Half-Life 2 – Gordon's back!

Half-Life 2 is, beyond a shadow of a doubt, the most eagerly awaited PC game of the year. The game's sounds, A.I., and physics all help immerse players in the game, but it's the graphics that first grab you and bring you into the world.

So while benchmarking the Video Stress Test included in Counter-Strike: Source has been fun, it's not the same as playing Half-Life 2. And of course when a blockbuster title like Half-Life 2 comes out, everyone wants to see how their hardware will perform.

Benchmarking graphics hardware using Half-Life 2

Half-Life 2 is a graphically intense, shader-heavy, game that will thoroughly test graphics hardware. Much like other Valve titles, Half-Life 2 allows the recording and playback of real game scenes (in timedemos). By recording multiple timedemos, each testing various aspects of Half-Life 2 and the Source engine, you can produce results indicative of real gameplay performance.

Timedemo Selection

Much of Half-Life 2 often runs extremely fast (> 200 fps on some maps) on a high-end card. In many sections of the game, performance is more dependant on CPU than any other factor. Obviously, any framerate this high will produce an enjoyable experience for the player, whether it is at 150 fps or 250 fps.

To develop a meaningful graphics benchmark for Half-Life 2, it is important to locate a scene where the framerate dips to approximately 50 fps or less. This creates a performance scenario where a 10 fps difference between boards (or between settings) will significantly impact the user experience.

If you are recording your own timedemos, be sure to verify that performance changes as the graphics settings (resolution, AA, etc.) are altered.

Benchmarking Tips
> ➢ Valve's color-coded framerate counter ("cl_showfps 1") is very useful for developing your own timedemos. Green means fast, yellow means moderate, and red means slow. Look for content that drops into yellow or red at least occasionally. Otherwise your test will very likely be CPU-bound.
> ➢ Make sure Steam is not downloading in the background while you run benchmarks. The extra CPU load will distort your scores, and it's possible that the game content will change midway through your test sweep.
> ➢ If you (physically) disconnect your benchmark computer from the internet, Steam should give you an option to stay offline for the duration of your testing. Make sure you copy all of the drivers and tools you need to the local machine before you disconnect.

Drivers

ATI's software team has been working very closely with the Valve team to ensure that our customers can experience the best gameplay with Half-Life 2 possible. To ensure the best experience, we have posted a beta of our upcoming CATALYST driver which will provide the best performance in Half-Life 2 along with some performance and stability enhancements in other games. Please visit the following link and use this driver when testing Half-Life 2:
http://www.ati.com/support/infobase/4701.html.

When comparing an ATI product against a competing product, we recommend that you use a driver that delivers a similar level of image quality.

Half-Life 2 Image Quality and Performance

While some recent games look just fine at 800x600, you will find that the appearance of Half-Life 2 benefits considerably from higher resolutions. For optimal results, find the highest resolution possible that still produces an acceptable framerate.

For very high-end products, you should find playable framerates at 1600x1200 4xAA 8xAF.

Changing Graphics Settings

Half-Life 2 includes the same in-game graphics options as Counter-Strike: Source, including support for Anti-Aliasing and Anisotropic Filtering. These, and other image quality settings, can be accessed in the **Advanced Video Options** menu. Some options are also available on the command-line, covered later in this document.

Automatic Configuration

When you first run Half-Life 2, it automatically detects your video card, CPU, and other hardware, and configures default settings to ensure that the game runs at reasonable level of performance and quality.

This process is repeated any time a major system component (such as the graphics card) is changed.

Default resolution, degree of anisotropic filtering and multi-sample anti-aliasing are the settings most likely to be updated after a change of graphics adapter. Shader Quality and Water Quality may also be affected.

Half-Life 2 looks for your graphics ASIC ID in a file called **dxsupport.cfg** (in the Half-Life 2\bin folder) and applies any settings it finds there. After changing your graphics board, it's a good idea to run Half-Life 2 and check the "Advanced" section of the in-game video options before running any benchmarks. It is very likely that one or more of the Advanced Video Options will be changed to accommodate the new product.

Desktop Shortcut

Rather than launching Half-Life 2 through the Steam menus, create a desktop shortcut.

Right-click on Half-Life 2 in the "Play Games" menu and select "create desktop shortcut."

To see your Half-Life 2 command-line, right-click on your new shortcut and select "Properties".

Certain benchmarking options such as "nosound" and "dxlevel" are not easily accessible in any other way (aside from the command-line). See "Benchmarking from the Command-Line", later in this document, for details.
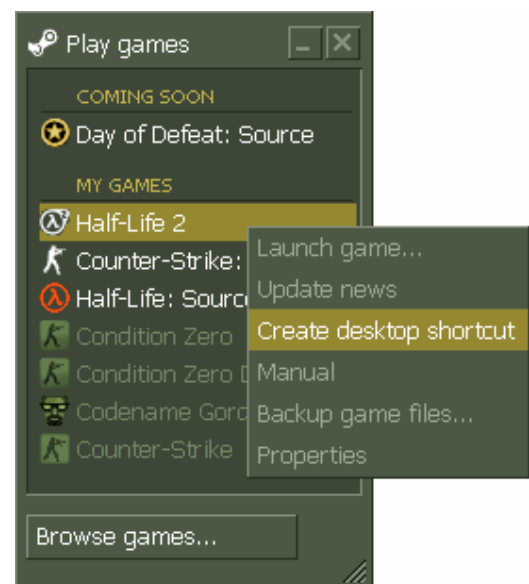
Benchmarking from the Console

Most of the commands required for benchmarking Half-Life 2 are available inside the game, from the console.

Here you can load maps, record timedemos, and play them back to measure performance.

Enabling the Console

To enable the console from inside Half-Life 2, use the menus:

Options → Keyboard → Advanced → Enable Developer Console.

The '~' key will open the console.

You can also enable the console with a command-line switch; see the command-line section of this document.

Console Commands for Half-Life 2

~	Opens the Console
bind *key command*	Attaches a command to a key. Useful for "record" and "stop" functions when creating timedemos. (e.g. **bind f1 "record mytimedemo"**)
cl_showfps 1	Turns on the on-screen framerate indicator.
map *map_name*	Loads the desired map (e.g. **map d1_canals_09**)
playdemo *demo_name*	Plays a demo at normal speed (i.e. not in "timedemo" mode)
record *demo_name*	Records a demo of all the user's actions within the game until the "stop" command is issues. Note that Half-Life 2 does not auto-increment the demo name as you record new demos. If you bind a key to the record function, be sure to re-issue the bind command with a new demo name before each use. Otherwise, Half-Life 2 will overwrite your existing demo. The ".dem" files appear in the "HL2/HL2" folder.
screenshot	Saves a screenshot in the Half-Life 2 folder. i.e. "C:\Valve\Steam\SteamApps\email@address.com\hl2\hl2\screenshots" Screenshots are saved in .tga format (texture files)
stop	Stops recording the current demo
timedemo *demo_name*	Plays the recorded demo as quickly as possible, and reports an average framerate in the console. Results are also logged to the *hl2\hl2\source.csv* file.
timedemoquit *demo_name*	Plays the recorded demo as quickly as possible and exits Half-Life 2 once complete. Results are logged to the *hl2\hl2\source.csv* file. This command is useful for automated testing.

Benchmarking from the Command-Line

There are some issues with running multiple Half-Life 2 tests back-to-back from a batch file.

A timedemoquit option is available (which exits Half-Life 2 once the timedemo is complete), but since it is Steam that launches HL2, and Steam does NOT exit at the end of the timedemo, you will find your batch sitting waiting for you to shut down Steam after each run.

You many find it more convenient to launch your tests manually from the console.

There are, however, some benchmark-related functions which are not easily accessible from inside the game. "Nosound" and "DXLevel" are examples. To gain access to these options, create a shortcut to Half-Life 2 (see "Desktop Shortcut" section, earlier in this document), and add the desired options at the end of the command-line in your shortcut.

You may also find it convenient to create several different shortcuts, one for each of your desired combinations of resolution, AA/AF and timedemo.

Command-Line Arguments for Half-Life 2

-console	allows access to the Half-Life 2 console while in the game (press ~)
-nosound	disables sound during the timedemo (note: some sounds are still played as the game launches)
-width *dimension*	sets the horizontal resolution
-height *dimension*	sets the vertical resolution (i.e. "-width 1024 -height 768")
+mat_antiaslias *AA_level*	sets the Mutli-Sample Anti-Aliasing mode (0, 2, 4, 6).
+mat_forceaniso *aniso_level*	sets the Anisotropic Filtering level (1 == none, 4, 8, 16)
+timedemo *demo_name*	Plays the recorded demo as quickly as possible, and will report your framerate. Results are also logged to the *hl2\hl2\source.csv* file.
+timedemoquit *demo_name*	Plays the recorded demo as quickly as possible and exits once complete. Results are logged to the *hl2\hl2\source.csv* file. This command is useful for automated testing.
-dxlevel *dx_level*	Forces your hardware to run a specific shader path (90, 81, 80), if it is capable. This is useful for apples-to-apples comparisons testing on products (such as the GeForce FX line) where DirectX® 9.0 is not the default shader path in Half-Life 2. i.e. "–dxlevel 90" forces DX 9.0 shaders, while "-dxlevel 81" runs 8.1
+r_fastzreject *on_off*	Enables (1) or disables (0) a depth fill pass that may improve performance in graphics-bound (high resolution, or AA + AF) situations. Currently, NVIDIA products default to ON, while ATI products are OFF (based solely upon ASIC-ID recognition).

Note

Be sure to specify *+mat_antialias 0* and *+mat_forceaniso 1* for any noAA noAF tests run from the command-line. If you don't specify a value for these options, Half-Life 2 will use the currently configured settings from the in-game control panel (and these might not be "disabled". See "Automatic Configuration", earlier in this document.

Sample Scores

Half-Life 2 is made up of a number of different environments, each with their own appearance and performance characteristics. We chose four demos from different parts of the game. They are identified below using the name of the Half-Life 2 map on which the timedemo was recorded.
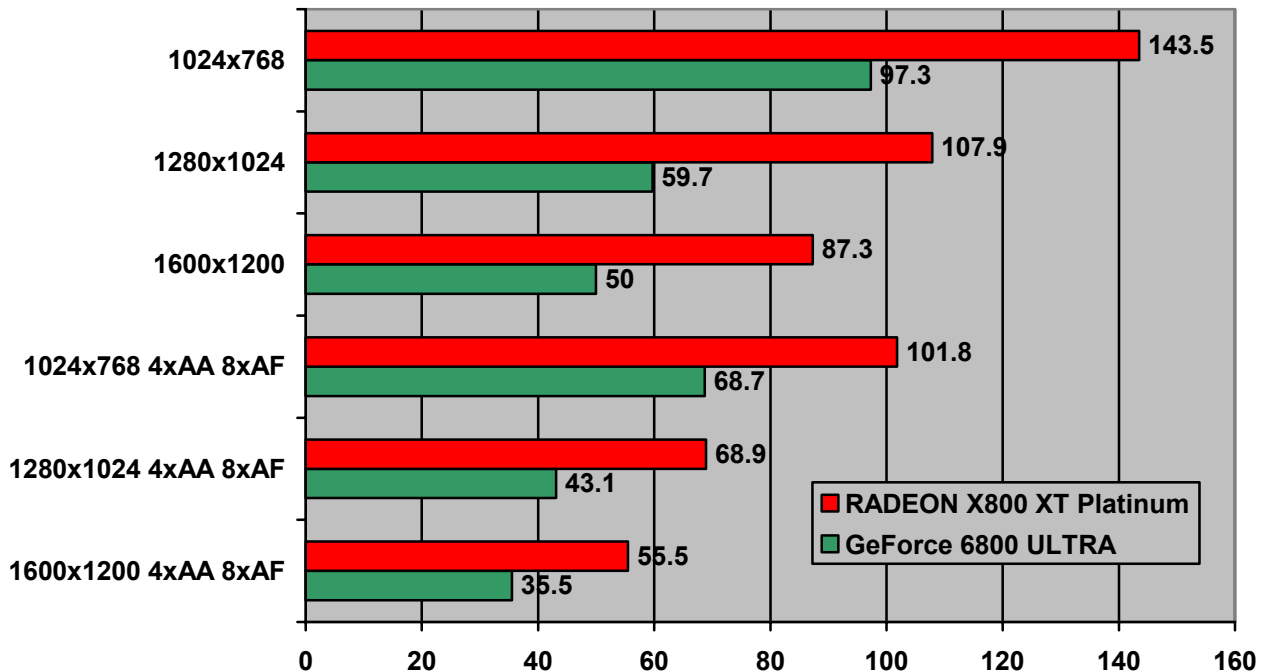
d1_Canals_09

The Canal maps make heavy use of reflection and refraction on the water surface.

The helicopter kicks up a spray that is alpha blended, and the sun flare is also blended into the scene.

Performance here is primarily limited by the water shader

RADEON X800 XT Platinum vs. GeForce 6800 ULTRA
d1_canals_09

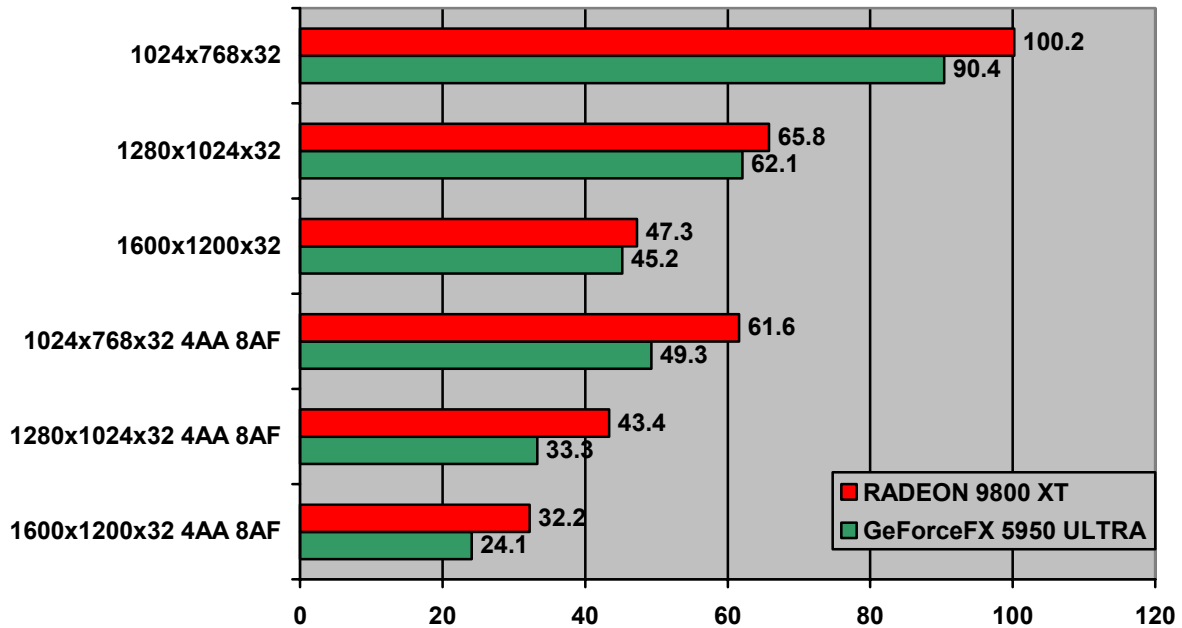| Resolution	RADEON X800 XT Platinum	GeForce 6800 ULTRA
1024x768	143.5	97.3
1280x1024	107.9	59.7
1600x1200	87.3	50
1024x768 4xAA 8xAF	101.8	68.7
1280x1024 4xAA 8xAF	68.9	43.1
1600x1200 4xAA 8xAF	55.5	35.5

d1_Town_01

The town section of the game is dark and spooky.

The flashlight is used here, adding considerably to the graphics complexity of the scene.

This demo also includes fire and explosions.

RADEON 9800 XT vs. GeForceFX 5950 ULTRA
d1_town_01

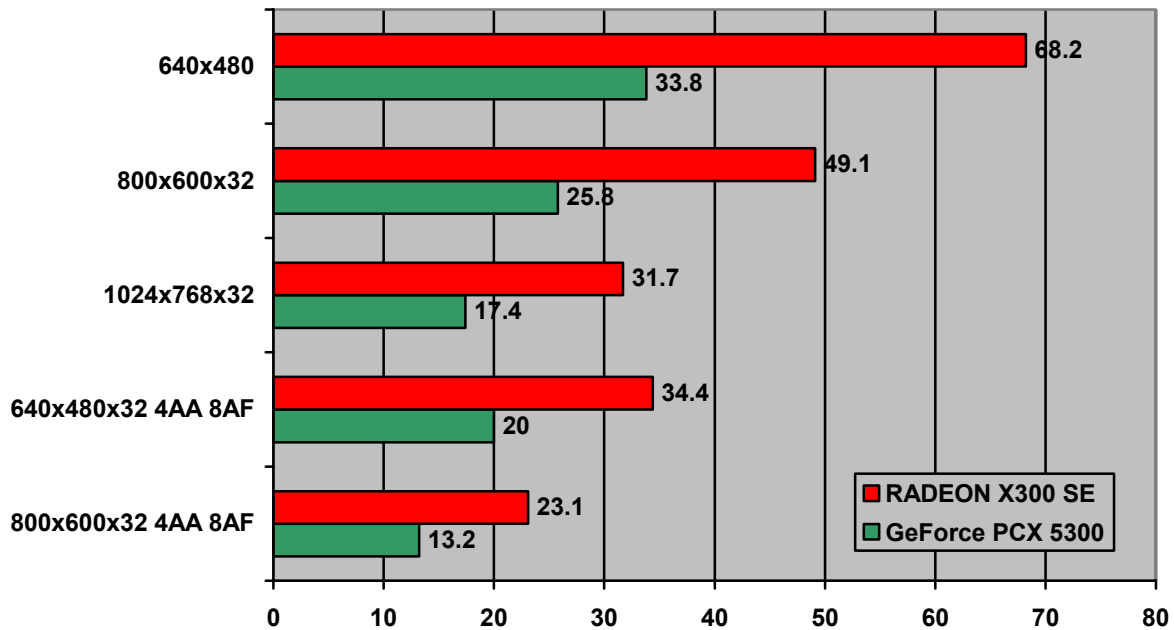| Resolution	RADEON 9800 XT	GeForceFX 5950 ULTRA
1024x768x32	100.2	90.4
1280x1024x32	65.8	62.1
1600x1200x32	47.3	45.2
1024x768x32 4AA 8AF	61.6	49.3
1280x1024x32 4AA 8AF	43.4	33.3
1600x1200x32 4AA 8AF	32.2	24.1

d1_Trainstation_02

The incredible detail of Half-Life 2 is apparent in this scene of a city square. The architecture is almost photo-realistic.

Watch the windows on the train station for a reflection effect.

This scene is somewhat CPU-bound on higher-end hardware, but may prove to be a useful test for lower-end cards.

RADEON X300 SE vs. GeForce PCX 5300
d1_trainstation_02

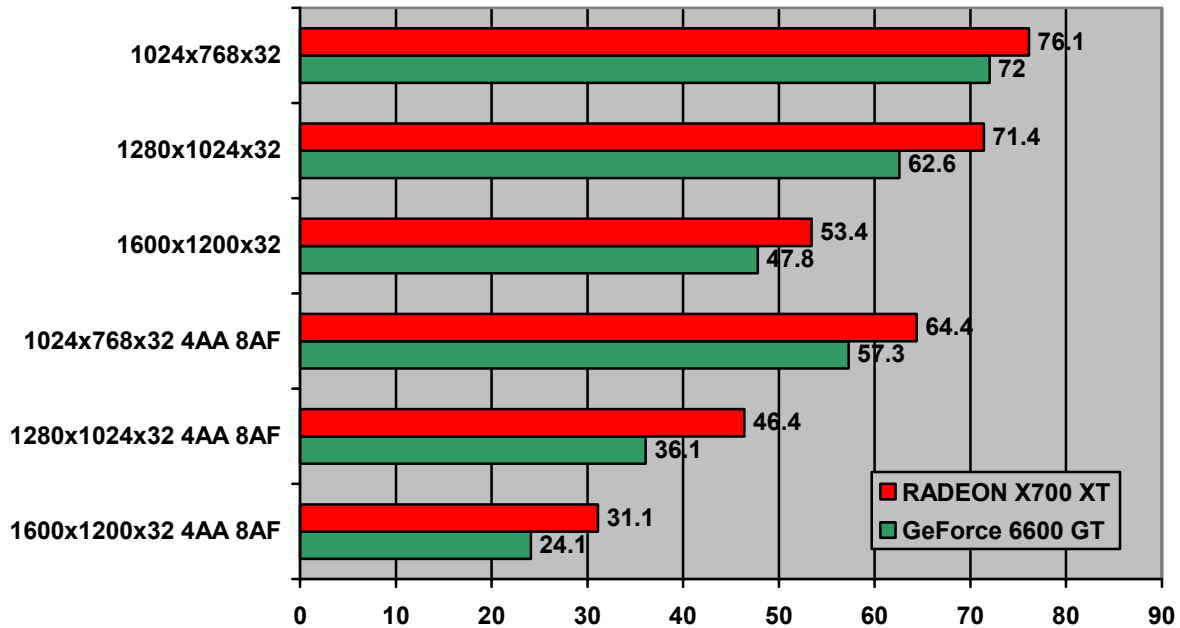| Resolution	RADEON X300 SE	GeForce PCX 5300
640x480	68.2	33.8
800x600x32	49.1	25.8
1024x768x32	31.7	17.4
640x480x32 4AA 8AF	34.4	20
800x600x32 4AA 8AF	23.1	13.2

d3_c17_12

This battle scene includes multiple combatants, fire, explosions, smoke and rocket trails.

Because of all the actors in the scene, this level tends to be CPU-bound on the fastest graphics adapters, but may be a useful test for mid-range and entry-level hardware.

RADEON X700 XT vs. GeForce 6600 GT
d3_c17_12

Resolution	RADEON X700 XT	GeForce 6600 GT
1024x768x32	76.1	72
1280x1024x32	71.4	62.6
1600x1200x32	53.4	47.8
1024x768x32 4AA 8AF	64.4	57.3
1280x1024x32 4AA 8AF	46.4	36.1
1600x1200x32 4AA 8AF	31.1	24.1

All scores in this document were measured using an AMD Athlon™ 64 FX-55 CPU and 1GB DDR400.
AGP products were tested on a VIA™ K8T800 Pro chipset.
PCI-E products were tested on an ATI RADEON® XPRESS 200P chipset
ATI driver is Catalyst 4.12 beta (8.08); NVIDIA driver is 66.93.