The wysiwyg and Vivien Hardware Guide

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Welcome to the wysiwyg and Vivien Hardware Guide! This guide describes the principles of selecting hardware components for a workstation and is meant to be a *guideline* for choosing the right hardware for *your intended use* of the software; as such, actual hardware models are not specified for most components. However, after going over the information below, you will be able to make informed decisions about your hardware requirements. Once you've done so, if you wish to confirm the components you selected, our Technical Support Department will be happy to look over your list; please see the end of this article for information on how to get in touch with us.

General Considerations

Before discussing the various components and the criteria for selecting them, there are four important things to note. *It strongly recommended that you read all this information (and follow the advice) before you consider purchasing new hardware.*

1. Geometry must always be properly optimized, in all files, regardless of their complexity. Even the best/fastest/most expensive hardware will not be able to properly-handle a file that is not optimized and therefore contains inefficient geometry. If you haven't done so already, please read through this thread on our Forum, in order to learn how to optimize your files. The key to understanding the optimization principles described here lies with the articles mentioned in the first paragraph of the first message, "Part 1" and "Part 2"; please ensure that you also click those links and read the information they reveal.

2. Even in an optimized file performance can be poor if your video card driver is out-of-date and/or your video card's settings and/or Shaded View options are inappropriate. This thread on our Forum provides information about how to ensure that your driver is up-to-date, while the Improving Performance in Shaded View article provides information about video card settings and Shaded View options.

3. A "good" video card, by itself, or a "good" processor (again, by itself) is not enough to make a "good" workstation. Instead, hardware selection should consist of components that work well together. For example, while it is likely possible to upgrade a three-year-old system with a latest-generation video card, the performance improvements will not be as significant as using that same video card in a modern system.

4. Hardware selection should be based on (a) the geometric complexity of the shows that you typically design in wysiwyg or Vivien, (b) the number and type of fixtures, and (c) your intended use of the software. In essence:

- The more complex/detailed the geometry, the more processing power it will require, so if you are constantly working with/importing "large" 3D models created in other software, a higher-end processor is recommended.

- The larger the number of fixtures in your file, the more processing and graphics power you will require, so if you constantly work on "(very) large" shows and/or use a lot of LED fixtures (which demand a higher number of resources than others) you will require a high-end processor and video card.
- If you are mainly concerned with visualization and/or pre-cueing, investing into a workstation-class CPU is not necessary—and if you considered this for your budget, the money would be better-spent on a higher-end video card. Even if you plan to render a lot (unlikely as that is these days) a workstation-class CPU is not necessary for wysiwyg work; please see more information about this in the next section.

Components

If after you've optimized your files and adjusted your settings as suggested performance is still poor, you may indeed wish to consider upgrading some of your hardware – or perhaps purchasing a new system altogether. To that end, please find below an analysis of how to look at the various components (and what to consider in each).

Processor (CPU)

The processor defines the overall speed at which the computer, and the software running on it, operates. More specifically for wysiwyg and Vivien, it plays the key role in how quickly files open, import or merge, how quickly complex/advanced operations such as Booleans or Mesh Consolidation process, and how quickly renderings will complete. If you plan to create *many* high-resolution renderings for *every file* you create, given the fact that renderings are processed solely by the processor (the video card/GPU has nothing to do with rendering) a workstation-class CPU from Intel's XEON line or AMD's Opteron lines *may* be worth the investment, but truly, an "extreme edition" desktop-class CPU is all you should need. (Workstation-class processors' much higher cost, along with the higher cost of the specialized hardware they require (specialized motherboard, registered/buffered RAM, possibly non-standard power supply, etc.) does not justify the somewhat shorter render processing times, and they offer no real advantage in any other areas of the software.)

No wysiwyg or Vivien workstation should be based around a CPU older than current-generation Intel Core or AMD Ryzen Zen+ processors. More specifically, the following should be considered, depending on individual requirements:

- Intel Core i5 "Coffee Lake" (8th/9th generation) or AMD Ryzen 5 "Pinnacle Ridge" CPUs will work well for most Vivien workstations and in wysiwyg workstations that are used mainly for drafting and paperwork, with minimal pre-visualization expected.

- Intel Core i7 "Coffee Lake" (8th/9th generation) or AMD Ryzen 7 "Pinnacle Ridge" processors should be considered for Vivien workstations typically used to design large events (of 500+ attendees), especially if finer details such as custom furniture & decor pieces, and place settings need to be incorporated. These are the processors around which most wysiwyg workstations should be built.
- Intel Core i9 "Skylake-X" or "Coffee Lake-S" or AMD Ryzen Threadripper "Pinnacle Ridge" CPUs will offer little advantage to Vivien, but should be strongly considered for any wysiwyg workstation where over four hundred fixtures need to be previsualized and/or virtual reality (VR) visualization is required.

Both wysiwyg and Vivien are multi-threaded—they can use multiple CPU cores, and therefore (concurrent) tasks process faster—so they will take advantage of multiple/hyperthreaded processor cores. However, not all functions are multi-threaded, because in many cases the overhead required by multithreading (such as the need to keep threads synchronized) results in lower performance; therefore, *a processor's speed, not its core count, should be the primary consideration when selecting the model*. The amount of cache on a CPU should play no role in deciding which to opt for, since cache is managed by the operating system, and therefore it is not something you need to "worry about".

Memory (RAM)

The most important thing to remember when choosing the amount of memory for your new system is that since wysiwyg and Vivien are currently a 32bit applications, the maximum amount of memory they can use is 4GB. This is the bare minimum amount you should opt for, with 8GB or 16GB being ideal: less than 4GB will result in a poorly-performing system overall, but there is no real need to go beyond 8GB for the time being because the software would never make use of it.[i] (In such a configuration, even if a .wyg or .vvn file is large enough to require the full 4GB of RAM the application can access, there would still be at least 4GB left for the operating system—which is sufficient.) All that said, most modern computers are equipped with at least 16GB of RAM, so if your budget allows this is recommended, especially considering that soon both Vivien and wysiwyg will be ported to 64bit.

The new system's memory configuration will be dictated by the memory architecture of the processor you select, which may be *dual-channel* (for Intel Core i5/i7/i9 "Coffee Lake-S" and AMD Ryzen+ 5/7 CPUs) or *quad-channel* (for Intel Core i9 "Skylake-X" or AMD Ryzen+ Threadripper processors). Considering that memory modules only come in sizes of 1GB, 2GB, 4GB, 8GB and 16GB, the following configurations are possible:

- For *dual-channel memory* (where modules are installed in multiples of two): 2GB (with two 1GB modules), 4GB (with two 2GB modules), 8GB (with two 4GB modules), and so on, always doubling a single module's size.
- For *quad-channel memory* (where modules are installed in multiples of four): 4GB (with four 1GB modules), 8GB (with four 2GB modules), 16GB (with four 4GB modules), and so on, always quadrupling a single module's size.

Please keep in mind that installing memory in configurations other than the ones above is physically possible (for example, you can insert one 2GB module and two 4GB modules in a dual-channel motherboard for a total of 10GB of RAM); this, however, will cause the memory to operate in single-channel mode, which will result in poor (overall) performance—and you would actually be better off reducing the amount of RAM to 8GB by eliminating the 2GB module. All in all, please ensure that you always install RAM modules as described in your motherboard's manual, and *do not* use single-channel configuration.

All processors mentioned above require DDR4 memory modules, so that is your only choice. Naturally, you will have to select memory modules that match the memory architecture and speed supported by the CPU and motherboard; please consult these components' user manuals and/or specifications in order to find this information. Consulting your motherboard's "Qualified RAM Vendor List" is also highly recommended, as the listed RAM modules have been tested by the manufacturer and are therefore known to be fully-compatible with the motherboard.

It is strongly recommended that a *memory kit* is purchased instead of individual memory modules, since modules within a kit ensure (near-)perfect compatibility with each other as a result of being manufactured in sequence—something that's nearly impossible to achieve with individually-purchased modules, but important to the computer's overall speed. Finally, a higher-speed kit with potentially-higher timings/lower latency is recommended over a lower-speed one with potentially-lower timings/higher latency.

Video Card (GPU)

The speed of wysiwyg's Shaded Views and Vivien's Virtual Views depends entirely on the video card or Graphics Processing Unit (GPU), which *must* be of the *gaming-grade variety*. *Do not consider workstation-grade video cards* for your new machine: such cards will *not* provide the performance you might expect (despite their much higher price tag) and *they are not supported*.[ii]

While both wysiwyg and Vivien can utilize the latest integrated GPUs (iGPU) (i.e. Intel's "HD Graphics" and "UHD Graphics" or AMD's "HD" GPUs, which are built into some of the

processors mentioned above) it *is strongly recommended* that a dedicated video card (GPU) is installed. This is due to the fact that iGPUs lack most features required by Shaded/Virtual Views, and this affects not only the quality of Shaded Views (for example, Volumetric beams are simply not available with integrated GPUs) but, even more so, performance.

For most wysiwyg workstations, as well as for Vivien workstations used to design large events, the only GPUs that will work well are nVIDIA's GeForce GT*X* 10 or16 or RTX 20 series, or AMD's Radeon RX 400 or RX Vega series. For most Vivien workstations, as well as for wysiwyg workstations where very little or no visualization will be performed, nVIDIA's GeForce GT GPUs or AMD's Radeon R7 GPUs are fine. That said, purchasing a higher-end card is a good idea, as it will provide a better experience overall (i.e. higher performance), and will also better "future-proof" the new system.

Modern video cards come with enough video memory that it is highly unlikely to "run out". In most cases however, the difference in price between a model with more memory is not great, so opting for this is also a good idea—for the same reasons as above.

Using multiple video cards in one system via nVIDIA's "SLI" or AMD's "CrossFireX" technologies is supported by wysiwyg, but benchmarking has showed only a 15-20% performance gain when using two cards of the same type in one system (versus using only one such card). Therefore, the expense of the extra card and specialized motherboard (one featuring enough PCIe lanes to allow each card to run at 16x speed—required in order for SLI/CrossFireX to truly make a difference, more on this below) may not necessarily make sense. Therefore, the best advice here is to purchase one card to begin with, and then add a second card (of the same type) if an actual need for it arises; yes, this would require the purchase of the more advanced motherboard to begin with, but such motherboards usually feature additional advantages (higher-end components, better layout, additional overclocking options, etc.) so they, too, may be worth the higher cost.

When choosing which actual video card to purchase, remember that you always get the same GPU: only the card itself, and its cooling solution, is made by different manufacturers. As such, if you purchase a "reference design" card (i.e. one that is not overclocked) there will be no difference in performance between, for example, a card made by ASUS and one made by EVGA. However, most manufacturers produce "overclocked" video cards which perform faster than "reference design" cards; the "higher numbers are better" rule applies here, so when comparing various cards' specifications, higher clock speeds mean better performance. This is the obvious advantage of purchasing a factory-overclocked card; the other is that the factory overclock is covered

by warranty, whereas warranty would not cover a card that you attempt to overclock yourself and happen to break as a result. Finally, speaking of warranty, some manufacturers offer longer periods than others, so that may be something worth considering.

Recommendations for nVIDIA GPUs

- Any of nVIDIA's current-generation GeForce 20 series, GeForce 16 series and previous-generation GeForce 10 (GTX) video cards work very well, although models lower than xx60 Ti should only be considered for "budget" systems, since they will deliver poor performance with large show files.
- At the time of this writing CAST Software has not yet tested any GeForce 20 or 16 video cards, so we cannot say how much better they perform compared to GeForce 10 series cards. (Based on their specs though, they should perform at least the same as the 10 series, but likely better.)
- The very high-end "Titan" and "Volta" cards should only be considered for VR, or in "extreme" cases, where even highly-optimized show files (containing many hundreds of fixtures, complex sets, moving scenery, large amounts of video streams, etc.) fail to perform acceptably. Note, however, that none of these cards have been tested by CAST Software.
- For VR visualization, aside from the aforementioned Titan and Volta cards, the only options worth considering are the GTX 1080, GTX 1080 Ti, RTX 2080 or RTX 2080 Ti.

Recommendation for AMD GPUs

- Any of AMD's current-generation RX Vega series and previous-generation RX 400 series video cards will work well, although models below the RX 460 should only be considered for "budget" systems, since they will deliver poor performance with large show files.
- For VR visualization, the only GPU worth considering is the RX Vega 64.

Motherboard

Should you opt to purchase a factory-built computer (i.e. one manufactured by Dell, HP, Lenovo, etc.) instead of building your own or having a local or online computer shop build it for you, you will not have a choice when it comes to the motherboard and features it offers. (A custom build is recommended – in order to have complete control over its hardware.)

While specific motherboard recommendations are beyond the scope of this article, here are some things to keep in mind when selecting your motherboard:

- Ensure that its chipset is compatible with the processor you've selected. (For example, Intel's "Coffee Lake" processors can operate on any of six chipsets, each with its own set of features, advantages and disadvantages, which may or may not play a part in your decision.)
- It should feature the necessary amount of PCI Express (PCIe) slots to accommodate the expansion cards (video card(s), video capture card(s), etc.) that you will need to connect to the system. Consider any potential future expansion as well, including the possibility of adding a second video card: while swapping the motherboard later is an option, this is a task best-avoided.
- Ensure that it features *the number of PCIe Lanes you require, regardless of the PCIe slots' physical size*. Many motherboards feature, for example, x4-size (or even x8-size) PCIe slots which are only wired for x1 operation; in such cases, even though an expansion card that requires x4 signalling will fit (physically) into the PCIe slot, that card will not work. Carefully check the motherboard's technical specification or manual for this information.
- This should not be a problem, but ensure that it features the enough USB 3.0/3.1 and SATA 3.0 connections to meet your peripheral & drive connectivity requirements.

Drives

Solid State Drives (SSDs), regardless of form factor (2.5", mSATA, M.2 or PCI-E) have become commonplace, and no modern computer should feature anything else for its system drive. An SSD will not make much difference to wysiwyg's speed (except when loading large files and when the library needs to be (re-)indexed) but will deliver a faster overall operating speed when compared to using a traditional hard drive (HDD) as the system drive. HDDs may be used as secondary/storage drives though.

Power Supply (PSU)

A factory- or shop-built computer will come with the correct power supply, but if you build your own system, you will have to choose it yourself. Consider the following when selecting this very important piece of hardware:

- Use an online tool such as Extreme Power Supply Calculator Lite to calculate your power requirements and therefore determine the wattage you should select. When using such tools, if you foresee the addition of a video card or other expansions in the future, add them to the initial calculation in order to factor them into the initial PSU purchase. (The PSU is a component which, like a motherboard, is time-consuming to swap out once the computer is built.)

- The PSU should provide enough power to supply the system under heavy load, but not much more. For example, if, based on your input, the power calculator determines that your system requires a 750W PSU, there is no reason to choose a 1000W unit.
- It should feature the necessary number, and correct type, of connectors required by the motherboard, video card and all other hardware that depends on power being supplied directly by the PSU. Note that all video cards mentioned above require at least one 6- or 8-pin power connection, while the higher-end cards require two.
- "Fully-modular" PSUs are somewhat of a gimmick because power connectors such as the ones which plug into the motherboard are ALWAYS required, and hence, modularity is irrelevant. "Semi-modular" PSU are not a bad idea though, as less cables and connectors mean less clutter within the case, ensuring better airflow.
- While 80 PLUS certification is not irrelevant, it need not be the primary concern when selecting the PSU.
- Ultimately, your PSU selection should be based on reviews, manufacturer's reputation and price (in this order); it is worth noting that when it comes to PSUs, "more expensive" almost never means "better". Consider your selection carefully: *potential damage to expensive components caused by a "cheap" PSU is simply not worth the risk*.

Cooling

The cooling solution that is bundled with most CPUs these days is typically adequate for normal operation (and neither wysiwyg nor Vivien can task the CPU beyond its specification). However, if you plan to overclock or if you simply desire a quieter machine, you will require an after-market CPU cooler, which can be of either the air or the liquid variety. Closed-loop liquid coolers are recommended for a quieter solution (note that these still use fans to cool the liquid!) but are only really required when overclocking. Many manufacturers offer a very wide selection of both; once again, consider basing your selection on reviews first and price second.

Keeping all of your hardware cool is very important for maintaining its lifespan, so ensure that your case can accommodate enough fans for your needs and that all cables are neatly tucked away so as not to impede airflow. *If you are not familiar with case cooling concepts, reading articles such as this or others found by a simple Google search is highly recommended.*

Operating System

wysiwyg and Vivien are supported on all of Microsoft's current operating systems (Windows 7, Windows 8.1 and Windows 10) but the 64bit versions of Windows are recommended due to their ability to access more memory. (32bit versions are limited to about 2.75GB of usable memory, which is very little by today's standards.) Despite being

32bit applications, both wysiwyg and Vivien are fully-compliant with 64bit operating systems, and do run better on these. Please note wysiwyg R43 and Vivien 2020 will only be available in 64bit "format", so there is no reason whatsoever to consider running 32bit Windows.

Confirming Your Hardware Selection

Now that you have read and understood the information above, should you have specific questions regarding components that you are considering, or if you have a new computer in mind, please send us the specification/components list, and we will be glad to discuss all this with you. In addition to the specs, please provide information about your intended use of wysiwyg and/or Vivien: rendering or live simulation, number and type of fixtures you typically use in a show, and complexity of stage setup and/or sets (in terms of 3D geometry). We look forward to hearing from you!

Additional Information

[i] Consider even more memory.

If you plan to use the computer for 64bit applications other than wysiwyg or Vivien, which are built with a 64bit code base (i.e. Adobe Creative Suite, AutoCAD and/or other 3D modelling/animation packages) which can, therefore, take advantage of more memory, you may wish to consider a higher amount of RAM.

[ii] This is why a workstation-grade video card is inappropriate for wysiwyg and Vivien.

The technologies that wysiwyg and Vivien employ in Shaded/Virtual Views are similar in many ways to those used in video games, and that is why they work best on gaming-grade video cards. Workstation-grade cards are designed to provide "pixel-perfect" simulation, so they must ensure that every pixel they render to the screen is the exact colour, shade, etc. that it is supposed to be. As always when it comes to quality versus performance, this is achieved by sacrificing frame rates (performance) in order to ensure accuracy (quality). Gaming cards on the other hand, do not analyze their output in such ways, and can therefore provide much higher frame rates: the less time spent on analysis the faster frames can be processed. In wysiwyg especially, since the Shaded View must be able to simulate and animate large and very large amounts of beams from multiple fixture types in real time while processing large amounts of incoming DMX data, this can simply not be achieved with "slower" workstation cards (note the intentional quotes).

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