display and hardware monitoring window
- Added *"Enable low-level IO driver"* option to the *"Compatibility properties"* section in *"General"* tab
- Added SLI sync performance limit graph for release 340 and newer NVIDIA drivers
- Display device enumeration implementation has been modified slightly to allow monitoring Intel iGPUs when low-level IO driver is not enabled
- Improved handshaking algorithm reduces the risk of seeing multiple running instances of child processes (e.g. RTSS)
- Optimized hardware polling for NVIDIA graphics cards
- Optimized hardware polling for multi-GPU systems
- Added SVI2 voltage control support via AMD ADL SDK to provide compatibility with future graphics cards
- Added automatic prerecording settings to *"Videocapture"* tab. When you enable automatic mode prerecording session is being started automatically on each 3D application startup. Please take a note that in this case you can still use video prerecord hotkey to stop then manually restart prerecording session if necessary
- Drastically improved skin engine:
  - Improved skin compiler gives more detailed error messages when skin compilation fail due to error in some source image file
  - Source image file format is no longer limited to 24-bit BMP files only. Now skin compiler supports all possible bit depths for BMP format and fully supports PNG format with alpha channel
  - Added built-in bitmap effect for extracting alpha-channel from PNG image files
  - Skin format has been upgraded to v1.3. New format supports alpha channel based transparency for skinned window, allowing skin designers to define semi-transparent skin areas, apply antialiasing to the skin window edges and so on
  - Added new skinned window composition modes support and *"Skin composition mode"* settings to *"User interface tab"*. New settings allows you to use one of the following modes:
    - Traditional mode – suits best for backward compatibility with existing skins and performance testing

- Layered mode with colorkey - provides much faster rendering of skins with non-rectangular window shape and additionally allows you to adjust transparency of skinned window
  - Layered mode with alpha – provides per-pixel alpha channel support and advanced visual effects for compatible skins and also allows you to adjust transparency of skinned window
- Skin format reference guide has been updated to v1.7 to document these changes
- Improved implementation of rollback to default skin
- Full skins cross-compatibility with other overclocking applications based on RivaTuner engine. Special GUI transformation layer allows you to use the skins designed for third party RivaTuner based overclocking applications and makes the process of migration to MSI Afterburner from such overclocking tools much more comfortable for you. You can keep the look and feel of your preferred overclocking application and at the same time enjoy extended MSI Afterburner's features including full range of supported graphics cards, industry leading powerful and robust monitoring module, flexible video recording features and many more
- RivaTuner Statistics Server has been upgraded to v6.2.0

## Version 3.0.1 (published on 10.06.2014)

- Added core voltage control for reference design AMD RADEON R9 295X2 series graphics cards with NCP81022 voltage regulators
- Fixed hardware database for reference design AMD RADEON HD 7990 and AMD RADEON HD 290X series graphic cards
- Fixed GDI resource leak when tray icon monitoring mode is enabled
- RivaTuner Statistics Server has been upgraded to version 6.1.2

## Version 3.0.0 (published on 21.05.2014)

- Ported to new VC++ compiler, new core and skin engine libraries with better extensibility
- Added Bonaire, Curacao and Hawaii graphics processors family support
- Added core and auxiliary VDDCI voltage control for reference design AMD RADEON R9 290/290X series graphics cards with IR3567B voltage regulators
- Added core voltage control for reference design AMD RADEON R7 260/260X series graphics cards with NCP81022 voltage regulators
- Added core voltage control for reference design AMD RADEON 7790 series graphics cards with NCP81022 voltage regulators
- Added NVIDIA GPU Boost 2.0 technology support for NVIDIA GeForce GTX Titan graphics cards:
  - Added slider for temperature limit adjustment
  - Added option for linked power limit and temperature limit adjustment
  - Added option for temperature limit prioritizing
  - Added maximum voltage adjustment
- Improved NVAPI access layer architecture with better extensibility
- Improved AMD ADL access layer with Overdrive 6 support to provide compatibility with future AMD GPUs
- Added NCP4206 voltage regulators support to provide compatibility with future custom design MSI graphics cards
- Improved voltage control layer architecture provides better compatibility with automatic voltage control on NCP4206 voltage regulators
- Improved hardware monitoring module architecture with better extensibility
- Added voltage control mode selection option to the *"Compatibility properties"* section in *"General"* tab. Now you can toggle between reference design, standard MSI and extended MSI voltage control modes
- Added *"boost edition"* / *"GHz edition"* GPU type selection option for reference design AMD RADEON 7970 and AMD RADEON 7950 based graphics cards to *"AMD compatibility properties"* section in *"General"* tab
- Added GPU usage averaging algorithm for Overdrive 6 capable AMD GPUs. Now displayed GPU usage is being averaged by sliding window to smooth GPU usage artifacts occurring due to bug in AMD ADL API on AMD Sea Islands GPU family
- Added optional unified GPU usage monitoring path via D3DKMT performance counters. You may tick *"Enable unified GPU usage monitoring"* option in *"AMD compatibilities properties"* in *"General"* tab as a workaround to replace native AMD GPU usage monitoring if it is working improperly (e.g. broken GPU usage monitoring in AMD ADL API for AMD Sea Islands GPU family)
- Added temperature limit, power limit, voltage limit, maximum overvoltage limit and GPU utilization limit graphs to hardware monitoring module for release 320 and newer NVIDIA driver. The graphs help you to understand the reasons of realtime performance limitations (e.g. limiting performance due to reaching power target) on GPU Boost compatible graphics cards
- Added framebuffer, video engine and bus controller usage graphs for NVIDIA graphics cards to hardware monitoring module
- Added generic NVAPI videomemory usage monitoring for NVIDIA graphics cards unattached to Windows desktop (e.g. dedicated PhysX accelerators)
- Updated power reporting for release 320 and newer NVIDIA drivers. Now MSI Afterburner reports normalized total power according to NVIDIA recommendations

- Added CPU temperature monitoring (Intel Core 2 and newer Intel CPUs only), CPU usage, RAM usage and pagefile (commit charge) usage graphs to hardware monitoring module
- Added CPU info to “i” window
- Added basic monitoring for unsupported GPUs (e.g. Intel integrated iGPUs):
  - Now GPU usage and videomemory usage can be monitored and displayed in On-Screen Display on any GPU, so you can use MSI Afterburner to monitor graphics subsystem on laptops without dedicated NVIDIA/AMD GPU
  - Extended GPU usage monitoring for Intel integrated iGPUs. You can independently monitor usage of main GPU execution unit (labeled as “GPU usage”) and MFX unit (labeled as “VID usage”) to keep NVIDIA-styled GPU domains naming)
- Now full list of currently active 3D processes is being displayed in On-Screen Display server info section in “i” window instead of one active 3D process before
- Fixed GUI issue causing vertical slider to be rendered improperly in advanced application properties window under certain conditions
- On-Screen Display text length limit has been extended from 256 bytes to 4 kilobytes
- Added predefined fan speed curves list to the “Fan” tab in advanced application properties. The list allows you to select default curve on all cards and additional pre-defined curves (such as silent or performance fan speed curve) on some custom design MSI graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 7x0 series graphics cards
- Added core voltage control for reference design AMD RADEON 7990 graphics cards with VT1556 voltage regulators
- Added core voltage control for reference design AMD RADEON 7870 XT graphics cards with CHL8225 voltage regulators
- Added core voltage control for cost down reference design AMD RADEON 7770 graphics cards with uP1609 voltage regulators
- Added limited core voltage control for reference design AMD RADEON 7850 graphics cards
- Added secondary voltage control loop support for CHL8214 voltage regulators to provide compatibility with future custom design MSI graphics cards
- Improved skin engine, now skinned slider controls support curved paths defined by alpha channel. Skin format reference guide has been updated to v1.6 to document new slider types support
- Fixed single tray icon mode functionality under Windows 8
- Improved single tray icon mode handling. It is no longer necessary to restart application when toggling single tray icon mode
- Now unofficial overlocking mode and official clock limits extension command line switch (XCL) for AMD graphics cards are accessible via GUI in “General” tab in “AMD compatibility properties” section
- Added “Disable ULPS” option to “AMD compatibility properties” section in “General” tab
- RestoreAfterSuspendedMode configuration file switch is no longer undocumented, now it is enabled by default and accessible via GUI in “General” tab in “Compatibility properties” section
- Added “Reset display mode on applying unofficial overlocking” option to “AMD compatibility properties” section in “General” tab. This option can be used as a workaround for infamous flickering issue, caused by bug in AMD driver
- Now MSI Afterburner displays path to driver registry key in “i” window
- Now MSI Afterburner displays voltage regulator model and location information in “i” window
- Now MSI Afterburner displays RivaTuner Statistics Server installation path and server version information in “i” window
- Added French and Turkish localizations
- Recompiled kernel mode driver to bypass false positive in driver verifier
- Added workaround for missing tray icon when starting application while EXPLORER.EXE is not responding
- Application tray icon is now being restored after restarting EXPLORER.EXE
- Build number is now displayed in “i” window and in application tray icon tooltip
- Localizable installer files for third party translators are now included in distributive in .\SDK\Localization\Installer folder
- Now power users can display graphs in hardware monitoring window in multiple columns via configuration file
- Framerate slider limit in “Videocapture” tab has been extended from 100 FPS to 120 FPS
- Now flashing camera icon is being displayed in the top left corner of monitoring window when video is being captured
- Added “Use dedicated encoder server” option to “Videocapture” tab
- Added prerecording settings to “Videocapture” tab. You can select one of the following prerecording modes:
  - Prerecord to a temporary file. This mode suits best for prerecording long videos (e.g. 10 minutes or more of H.264 video) or for prerecording videos with low compression ratio (e.g. lossless Lagarith video)
  - Prerecord to RAM. This mode suits best for prerecording short videos (e.g. a couple minutes of H.264 video) and it provides a bit better performance than prerecord to file. Also, unlike prerecord to file, prerecord to RAM minimizes writes so it can increase the lifetime of SSD if you plan to use the prerecording frequently
- Added “NV12 compression” to the list of available video formats to “Videocapture” tab. This format can be used to replace uncompressed video recording with fixed 2x compression ratio at the cost of some color information loss caused by RGB to YUV 4:2:0 color space conversion
- Added “External plugin” to the list of available video formats to “Videocapture” tab. External plugins provide hardware accelerated H.264 video encoding support for Intel QuickSync, NVIDIA NVENC and AMD VCE platforms
- Improved DirectInput hotkey handler minimizes the risk of losing hotkey functionality until application restart under certain conditions
- RivaTuner Statistics Server has been upgraded to version 6.1.1:
  - The server is no longer being distributed as a part of client applications like MSI Afterburner and EVGA Precision. Now it comes under generic RivaTuner Statistics Server name with own installer and can be optionally installed when necessary.

The clients will automatically hide any server dependent functionality (such as On-Screen Display, framerate monitoring, automatic 2D/3D profiles management, screen and video capture and so on) when the server is not installed

- Now RivaTuner Statistics Server installer is being started by MSI Afterburner installer to make installation process easier for beginners. The server distributive is being copied to .\Redist\RTSSSetup.exe during MSI Afterburner installation, so you may always install it later if necessary

## Version 2.3.1 (published on 23.01.2013)

- Now MSI Afterburner optionally allows you to detect VRM defaults without rebooting the PC
- Added voltage control support for UEFI GOP BIOS for MSI R7970 Lightning Boost Edition series graphics cards
- Now MSI Afterburner displays the list of assigned global hotkeys in "i" window
- Now MSI Afterburner properties window is resizable to provide compatibility with low-resolution desktops (less than 1280x1024 with 100% DPI)
- Added new *"Enable hardware control and monitoring"* option to compatibility properties. This option can be useful if you are using MSI Afterburner for framerate monitoring and videocapture only and don't want to risk suddenly overclocking your PC
- Added NCT7511Y thermal sensors support to provide compatibility with future MSI graphics cards
- Added workaround for possible VID rounding issues for all supported voltage generator models
- Updated Italian localization
- MSI On-Screen Display server has been upgraded to version 4.5.0. New version gives you the following improvements:
  - Improved audio mixer architecture provides better extendibility and better audio tracks synchronization when mixing multiple audio tracks in one
  - Push-To-Talk audio recording support. Now you can assign a hotkey for each audio stream and record unmuted audio only when the hotkey is pressed
  - Updated German localization

## Version 2.3.0 (published on 19.11.2012)

- Added 9-bit VID support for CHL8318 voltage regulators to bypass 1.6V limit in Extreme versions of MSI Afterburner
- Fixed rounding error in VID generation for offset voltage control mode for CHL8318 voltage generators
- Now it is possible to start MSI Afterburner in limited functionality mode on the systems with no supported AMD or NVIDIA graphics card. This allows you to use hardware independent features like high-performance Predator™ video capture module on any PC, even if it is using integrated Intel graphics
- Added frametime graph to hardware monitoring module. The graph is displaying the maximum frame time on each sampling period and it is useful for detecting microstutters, which are invisible on averaged framerate graph
- All documentation is now provided in PDF format
- Added unified videomemory usage monitoring implementation for Windows 8
- Removed obsolete GPU type selection settings for some AMD graphics cards
- Removed obsolete shader clock monitoring for NVIDIA Kepler graphics cards
- Improved hardware database format, now custom design MSI graphics cards are calibrated in separate OEM file to minimize the risk of introducing typos in reference design cards definitions when updating the database
- MSI On-Screen Display server has been upgraded to version 4.4.0. New version gives you the following major improvements in Predator™ video capture module:
  - Improved RTV1 compression algorithm. New compression approach combines DXTC, RLE and uncompressed data saving algorithms and allows you to increase image quality at the cost of decreasing compression ratio, while keeping extremely fast compression performance. Please take a note that the previous RTV1 compression implementation is equal to the lowest possible 25% image quality/compression ratio balance in new implementation
  - Added 64-bit version of RivaTuner Video Codec. Now RTV1 videos are playable and editable in 64-bit applications (e.g. 64-bit Sony Vegas PRO or Adobe Premiere PRO CS6)
  - Huffman tables are no longer omitted by MJPG encoder to improve compatibility with applications using limited MJPG decoders (e.g. Sony Vegas PRO)
  - Now both 32-bit and 64-bit versions of RivaTuner Video Codec can optionally decode MJPG videos. Third party MJPG codec installation is no longer required to play or edit MJPG videos with omitted Huffman tables in some applications with limited MJPG decoding support (e.g. Sony Vegas PRO). MJPG decoder can be enabled in video capture compatibility properties
  - Multisource audio recording. Now it is possible to record audio from two independent audio sources (e.g. game audio and microphone sound) in two independent audio tracks then mix them later in video editing application (e.g. Sony Vegas PRO) or optionally mix multiple tracks in realtime during capture

- Now it is possible to downmix multichannel audio to stereo in stereo rip and stereo mix modes. Previously available stereo rip mode simply rips front left and right audio channels from multichannel audio stream, whilst new stereo mix mode merges audio from front left, right, center and surround channels
- WASAPI audio packets with timestamp error are no longer included into output audio stream
- External VFW codecs support. Now in addition to built-in uncompressed, RTV1 and MJPG encoders it is also possible to encode video using external VFW codecs installed in the system. It is recommended to download, install and use Lagarith Lossless Codec for lossless video capturing or x264vfw codec for the maximum compression ratio, MSI Afterburner was developed to provide the best compatibility with these codecs
- Video stream synchronization is now based on inserting NULL frames instead of indexing existing frames
- Frame dropping implementation has been improved to provide compatibility with external VFW codecs using temporal compression and deltaframes
- Now output video dimensions are always cropped to be multiples of 2 to provide compatibility with external VFW codecs
- Now framerate is calculated on each frame with sliding 1000ms window approach instead of calculating it once per second
- Improved rendering pipeline flushing implementation for Direct3D9 applications provides more stable framerate when capturing videos with VSync enabled
- New dynamic Direct3D rendering pipeline flushing approach can decrease videocapture related performance hit when capturing videos in Direct3D applications with high rendering framerates
- Added On-Screen Display support for Direct3D 10 applications in Windows 8
- Added German localization
- Updated profiles list

## Version 2.2.5 (published on 31.10.2012)

- Updated hardware database for custom design MSI GTX660 series graphics cards

## Version 2.2.4 (published on 17.09.2012)

- Core voltage control is now capped by NVIDIA VGA BIOS voltage limits on MSI N680GTX Lightning series graphics cards due to NVIDIA restrictions
- Added core voltage control for reference design NVIDIA GeForce GTX 660 series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 650Ti series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GT 650 series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GT 640 series graphics cards
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI GTX660Ti Power Edition series graphics cards with uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI GTX660 HAWK series graphics cards with uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI GTX660 HAWK series graphics cards with NCT7718W thermal sensors
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI GTX650Ti HAWK series graphics cards with uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI GTX650Ti Power Edition series graphics cards with uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI GTX650 Power Edition series graphics cards with uP6262 voltage regulators

## Version 2.2.3 (published on 24.07.2012)

- Revised I2C access API for NVIDIA 301.xx and newer display drivers
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N680GTX Lightning series graphics cards with CHL8318+uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI N680GTX Lightning series graphics cards with NCT7718W thermal sensors
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N670GTX Power Edition series graphics cards with uP6262 voltage regulators



## Version 2.2.2 (published on 20.06.2012)

- Increased upper allowed power limit for power limit adjustment slider on some extreme editions of NVIDIA GeForce GTX 600 series graphics cards
- ATIPDLXX.DLL is no longer included in MSI Afterburner distributive
- MSI On-Screen Display server has been upgraded to version 4.3.4. New version gives you the following improvements:
  - Fixed framerate calculation for DirectX10/DirectX11 applications, which actively use presentation testing during rendering (e.g. Max Payne 3)

## Version 2.2.1 (published on 14.05.2012)

- Added reference design AMD RADEON 7850 series graphics cards support
- Added NVIDIA GeForce GTX 690 series graphic cards support
- Added big editions of default and legacy skins
- Updated localizations

## Version 2.2.0 (published on 19.04.2012)

- Added NVIDIA Kepler graphics processors family support
- Added GPU power consumption monitoring for NVIDIA Kepler series graphics cards
- Added core clock offset, memory clock offset and voltage offset control support for dynamic overclocking on NVIDIA Kepler series graphic cards
- Dynamic clock frequency and voltage monitoring is now performed via new NVIDIA Kepler compatible API on branch 295 and newer NVIDIA display drivers
- Shader clock control is no longer supported via default MSI Afterburner skin, the skin has been redesigned to provide convenient access to modern power control technologies (AMD PowerTune and NVIDIA GPU Boost power target) instead of outdated independent shader clock control technology. Old graphics cards owners may still get access to independent shader clock control via alternate legacy skin, included in MSI Afterburner distributive
- Added AMD Tahiti, Verde and Pitcairn graphics processors family support
- Added uP1637 voltage regulators support
- Added core and memory voltage control for reference design AMD RADEON 7970 and AMD RADEON 7950 graphics cards with CHL8228 voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7970 Lightning series graphics cards with CHL8228+uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI R7970 Lightning series graphics cards with NCT7718W thermal sensors
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7970 Power Edition series graphics cards with CHL8228+uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI R7970 Power Edition series graphics cards with NCT7718W thermal sensors
- Added core and memory voltage control for reference design AMD RADEON 7870 graphics cards with CHL8228 voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7870 Hawk series graphics cards with CHL8228+uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI R7870 Hawk series graphics cards with NCT7718W thermal sensors
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7850 Power Edition series graphics cards with uP1637+uP6262 voltage regulators
- Added core voltage control for reference design AMD RADEON 7770 graphics cards with L6788A voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7770 Power Edition series graphics cards with uP6266+uP6262 voltage regulators
- Added core voltage control for custom design MSI R7750 series graphics cards with uP6266 voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R7750 Power Edition series graphics cards with uP6204+uP6262 voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R6930 Twin Frozr III Power Edition series graphics cards with uP6266+uP6262 voltage regulators

- Now MSI Afterburner displays target VID instead of real voltage sensor reading on “GPU voltage” graph on graphics cards equipped with CHL8228 voltage regulators. These changes are implemented to avoid confusing the beginners and prevent the hysteria about voltage drop on AMD RADEON 7970 series graphic cards spreading across different discussion forums. Experienced users, understanding the difference between target and real voltages, may still unlock the previous real voltage monitoring mode via editing the hardware profiles
- Added core voltage control for reference design NVIDIA GeForce GTX 560 Ti 448 cores series graphics cards
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N560GTX-448 Twin Frozr III Power Edition series graphics cards with uP6218+uP6262 voltage regulators
- Added core voltage control for reference design AMD RADEON 6990 series graphics cards with VT1556 voltage regulators
- Added voltage control for custom design MSI R6790 series graphics cards with CHL8214 voltage regulators
- Added core, memory and auxiliary VDDCI voltage control for custom design MSI R6950 Twin Frozr III Power Edition series graphics cards with uP6266+uP6262 voltage regulators
- Added core voltage control for custom design MSI R6950 Twin Frozr II series graphics cards with CHL8214 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N580GTX Lightning series graphics cards with uP6218+uP6262 voltage regulators
- Added memory and VRM temperature monitoring for custom design MSI N580GTX Lightning series graphics cards with NCT7718W thermal sensors
- Added memory and VRM temperature monitoring for custom design MSI R6970 Lightning series graphics cards with NCT7718W thermal sensors
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N570GTX Twin Frozr III Power Edition series graphics cards with uP6218+uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N560GTX-Ti Hawk series graphics cards with uP6218+uP6262 voltage regulators
- Added CHL8225 and CHL8318 voltage regulators support to provide compatibility with future MSI graphics cards
- Added core voltage control for alternate revision of reference design NVIDIA GeForce GTX 570 series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 460 V2 series graphics cards
- Improved overclocking profiles format provides compatibility with NVIDIA Kepler series graphics cards. Please take a note that existing overclocking profiles (startup overclocking profile and profile slots) will be ignored and must be recreated in new version
- Improved compatibility with some smart UPS models, MSI Afterburner task is no longer being terminated by Windows task scheduler when the PC is entering suspended mode
- Added new compatibility option to “General” tab, allowing you to select GPU type on some graphics card models using different GPU types (e.g. low-leakage and high-leakage Cayman GPUs on RADEON 6900 series graphics cards). The option affects default reference GPU voltage and 3D voltage control path
- Now MSI Afterburner’s startup daemon routine precaches VRM I2C registers state at the first Windows startup. Precached VRM state is being used to detect default voltage instead of hardcoding default voltages into the database. Please take a note that you may forcibly perform precaching later with command line switch or disable the precaching at all via configuration file if necessary and force MSI Afterburner to use the previous hardcoded database based default voltage detection
- Fixed sub-zero temperatures reading on certain custom design MSI graphics cards with LM96163 and NCT7718W dedicated thermal sensors
- Hardware abstraction layer (HAL) architecture has been improved to provide compatibility with NVIDIA Kepler graphics cards series
- Now multi-GPU overclocking and fan control settings synchronization is performed at HAL level instead of display driver wrapper level to improve HAL architecture extendibility and provide compatibility with NVIDIA Kepler graphics cards series
- Added new "Force fan speed update on each period" option to the "Fan" tab. New option may improve compatibility of software automatic fan speed control mode with some bugged display drivers, overriding manually programmed fan speed under certain conditions
- Shared control memory format has been upgraded to v2.0. New format provides power limit adjustment support and forward compatibility with NVIDIA Kepler graphics cards series
- Now it is possible to override group names for values displayed in the On-Screen Display or in Logitech keyboard LCD display
- MSI On-Screen Display server has been upgraded to version 4.3.3. New version gives you the following improvements:
  - Added audio capture support to video capture engine. The engine supports stereo audio capture via DirectSound under Windows XP and both multichannel or downmixed stereo capture via WASAPI under Windows Vista and newer operating systems
  - Primary desktop video capture support for Windows XP and newer operating systems. Please take a note that desktop video capture is not supported under Windows Vista and newer OS with Aero Glass interface enabled, so Aero Glass is being automatically disabled by the server while capturing a video from desktop. Please take a note that both desktop video capture support and forcible Aero Glass interface toggling can be disabled via the configuration files if necessary
  - Improved OpenGL On-Screen Display coordinates calculation for framebuffer coordinate space mode
  - Added custom raster 3D fonts support to On-Screen Display in addition to the previously available vector 2D / 3D fonts. On-Screen Display 3D mode rendering mode switch has been replaced with new vector 2D / vector 3D / raster 3D rendering modes tri-switch
  - Now On-Screen Display coordinates are specified in pixels instead of zoomed units
  - Now it is possible to use drag-and-drop in On-Screen Display preview window to adjust On-Screen Display position
  - Now On-Screen Display supports tabulation symbols for better appearance in conjunction with new variable width custom fonts

- Improved desktop windows notification mechanism for faster server startup and shutdown
- Windows Sidebar is now captured properly on desktop screenshots
- Updated system profile template mapping rules for application profiles
- Improved bitrate calculation in AVI file headers
- Modified screen/videocapture progress indicator appearance
- Fixed bug causing multiple used OSD slots to overwrite each other instead of merging the slots correctly
- Added screencapture and videocapture support for Direct3D10 and Direct3D11 applications using framebuffers with 10-bit RGB components (e.g. Dirt 3)
- Added screencapture and videocapture support for Direct3D10 and Direct3D11 applications using BGR framebuffers (e.g. F.3.A.R.)
- Improved video frames timestamping approach may improve smoothness of videos captured on low framerates
- Fixed vertex buffer overflow issue causing improper On-Screen Display rendering or crashing in Direct3D10 / Direct3D11 applications when too many items are selected to be displayed in On-Screen Display
- Improved RTV1 codec provides better compression ratio (significantly better under certain conditions) without affecting the image quality and encoding performance
- Added alternate RTV1 compression mode providing 1.5x - 2x better realtime compression performance at the cost of some minor image quality loss. Video quality slider is now unlocked for RTV1 format, 100% quality selects original compression mode whilst any other value selects new high performance compression mode
- Now MSI Afterburner displays captured video file time, size, per-frame compression ratio and time in the On-Screen Display next to the video capture progress indicator when "Show own statistics" option is enabled in the server's properties
- Added new profile setting "Enable compatibility with modified Direct3D runtime libraries" allowing MSI On-Screen Display Server to detect runtime function offsets dynamically on each 3D application startup. This provides On-Screen Display functionality support in applications using modified Direct3D runtime libraries (e.g. FXAA injection Direct3D runtimes)
- Added new profile settings allowing you to limit the framerate during gaming. Limiting the framerate during gaming can help to reduce the power consumption as well as it can improve gaming experience due to removing unwanted microstuttering effect caused by framerate fluctuations
- Now video capture clients can limit the framerate during video capture. Limiting the framerate during videocapture can improve resulting video smoothness
- Added gamma corrected video capture support
- Added Vector 3D On-Screen Display rendering mode support for OpenGL applications
- Added Raster 3D On-Screen Display rendering mode support for OpenGL applications using ARB shaders (e.g. ID Software's Rage)
- Added workaround for AMD Direct3D driver issues causing OSD to be invisible in Direct3D8 and Direct3D9 applications when using Raster 3D On-Screen Display rendering mode
- Added workaround for AMD OpenGL driver PBO issues causing the driver to crash or perform abnormally slow during videocapture
- Added Direct3D9Ex support (DOTA 2 and Darkness 2 demo)
- Improved desktop windows notification mechanism eliminates unwanted beeps occurring on some systems during the server startup / shutdown
- Added video capture compatibility setting allowing cropping output video dimensions to make them multiples of 16 to improve compatibility with some third party MJPG decoders
- Improved tabbed text formatting provides better compatibility with custom On-Screen Display group names
- Dedicated 1/2, 1/3 and 1/4 frame downsampling routines have been replaced with unified arbitrary downsampling routine. Now MSI Afterburner provides arbitrary frame downsampling functionality and allows selecting 360p, 480p, 720p, 900p, 1080p frame sizes for both 16:9 and 16:10 aspect ratios. Please take a note that arbitrary frame sizes list is user extendable so you may add your own custom frame sizes to the configuration file if necessary
- Now multithreaded video capture optimization is forcibly disabled by default on single core CPUs
- Updated profiles list
- Screen and video capture no longer stop working properly after selecting a drive root as a destination folder and restarting the application
- Now SDK includes new sample code, demonstrating On-Screen Display usage from any third party application. The sample is displaying CPU usage in On-Screen Display and provides third party developers helper object for RivaTuner-styled grouped OSD text formatting
- MSI Afterburner is no longer using native AMD ADL SDK GPU indices. Now it always sorts GPUs by PCI location to ensure that GPU indices stay the same in the system regardless of operating system, display driver version and GPU display outputs connection
- Added driver-level fan tachometer monitoring fallback for AMD graphics cards via AMD ADL SDK
- PowerTune settings are now being forcibly reapplied after changing the clocks via unofficial overclocking path to bypass bug in AMD driver causing PowerTune settings to be reset to defaults during programming PowerPlay table
- Unofficial overclocking is now ignored for inactive ULPS enabled AMD graphics cards to prevent system crashing. Please take a note that you still need to disable ULPS to control all graphics cards in unofficial overclocking mode
- Added unofficial overclocking support for AMD graphics cards unattached to Windows desktop

- Now unofficial overclocking can be enabled without typing in the EULA into the configuration file. In this case the EULA is displayed and you're forced to accept it during MSI Afterburner startup
- Added power user oriented command line switches allowing to extend Overdrive clock limits on AMD graphics cards attached to Windows desktop
- ATIPDLXX.DLL is now redistributed with MSI Afterburner to address issues with unofficial overclocking under Catalyst 12.2 and newer AMD drivers
- Improved Catalyst version detection for AMD graphics cards unattached to Windows desktop
- Improved GPU type definition format in hardware database to fix ambiguous GPU type selection on some custom design MSI graphics cards (e.g. MSI R5870 Lightning series)
- Now MSI Afterburner's startup daemon routine precaches graphics card state at the first Windows startup. Precached state is being used to improve default clocks detection and clock sliders calibration in some cases when display driver provides no trustworthy defaults detection mechanism (e.g. on AMD graphics cards in unofficial overclocking mode)
- Added unified vendor independent videomemory usage monitoring layer for graphics cards, having no generic videomemory monitoring interfaces implementation in display drivers. Unified videomemory usage monitoring layer is based upon RivaTuner's VidMem plugin technology under Windows XP and original concepts of accessing Direct3D kernel mode thunk statistics under Windows Vista and Windows 7, introduced by Mark Russinovich in ProcessExplorer 15. By default unified videomemory usage monitoring path is enabled as primary path on AMD graphics cards and as a fallback path on NVIDIA graphics cards when generic NVAPI videomemory usage monitoring is not available (e.g. on NVIDIA graphics cards unattached to Windows desktop, such as dedicated PhysX or other GPGPU graphics cards). Power users may redefine unified and generic videomemory monitoring paths usage behaviors for both AMD and NVIDIA hardware abstraction layers via the configuration file
- Changed current value and time labels rendering Z-order in hardware monitoring graphs renderer
- Improved active monitoring graphs list control in *"Monitoring"* tab reduces list flickering when hovering mouse cursor over it
- ReadMe file is now provided in RTF format instead of plain text format
- Now beta versions display notification messages informing you that it is about to expire soon in one week or less before the end of trial period
- Added update checking system
- Added RivaTuner-styled command line interface providing direct GPU and I2C device registers access. Logical AND, OR and XOR operations are supported in addition to regular read and write operations. Now MSI Afterburner can be used by vendors for pre-production custom VRM testing and calibration
- Added new compatibility option allowing disabling low-level access to hardware. New option replaces more complex RTCore.cfg renaming related workaround for BFBC2 Punkbuster's bug
- Kernel mode RTCore driver has been upgraded to v1.6. New driver introduces RivaTuner-styled protected MMIO IOCTLs and removes outdated IOCTLs dedicated for some old and currently abandoned RTCore technology based applications (HIS iTurbo and RMClock)
- Added new compatibility option allowing using protected kernel mode low-level access to hardware instead of user mode one. This option can also be used to bypass Punkbuster related stability issues
- Now MSI Afterburner restores default hardware automatic fan control mode when logging off from Windows
- Now MSI Afterburner starts significantly faster than before due to optimized I2C devices scanning, cached database access and optimized GPU context switching in profile load routine
- Fixed RTV1 codec installation issue on 64-bit systems
- Now power users may unlock additional hidden video capture formats via the configuration file
- Now screenshot and video capture quality can be adjusted with precise 1% steps instead of 5% steps in the previous version
- Now video capture framerate can be adjusted in [1 FPS; 100 FPS] range with precise 1 FPS steps instead of [25 FPS; 100 FPS] range and 5 FPS steps in the previous version
- Added *"Single tray icon mode"* option to *"User interface"* tab. When single tray icon mode is enabled, the primary application tray icon is being replaced with hardware monitoring tray icon(s) if monitoring in system tray is enabled and MSI On-Screen Display server's icon is not being displayed in tray when the server is loaded. Please take a note that MSI On-Screen Display server's properties are still accessible via *"More"* button in *"OSD"* tab
- Now shared control memory reinitialization is initiated by delayed fan speed readback mechanism
- Now MSI Afterburner can restart itself automatically instead of displaying restart requirement notification after changing some global compatibility options, e.g. unlocking voltage control or disabling low-level hardware access interface
- Now DirectX web setup is integrated into the installer
- Skin format reference guide has been updated to v1.5 to document new indicator types support
- Now new user interface language selection into MSI Afterburner GUI also results in selecting the same user interface language into MSI On-Screen Display Server
- Updated Korean localization
- Added Simplified Chinese localization
- Added Indonesian localization
- Added Japanese localization
- Added German localization
- Added Polish localization
- Added multilanguage installer

## Version 2.1.0 (published on 24.02.2011)

- Added AMD Barts and Cayman graphics processors family support
- Added core voltage control for reference design AMD RADEON 6970 graphics cards with CHL8228 voltage regulators
- Added core voltage control for reference design AMD RADEON 6970 graphics cards with VT1556 voltage regulators
- Added core voltage control for reference design AMD RADEON 6950 graphics cards with CHL8214 voltage regulators. Please take a note that voltage control is not supported on AMD RADEON 6950 graphics cards flashed with AMD 6970 BIOS
- Added core voltage control for reference design AMD RADEON 6950 graphics cards with VT1556 voltage regulators. Please take a note that voltage control is not supported on AMD RADEON 6950 graphics cards flashed with AMD 6970 BIOS
- Added core voltage control for reference design AMD RADEON 6870 graphics cards with CHL8214 voltage regulators
- Added core voltage control for reference design AMD RADEON 6850 graphics cards with CHL8214 voltage regulators
- Added core voltage control for reference design NVIDIA GeForce GTX 580 series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 570 series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 560 Ti series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 550 Ti series graphics cards
- Added core voltage control for reference design NVIDIA GeForce GTX 460 SE series graphics cards
- Added delayed fan speed readback mechanism to improve compatibility with fan control on GeForce GTX 580 series
- Added low-level fan tachometer monitoring for RV7xx and newer AMD graphics cards using on-die GPU tachometer
- Fixed low-level memory clock monitoring for some mid-range AMD RADEON 5xxx series graphics cards using QDR control related power saving technologies
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N465GTX Twin Frozr II Power Edition series graphics cards with uP6218+uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N450GTS Cyclone Power Edition series graphics cards with uP6262 voltage regulators
- Added core voltage control for custom design MSI N450GT DDR5 series with uP6262 voltage regulators
- Added core and memory voltage control for custom design MSI N430GT and N420GT series with uP6262 voltage regulators
- Fixed typo in hardware database causing regular MSI N470GTX and MSI N470GTX Twin Frozr II graphics cards to be detected as MSI N470GTX Twin Frozr II Power Edition series and causing voltage control to be locked
- Added I2C bus index filtering in uP6262 voltage regulators detection code to prevent voltage regulator detection conflicts with DDC on the systems with some specific monitor models. The conflicts resulted in displaying fake +10/+20/+30 voltages on MSI GeForce N460GTX Hawk series
- Added power user oriented configuration file switch for adjusting retry counter for external I2C voltage regulators detection. Retry counter is set to 3 by default
- Fixed bug in the context help system causing it to display wrong floating tooltips when hovering cursor over the controls under certain conditions
- Added ability to assign a hotkey for toggling the On-Screen Display Server blocking. This hotkey is aimed to provide a simple way for diagnosing the server related compatibility issues
- Changed default fan speed curve for user defined software automatic fan speed mode
- Now MSI Afterburner uses previously undocumented power user oriented DirectInput based hotkey handler. New hotkey handling mechanism drastically reduces hotkey response time in applications heavily loading CPU. Please take a note that new sophisticated hotkeys handling can cause some system security applications (e.g. KIS proactive defense module) to warn you about possible keylogging threat
- Fixed bug in hotkey handler causing it to detect false keystrokes under certain conditions
- MSI On-Screen Display server has been upgraded to version 4.0.1. New version gives you the following improvements:
  - Reduced On-Screen Display rendering related CPU performance hit due to more effective geometry batching in On-Screen Display 3D rendering mode codepath
  - Now MSI On-Screen Display server supports RivaTuner's user extendable localization system
  - Screenshot compression library SaveImage.dll has been replaced with more progressive SaveMedia.dll library providing unified screenshot and video encoding engine
  - JPEG screenshot quality settings are no longer power user oriented and can be adjusted directly from the client application GUI
  - Screen capture implementation is now multithreaded to minimize the impact on the game performance when saving screenshots on the systems with multicore CPUs
  - Text indication of screen capture events in the On-Screen Display has been replaced with graphics progress indicator
  - Fixed bug causing the On-Screen Display to be rendered in wrong colors in 3D mode in some multitextured Direct3D9 applications (e.g. several bumpmapping related samples from DirectX 9 SDK)
  - Updated profiles list
- Added high performance realtime in-game video capture support by means of built-in video capture engine of new MSI On-Screen Display server. You no longer need to waste your money on purchasing an additional video capture application, now MSI Afterburner is providing such functionality to everyone and absolutely for free! The key features of video capture engine are:
  - Realtime video capture support for any Direct3D8, Direct3D9, Direct3D10, Direct3D11 and OpenGL applications

- Queued frame capture algorithms are aimed to minimize the graphics pipeline stalling caused by transferring pixel data from GPU to CPU and keep high and smooth in-game framerate while video capture is in progress
  - Multiple video capture formats: uncompressed video capture for the systems with high performance disk I/O subsystems, two different compression modes for the systems with both mid-range and high performance multicore CPUs
  - Multithreaded SIMD optimized encoders are aimed to provide the maximum compression performance on modern multicore CPUs with SSE2 instructions support
  - Various options allowing you to tweak video capture performance on your system: customizable target video framerate, customizable target video quality, controllable multithreaded optimization and various frame downsampling modes
  - Audio stream capture and additional video capture related enhancements are coming in future versions
- Now screen capture events are also indicated by notification messages in the hardware monitoring window
- Added option allowing hiding On-Screen Display on captured screenshots and videos
- Reduced hardware polling time on multi-GPU systems due to cached GPU context switching in hardware monitoring module
- Improved hardware monitoring shared memory layout v2.0 introduces additional data source identification related fields and new GPU descriptors array. Third party developers may refer to updated sample code included in the SDK
- Added new control shared memory interface for future MSI software products integration with MSI Afterburner. New shared memory interface allows third party applications to program graphics card clock frequencies, voltages and fans via MSI Afterburner. Such shared memory interface allows developing a lot of useful external applications, for example smartphone overclocking client applications connected to the PC server and remotely controlling the hardware via MSI Afterburner and so on. The SDK included in MSI Afterburner distributive contains open source sample demonstrating the access to new control shared memory from a third party application
- All synchronization mutexes have been moved from local to global namespace
- Now Microsoft Visual C++ 2008 runtime libraries are included in distributive and installed with software
- Hardware database is now configured to force fan duty cycle monitoring to be performed less efficient AMD ADL SDK path on AMD RADEON 4870 X2 and HD 5970 series graphics cards
- Changed way of unlocking unofficial overclocking on AMD graphics cards
- Added alternate unofficial overclocking path allowing keeping PowerPlay active on some modern ASIC families during overclocking
- Fan control settings are now being forcibly reapplied after changing the clocks via unofficial overclocking path to bypass bug in AMD driver causing the fan control settings to be reset to defaults during programming PowerPlay table
- Fixed bug in uP6266 voltage control codepath causing setting wrong fixed 0.920V voltage instead of desired one when *"Force constant voltage"* option is enabled
- Localization reference guide documentation has been updated to v1.2
- Various typo fixes in different language packs

## Version 2.0.0 (published on 02.09.2010)

- Voltage control layer has been seriously revamped to give additional freedom to extreme overclockers with new custom design MSI graphics cards. Now MSI Afterburner is able to control up to 3 voltages on custom design MSI Fermi and other future custom design MSI graphics cards. New adjustable voltages include memory voltage and special multi-purpose auxiliary voltage feeding either memory bus (also known as VDDCI on AMD graphics cards) or PCIe bus and crystal (PEXVDD on NVIDIA graphics cards)
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N480GTX Lightning series graphics cards with uP6225+uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N470GTX Twin Frozr II OV3 series graphics cards with uP6218+uP6262 voltage regulators
- Added core, memory and auxiliary PEXVDD voltage control for custom design MSI N460GTX Hawk series graphics cards with uP6262 voltage regulators
- Added core voltage control for custom design MSI N460GTX Cyclone series graphics cards
- Added auxiliary VDDCI voltage control for reference design AMD RADEON HD 5870 series graphics cards
- Added fan tachometer monitoring for NVIDIA graphics cards. Please take a note that not all graphics cards are tachometer reading capable. So depending on graphics card and cooling system fan tachometer monitoring can be unavailable
- Optimized NVIDIA driver-level clock frequency monitoring codepath
- Minimum clock limits for all graphics cards have been reduced from 75% to 50%
- Dynamic overclocking, voltage and fan speed limits. MSI Afterburner no longer uses static slider limits calibration and adjusts the limits dynamically when some external factors affect it (e.g. Overdrive clock limits on AMD cards or VGA BIOS fan speed and voltage limits on NVIDIA GeForce GTX 400 cards)
- New temperature hysteresis settings for software automatic fan control mode gives you additional way to improve cooling system thermal and acoustic parameters
- Now fan speed limits (i.e. minimum and maximum fan speeds accepted by VGA BIOS and display driver) are displayed in custom fan speed curve editor window
- Built-in skin sizes have been reduced due to optimized internal skin panels representation and optimized compiled bitmap cache

- Optional skin compression ability in the built-in skin compiler. Skin format reference documentation has been updated to document new compression options
- Minor built-in skins appearance tweaks
- Now MSI Afterburner uses previously undocumented power user oriented startup mode via the task scheduler under Windows Vista / Windows 7. MSI Afterburner launch no longer requires UAC confirmation at Windows startup. Please take a note that Microsoft Visual C++ 2008 runtime libraries must be installed to get new startup mode working
- Now MSI Afterburner automatically fixes startup link if *"Start with Windows"* or *"Apply overclocking at system startup"* is enabled but the registry or task scheduler startup entry is missing
- Startup profile is now displayed in *"Apply at Windows startup"* option floating tooltip instead of the main window
- Now power users can enable optional DirectInput based hotkeys handler via the configuration file. DirectInput based hotkeys processing can seriously reduce hotkey response time in the applications heavily loading CPU (mostly 3D games) and leaving not enough time for processing standard keyboard input message queues. Please take a note that enabling such sophisticated hotkeys handling mode can cause some system security applications (e.g. KIS proactive defense module) to warn you about possible keylogging threat
- Improved skin engine, now skinned controls support horizontal and/or vertical centering. Skin format reference guide has been updated to document these new alignment modes
- MSI On-Screen Display server has been upgraded to version 3.7.2. New version gives you the following improvements:
  - Now screen capture events are identified visually by text message flashing in On-Screen Display during 0.25s
  - Built-in skin sizes have been reduced due to optimized compiled bitmap cache
  - Added On-Screen Display profile for Startcraft II : Wings of Liberty
  - *"Start the task only when computer is running on AC power"* option is no longer set in the startup task settings to allow automatically starting application via the task scheduler on laptops or on some UPS models
- Added configuration file switch allowing sending MSI Afterburner to system tray instead of closing on *"Close"* button click
- *"Start the task only when computer is running on AC power"* option is no longer set in the startup task settings to allow automatically starting application via the task scheduler on laptops or on some UPS models
- Added optional data filtering mode for all hardware monitoring graphs. Now it is possible to enable special math data filtering algorithm independently for each hardware monitoring graph to reject misreading spikes caused by sensor access conflicts when running multiple hardware monitoring tools at the same time
- Now it is possible to use both core and shader clock as the primary clock when adjusting the clocks in linked mode
- Fixed videomemory usage monitoring for non-primary NVIDIA graphics cards
- Application restart is no longer required to apply new user interface language
- Updated localization engine. Now floating tooltips based context help system supports macro definitions
- Localization reference guide documentation has been updated to v1.1
- Various typo fixes in different language packs
- Added Korean localization

## Version 1.6.1 (published on 12.07.2010)

- Added NVIDIA GeForce GTX 460 series graphics cards support

## Version 1.6.0 (published on 07.06.2010)

- Added NVIDIA GeForce GTX 400 series graphics cards support (including voltage control!)
- Added voltage control for MSI N240GT Low Profile series graphics cards
- Added basic screen capture support by means of built-in screen capture engine of MSI On-Screen Display server. Now it is possible to assign the hotkey for capturing screenshots in BMP, PNG or JPG formats on desktop, in DirectX or in OpenGL applications
- Added hardware monitoring history logging support. Now MSI Afterburner is able to save history in native RivaTuner Hardware Monitoring Log file format. The log files captured with MSI Afterburner can be viewed in any text editor like Notepad or in graphics form in RivaTuner's HML file viewer (RivaTuner must be installed for viewing log files in graphics form)
- Added new safety option allowing forcing constant voltage on some cards with voltage regulators supporting programmable dynamic voltage management (e.g. VT1165 or uP6266). New safety option may improve stability on some systems as well as provide power state independent voltage control on the systems with non-standard voltage control implementation
- Screen capture and On-Screen Display hotkey events are now being processed via direct connection to the On-Screen Display server instead of command line. Due to this change Screen capture and On-Screen Display visibility control hotkeys are being processed faster now
- MSI On-Screen Display server has been upgraded to version 3.7.1. New server gives you a lot of improvements including:
  - DirectX11 On-Screen Display and screen capture support

- DirectX screen capture engine is no longer using DirectX runtimes to capture and compress screenshots. Screen capture and compression to PNG/JPG formats in DirectX applications is now handled by own more effective LIBPNG/JPEGLIB based library
- PNG and JPG screen capture support for desktop and OpenGL applications
- Adjustable JPG screen capture quality for experienced users
- Screen capture support for DirectX10 and DirectX11 applications using multisampled antialiasing or non-standard frame buffer formats (e.g. sRGB)
- Optional On-Screen Display 3D rendering mode. New mode uses 3D accelerated DirectX functions to emulate previously used 2D framebuffer access functions and render 2D text. New rendering mode provides On-Screen Display support in DirectX10 and DirectX11 applications using multisampled antialiasing and can also drastically reduce OSD related performance hit on the systems with badly optimized 2D acceleration in display drivers
- Simplified On-Screen Display coordinate space settings. Rarely used desktop and window coordinate space modes have been merged into single framebuffer coordinate space mode
- Now the server automatically selects framebuffer coordinate space instead of viewport coordinate space when viewport is not accessible (e.g. if pure Direct3D8 device is in use)
- Improved application notification scheme during runtime profiles adjustment. Now runtime changes in OSD application profiles (e.g. OSD zoom ratio change on the fly) are reflected in affected application almost immediately instead of approximately 1 second delay in the previous versions
- Reduced runtime skin engine memory footprint due to dynamic skin storage unloading
- Improved race condition protection system for multithreaded 3D engines (e.g. Age of dragons : Origins and ArMA II)
- Improved race condition protection system for the systems running multiple OSD applications simultaneously (e.g. OSD server, FRAPS and STEAM In-Game Chat)
- Improved floating injection address hooking technology. Due to more advanced built-in code analyzer hooks can be injected deeper into 3D application code if stealth mode is enabled. These changes improve stealth mode compatibility with third party tools using similar stealth injection technologies (e.g. FRAPS v2.9.8 and newer)
- Now stealth mode cannot be toggled during 3D application runtime to reduce the risk of crashing 3D application
- Removed single screen capture per second limitation
- Updated profiles list
- Now MSI Afterburner distributive includes original 128x128 PNG application logo (stored in .\Graphics folder) for dockbar applications like RocketDock or ObjectDock
- It is no longer necessary to close the application to save monitoring window attachment state
- *"Stop the task if it runs longer than 3 days"* option is no longer set in the task settings when using alternate startup mode via the task scheduler under Windows Vista / Windows 7
- Full list of active On-Screen Display server clients is now displayed in *"I"* window instead of the most recent client
- Floating tooltips help system is now reinitialized properly after runtime skin switching
- Added Ukrainian localization

## Version 1.5.1 (published on 13.03.2010)

- Added voltage control for MSI R5830 Twin Frozr II series graphics cards
- Added voltage control for MSI R5670 Twin Frozr II series graphics cards
- Fixed voltage control for MSI R5870 Lightning and R5870/R5850 Twin Frozr II series graphics cards
- Fixed description of R5670 1GB series

## Version 1.5.0 (published on 10.02.2010)

- Added videomemory usage monitoring for NVIDIA graphics cards under ForceWare 185.xx and newer drivers
- Added GPU usage monitoring for NVIDIA GT2xx and newer graphics cards under ForceWare 185.xx and newer drivers
- Added VGA BIOS version detection for AMD graphics cards
- Added optional ability to display hint messages in hardware monitoring window area. The messages notify the user about runtime profile management activity (such as profile creation, removal or applying) and other application events
- Minor appearance tweaks in default skins
- Added compact versions of default skins (default green, red and blue editions)
- Now advanced MSI Afterburner properties also support floating tooltip based context help system similar to the main application window
- Now MSI Afterburner supports RivaTuner's user extendable localization system. Currently localization system includes default English, Russian, Traditional Chinese, Spanish, Italian and Dutch language packs and affects context help system and non-skinned advanced properties interface. Similar to RivaTuner you can also create your own language packs for your native language and share your work with MSI Afterburner users' community!



- Improved skin format. Now skinned fonts support characters remapping feature. All skins supplied with MSI Afterburner are using this feature, third party skin designers may decompile and peek into these skins to see an example of new feature usage
- Now hardware monitoring window font size can be redefined via the skin, third party skin designers may decompile and peek into compact versions of default skins to see an example of new feature usage
- Skin format reference documentation has been updated to v1.1 to reflect the format improvements mentioned above
- Added shared memory interface allowing any third party applications to access MSI Afterburner hardware monitoring statistics. The interface is intended for future MSI Afterburner Vista / Windows 7 sidebar gadgets, however, the shared memory layout is publicly open so third party developers can use it to access MSI Afterburner hardware monitoring statistics from their own applications. The SDK included in MSI Afterburner distributive contains open source sample demonstrating the access to shared memory from a third party application
- Added command line switches for forcing MSI Afterburner to be minimized to the system tray area on startup or during runtime and for opening desired advanced MSI Afterburner properties tab. The switches are intended for interaction with future MSI Afterburner Vista / Windows 7 sidebar gadgets. Sample code included in the SDK also shows you how to detect, start and minimize installed MSI Afterburner, how to open desired tab in advanced properties and how to use MSI Afterburner profiles from third party applications
- Reduced runtime skin engine memory footprint due to dynamic skin storage unloading
- Startup settings are now displayed next to the *"Apply overclocking at system startup"* button
- Added button for locking profiles modification
- Now voltage control is also locked by default in safety options in advanced MSI Afterburner properties
- Added AccessibilityCheckingPeriod configuration file switch for improving the compatibility with AMD ULPS power saving technology on Crossfire systems. The switch allows low-level monitoring module to use AMD driver API to check GPU accessibility and detect and display GPU sleep state properly. Please take a note that AMD API implementation is ineffective and hardly suits to realtime monitoring due to high CPU stress resulting in periodic stuttering in games. That is why the compatibility switch is disabled by default, enable it only if you absolutely need to see slave GPU sleep state on the graphs and accept side effects like performance drop and stuttering resulting from ineffective AMD API implementation
- Added NVIDIA GT240M PCI DeviceID range to the core to provide more efficient hardware monitoring via low-level core on mobile NVIDIA GT240 based systems (bonus feature, official mobile systems support is still not declared)
- Graph limits are now adjustable in the graph properties in *"Monitoring"* tab
- Added AMD RV810 graphics processors family supports
- Added voltage control for custom design MSI R5670 1GB series graphics cards with uP6262 voltage regulators
- Added voltage control for custom design MSI R5870 Lightning series graphics cards with uP6266 voltage regulators
- Added voltage control for custom design MSI R5870 Twin Frozr II series graphics cards with uP6266 voltage regulators
- Added voltage control for custom design MSI R5850 Twin Frozr II series graphics cards with uP6266 voltage regulators
- Added integration with external MSI Kombustor stability testing application
- Added workaround for overclocking bug of ForceWare 196.21. Please take a note that the workaround is applied only to 196.00 - 196.21 driver versions range in order to ensure compatibility with future fixed NVIDIA drivers.
- Now hardware database includes marketing names of MSI graphics cards so MSI Afterburner displays marketing names instead of generic graphics card model names when possible

## Version 1.4.2 (published on 07.01.2010)

- Added voltage control for custom design MSI N240GT D5 1GB series graphics cards with uP6262 voltage regulators
- Added voltage control for custom design MSI R5770 Hawk graphics cards with uP6204 voltage regulators

## Version 1.4.1 (published on 23.11.2009)

- Fixed incorrect database entry for MSI N240GT D3 series graphics cards

## Version 1.4.0 (published on 11.11.2009)

- Added initial AMD RADEON HD 5970 series graphics cards support
- Added voltage control for cost down reference design AMD RADEON HD 4870 series graphics cards with L6788A voltage regulators
- Added voltage control for custom design MSI R4770 Cyclone graphics cards series with uP6204 voltage regulators
- Ineffective and slow temperature, clock, GPU usage and fan speed monitoring implementation provided by native AMD's ADL SDK has been replaced with own more effective low-level codepath. Due to new codepath hardware monitoring related CPU performance hit has been reduced drastically on the systems with AMD graphics cards and drivers

- On-Screen Display and Logitech LCD monitoring modules no longer explicitly read displayed data from hardware and retrieve cached data from monitoring graphs instead. Due to this change CPU performance hit is reduced when OSD or LCD monitoring features are enabled
- Fan speed slider position and numeric fan speed input field are now being refreshed in automatic fan speed mode only when MSI Afterburner window is active
- Added configuration file switch allowing power users to unlock unofficial overclocking codepath in AMD display drivers (similar to AMDGPUClockTool, ATITool and RivaTuner overclocking implementation on AMD graphics cards). Unlike AMD's official ADL SDK overclocking ways, unofficial ones are not limited with CCC clock limit but have some alternate disadvantages (e.g. PowerPlay support limitation). Please take a note that unofficial overclocking methods are not supported either by AMD or by MSI, so unlock and use it at your own risk
- Now it is possible to toggle performance profiler status info visibility in hardware monitor window via *"Show status"* option in the context menu
- Fixed L6788A database entry for AMD RADEON HD 4770 series graphics cards
- GPU voltage monitoring feature is now locked and not available by default. Unfortunately some inexperienced users don't understand the risk of running multiple tools accessing voltage regulator at the same time and tend to use helper voltage monitoring features in everyday hardware monitoring sessions in conjunction with third party VRM monitoring tools, intensively writing data to VRM and periodically causing it to enter wrong state due to write collision. Unfortunately such issues are wrongly treated by certain users as instability of our product. To prevent such rumors, since this version voltage monitoring feature is no longer available to beginners by default. Experienced users understanding these specifics and accepting these risks may unlock voltage monitoring features via new safety option in *"General"* tab
- AMD RV8xx I2C microcontroller is now being forcibly reset prior to starting new I2C transaction to minimize the risk of I2C collisions with third party tool without I2C synchronization protocol support (e.g. AMDGPUClockTool)
- Added safety option allowing users to disable voltage control feature if it is not needed
- Now Afterburner forcibly changes memory clock for all performance levels at once on AMD graphics cards with equal default memory clocks defined for all performance levels to bypass flickering issue caused by incorrect PowerPlay dynamic memory clock changing implementation on some cards
- Added Catalyst driver family version detection for AMD graphics cards
- Added option to display system time in the On-Screen Display
- Added red and blue editions of default skin
- Various minor user interface and skin tweaks
- Added configuration file switches allowing power users to tweak Afterburner startup process and define startup delay or force the startup to be handled by Windows Vista / Windows 7 Task Scheduler to bypass UAC evaluation window (additional Microsoft Visual C++ 2008 runtime libraries installation is required for task scheduler based startup way)
- MSI On-Screen Display server has been upgraded to version 3.6.0. New server provides improved desktop windows notification mechanism and also features optional power user oriented task scheduler based startup way
- Added skin format reference documentation. Now third party skin designers may use this local offline documentation to create their own skins for MSI Afterburner. Official MSI Afterburner skin creation contest is approaching! Do you feel that you can design nice skins for MSI Afterburner? Stay tuned and don't miss your chance to win the prize!

## Version 1.3.0 (published on 19.10.2009)

- Added voltage control for reference design AMD RADEON HD 4770 and AMD RADEON HD 5770 series graphics cards with L6788A voltage regulators
- Added voltage control for custom design MSI N240GT D3 series graphics cards with uP6262 voltage regulators
- Fixed database entry for AMD RADEON HD 4870 X2 graphics cards. Afterburner no longer adjusts 2D voltage instead of 3D voltage on AMD RADEON HD 4870 X2

## Version 1.2.0 (published on 12.10.2009)

- Added NVIDIA GeForce G 210 and NVIDIA GeForce GT 240 series graphics cards support
- Added voltage control for custom design MSI N220GT D2, MSI N220GT D3 and MSI N240GT D5 series graphics cards with uP6262 voltage regulators
- Added initial AMD RADEON HD 5750 and AMD RADEON HD 5770 series graphics cards support
- Added Logitech keyboards LCD displays support. Now it is possible to display hardware monitor data in Logitech keyboards LCD
- Extended I2C address scanning range for uP6208 voltage regulators to allow supporting voltage control on non-MSI custom design graphics cards equipped with uP6208
- Fixed on-board memory size detection for AMD RADEON HD 5000 series graphics cards
- Now *"Synchronize settings for similar graphics processors"* option also affects voltage control

- Fixed database entry for AMD RADEON HD 4890 series graphics cards. Afterburner no longer adjusts 2D voltage instead of 3D voltage on AMD RADEON HD 4890
- Fixed database entry for AMD RADEON HD 5850 series graphics cards. Afterburner no longer adjusts UVD voltage instead of 3D voltage on AMD RADEON HD 5850
- Automatic profiles manager is now restarted after resuming from suspended mode
- Revised VRM access synchronization protocol for safer simultaneous VRM polling by multiple software products at the same time
- Added *"Always on top"* setting to the context menu of detached hardware monitor window. When this option is disabled, hardware monitor window can be minimized to the taskbar while staying in detached mode
- Now it is possible to pause hardware monitor activity via *"Pause"* option in the context menu of hardware monitor window
- Maximum allowed hardware polling period has been extended from 5 to 60 seconds
- Added configuration file setting allowing power users to display performance profiler status information in the hardware monitor window. The information allows estimating average CPU performance hit caused by hardware monitor and software automatic fan control layers
- Optimized timer message queue processing under high CPU load conditions for better hardware monitoring and software automatic fan control events handling
- Reduced CPU usage for simultaneous GPU clock frequency and GPU usage readings on AMD graphics cards, both values are being read in single pass now
- Maximum limits has been extended from 1000 to 1500MHz for core clock graph and from 2000 to 2500MHz for shader clock and memory clock graphs
- Added readme file and option to display it in the installer
- Now *"Fan"* tab is not displayed in advanced settings window if there are no fan control capable GPUs in the system
- Updated context help files, added more hints to *"User define"* button help

## Version 1.1.0 (published on 01.10.2009)

- Added AMD RADEON HD 5850 and AMD RADEON HD 5870 series graphics cards support
- Added NVIDIA GeForce GT 220 series graphics cards support
- Fixed database entry for MSI N260GTX Lightning series graphics cards. Voltage control is no longer locked on MSI N260GTX Lightning cards
- Fixed bug causing the hotkeys to be ignored till restarting software after opening and closing advanced settings window
- Default tray icon text color has been changed from white to red to improve icon text readability in Windows 7
- Improved internal command line based I2C scanner

## Version 1.0.0 (published on 17.09.2009)

- Initial version printed on CD