

Tech Tip 31 - Gaming Graphics Glossary

A recent Tech Tip (<http://www.geeks.com/pix/techtips-02JUN05.htm>) provided a look at items that may be on the wish list of some computer game players, and a solid graphics card is definitely at the top of such a list. Graphics cards, like so many other tech components, seem to require their own language to describe the functions and features they provide. This Tech Tip will take a look at a handful of terms related to graphics cards, and some more specifically related to graphics cards as used for video games.

1. Accelerated Graphics Port (AGP) – AGP is one type of interface for graphics cards whose days may be numbered, but presently is the most common type out there due to its years as the number one format. According to a previous Tech Tip (<http://www.geeks.com/pix/techtips-030305.htm>), AGP is “a dedicated, point-to-point interface that connects a video card directly to the system’s memory and processor.” Developed by Intel in 1996, AGP graphics cards (<http://www.geeks.com/products.asp?cat=VCD#AGP-256MB>) were the leaders for gaming graphics until the release of PCI Express.
2. Aliasing / Anti-Aliasing – This topic was covered in a previous Tech Tip (<http://www.geeks.com/pix/techtips-05MAY05.htm>) related to digital cameras, and the concept is the same as it applies to gaming graphics. Aliasing is basically described as the tendency for a curved or diagonal line to appear jagged since they are composed of tiny squares, or pixels. Anti-aliasing remedies this jagged appearance through software, making images appear more smooth and natural. Video games may provide varying levels of anti-aliasing, and generally with higher levels of anti-aliasing, the overall performance of the game will be lower since more processing power is being dedicated to smoothing each image. For this reason, many graphics card reviews will show the effect on the frame rate of a game when run with different levels of anti-aliasing applied.
3. Anisotropic Filtering – The definition of the word anisotropic from m-w.com states “exhibiting properties with different values when measured in different directions.” This is a common filtering technique applied to video games that helps improve the perspective of the image shown. Like anti-aliasing, various levels are available, and the higher the level of anisotropic filtering, the lower the overall performance of the game. Reviews may also focus on the effect of various levels of this filtering when presenting the frame rates achieved on a certain graphics card.
4. Application Programming Interface (API) – A set of standard instruction that allow for video game programmers to work more efficiently by not having to recreate routine operations that may be common across many games. Some examples of APIs include Direct3D and OpenGL.

5. Artifact – An artifact is any unintentional and undesirable element found in the image of a video game. Artifacts may include a flickering effect, pixels colored incorrectly, image ghosting (where a previous image is still visible in later screens), blurring, or gaps in the processing of images. Artifacts may be caused by overclocking the system (especially the graphics processor), unstable or incorrect drivers, component overheating, and other hardware or software errors.
6. Bump Mapping – Bump mapping is a means of applying textures to give the 2D image on screen a more rough (or bumpy) 3D appearance. Lighting effects are used to create light and dark areas to simulate the surface of items like walls, rocks, etc.
7. Direct3D – Direct3D is an API owned and developed by Microsoft for the creation of 3D games.
8. DirectX – DirectX is the term given to a collection of common APIs, including Direct3D, which are owned and developed by Microsoft.
9. Digital Video Interface (DVI) – DVI is an interface that allows for the transfer of a digital video signal from a computer to a display, which increases the image quality and performance over a comparable analog system. The white connection seen on the left-hand side of this graphics card's <http://www.geeks.com/details.asp?invtid=PCX-5300TM-128MTV&cat=VCD> back plate is a DVI connection. DVI is not only being used in computers, but as an interface for televisions to display high quality images from HDTV, DVD, and other digital sources. There are three levels to of DVI connectors: DVI-A (DVI Analog) - this is an analog ONLY DVI connector (you don't get the benefits of the digital signal - fortunately, you really don't see these anymore); DVI-D (DVI Digital) - this is a DVI connector that ONLY puts out a digital signal; DVI-I (DVI Digital OR Analog) - this is the most common connector. It can output a Digital signal or an Analog signal. When using a DVI connector with an analog monitor (either a DVI-A or DVI-I connector), you will usually need a DVI to VGA Adapter <http://www.geeks.com/details.asp?Invtid=DVI-M-HD15F>, sometimes this is provided by the video card manufacturer, but often times it is not. When most card manufacturers ads refer to their cards having a "DVI connector," they most often mean a DVI-I connector.
10. Frame Rate – The speed at which still images are generated on the screen in order to create the effect of full motion is referred to as the frame rate, which is measured in terms of frames per second (fps). While humans can generally only see 30 frames per second, many gaming benchmarks indicate that cards can provide performance far exceeding this value, and some may consider something around 60 fps the current minimum for acceptable performance. Adjusting many of the setting described in this Tech Tip will have an impact on the frame rate, and finding a balance of good performance and appearance in today's games may take some work on anything but the best graphics cards.
11. GDDR – GDDR is a type of DDR (double data rate) memory produced specifically for graphics applications. Most modern graphics cards use GDDR memory to handle the demands of graphics processing, as the specialized clock speeds, bandwidth, and power requirements are more appropriate than the generally less expensive 'standard' DDR format.

12. Graphics Processing Unit (GPU) – The GPU is the processor found on a graphics card, and is the main chip for handling the work required to create the image produced on a display.
13. OpenGL – OpenGL is an application programming interface that competes with Direct3D, and it is not owned by any one corporation. The “open” nature of this API appeals to those in favor of open source development and this type of development can lead to more frequent updates.
14. PCI Express (PCIe) – PCI Express is the latest interface for connecting a graphics card to a computer system, and it is the successor to AGP in terms of gaming graphics performance. A recent Tech Tip (<http://www.geeks.com/pix/techtips-031005.htm>) focused on PCIe and detailed the significant performance increases and flexible configurations available with PCI Express graphics cards ([http://www.geeks.com/products.asp?cat=VCD#PCIExpress\(PCIe\)](http://www.geeks.com/products.asp?cat=VCD#PCIExpress(PCIe))).
15. Random Access Memory Digital-to-Analog Converter (RAMDAC) – RAMDACs are chips found on graphics cards that convert the digital signal received from the graphics processing unit (GPU) to an analog signal to be sent to the monitor. Digital displays can receive the unconverted signal from graphics cards capable of digital video output (via the DVI connector), and therefore do not require the additional processing provided by the RAMDAC.
16. Resolution – The number of pixels displayed on the screen is referred to as the resolution, and the value is represented by the number of horizontal pixels times (x) the number of vertical pixels. Raising the resolution from 800x600 to 1600x1200, for example, will provide enhanced image quality but generally at the expense of lower frame rates.
17. Texture Mapping – Texture mapping uses bitmap images stored in memory to provide the surface appearance of an object rendered in 3D. The texture is wrapped around the frame of an object, and provides a fairly simple approach for providing a complex shape. The simplicity may save processing power and provide a reasonable representation of the desired texture, but it can also lead to a chunky appearance during motion.
18. Vertical Sync (VSync) – Vertical Synchronization is an option found in many games that allows the frame rate of the game to be matched to the refresh rate of the monitor. Generally, allowing VSync provides the greatest stability, but turning it off can allow for much higher frame rates. The downside of the greater speed is the potential for artifacts to develop.
19. Video Graphics Array (VGA) – VGA was originally a graphics standard developed by IBM that allowed for 640x480 resolution with 16 colors. This standard has obviously been advanced to provide the greater resolutions and colors we enjoy today, but all computers support at least VGA mode. The term VGA is now mainly used to describe the 15-pin analog connection found on many graphics cards for connecting a monitor. The blue connection seen on the right-hand side of this graphics card's (<http://www.geeks.com/details.asp?invtid=SE6200-N&cat=VCD>) back plate is a VGA connection.

20. Video In / Video Out (VIVO) – VIVO capable graphics cards can not only send a video signal out to a monitor, but they can also receive a video signal for use by the computer system. VIVO capable graphics cards, such as this one (<http://www.geeks.com/details.asp?invtid=RX60X128V&cpc=SCH&srn=0>), or the famous All-In-Wonder cards offered by ATI (<http://mirror.ati.com/products/radeonx800/aiwx800xt/index.html>) include a dedicated connection for sending/receiving a video signal, and generally include a separate chip for processing the incoming video signal, as well as special software for utilizing the signal. VIVO really has no bearing on game play, but many graphics cards well-suited for game play may include this multimedia connection.

Final Words

Twenty terms related to graphics, and more specifically gaming graphics, were covered in this Tech Tip, but it is by no means an exhaustive resource. There are too many specialized terms and technologies related to graphics to cover in a single Tech Tip, and the number continues to grow as the technology advances. The terms covered are some of the more common ones that may be encountered, and should provide a good reference for trying to understand graphics card (or video game) features and specifications.