WHY THE INDUSTRY NEEDS TECHNOLOGIES LIKE AMD FREESYNC

For quite some time the gaming hardware industry has been looking for ways to resolve the age-old problem of screen tearing caused by the confusion between the GPU and monitor. This primarily occurs on systems where the GPU (graphics processing unit) is capable of generating frame rates far greater than what the monitor is capable of. The original solution to this problem was the creation of VSync (vertical sync) which reduced the frame rate of the GPU to either 30 or 60 FPS in order to smooth out the frames and reduce the possibility of frames being generated out of sync from the monitor's refresh rate.

This screen tearing is seen as unsightly by most gamers and as a result many gamers find themselves unhappy with their gaming experience. Many of them find themselves dissatisfied without an apparent understanding of what is causing their choppy game play. Some even find tearing to be an issue even when they spend thousands of dollars on a new gaming PC even though they believe that they are supposed to have the best gaming setup available.

This problem did not have a solution on gaming desktop PCs simply because there was no way to perfectly sync the monitor with the GPU. The inability to sync the refreshing of the LCD's panel with the frames generated on the GPU has been the core of this issue since the very beginning of PC gaming. As mentioned before, VSync was a stopgap measure to attempt to resolve this issue, but it ultimately accomplished very little more than to limit the performance of PC gaming.

How AMD FreeSync Emerged

Over the course of the past few years, some technologies have been modified, voted on and ratified that ultimately help solve this problem. Some of those standards are proprietary and others are industry standards which creates some friction in the market as to which solution is the best. The industry standard solution is based off of VESA's own Adaptive-Sync protocols which were added to the DisplayPort cabling standard from eDP (embedded DisplayPort) which already had that capability.

Some members of the VESA (Video Electronics Standards Association) membership suggested that this Active-Sync protocol be added as part of the 1.2a standard. Seeing as this would require less validation and waiting time than the upcoming 1.3 standard, VESA members voted on it and approved the creation of DisplayPort 1.2a with Adaptive-Sync. Keep in mind that virtually the entire IT industry is already members of VESA, so almost anyone can implement this standard for free.[1]

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[1] VESA, *VESA® Adds 'Adaptive-Sync' to Popular DisplayPort™ Video Standard* 2013.

By bringing Adaptive-Sync to DisplayPort via an update to the cabling standard called DisplayPort 1.2a, VESA has enabled the GPU to directly communicate with the panel and to properly sync the frames generated with the refresh rate of the panel. This solution, however, requires the GPU manufacturer to have the appropriate display drivers and display controllers, which is purely dependent on the GPU's architecture.

How Does AMD FreeSync Work?

FreeSync is AMD's own implementation of the dynamic refresh that utilize VESA's Adaptive-Sync protocols used in conjunction with their GPUs and partner monitor scaler manufacturers. FreeSync has been under development for over a year now and is partially the company's response to the industry's renewed interest in smoother and more fluid gameplay.

FreeSync enables the gamer to enable the syncing of their AMD GPU with their monitor's panel in a way that creates smoother game play. This is done by refreshing the monitor at whatever intervals are necessary in order to refresh once a frame is generated. Every time the GPU generates the frame, the monitor is ready to refresh it. This creates the desired smoothness of gameplay without any sort of graphical tearing or stuttering.

The reason it is called FreeSync is because AMD touts this technology as a virtually free feature for both the consumer and the monitor manufacturers. It accomplishes this by utilizing the VESA standards of which all of these companies are already members. Hence, the name FreeSync was coined to illustrate that such a feature can be implemented for little to no additional cost to anyone.

In addition to gaming, FreeSync also can offer improved media playback by actually playing back the content from a film at the frame rate it was shot/rendered at. As such, it is possible that some power savings could be found by simply running a monitor at 24 Hz rather than 30 Hz. It should also visually appear smoother to film buffs and anyone capable of discerning the difference between 24 and 30 FPS films.

AMD's FreeSync does not work on all AMD GPUs, and is currently supported on certain GPUs with the appropriate display controller IP physically built into the GPU's silicon. The AMD Radeon R9 295X2, R9 290X, R9 290, R9 285, R7 260X and R7 260 GPUs along with all current generation APUs care capable of supporting the dynamic refresh rates of FreeSync.

It does, however, support multi-GPU configurations (CrossFire) as well as UHD resolutions of up to 3840 x 2160. FreeSync could also theoretically be enabled on TVs that utilize DisplayPort 1.2a and have the appropriate scalers that support Adaptive-Sync already built into them. As such, there is even a possibility that gamers could buy FreeSync-enabled UHD TVs, even though those seem far less likely than UHD gaming monitors with FreeSync.

FreeSync Brings Affordable Dynamic Refresh Rates to the People

Although FreeSync is undoubtedly still tied to AMD's own GPUs, which fundamentally prevents other GPU vendors from implementing it, it is still the first real attempt to democratize the technology. Previous attempts utilized proprietary scaler and GPU technologies and drove up BOM costs for monitor manufacturers which ultimately resulted in more expensive monitors which were still locked into a proprietary GPU platform.

By bringing dynamic refresh through Adaptive-Sync, FreeSync finally allows for display manufacturers to affordably implement the technology into their products and to integrate them affordably into the everyday lives of gamers. Currently, there are already displays utilizing AMD's FreeSync already on sale and big name manufacturers like Samsung have already committed to building FreeSync into their higher end monitors which include UHD monitors.

There will be a large crop of FreeSync monitors coming to market starting in early 2015, coming from all of the major monitor manufacturers. At this year's CES, AMD announced that the FreeSync ecosystem expanded to BenQ, LG Electronics, Nixeus, Samsung, and Viewsonic. However, due to the fact that most of the scalers that can enable FreeSync are still of the higher end variety, it is unlikely that we will see more mainstream monitors with FreeSync capabilities until later in the year or in 2016.

FreeSync Improves Gaming for Some But not all

FreeSync acknowledges and affordably solves one of the biggest problems that has plagued the gaming industry almost since its inception. Game developers have welcomed dynamic refresh technologies with open arms and are excited to finally see their games played in the way that they had envisioned them.

While it is apparent that not everyone will be able to utilize FreeSync due to the nature of being only compatible with AMD GPUs, AMD's progress with industry standards will likely reap benefits for owners of other graphics hardware down the line as well. With FreeSync AMD has illustrated that leveraging an industry standard takes longer to accomplish, but is more affordable and therefore attractive to virtually everyone.

FreeSync has its own detractors, but the reality is that the technology will ultimately move the industry forward in a direction that everyone agrees has been a long time coming. VESA's Adaptive-Sync which enables FreeSync will very likely see broader implementation in the future thanks to FreeSync and will promote more affordable and quality gaming for all.

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