



## UNIGINE HEAVEN BENCHMARK 4.1 (PRO EDITION)

### OVERVIEW

[Heaven Benchmark](#) is a beautiful GPU benchmark powered by the cutting-edge [UNIGINE Engine™](#). It is a reliable tool that produces unbiased workload to determine the stability of a GPU under extremely stressful conditions, as well as check the cooling system's potential under maximum heat output.

Heaven Benchmark immerses a user into a magical steampunk world of shiny brass, wood and gears. Nested on flying islands, a tiny village with its cozy, sun-heated cobblestone streets, an elaborately crafted dirigible above the expanse of fluffy clouds, and a majestic dragon on the central square gives a true sense of adventure. An interactive experience with fly-by and walk-through modes allows for exploring all corners of this world.

### FEATURES

- Extreme hardware stability testing
- Accurate results due to 100% GPU-bound benchmarking
- Benchmarking presets for convenient comparison of results
- Stress testing mode (benchmark looping) [only for Advanced and Pro versions]
- Support for DirectX 9, DirectX 11 and OpenGL 4.0
- Multi-Platform support for Windows, Linux and Mac OS X
- Comprehensive use of hardware tessellation, with adjustable settings
- Dynamic sky with volumetric clouds and tweakable day-night cycle
- Real-time global illumination and screen-space ambient occlusion
- Cinematic and interactive fly/walk-through camera modes
- Support for multi-monitor configurations
- Various stereo 3D modes
- Support for Oculus Rift virtual reality display

- GPU temperature and clock monitoring
  - Command line automation support [only for Advanced and Pro versions]
  - Reports in CSV format [only for Advanced and Pro versions]
  - Support for software rendering mode in DirectX 11 for reference purposes [only for Pro version]
- Support for English, Russian and Chinese languages

## SYSTEM REQUIREMENTS

- Hardware:
  - GPU:
    - ATI Radeon HD 4xxx and higher
    - NVIDIA GeForce 8xxx and higher
    - NVIDIA Quadro
    - Intel HD 3000 and higher
  - Video memory: 512 Mb
  - Disk space: 1 Gb
- Operating system:
  - MS Windows XP / Vista / 7 / 8
  - Linux (proprietary video drivers required)
  - Mac OS X 10.8+ (Mountain Lion)
- For hardware tessellation, both a video card with DirectX 11 / OpenGL 4.0 support and MS Windows Vista / 7 / 8 or Linux are required.

## LAUNCH OPTIONS

In the launcher, it is possible to choose one of the benchmarking presets or specify settings to run Heaven.

- **Language** - use English, Russian or Chinese language for the interface
- **Preset** - benchmarking preset
  - **Custom** - allows for changing launch options
  - **Basic** - provides standard GPU load
  - **Extreme** - provides extremely heavy load for system testing
- **API** - graphics API to be used:
  - DirectX 11
  - DirectX 9 (no tessellation)
  - OpenGL
- **Quality** - quality preset, from Low to Ultra high.
- **Tessellation** - tessellation preset:

- **Disabled** - disable the tessellation
- **Moderate** - this mode is targeted to provide reasonable performance on a wide range of DX11 hardware.
- **Normal** - default mode available in the benchmark shows optimal quality-to-performance ratio. That's the way to achieve prominent visual difference with hardware tessellation technology.
- **Extreme** - pushes up the tessellation level to the extreme to showcase the capabilities of the top-shelf hardware
- **Stereo 3D** - enables stereo rendering:
  - **Disabled** - no stereo 3D rendering
  - **3D Vision** - NVIDIA 3D Vision stereo. This mode requires 3D Vision-compatible graphics card and monitor, as well as active shutter glasses (or anaglyph ones, depending on the 3D Vision driver settings)
  - **3D Surround** - NVIDIA 3D Surround stereo across three monitors (the same requirements as for NVIDIA 3D Vision apply)
  - **Dual Output** - stereo mode for custom VR/AR output devices that support separate images input, such as 3D video glasses or helmets
  - **Side-by-side** - screen is halved horizontally to render left- and right-eye images
  - **Top-and-bottom** - screen is halved vertically to render left- and right-eye images
  - **Interlaced** - interlaced stereo
  - **Anaglyph** - anaglyph stereo (red-cyan glasses are required)
  - **Oculus** - stereo mode for Oculus Rift virtual reality display
- **Monitors** - render Heaven across multiple monitors
  - **Single** - render on one monitor
  - **Surround 3x1** - span Heaven across three monitors using one window only
  - **Wall Auto** - detect the number of available monitors (works only for identical monitors, with identical resolution)
  - **Wall 2x1** - 2 monitors in a row
  - **Wall 1x2** - 2 monitors in a column
  - etc.
  - **Panorama** – panoramic rendering
  - **Fisheye** - stereoscopic fisheye rendering
- **Anti-aliasing** - set the level of hardware anti-aliasing or disable it
- **Full Screen** - full screen mode
- **Resolution** - choose screen resolution or window size from the list
  - **System** - auto-detection of used resolutions
  - **Custom** - set custom width and height to be used

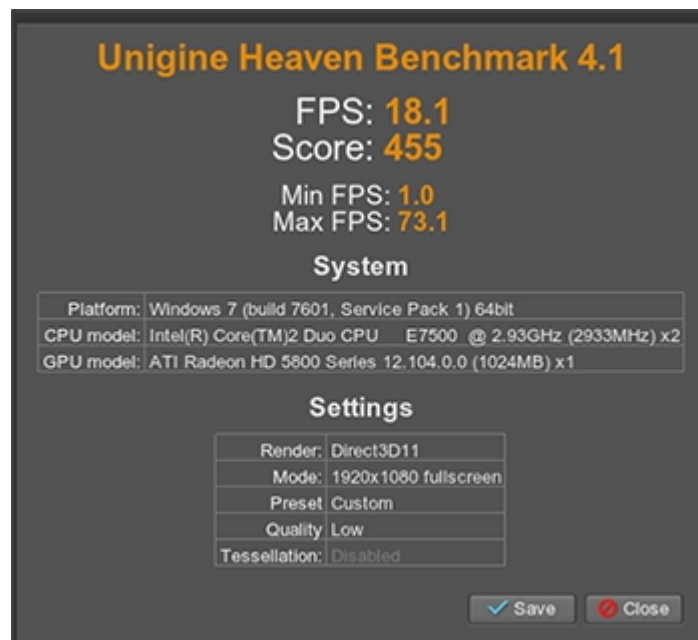
**Run** button runs Heaven Benchmark application.

## BENCHMARK

This option starts benchmarking of the system. During this run, the GPU is stressed to 100% in order to test if it runs reliably under an extremely heavy load.

The following parameters are displayed during benchmarking (you can press Esc to cancel a test run):

- **FPS** - the current, per-frame FPS
- **Time** - duration of benchmarking
- **Frames count**
- **Min FPS** - the minimum FPS since the beginning of benchmarking
- **Max FPS** - the maximum FPS since the beginning of benchmarking
- **Scene** - the number of cinematic scenes shown/left



The results of benchmarking are output onto the screen and can be saved into HTML file. In addition to the above mentioned parameters, they include:

- **FPS** – average FPS during benchmarking
- **Score** – your system score
- **Platform** – system data and version of the UNIGINE Engine powering the benchmark
- **GPU and CPU** model data
- **Settings** - graphics settings used to run the benchmark

## CAMERA

The Camera mode option allows to view the cinematic scenes or switch to an interactive mode:

- **Cinematic** - cinematic scenes
- **Free** - fly-by mode
- **Walk** - walk-through mode

In the **Cinematic** camera mode, the following hot keys are available:

- **Space bar** — stop/resume scene playback
- **Enter** — skip the scene
- **Backspace** — replay the scene from the start

In interactive camera modes the depth of field effect can be additionally tweaked:

- **Focus** - change the focus point from close-by objects to distant ones
- **Aperture** - change the width of the area in focus

To take a screenshot of the current scene press **F12** button on your keyboard. The *\*.png* format image will be saved to the following files directories by default:

- For MS Windows XP / Vista / 7 / 8, it is `%userprofile%/Heaven/screenshots`
- For Linux, it is `~/Heaven/screenshots`
- For OS X 10.8.2+, it is `~/Library/Application Support/Heaven/screenshots`

## ENVIRONMENT

The Environment option allows for setting any time from the full day-night cycle. From early dawn to the deep of the starry night, true-to-life atmospheric conditions are simulated.

## TESSELLATION

The Tessellation options allow for changing the hardware-accelerated tessellation on the fly, to see drastically more detailed the scene becomes. Tessellation can be toggled via **Enable** option or **F3** hotkey.

- **Scale** controls the scale of displacement. The higher the Scale, the more raised the details are. Low values result in level surfaces.
- **Factor** controls how finely to tessellate. The higher the Factor, the higher the number of polygons into which objects are subdivided in real-time.
- **Distance** controls if further objects are less tessellated to save performance. Low

values means that only close-by objects are tessellated.

To see how polygons are divided in real-time, the wireframe of objects can be toggled via **F2**.

## QUALITY

The Quality option allows for choosing between 4 quality presets when rendering Heaven, from Low to Ultra one. This option effectively scales the rendering performance load.

## SOUND

The Sound option toggles the background sound.

## AUTOMATION

There is a number of automation Python scripts (\*.py files) for different scenarios available out of the box ([Python 2.7.x](#) is required). These scripts are located in the *automation* directory.

## Report Files

Report files are generated in [CSV](#) format and are compatible with any spreadsheet applications, such as Microsoft Excel or OpenOffice Calc. They are written into the specified file with \*.csv extension.

Reports are saved into the following files directories by default:

- For Windows XP/Vista / 7 / 8, it is %userprofile%/Heaven/reports
- For Linux, it is ~/Heaven/reports
- For OS X 10.8.2+, it is ~/Heaven/reports

## Available Scripts

### **all\_apis.py**

Runs the benchmark in different graphics APIs: OpenGL, DirectX 9, DirectX 11.

### **all\_resolutions.py**

Runs the benchmark with different screen resolutions. See *resolutions* array in the script

for the details.

### **loop\_100x.py**

Performs a stress-test by running the benchmark in a loop mode. Edit *iterations\_number* parameter to control the number of loops.

### **single\_run.py**

Runs the benchmark a single time.

### **deep\_analysis.py**

Generates a detailed report by logging (at a specified interval) the GPU temperature and chip frequency, as well as the average FPS values.

Available options are:

- **step**: step for logging temperature, frequency and frames (in seconds)
- **temperature\_log**: file name for the temperature report
- **frequency\_log**: file name for the frequency report
- **frames\_log**: file name for the average FPS report

### **frame\_loop.py**

Renders a single frame several times. Use *frame\_number* and *iteration\_number* parameters to control the script.

### **frame\_software\_render.py**

Renders a frame in the software rendering mode (without GPU acceleration). Please note that DirectX SDK is required.

Available options are:

- **applevel**: 0 (by default), 1.  
If set to 1, the benchmark runs using a software renderer plugin (required to enable software rendering mode).
- **driver\_type**: *hw*, *ref*, *null*, *soft*, *warp*.  
Types of drivers:
  - *hw* - hardware GPU
  - *ref* - a reference rasterizer (recommended)
  - *null* - no renderer
  - *soft* - a software rasterizer
  - *warp* - a WARP device (faster, doesn't support DX11 features)
- **feature\_level**: *auto*, 10, 101, 11.  
The DirectX feature level used in the software renderer mode (10, 10.1 or 11).
- **driver\_debug**: 0 (by default), 1.  
Enables the debugging mode.

## Customization

To customize any of these scripts, modify *heaven\_automation.run()* options inside of them.

- **api:** *DX9* (by default), *DX11*, *GL*
- **fullscreen:** *0*, *1* (by default)
- **aa:** *0* (by default), *2*, *4*, *8*
- **width:** an integer value (in pixels, *1280* by default)
- **height:** an integer value (in pixels, *720* by default)
- **quality:** *LOW*, *MEDIUM*, *HIGH*, *ULTRA* (by default)
- **tessellation:** *DISABLED*, *MODERATE*, *NORMAL* (by default), *EXTREME*
- **frame\_number:** frame number. If not set to *-1* (by default), the benchmark runs in the one-frame rendering mode
- **number\_of\_frames:** number of iterations for the one-frame rendering mode (*0* by default)
- **log:** report file name (can contain subfolders), set to *"* to omit
- **log\_caption:** comma-separated report file captions
- **log\_format:** Report format (by default, it is *\$F,\$A,\$v,\$m,\$quality,\$tessellation,\$g,\$c*). Available placeholders are:
  - **\$F** – average frames per second value
  - **\$z** – minimal frames per second value
  - **\$x** – maximal frames per second value
  - **\$v** – screen resolution
  - **\$m** – anti-aliasing mode
  - **\$g** – video card info
  - **\$c** – CPU info
  - **\$A** – graphics API
  - **\$S** – score
  - **\$tessellation** – tessellation mode
  - **\$quality** – quality preset

**TECHNICAL SUPPORT**



Feel free to contact our technical support service via e-mail if there are any questions or suggestions: [heaven-support@unigine.com](mailto:heaven-support@unigine.com)